Hyperparameter-tuning Cookbook

A guide for scikit-learn, PyTorch, river, and spotPython

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Preface

The goal of hyperparameter tuning (or hyperparameter optimization) is to optimize the hyperparameters to improve the performance of the machine or deep learning model.

spotPython ("Sequential Parameter Optimization Toolbox in Python") is the Python version of the well-known hyperparameter tuner SPOT, which has been developed in the R programming environment for statistical analysis for over a decade. The related open-access book is available here: Hyperparameter Tuning for Machine and Deep Learning with R—A Practical Guide.

scikit-learn is a Python module for machine learning built on top of SciPy and is distributed under the 3-Clause BSD license. The project was started in 2007 by David Cournapeau as a Google Summer of Code project, and since then many volunteers have contributed.

PyTorch is an optimized tensor library for deep learning using GPUs and CPUs.

River is a Python library for online machine learning. It is designed to be used in real-world environments, where not all data is available at once, but streaming in.

> ! Important: This book is still under development.

Citation

If this document has been useful to you and you wish to cite it in a scientific publication, please refer to the following paper, which can be found on arXiv: https://arxiv.org/abs/2305.11930.

```
@ARTICLE{bart23earxiv,
       author = {{Bartz-Beielstein}, Thomas},
        title = "{PyTorch Hyperparameter Tuning -- A Tutorial for spotPython}",
      journal = {arXiv e-prints},
     keywords = {Computer Science - Machine Learning, Computer Science - Artificial Intell
         year = 2023,
        month = may,
          eid = {arXiv:2305.11930},
```

```
        pages = {arXiv:2305.11930},
          doi = {10.48550/arXiv.2305.11930},
archivePrefix = {arXiv},
       eprint = {2305.11930},
 primaryClass = {cs.LG},
       adsurl = {https://ui.adsabs.harvard.edu/abs/2023arXiv230511930B},
      adsnote = {Provided by the SAO/NASA Astrophysics Data System}
}
```

1 Introduction: Hyperparameter Tuning

Hyperparameter tuning is an important, but often difficult and computationally intensive task. Changing the architecture of a neural network or the learning rate of an optimizer can have a significant impact on the performance.

The goal of hyperparameter tuning is to optimize the hyperparameters in a way that improves the performance of the machine learning or deep learning model. The simplest, but also most computationally expensive, approach uses manual search (or trial-and-error (Meignan et al. 2015)). Commonly encountered is simple random search, i.e., random and repeated selection of hyperparameters for evaluation, and lattice search ("grid search"). In addition, methods that perform directed search and other model-free algorithms, i.e., algorithms that do not explicitly rely on a model, e.g., evolution strategies (Bartz-Beielstein et al. 2014) or pattern search (Lewis, Torczon, and Trosset 2000) play an important role. Also, "hyperband", i.e., a multi-armed bandit strategy that dynamically allocates resources to a set of random configurations and uses successive bisections to stop configurations with poor performance (Li et al. 2016), is very common in hyperparameter tuning. The most sophisticated and efficient approaches are the Bayesian optimization and surrogate model based optimization methods, which are based on the optimization of cost functions determined by simulations or experiments.

We consider below a surrogate model based optimization-based hyperparameter tuning approach based on the Python version of the SPOT ("Sequential Parameter Optimization Toolbox") (Bartz-Beielstein, Lasarczyk, and Preuss 2005), which is suitable for situations where only limited resources are available. This may be due to limited availability and cost of hardware, or due to the fact that confidential data may only be processed locally, e.g., due to legal requirements. Furthermore, in our approach, the understanding of algorithms is seen as a key tool for enabling transparency and explainability. This can be enabled, for example, by quantifying the contribution of machine learning and deep learning components (nodes, layers, split decisions, activation functions, etc.). Understanding the importance of hyperparameters and the interactions between multiple hyperparameters plays a major role in the interpretability and explainability of machine learning models. SPOT provides statistical tools for understanding hyperparameters and their interactions. Last but not least, it should be noted that the SPOT software code is available in the open source `spotPython` package on github[1], allowing replicability of the results. This tutorial descries the Python variant of SPOT, which is called

[1] https://github.com/sequential-parameter-optimization

`spotPython`. The R implementation is described in Bartz et al. (2022). SPOT is an established open source software that has been maintained for more than 15 years (Bartz-Beielstein, Lasarczyk, and Preuss 2005) (Bartz et al. 2022).

This tutorial is structured as follows. The concept of the hyperparameter tuning software `spotPython` is described in Section 1.1. Chapter 20 describes the execution of the example from the tutorial "Hyperparameter Tuning with Ray Tune" (PyTorch 2023a). The integration of `spotPython` into the `PyTorch` training workflow is described in detail in the following sections. **?@sec-setup** describes the setup of the tuners. **?@sec-data-loading** describes the data loading. Section 25.4 describes the model to be tuned. The search space is introduced in **?@sec-search-space**. Optimizers are presented in **?@sec-optimizers**. How to split the data in train, validation, and test sets is described in **?@sec-data-splitting**. The selection of the loss function and metrics is described in **?@sec-loss-functions**. **?@sec-prepare-spot-call** describes the preparation of the `spotPython` call. The objective function is described in **?@sec-the-objective-function**. How to use results from previous runs and default hyperparameter configurations is described in Section 20.11. Starting the tuner is shown in **?@sec-call-the-hyperparameter-tuner**. TensorBoard can be used to visualize the results as shown in Chapter 19. Results are discussed and explained in **?@sec-results** Finally, Section 20.15 presents a summary and an outlook.

> **Note**
>
> The corresponding `.ipynb` notebook (Bartz-Beielstein 2023) is updated regularly and reflects updates and changes in the `spotPython` package. It can be downloaded from https://github.com/sequential-parameter-optimization/spotPython/blob/main/notebooks/14_spot_ray_hpt_torch_cifar10.ipynb.

1.1 The Hyperparameter Tuning Software SPOT

Surrogate model based optimization methods are common approaches in simulation and optimization. SPOT was developed because there is a great need for sound statistical analysis of simulation and optimization algorithms. SPOT includes methods for tuning based on classical regression and analysis of variance techniques. It presents tree-based models such as classification and regression trees and random forests as well as Bayesian optimization (Gaussian process models, also known as Kriging). Combinations of different meta-modeling approaches are possible. SPOT comes with a sophisticated surrogate model based optimization method, that can handle discrete and continuous inputs. Furthermore, any model implemented in `scikit-learn` can be used out-of-the-box as a surrogate in `spotPython`.

SPOT implements key techniques such as exploratory fitness landscape analysis and sensitivity analysis. It can be used to understand the performance of various algorithms, while simultaneously giving insights into their algorithmic behavior. In addition, SPOT can be used as an optimizer and for automatic and interactive tuning. Details on SPOT and its use in practice are given by Bartz et al. (2022).

A typical hyperparameter tuning process with `spotPython` consists of the following steps:

1. Loading the data (training and test datasets), see **?@sec-data-loading**.
2. Specification of the preprocessing model, see **?@sec-specification-of-preprocessing-model**. This model is called `prep_model` ("preparation" or pre-processing). The information required for the hyperparameter tuning is stored in the dictionary `fun_control`. Thus, the information needed for the execution of the hyperparameter tuning is available in a readable form.
3. Selection of the machine learning or deep learning model to be tuned, see Section 20.4.2. This is called the `core_model`. Once the `core_model` is defined, then the associated hyperparameters are stored in the `fun_control` dictionary. First, the hyperparameters of the `core_model` are initialized with the default values of the `core_model`. As default values we use the default values contained in the `spotPython` package for the algorithms of the `torch` package.
4. Modification of the default values for the hyperparameters used in `core_model`, see Section 20.5.3.1. This step is optional.
    1. numeric parameters are modified by changing the bounds.
    2. categorical parameters are modified by changing the categories ("levels").
5. Selection of target function (loss function) for the optimizer, see **?@sec-loss-functions**.
6. Calling SPOT with the corresponding parameters, see **?@sec-call-the-hyperparameter-tuner**. The results are stored in a dictionary and are available for further analysis.
7. Presentation, visualization and interpretation of the results, see **?@sec-results**.

1.2 Spot as an Optimizer

The `spot` loop consists of the following steps:

1. Init: Build initial design X
2. Evaluate initial design on real objective f: $y = f(X)$
3. Build surrogate: $S = S(X, y)$
4. Optimize on surrogate: $X_0 = \text{optimize}(S)$
5. Evaluate on real objective: $y_0 = f(X_0)$
6. Impute (Infill) new points: $X = X \cup X_0$, $y = y \cup y_0$.
7. Got 3.

Central Idea: Evaluation of the surrogate model `S` is much cheaper (or / and much faster) than running the real-world experiment f. We start with a small example.

1.3 Example: `Spot` and the Sphere Function

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
```

1.3.1 The Objective Function: Sphere

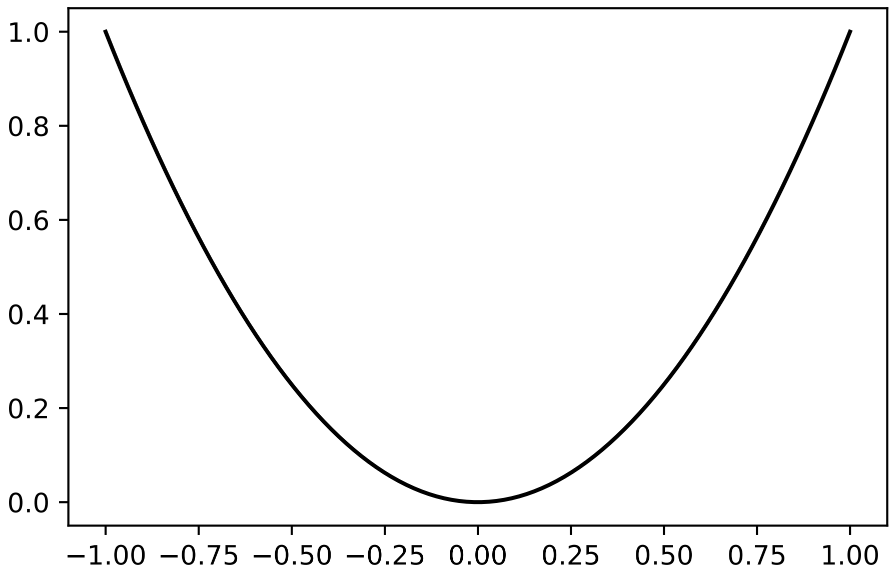
The `spotPython` package provides several classes of objective functions. We will use an analytical objective function, i.e., a function that can be described by a (closed) formula:

$$f(x) = x^2$$

```
fun = analytical().fun_sphere
```

We can apply the function `fun` to input values and plot the result:

```
x = np.linspace(-1,1,100).reshape(-1,1)
y = fun(x)
plt.figure()
plt.plot(x, y, "k")
plt.show()
```




```
spot_0 = spot.Spot(fun=fun,
                   lower = np.array([-1]),
                   upper = np.array([1]))
```

```
spot_0.run()
```

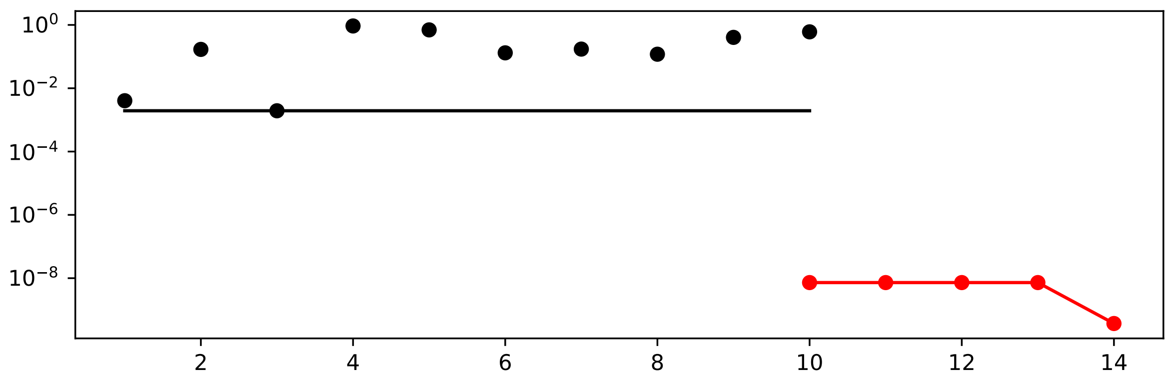
```
<spotPython.spot.spot.Spot at 0x105b720b0>
```

```
spot_0.print_results()
```

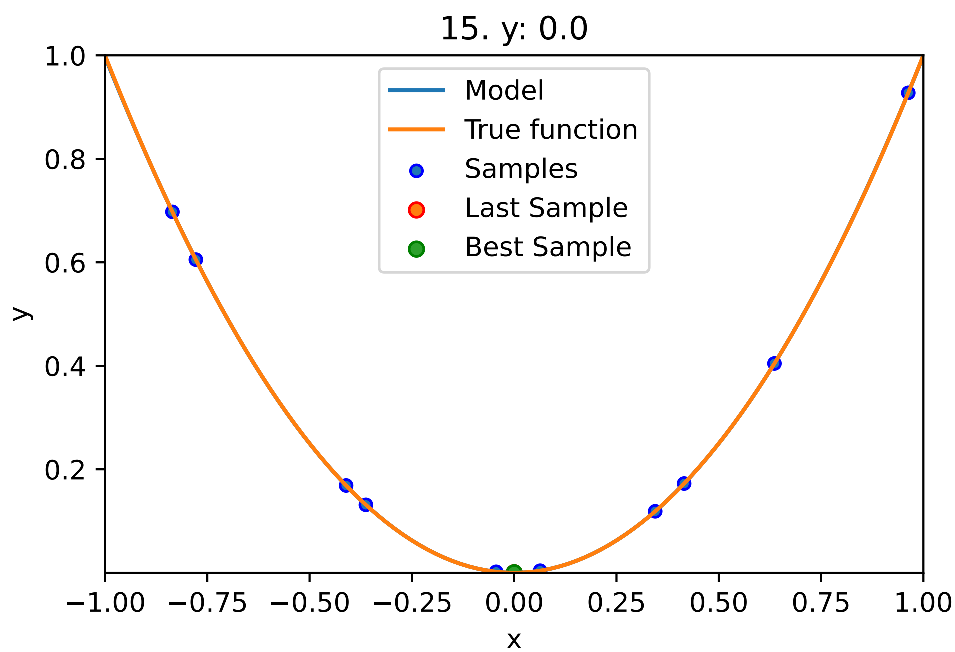
```
min y: 3.696886711914087e-10
x0: 1.922728975158508e-05
```

```
[['x0', 1.922728975158508e-05]]
```

```
spot_0.plot_progress(log_y=True)
```




```
spot_0.plot_model()
```



1.4 Spot Parameters: `fun_evals`, `init_size` and `show_models`

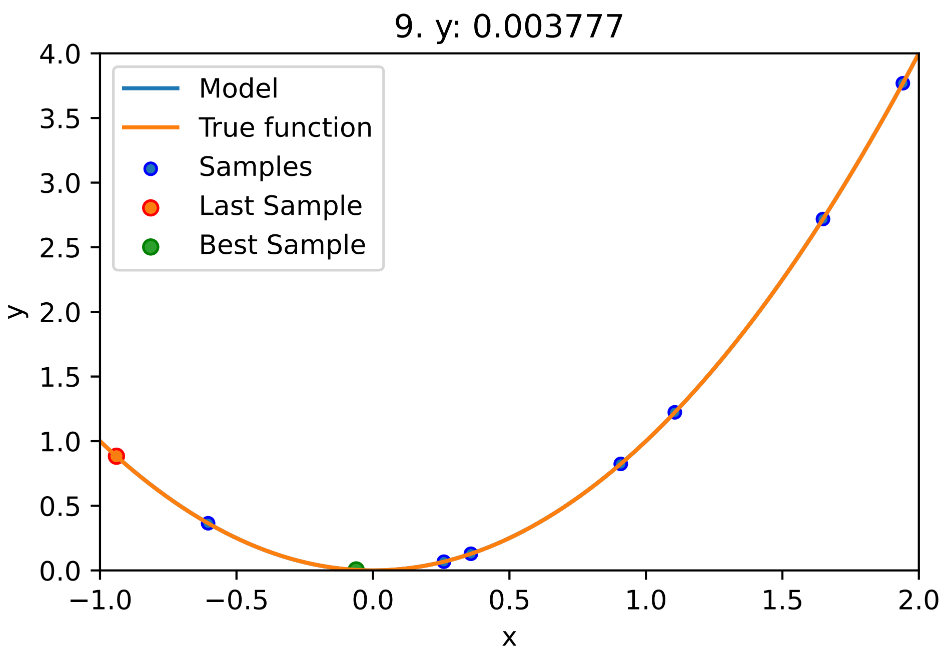
We will modify three parameters:

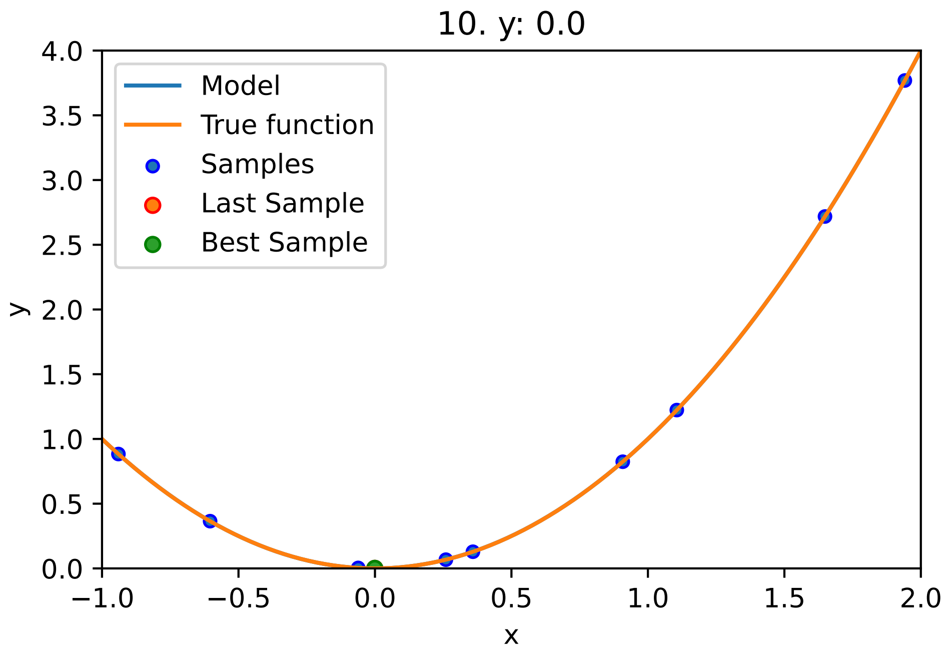
1. The number of function evaluations (`fun_evals`)
2. The size of the initial design (`init_size`)

3. The parameter `show_models`, which visualizes the search process for 1-dim functions.

The full list of the `Spot` parameters is shown in the Help System and in the notebook `spot_doc.ipynb`.

```
spot_1 = spot.Spot(fun=fun,
                   lower = np.array([-1]),
                   upper = np.array([2]),
                   fun_evals= 10,
                   seed=123,
                   show_models=True,
                   design_control={"init_size": 9})
spot_1.run()
```






```
<spotPython.spot.spot.Spot at 0x16c39f5e0>
```

1.5 Print the Results

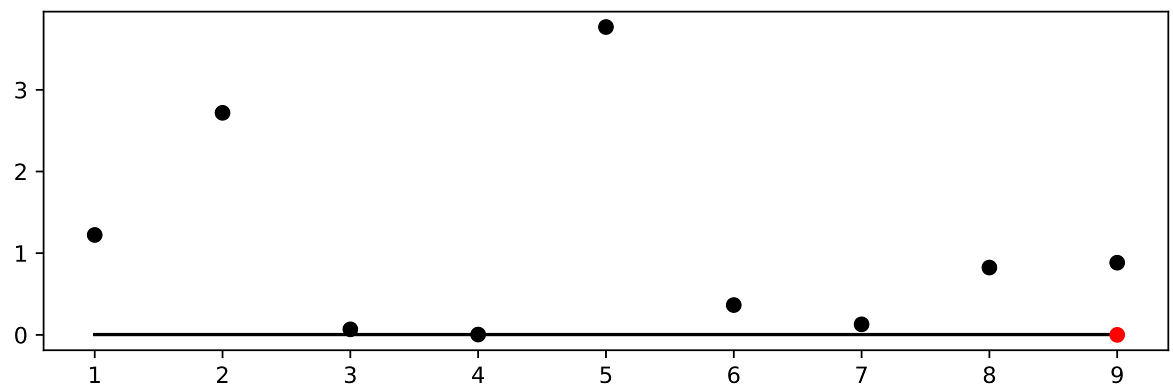
```
spot_1.print_results()
```

```
min y: 3.6779240309761575e-07
x0: -0.0006064589047063418
```

```
[['x0', -0.0006064589047063418]]
```

1.6 Show the Progress

```
spot_1.plot_progress()
```



0
1
2
3
1
2
3
4
5
6
7
8
9

2 Multi-dimensional Functions

This notebook illustrates how high-dimensional functions can be analyzed.

2.1 Example: `Spot` and the 3-dim Sphere Function

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
import pylab
from numpy import append, ndarray, multiply, isinf, linspace, meshgrid, ravel
from numpy import array
```

2.1.1 The Objective Function: 3-dim Sphere

- The `spotPython` package provides several classes of objective functions.
- We will use an analytical objective function, i.e., a function that can be described by a (closed) formula:

$$f(x) = \sum_i^n x_i^2$$

- Here we will use $n = 3$.

```
fun = analytical().fun_sphere
```

- The size of the `lower` bound vector determines the problem dimension.
- Here we will use `np.array([-1, -1, -1])`, i.e., a three-dim function.

- We will use three different `theta` values (one for each dimension), i.e., we set `surrogate_control={"n_theta": 3}`.

```
spot_3 = spot.Spot(fun=fun,
                   lower = -1.0*np.ones(3),
                   upper = np.ones(3),
                   var_name=["Pressure", "Temp", "Lambda"],
                   show_progress=True,
                   surrogate_control={"n_theta": 3})

spot_3.run()
```

```
spotPython tuning: 0.03443344056467332 [#######---] 73.33%

spotPython tuning: 0.03134865993507926 [########--] 80.00%

spotPython tuning: 0.0009629342967936851 [#########-] 86.67%

spotPython tuning: 8.541951463966474e-05 [#########-] 93.33%

spotPython tuning: 6.285135731399678e-05 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x14047fd00>
```

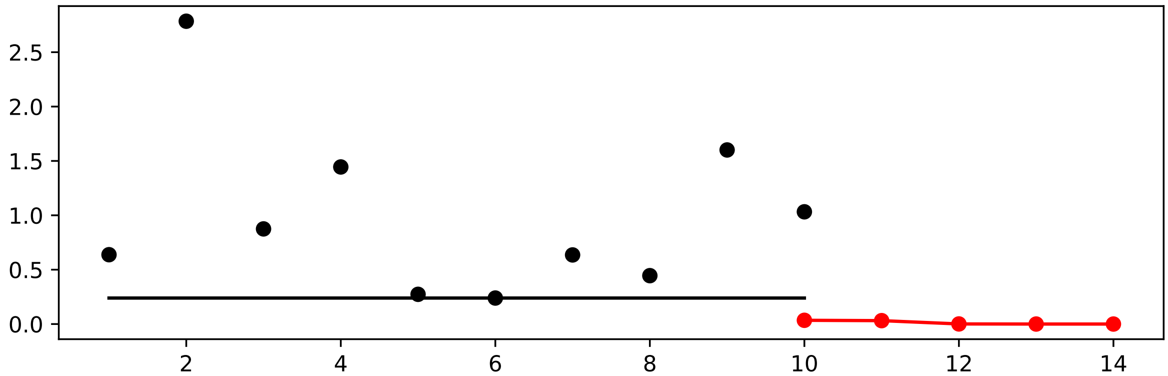
2.1.2 Results

```
spot_3.print_results()
```

```
min y: 6.285135731399678e-05
Pressure: 0.005236109709736696
Temp: 0.0019572552655686714
Lambda: 0.005621713639718905
```

```
[['Pressure', 0.005236109709736696],
 ['Temp', 0.0019572552655686714],
 ['Lambda', 0.005621713639718905]]
```

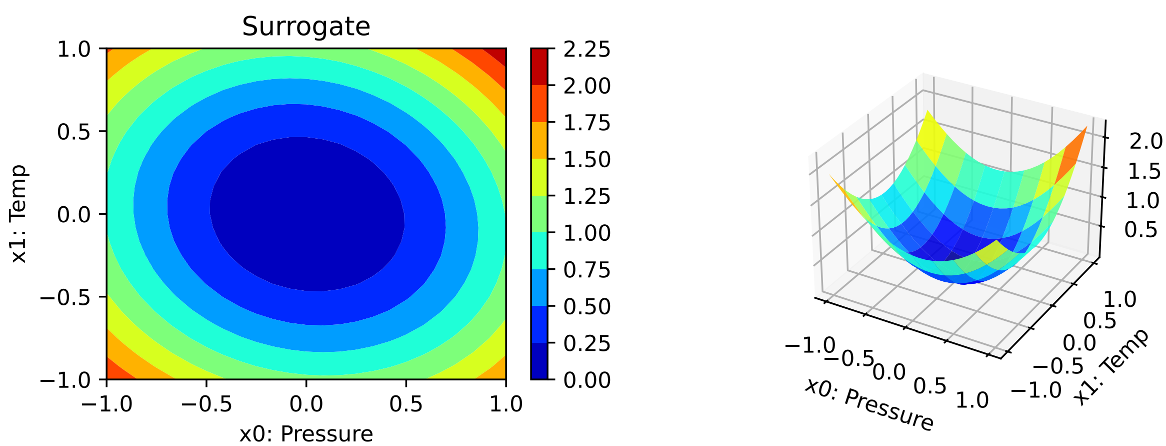
```python
spot_3.plot_progress()
```



2.1.3 A Contour Plot

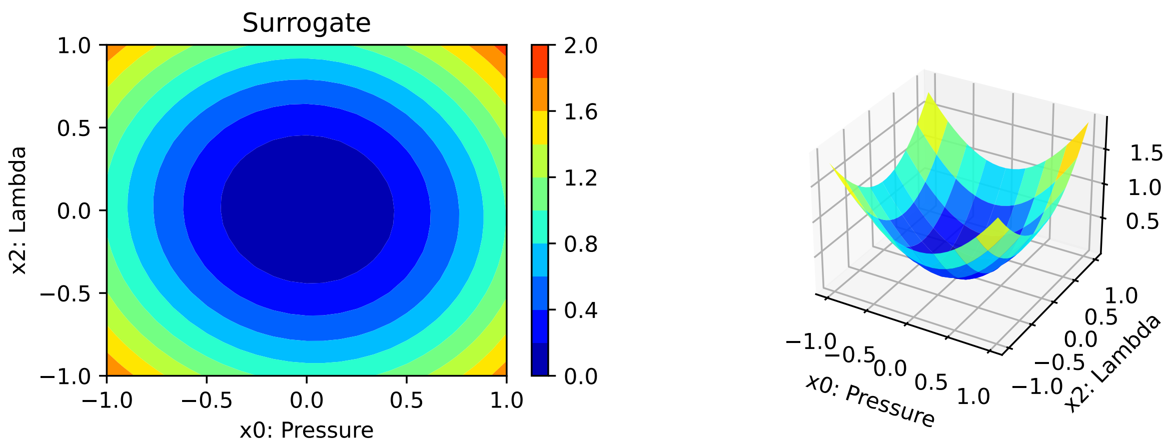
- We can select two dimensions, say $i = 0$ and $j = 1$, and generate a contour plot as follows.
  - Note: We have specified identical `min_z` and `max_z` values to generate comparable plots!

```python
spot_3.plot_contour(i=0, j=1, min_z=0, max_z=2.25)
```



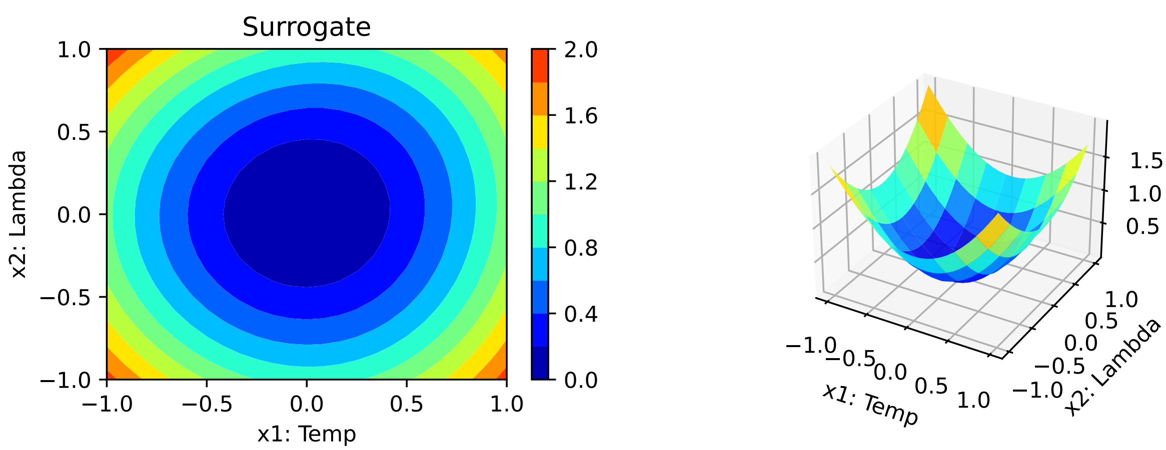
- In a similar manner, we can plot dimension $i = 0$ and $j = 2$:

```
spot_3.plot_contour(i=0, j=2, min_z=0, max_z=2.25)
```



- The final combination is $i = 1$ and $j = 2$:

```
spot_3.plot_contour(i=1, j=2, min_z=0, max_z=2.25)
```



- The three plots look very similar, because the `fun_sphere` is symmetric.
- This can also be seen from the variable importance:

```
spot_3.print_importance()
```

```
Pressure:  99.35185545837122
Temp:  99.99999999999999
```

```
Lambda:  94.31627052007231
```

```
[['Pressure', 99.35185545837122],
 ['Temp', 99.99999999999999],
 ['Lambda', 94.31627052007231]]
```

2.2 Conclusion

Based on this quick analysis, we can conclude that all three dimensions are equally important (as expected, because the analytical function is known).

2.3 Exercises

- Important:
  - Results from these exercises should be added to this document, i.e., you should submit an updated version of this notebook.
  - Please combine your results using this notebook.
  - Only one notebook from each group!
  - Presentation is based on this notebook. No addtional slides are required!
  - spotPython version `0.16.11` (or greater) is required

2.3.1 The Three Dimensional `fun_cubed`

- The input dimension is `3`. The search range is $-1 \leq x \leq 1$ for all dimensions.
- Generate contour plots
- Calculate the variable importance.
- Discuss the variable importance:
  - Are all variables equally important?
  - If not:
    - Which is the most important variable?
    - Which is the least important variable?

2.3.2 The Ten Dimensional `fun_wing_wt`

- The input dimension is `10`. The search range is $0 \leq x \leq 1$ for all dimensions.
- Calculate the variable importance.
- Discuss the variable importance:
  - Are all variables equally important?
  - If not:
    - Which is the most important variable?
    - Which is the least important variable?
  - Generate contour plots for the three most important variables. Do they confirm your selection?

2.3.3 The Three Dimensional `fun_runge`

- The input dimension is `3`. The search range is $-5 \leq x \leq 5$ for all dimensions.
- Generate contour plots
- Calculate the variable importance.
- Discuss the variable importance:
  - Are all variables equally important?
  - If not:
    - Which is the most important variable?
    - Which is the least important variable?

2.3.4 The Three Dimensional `fun_linear`

- The input dimension is `3`. The search range is $-5 \leq x \leq 5$ for all dimensions.
- Generate contour plots
- Calculate the variable importance.
- Discuss the variable importance:
  - Are all variables equally important?
  - If not:
    - Which is the most important variable?
    - Which is the least important variable?

3 Isotropic and Anisotropic Kriging

3.1 Example: Isotropic `Spot` Surrogate and the 2-dim Sphere Function

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
```

3.1.1 The Objective Function: 2-dim Sphere

- The `spotPython` package provides several classes of objective functions.
- We will use an analytical objective function, i.e., a function that can be described by a (closed) formula:

$$f(x, y) = x^2 + y^2$$

```
fun = analytical().fun_sphere
fun_control = {"sigma": 0,
               "seed": 123}
```

- The size of the `lower` bound vector determines the problem dimension.
- Here we will use `np.array([-1, -1])`, i.e., a two-dim function.

```
spot_2 = spot.Spot(fun=fun,
                   lower = np.array([-1, -1]),
                   upper = np.array([1, 1]))

spot_2.run()
```

```
<spotPython.spot.spot.Spot at 0x17e37bc10>
```

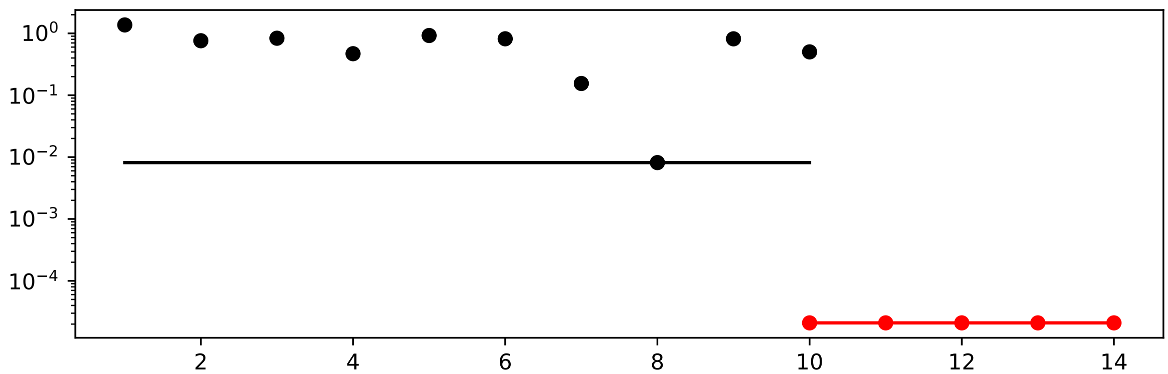
3.1.2 Results

```
spot_2.print_results()
```

```
min y: 2.093282610941807e-05
x0: 0.0016055267473267492
x1: 0.00428428640184529
```

```
[['x0', 0.0016055267473267492], ['x1', 0.00428428640184529]]
```

```
spot_2.plot_progress(log_y=True)
```



3.2 Example With Anisotropic Kriging

- The default parameter setting of `spotPython`'s Kriging surrogate uses the same `theta` value for every dimension.
- This is referred to as "using an isotropic kernel".
- If different `theta` values are used for each dimension, then an anisotropic kernel is used
- To enable anisotropic models in `spotPython`, the number of `theta` values should be larger than one.
- We can use `surrogate_control={"n_theta": 2}` to enable this behavior (2 is the problem dimension).

```
spot_2_anisotropic = spot.Spot(fun=fun,
                    lower = np.array([-1, -1]),
                    upper = np.array([1, 1]),
                    surrogate_control={"n_theta": 2})
spot_2_anisotropic.run()
```

```
<spotPython.spot.spot.Spot at 0x17ffb3100>
```

3.2.1 Taking a Look at the `theta` Values

- We can check, whether one or several `theta` values were used.
- The `theta` values from the surrogate can be printed as follows:

```
spot_2_anisotropic.surrogate.theta
```

```
array([0.19447342, 0.30813872])
```

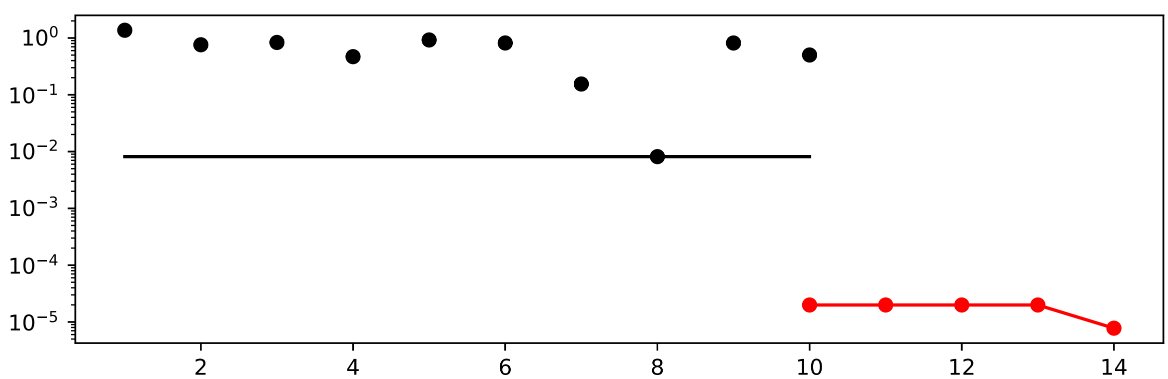
- Since the surrogate from the isotropic setting was stored as `spot_2`, we can also take a look at the `theta` value from this model:

```
spot_2.surrogate.theta
```

```
array([0.26287447])
```

- Next, the search progress of the optimization with the anisotropic model can be visualized:

```
spot_2_anisotropic.plot_progress(log_y=True)
```

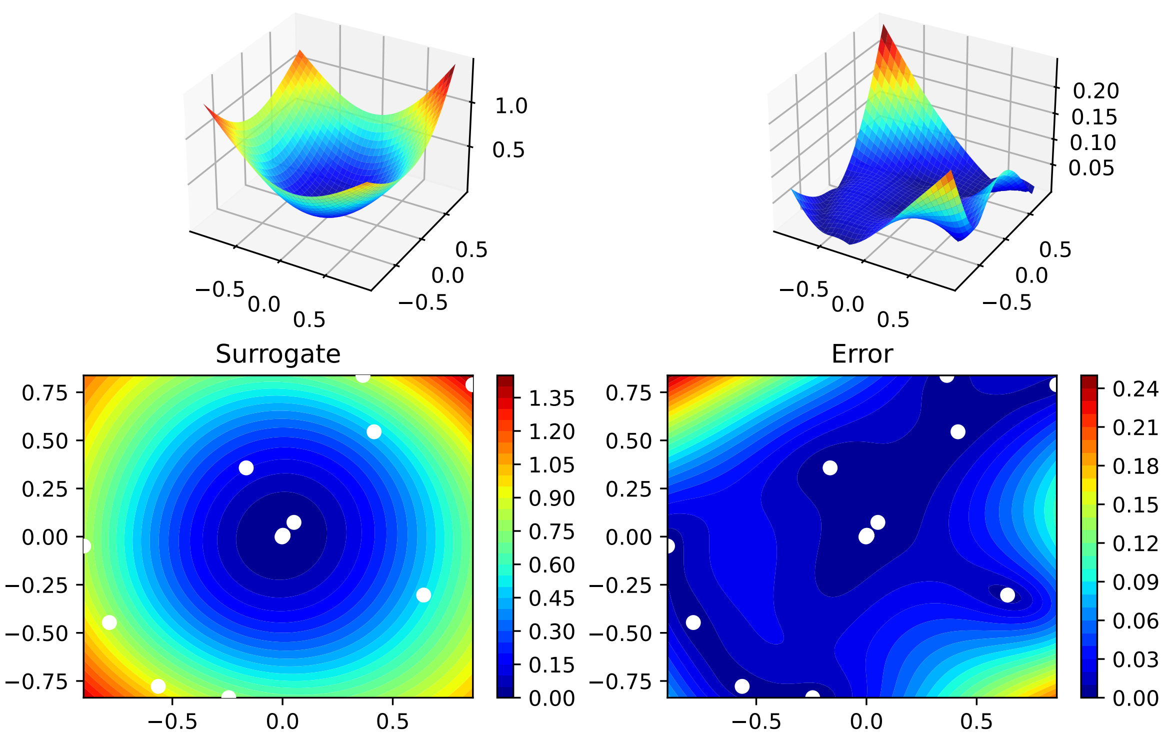


```
spot_2_anisotropic.print_results()
```

```
min y: 7.77061191821505e-06
x0: -0.0024488252797500764
x1: -0.0013318658594137815
```

```
[['x0', -0.0024488252797500764], ['x1', -0.0013318658594137815]]
```

```
spot_2_anisotropic.surrogate.plot()
```



4 Exercises

4.1 `fun_branin`

- Describe the function.
  - The input dimension is `2`. The search range is $-5 \leq x_1 \leq 10$ and $0 \leq x_2 \leq 15$.
- Compare the results from `spotPython` run a) with isotropic and b) anisotropic surrogate models.
- Modify the termination criterion: instead of the number of evaluations (which is specified via `fun_evals`), the time should be used as the termination criterion. This can be done as follows (`max_time=1` specifies a run time of one minute):

```
fun_evals=inf,
max_time=1,
```

4.2 `fun_sin_cos`

- Describe the function.
  - The input dimension is `2`. The search range is $-2\pi \leq x_1 \leq 2\pi$ and $-2\pi \leq x_2 \leq 2\pi$.
- Compare the results from `spotPython` run a) with isotropic and b) anisotropic surrogate models.
- Modify the termination criterion (`max_time` instead of `fun_evals`) as described for `fun_branin`.

4.3 `fun_runge`

- Describe the function.
  - The input dimension is `2`. The search range is $-5 \leq x_1 \leq 5$ and $-5 \leq x_2 \leq 5$.
- Compare the results from `spotPython` run a) with isotropic and b) anisotropic surrogate models.

- Modify the termination criterion (`max_time` instead of `fun_evals`) as described for `fun_branin`.

4.4 `fun_wingwt`

- Describe the function.
  - The input dimension is `10`. The search ranges are between 0 and 1 (values are mapped internally to their natural bounds).
- Compare the results from `spotPython` run a) with isotropic and b) anisotropic surrogate models.
- Modify the termination criterion (`max_time` instead of `fun_evals`) as described for `fun_branin`.

5 Using `sklearn` Surrogates in `spotPython`

This notebook explains how different surrogate models from `scikit-learn` can be used as surrogates in `spotPython` optimization runs.

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
```

5.1 Example: Branin Function with `spotPython`'s Internal Kriging Surrogate

5.1.1 The Objective Function Branin

- The `spotPython` package provides several classes of objective functions.
- We will use an analytical objective function, i.e., a function that can be described by a (closed) formula.
- Here we will use the Branin function:

```
y = a * (x2 - b * x1**2 + c * x1 - r) ** 2 + s * (1 - t) * np.cos(x1) + s,
where values of a, b, c, r, s and t are: a = 1, b = 5.1 / (4*pi**2),
c = 5 / pi, r = 6, s = 10 and t = 1 / (8*pi).
```

- It has three global minima:

```
f(x) = 0.397887 at (-pi, 12.275), (pi, 2.275), and (9.42478, 2.475).
```

```
from spotPython.fun.objectivefunctions import analytical
lower = np.array([-5,-0])
```

```python
upper = np.array([10,15])
```

```python
fun = analytical().fun_branin
```

5.1.2 Running the surrogate model based optimizer `Spot`:

```python
spot_2 = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = 20,
                   max_time = inf,
                   seed=123,
                   design_control={"init_size": 10})
```

```python
spot_2.run()
```

```
<spotPython.spot.spot.Spot at 0x105e6e080>
```

5.1.3 Print the Results

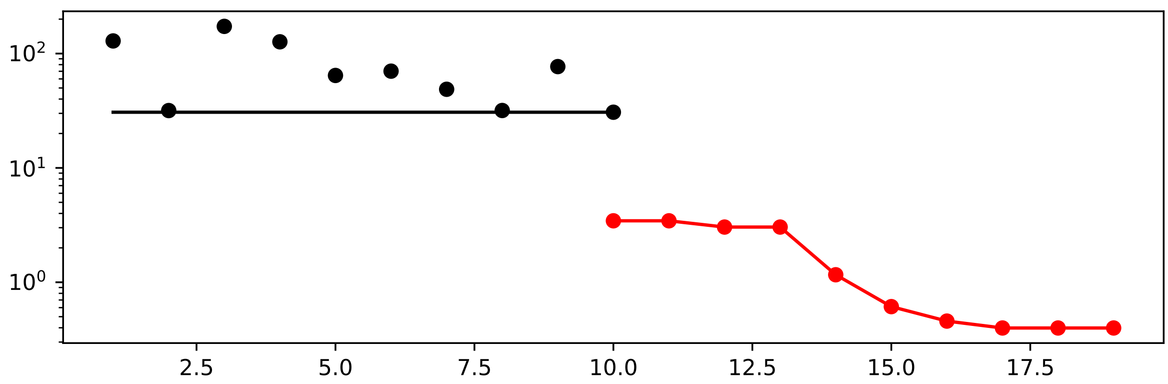
```python
spot_2.print_results()
```

```
min y: 0.3982295132785083
x0: 3.135528626303215
x1: 2.2926027772585886
```

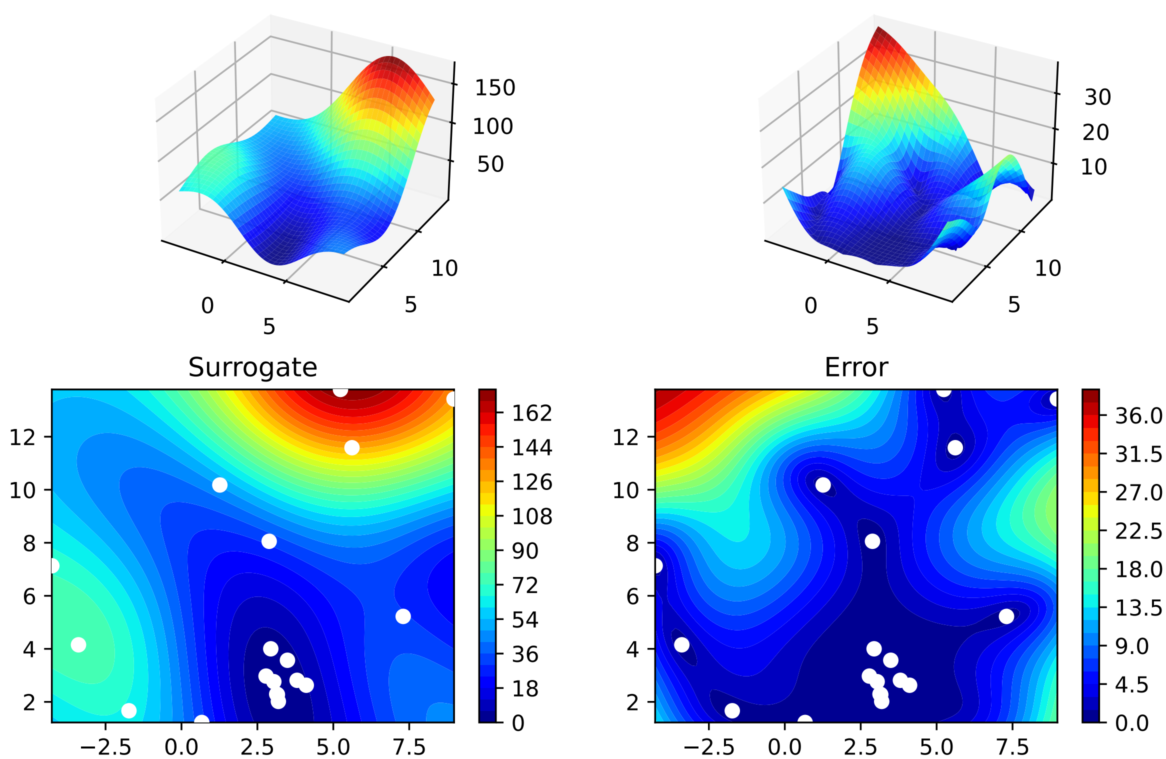
```
[['x0', 3.135528626303215], ['x1', 2.2926027772585886]]
```

5.1.4 Show the Progress and the Surrogate

```python
spot_2.plot_progress(log_y=True)
```




```
spot_2.surrogate.plot()
```



5.2 Example: Using Surrogates From scikit-learn

- Default is the `spotPython` (i.e., the internal) `kriging` surrogate.

- It can be called explicitely and passed to `Spot`.

```
from spotPython.build.kriging import Kriging
S_0 = Kriging(name='kriging', seed=123)
```

- Alternatively, models from `scikit-learn` can be selected, e.g., Gaussian Process, RBFs, Regression Trees, etc.

```
# Needed for the sklearn surrogates:
from sklearn.gaussian_process import GaussianProcessRegressor
from sklearn.gaussian_process.kernels import RBF
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn import linear_model
from sklearn import tree
import pandas as pd
```

- Here are some additional models that might be useful later:

```
S_Tree = DecisionTreeRegressor(random_state=0)
S_LM = linear_model.LinearRegression()
S_Ridge = linear_model.Ridge()
S_RF = RandomForestRegressor(max_depth=2, random_state=0)
```

5.2.1 GaussianProcessRegressor as a Surrogate

- To use a Gaussian Process model from `sklearn`, that is similar to `spotPython`'s `Kriging`, we can proceed as follows:

```
kernel = 1 * RBF(length_scale=1.0, length_scale_bounds=(1e-2, 1e2))
S_GP = GaussianProcessRegressor(kernel=kernel, n_restarts_optimizer=9)
```

- The scikit-learn GP model `S_GP` is selected for `Spot` as follows:

  `surrogate = S_GP`

- We can check the kind of surogate model with the command `isinstance`:

```
isinstance(S_GP, GaussianProcessRegressor)
```

```
True
```

```
isinstance(S_0, Kriging)
```

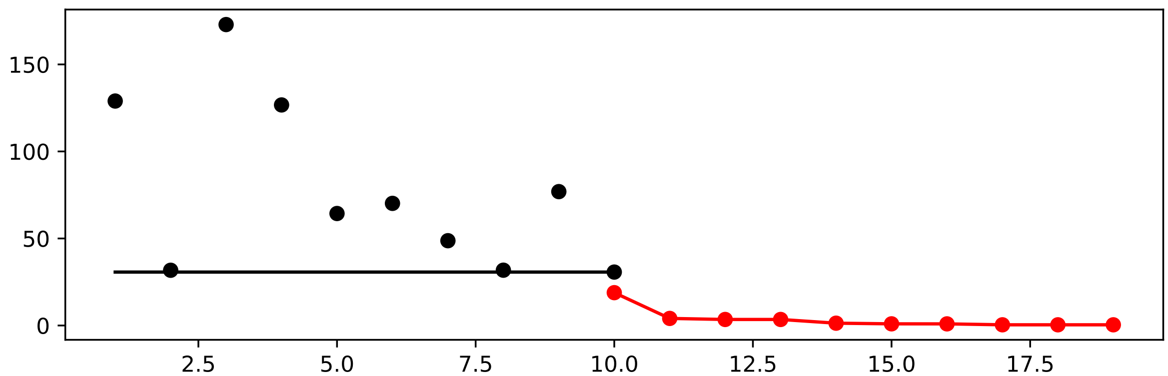
```
True
```

- Similar to the `Spot` run with the internal `Kriging` model, we can call the run with the `scikit-learn` surrogate:

```
fun = analytical(seed=123).fun_branin
spot_2_GP = spot.Spot(fun=fun,
                     lower = lower,
                     upper = upper,
                     fun_evals = 20,
                     seed=123,
                     design_control={"init_size": 10},
                     surrogate = S_GP)
spot_2_GP.run()
```

```
<spotPython.spot.spot.Spot at 0x16bf7f730>
```

```
spot_2_GP.plot_progress()
```




```
spot_2_GP.print_results()
```

```
min y: 0.39822345433320194
x0: 3.1499589816336693
x1: 2.26870010026829
```

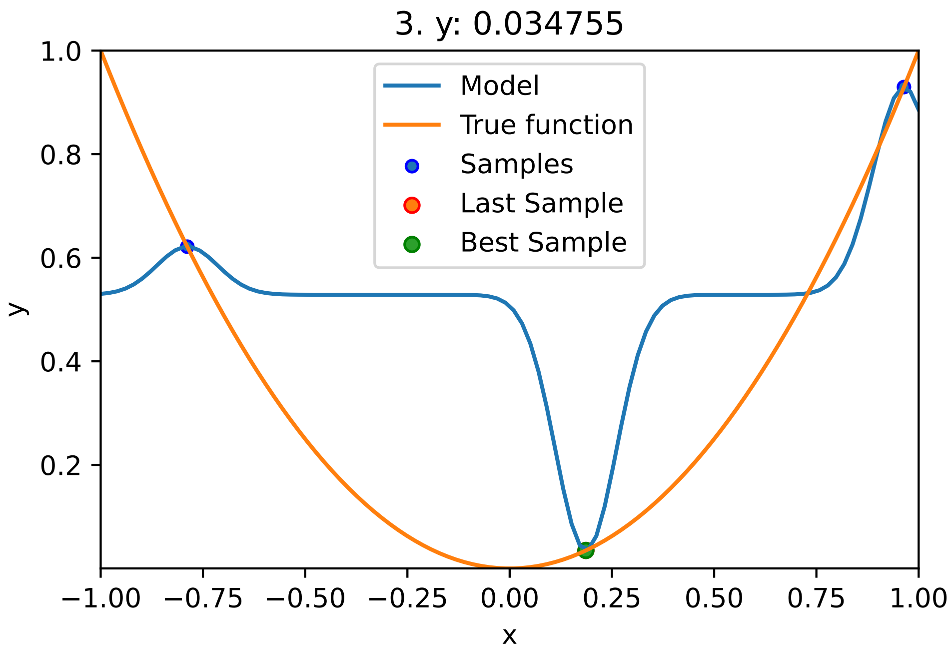
```
[['x0', 3.1499589816336693], ['x1', 2.26870010026829]]
```

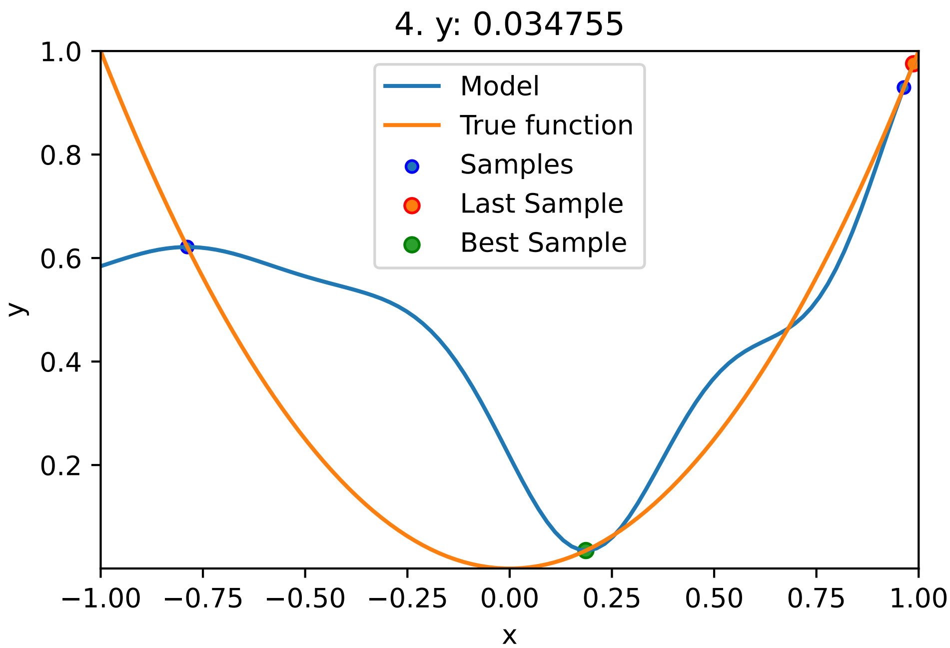
6 Example: One-dimensional Sphere Function With `spotPython`'s Kriging

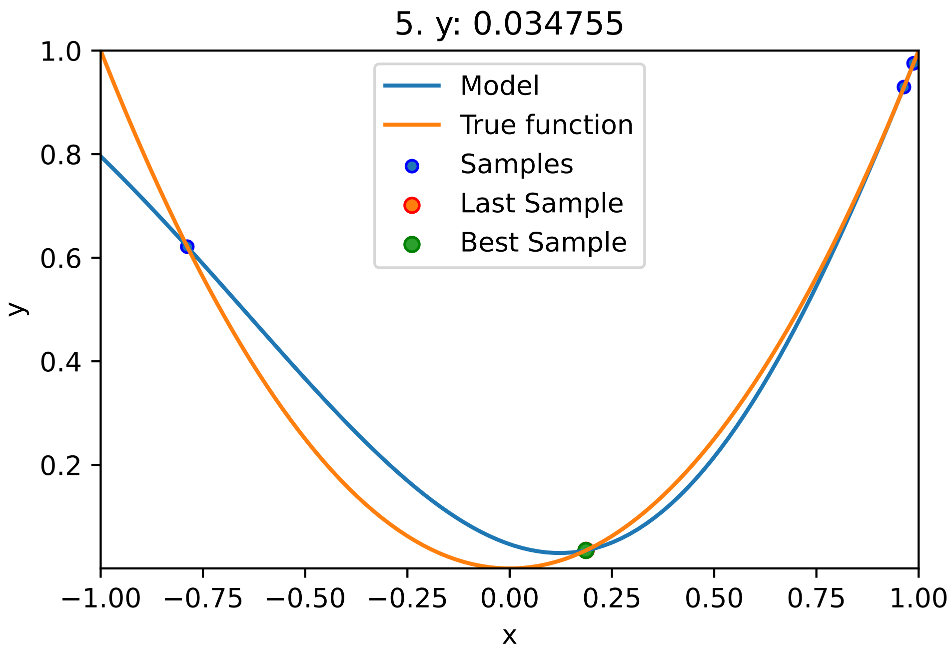
- In this example, we will use an one-dimensional function, which allows us to visualize the optimization process.
  - `show_models= True` is added to the argument list.

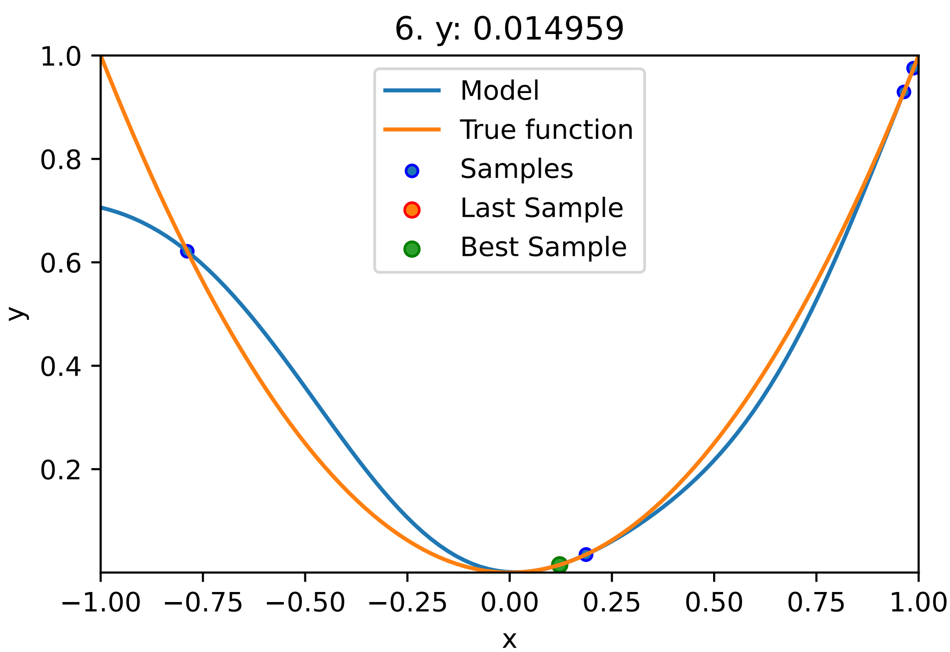
```
from spotPython.fun.objectivefunctions import analytical
lower = np.array([-1])
upper = np.array([1])
fun = analytical(seed=123).fun_sphere
```

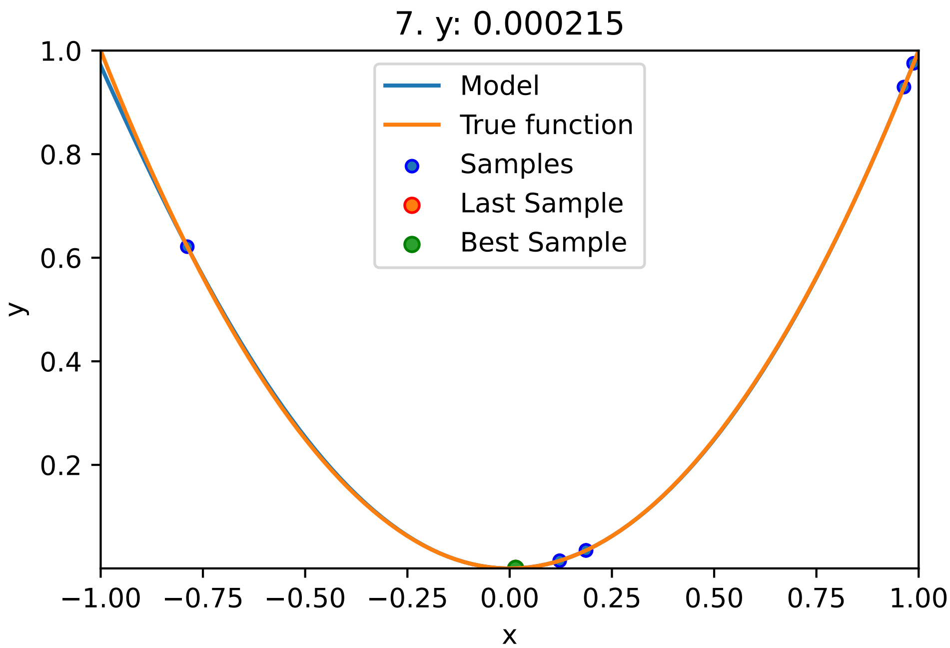
```
spot_1 = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = 10,
                   max_time = inf,
                   seed=123,
                   show_models= True,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   design_control={"init_size": 3},)
spot_1.run()
```

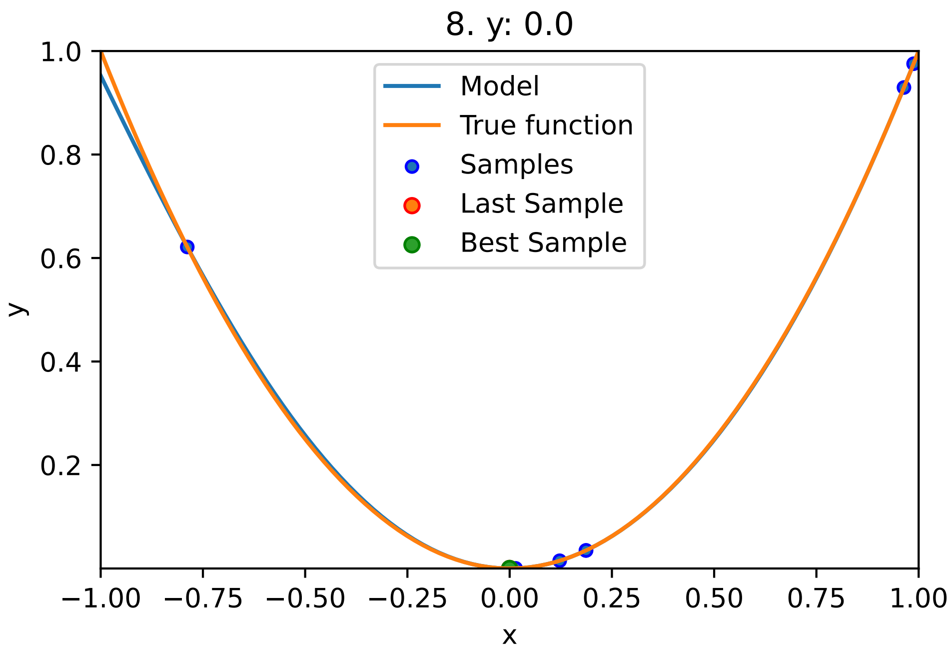

3. y: 0.034755
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

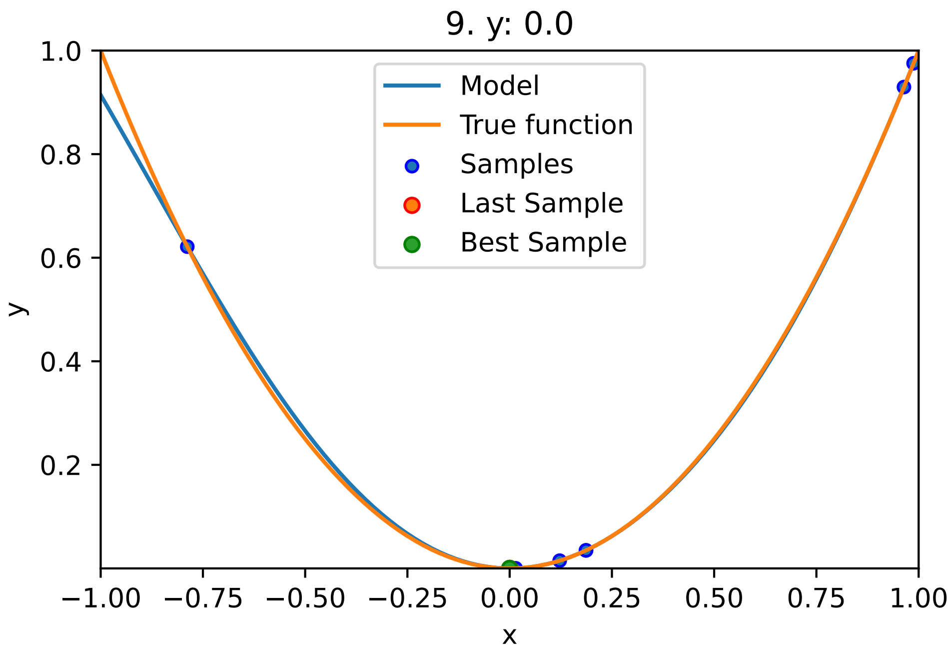

4. y: 0.034755
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

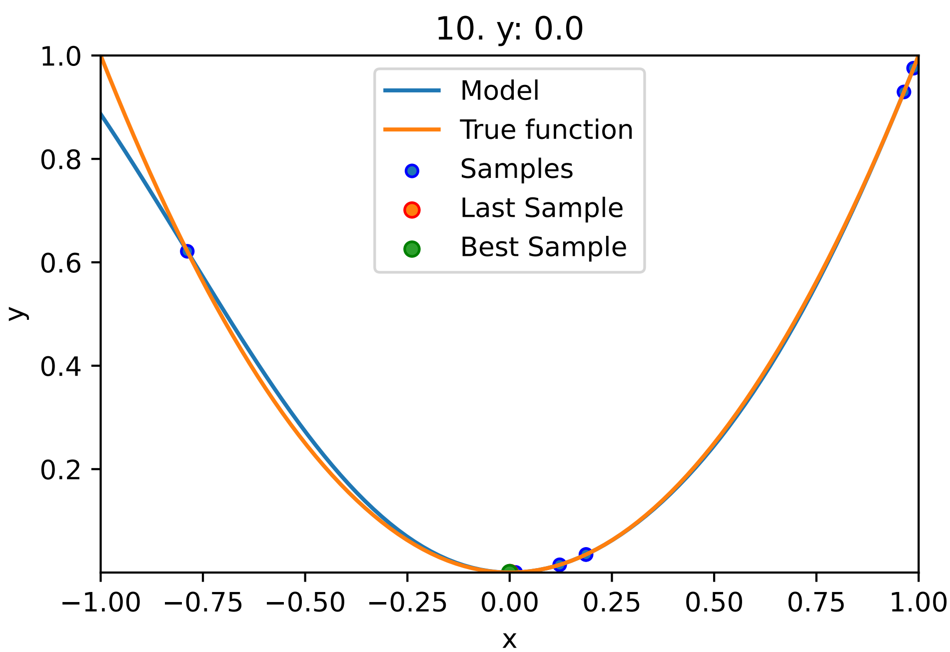

5. y: 0.034755
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x


6. y: 0.014959
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x


7. y: 0.000215
Model
True function
Samples
Last Sample
Best Sample
y
x
1.0
0.8
0.6
0.4
0.2
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00


8. y: 0.0
Model
True function
Samples
Last Sample
Best Sample
y
x
1.0
0.8
0.6
0.4
0.2
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00






```
<spotPython.spot.spot.Spot at 0x16bf7f010>
```

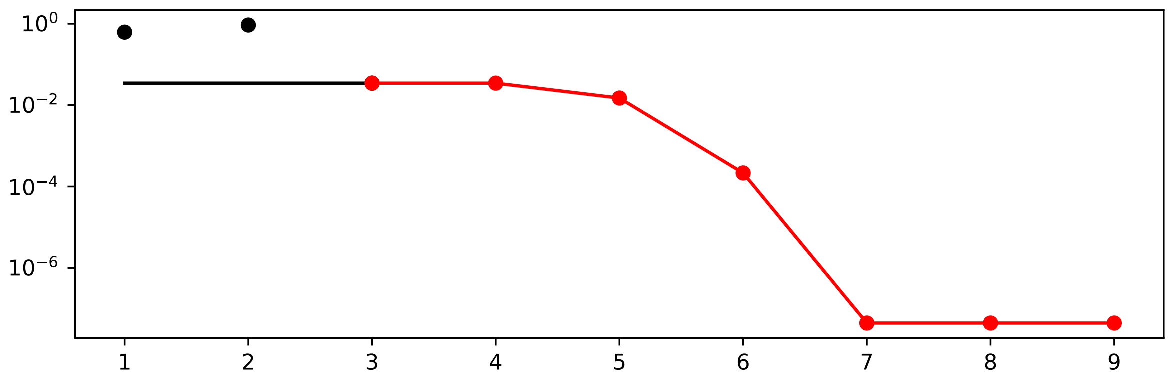
6.0.1 Results

```
spot_1.print_results()
```

```
min y: 4.41925228274096e-08
x0: -0.00021022017702259125
```

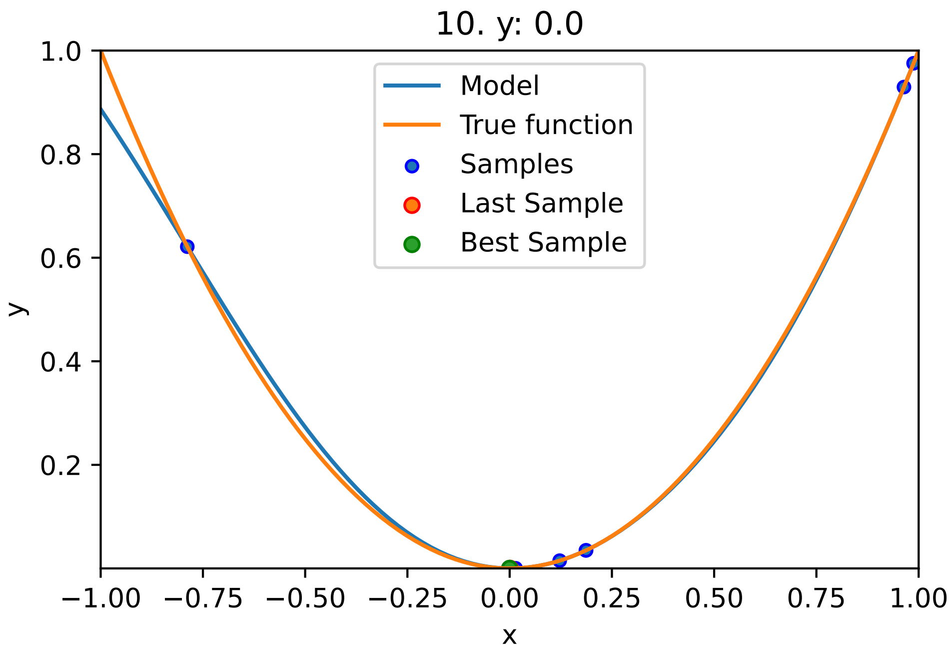
```
[['x0', -0.00021022017702259125]]
```

```
spot_1.plot_progress(log_y=True)
```



- The method `plot_model` plots the final surrogate:

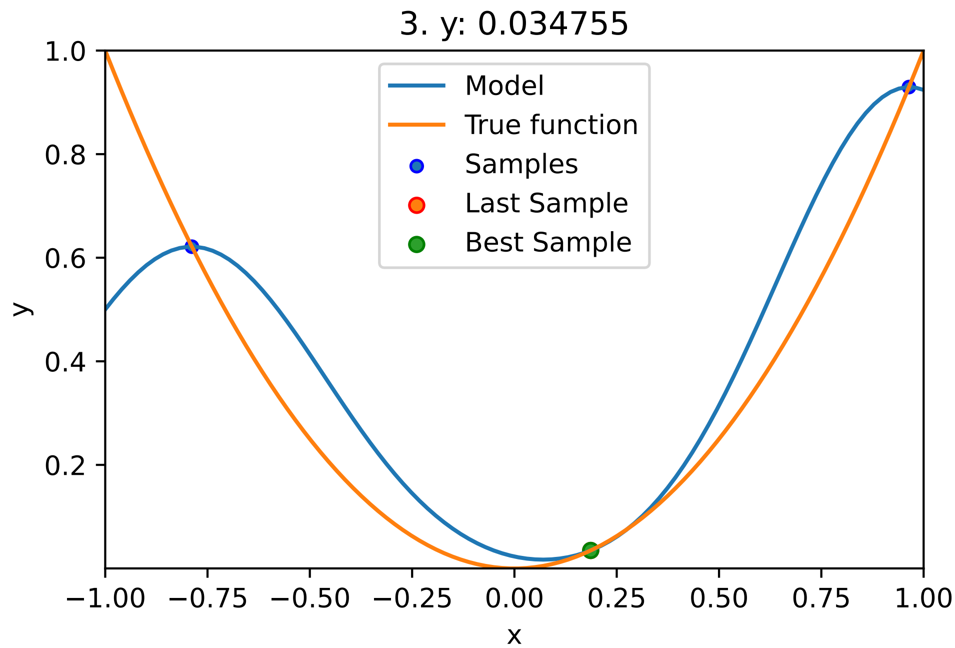
```
spot_1.plot_model()
```

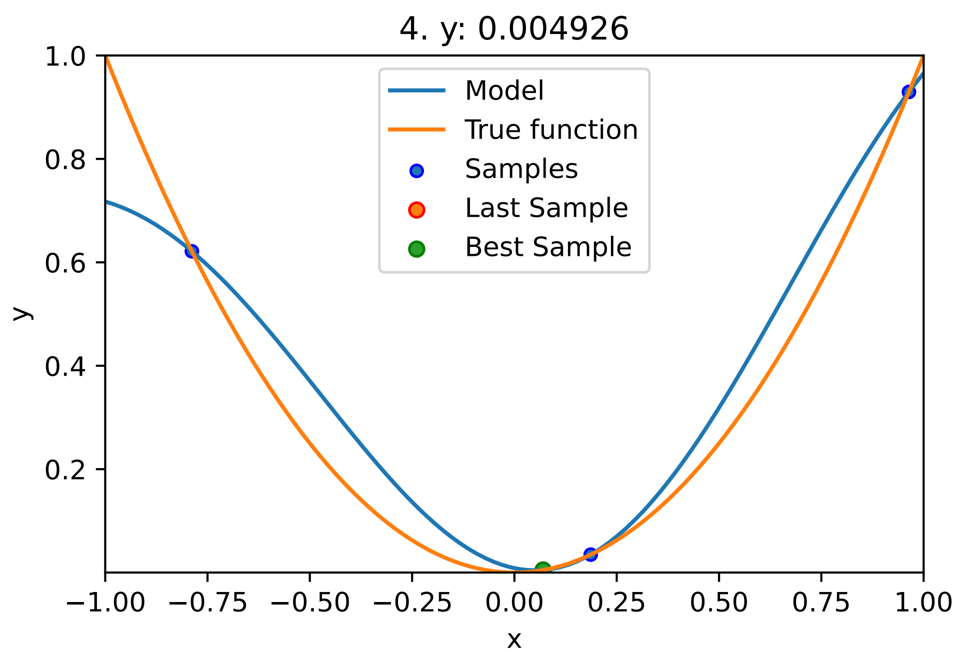


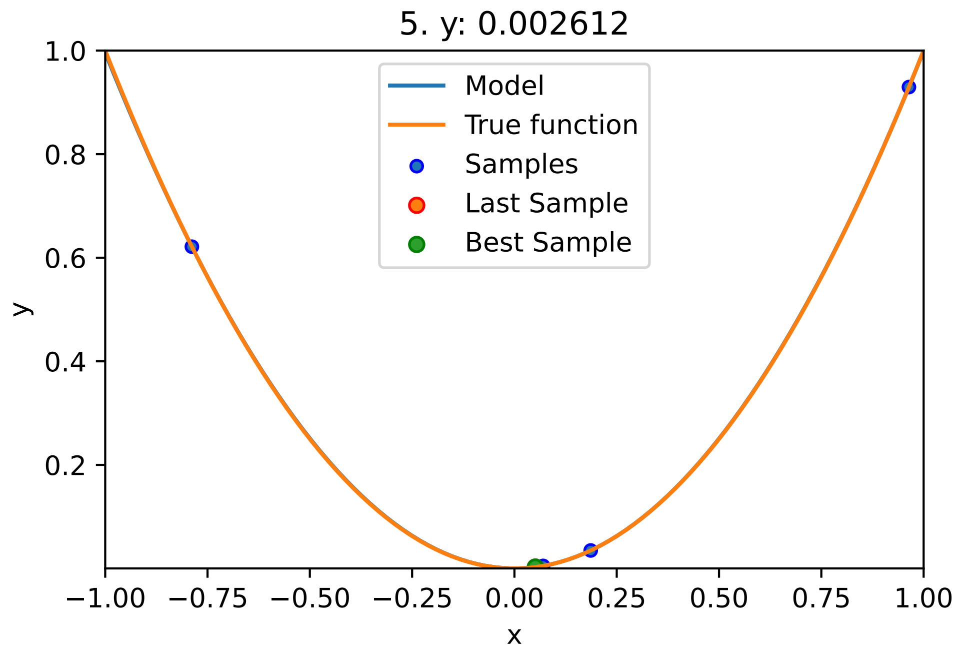
6.1 Example: `Sklearn` Model GaussianProcess

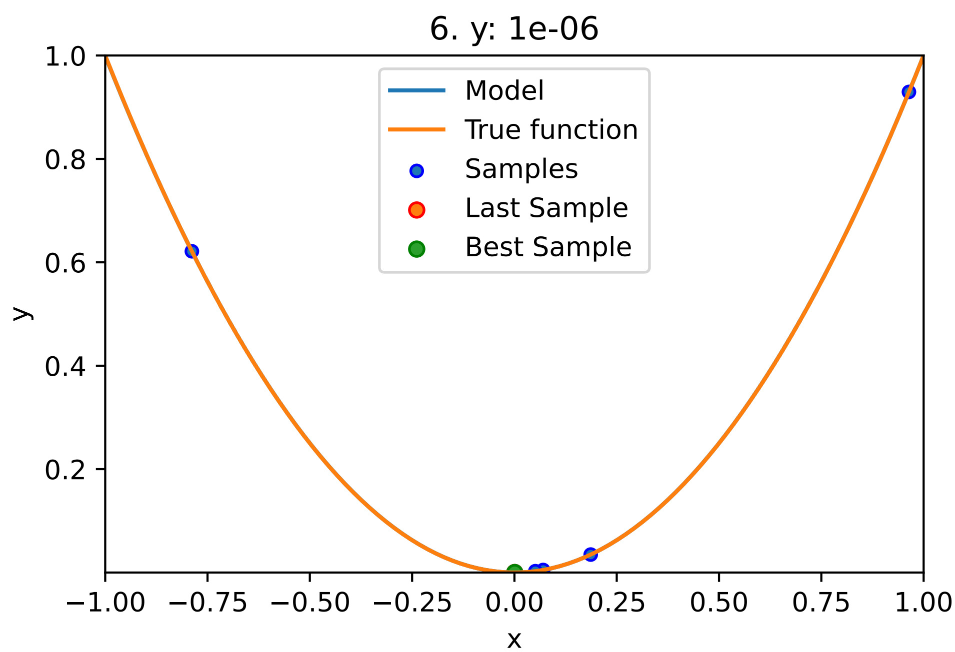
- This example visualizes the search process on the `GaussianProcessRegression` surrogate from `sklearn`.
- Therefore `surrogate = S_GP` is added to the argument list.

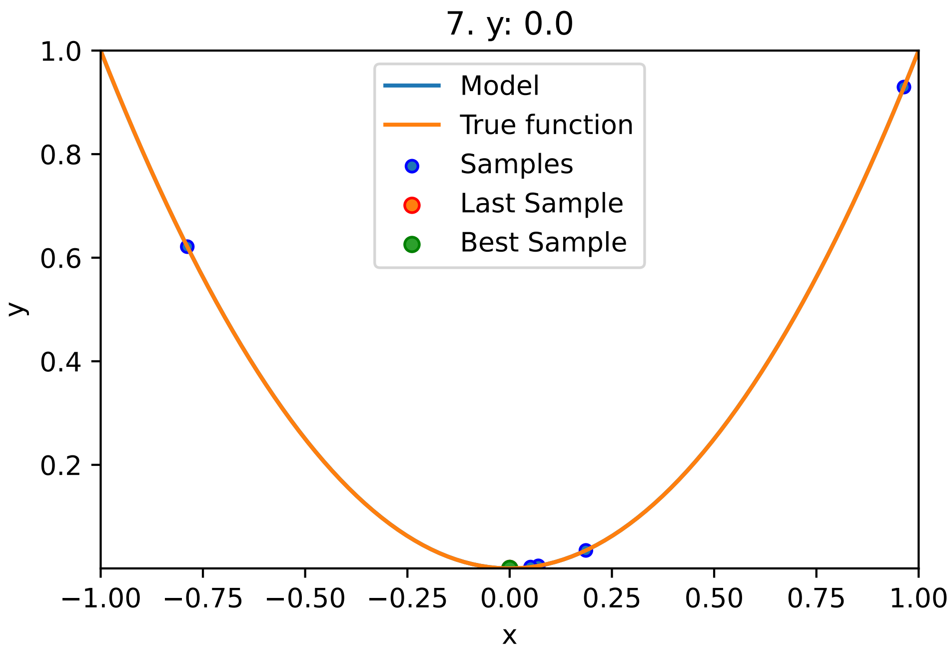
```
fun = analytical(seed=123).fun_sphere
spot_1_GP = spot.Spot(fun=fun,
                    lower = lower,
                    upper = upper,
                    fun_evals = 10,
                    max_time = inf,
                    seed=123,
                    show_models= True,
                    design_control={"init_size": 3},
                    surrogate = S_GP)
spot_1_GP.run()
```

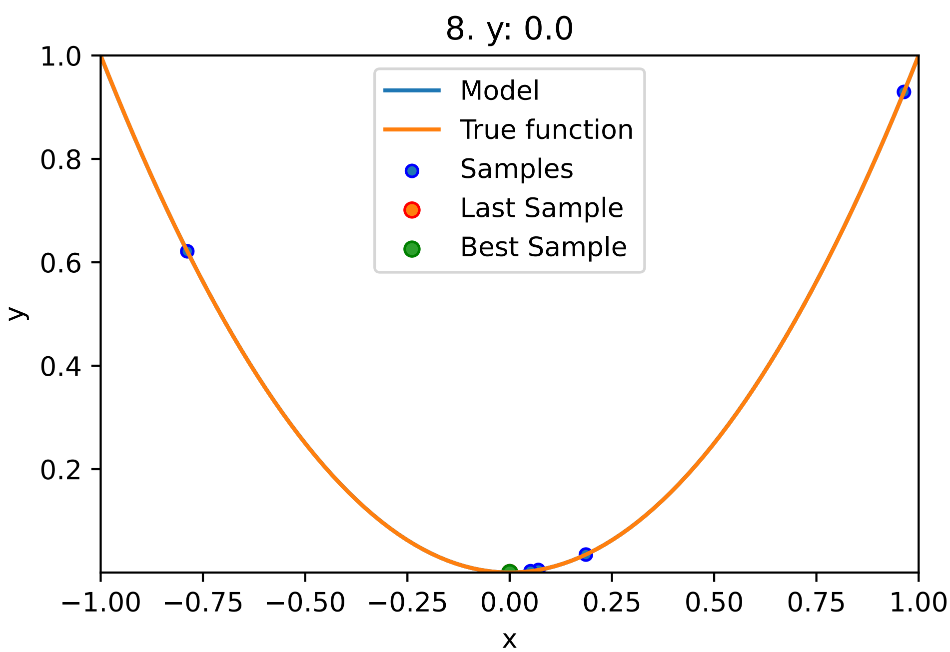

3. y: 0.034755
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

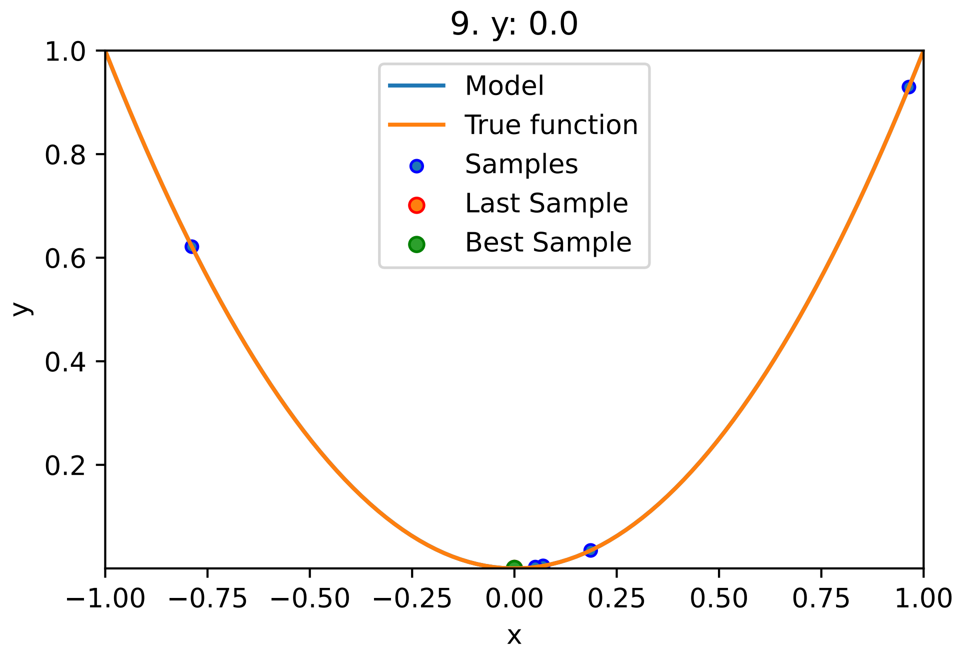

4. y: 0.004926
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

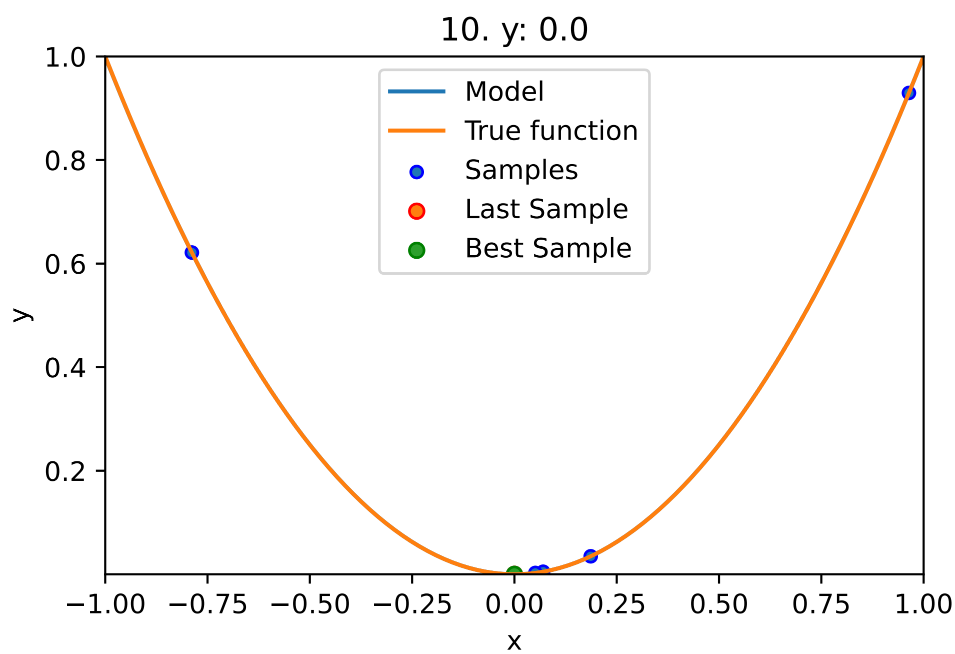

5. y: 0.002612
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x


6. y: 1e-06
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x


7. y: 0.0
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x


8. y: 0.0
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x





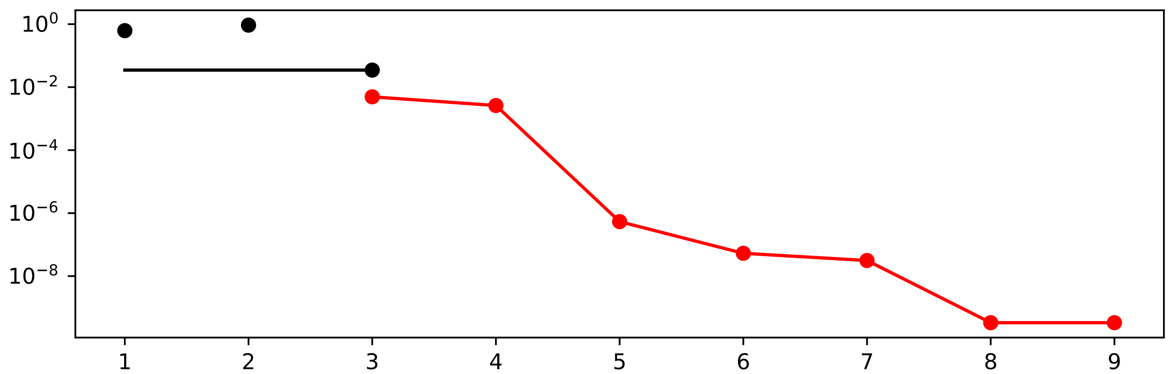

```
<spotPython.spot.spot.Spot at 0x17bc77160>
```

```python
spot_1_GP.print_results()
```

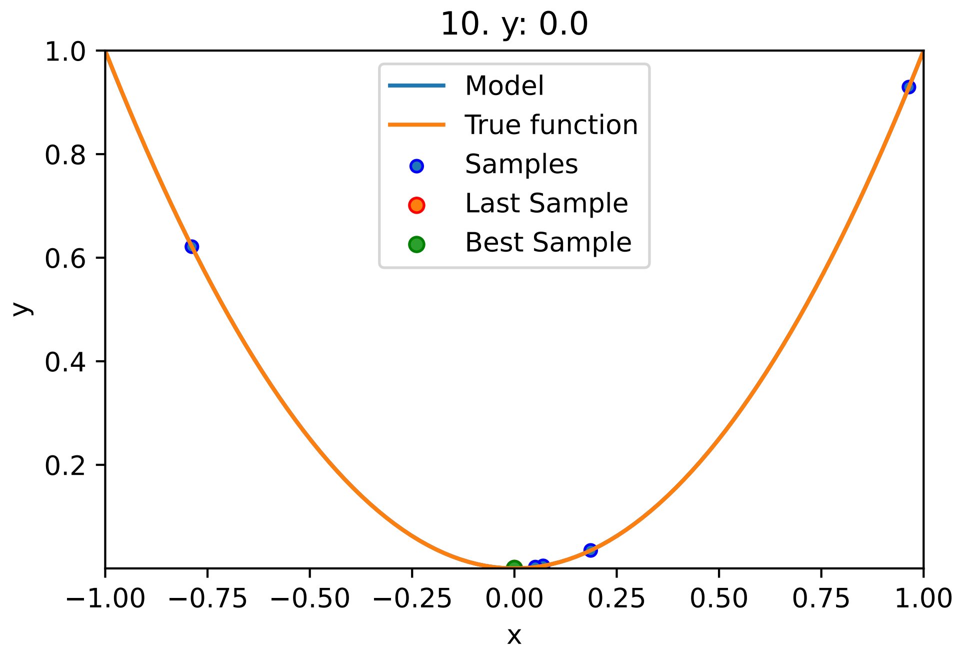
```
min y: 3.3239094346957235e-10
x0: -1.823159190716961e-05
```

```
[['x0', -1.823159190716961e-05]]
```

```python
spot_1_GP.plot_progress(log_y=True)
```




```python
spot_1_GP.plot_model()
```


10. y: 0.0
Model
True function
Samples
Last Sample
Best Sample
1.0
0.8
0.6
0.4
0.2
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

7 Exercises

- Important:
  - Results from these exercises should be added to this document, i.e., you should submit an updated version of this notebook.
  - Please combine your results using this notebook.
  - Only one notebook from each group!
  - Presentation is based on this notebook. No addtional slides are required!
  - spotPython version `0.16.11` (or greater) is required.

7.0.1 `DecisionTreeRegressor`

- Describe the surrogate model.
- Use the surrogate as the model for optimization.

7.0.2 `RandomForestRegressor`

- Describe the surrogate model.
- Use the surrogate as the model for optimization.

7.0.3 `linear_model.LinearRegression`

- Describe the surrogate model.
- Use the surrogate as the model for optimization.

7.0.4 `linear_model.Ridge`

- Describe the surrogate model.
- Use the surrogate as the model for optimization.

7.1 Exercise 2

- Compare the performance of the five different surrogates on both objective functions:
  - `spotPython`'s internal Kriging
  - `DecisionTreeRegressor`
  - `RandomForestRegressor`
  - `linear_model.LinearRegression`
  - `linear_model.Ridge`

8 Sequential Parameter Optimization: Using `scipy` Optimizers

This notebook describes how different optimizers form the `scipy optimize` package can be used on the surrogate. The optimization algorithms are available from https://docs.scipy.org/doc/scipy/reference/optimize.html

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
from scipy.optimize import dual_annealing
from scipy.optimize import basinhopping
import matplotlib.pyplot as plt
```

8.1 The Objective Function Branin

- The `spotPython` package provides several classes of objective functions.
- We will use an analytical objective function, i.e., a function that can be described by a (closed) formula.
- Here we will use the Branin function. The 2-dim Branin function is

$$y = a * (x2 - b * x1 * *2 + c * x1 - r) * *2 + s * (1 - t) * cos(x1) + s,$$

  where values of a, b, c, r, s and t are: $a = 1, b = 5.1/(4 * pi * *2), c = 5/pi, r = 6, s = 10$ and $t = 1/(8 * pi)$.
- It has three global minima:

  $f(x) = 0.397887$ at $(-\pi, 12.275)$, $(\pi, 2.275)$, and $(9.42478, 2.475)$.

- Input Domain: This function is usually evaluated on the square x1 in [-5, 10] x x2 in [0, 15].

```
from spotPython.fun.objectivefunctions import analytical
lower = np.array([-5,-0])
upper = np.array([10,15])
```

```
fun = analytical(seed=123).fun_branin
```

8.2 The Optimizer

- Differential Evalution from the `scikit.optimize` package, see https://docs.scipy.org/doc/scipy/reference/generated/scipy.optimize.differential_evolution.html#scipy.optimize.differential_evolution is the default optimizer for the search on the surrogate.
- Other optimiers that are available in `spotPython`:
  - `dual_annealing`
  - `direct`
  - `shgo`
  - `basinhopping`, see https://docs.scipy.org/doc/scipy/reference/optimize.html#global-optimization.
- These can be selected as follows:

  `surrogate_control = "model_optimizer": differential_evolution`
- We will use `differential_evolution`.
- The optimizer can use `1000` evaluations. This value will be passed to the `differential_evolution` method, which has the argument `maxiter` (int). It defines the maximum number of generations over which the entire differential evolution population is evolved, see https://docs.scipy.org/doc/scipy/reference/generated/scipy.optimize.differential_evolution.html#scipy.optimize.differential_evolution

```
spot_de = spot.Spot(fun=fun,
                    lower = lower,
                    upper = upper,
                    fun_evals = 20,
                    max_time = inf,
                    seed=125,
                    noise=False,
```

```
                    show_models= False,
                    design_control={"init_size": 10},
                    surrogate_control={"n_theta": 2,
                                       "model_optimizer": differential_evolution,
                                       "model_fun_evals": 1000,
                                       })
spot_de.run()
```

```
<spotPython.spot.spot.Spot at 0x105929ba0>
```

8.3 Print the Results

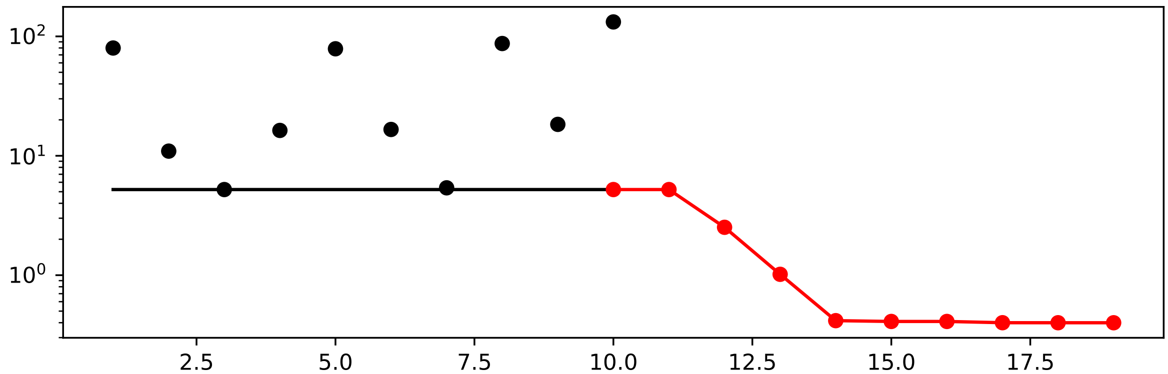
```
spot_de.print_results()
```

```
min y: 0.39951958110619046
x0: -3.1570201165683587
x1: 12.289980569430284
```

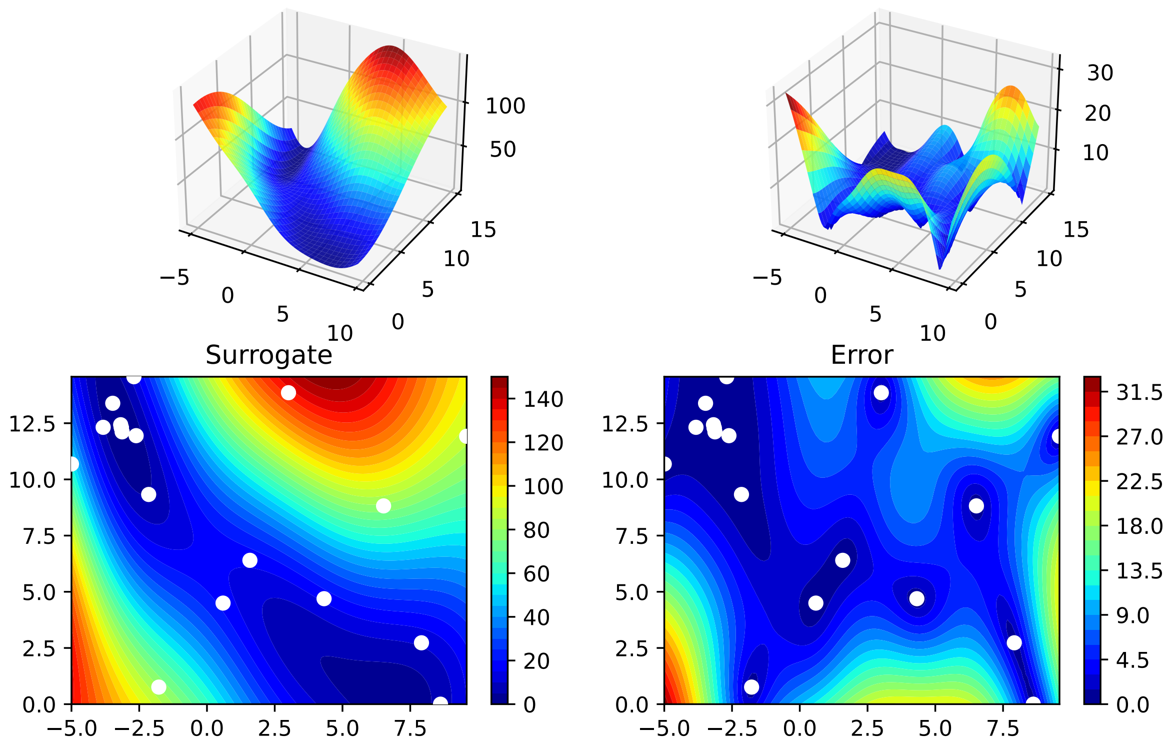
```
[['x0', -3.1570201165683587], ['x1', 12.289980569430284]]
```

8.4 Show the Progress

```
spot_de.plot_progress(log_y=True)
```



```
spot_de.surrogate.plot()
```



9 Exercises

9.1 `dual_annealing`

- Describe the optimization algorithm
- Use the algorithm as an optimizer on the surrogate

9.2 `direct`

- Describe the optimization algorithm
- Use the algorithm as an optimizer on the surrogate

9.3 `shgo`

- Describe the optimization algorithm
- Use the algorithm as an optimizer on the surrogate

9.4 `basinhopping`

- Describe the optimization algorithm
- Use the algorithm as an optimizer on the surrogate

9.5 Performance Comparison

Compare the performance and run time of the 5 different optimizers:

```
* `differential_evolution`
* `dual_annealing`
*  `direct`
* `shgo`
* `basinhopping`.
```

The Branin function has three global minima:

- $f(x) = 0.397887$ at
  - $(-\pi, 12.275)$,
  - $(\pi, 2.275)$, and
  - $(9.42478, 2.475)$.

- Which optima are found by the optimizers? Does the `seed` change this behavior?

10 Sequential Parameter Optimization: Gaussian Process Models

- This notebook analyzes differences between
  - the `Kriging` implementation in `spotPython` and
  - the `GaussianProcessRegressor` in `scikit-learn`.

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.design.spacefilling import spacefilling
from spotPython.spot import spot
from spotPython.build.kriging import Kriging
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
import math as m
from sklearn.gaussian_process import GaussianProcessRegressor
from sklearn.gaussian_process.kernels import RBF
```

10.1 Gaussian Processes Regression: Basic Introductory `scikit-learn` Example

- This is the example from scikit-learn: https://scikit-learn.org/stable/auto_examples/gaussian_process/pl
- After fitting our model, we see that the hyperparameters of the kernel have been optimized.
- Now, we will use our kernel to compute the mean prediction of the full dataset and plot the 95% confidence interval.

10.1.1 Train and Test Data

```
X = np.linspace(start=0, stop=10, num=1_000).reshape(-1, 1)
y = np.squeeze(X * np.sin(X))
rng = np.random.RandomState(1)
training_indices = rng.choice(np.arange(y.size), size=6, replace=False)
X_train, y_train = X[training_indices], y[training_indices]
```

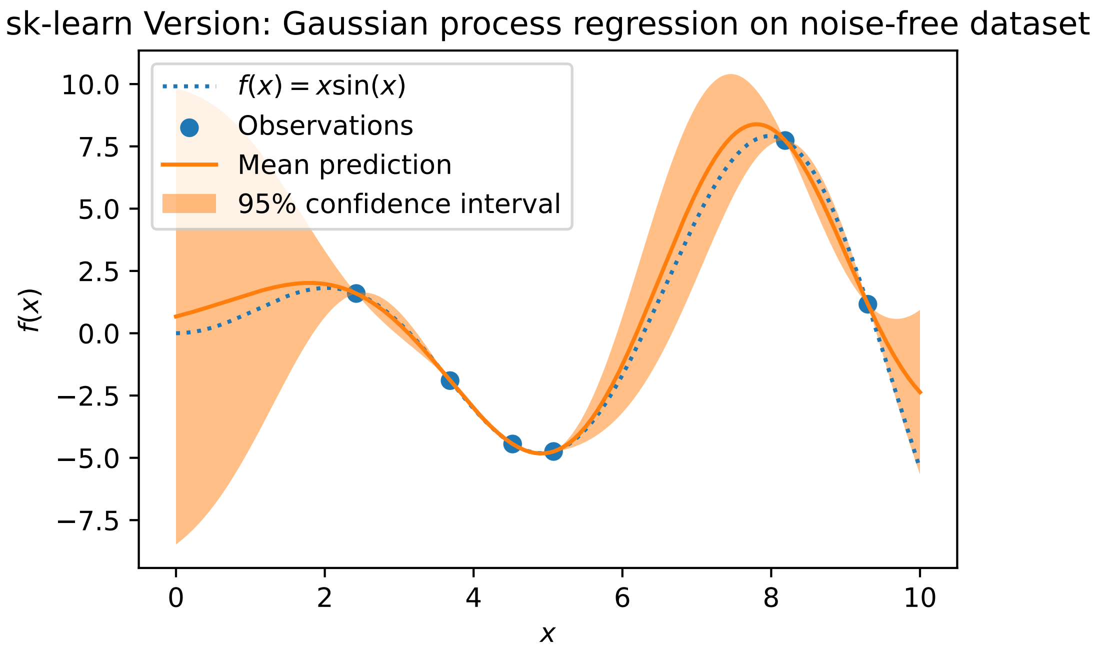
10.1.2 Building the Surrogate With `Sklearn`

- The model building with `sklearn` consisits of three steps:
    1. Instantiating the model, then
    2. fitting the model (using `fit`), and
    3. making predictions (using `predict`)

```
kernel = 1 * RBF(length_scale=1.0, length_scale_bounds=(1e-2, 1e2))
gaussian_process = GaussianProcessRegressor(kernel=kernel, n_restarts_optimizer=9)
gaussian_process.fit(X_train, y_train)
mean_prediction, std_prediction = gaussian_process.predict(X, return_std=True)
```

10.1.3 Plotting the `Sklearn`Model

```
plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, mean_prediction, label="Mean prediction")
plt.fill_between(
    X.ravel(),
    mean_prediction - 1.96 * std_prediction,
    mean_prediction + 1.96 * std_prediction,
    alpha=0.5,
    label=r"95% confidence interval",
)
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("sk-learn Version: Gaussian process regression on noise-free dataset")
```



10.1.4 The spotPython Version

- The `spotPython` version is very similar:

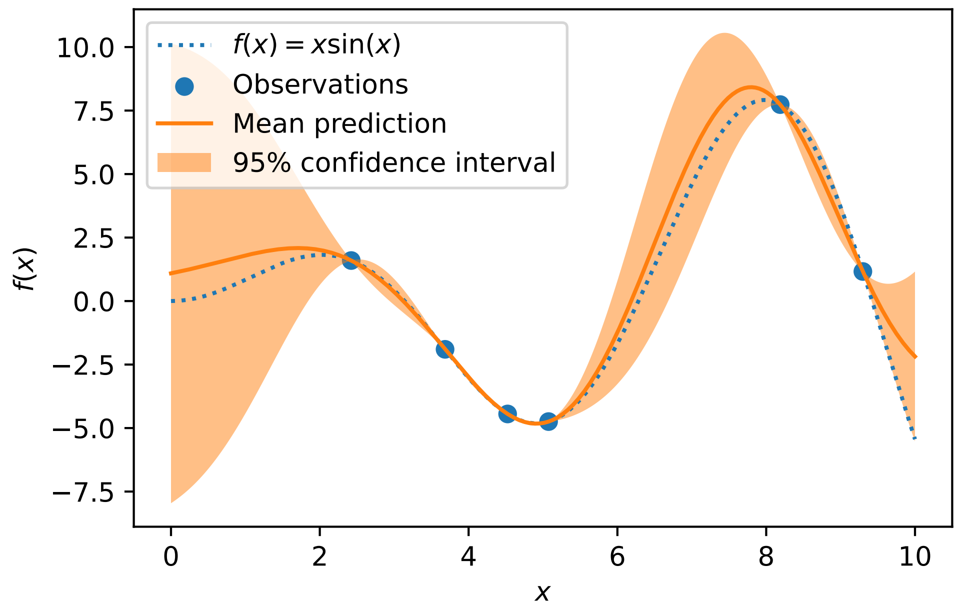
  1. Instantiating the model, then
  2. fitting the model and
  3. making predictions (using `predict`).

```
S = Kriging(name='kriging',  seed=123, log_level=50, cod_type="norm")
S.fit(X_train, y_train)
S_mean_prediction, S_std_prediction, S_ei = S.predict(X, return_val="all")
```

```
plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, S_mean_prediction, label="Mean prediction")
plt.fill_between(
    X.ravel(),
    S_mean_prediction - 1.96 * S_std_prediction,
    S_mean_prediction + 1.96 * S_std_prediction,
    alpha=0.5,
    label=r"95% confidence interval",
```

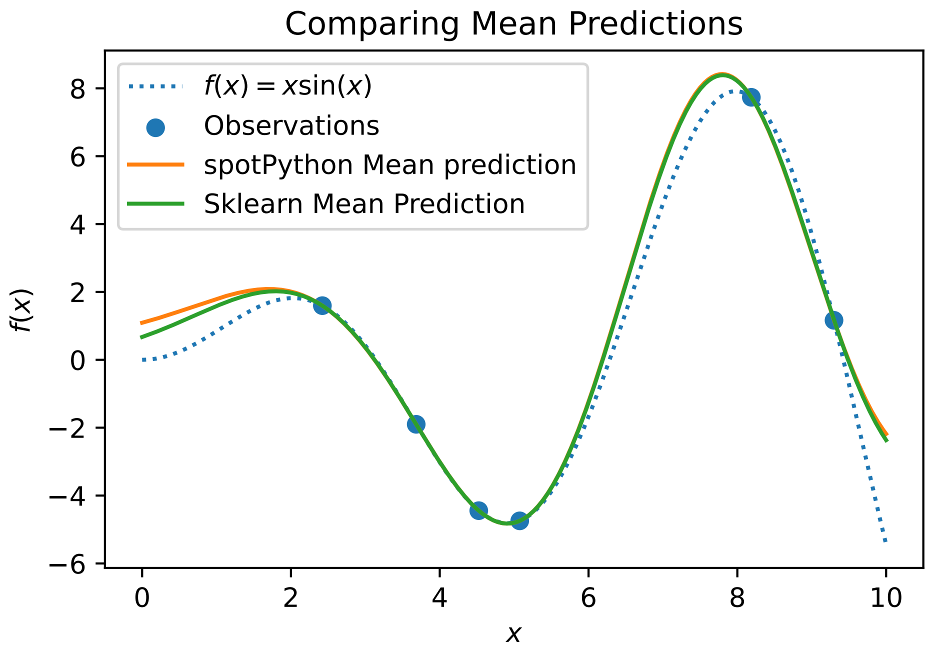
```
)
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("spotPython Version: Gaussian process regression on noise-free dataset")
```

spotPython Version: Gaussian process regression on noise-free dataset



10.1.5 Visualizing the Differences Between the `spotPython` and the `sklearn` Model Fits

```
plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, S_mean_prediction, label="spotPython Mean prediction")
plt.plot(X, mean_prediction, label="Sklearn Mean Prediction")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Comparing Mean Predictions")
```



Comparing Mean Predictions
$f(x) = x\sin(x)$
Observations
spotPython Mean prediction
Sklearn Mean Prediction
$f(x)$
x

11 Exercises

11.1 Schonlau Example Function

- The Schonlau Example Function is based on sample points only (there is no analytical function description available):

```
X = np.linspace(start=0, stop=13, num=1_000).reshape(-1, 1)
X_train = np.array([1., 2., 3., 4., 12.]).reshape(-1,1)
y_train = np.array([0., -1.75, -2, -0.5, 5.])
```

- Describe the function.
- Compare the two models that were build using the `spotPython` and the `sklearn` surrogate.
- Note: Since there is no analytical function available, you might be interested in adding some points and describe the effects.

11.2 Forrester Example Function

- The Forrester Example Function is defined as follows:

  `f(x) = (6x- 2)^2 sin(12x-4) for x in [0,1].`

- Data points are generated as follows:

```
X = np.linspace(start=-0.5, stop=1.5, num=1_000).reshape(-1, 1)
X_train = np.array([0.0, 0.175, 0.225, 0.3, 0.35, 0.375, 0.5,1]).reshape(-1,1)
fun = analytical().fun_forrester
fun_control = {"sigma": 0.1,
               "seed": 123}
y = fun(X, fun_control=fun_control)
y_train = fun(X_train, fun_control=fun_control)
```

- Describe the function.

- Compare the two models that were build using the `spotPython` and the `sklearn` surrogate.
- Note: Modify the noise level (`"sigma"`), e.g., use a value of `0.2`, and compare the two models.

```
fun_control = {"sigma": 0.2}
```

11.3 `fun_runge Function (1-dim)`

- The Runge function is defined as follows:

  `f(x) = 1/ (1 + sum(x_i))^2`

- Data points are generated as follows:

```
gen = spacefilling(1)
rng = np.random.RandomState(1)
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_runge
fun_control = {"sigma": 0.025,
               "seed": 123}
X_train = gen.scipy_lhd(10, lower=lower, upper = upper).reshape(-1,1)
y_train = fun(X, fun_control=fun_control)
X = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
y = fun(X, fun_control=fun_control)
```

- Describe the function.
- Compare the two models that were build using the `spotPython` and the `sklearn` surrogate.
- Note: Modify the noise level (`"sigma"`), e.g., use a value of `0.05`, and compare the two models.

```
fun_control = {"sigma": 0.5}
```

11.4 `fun_cubed (1-dim)`

- The Cubed function is defined as follows:

  `np.sum(X[i]** 3)`

- Data points are generated as follows:

```
gen = spacefilling(1)
rng = np.random.RandomState(1)
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_cubed
fun_control = {"sigma": 0.025,
               "seed": 123}
X_train = gen.scipy_lhd(10, lower=lower, upper = upper).reshape(-1,1)
y_train = fun(X, fun_control=fun_control)
X = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
y = fun(X, fun_control=fun_control)
```

- Describe the function.
- Compare the two models that were build using the `spotPython` and the `sklearn` surrogate.
- Note: Modify the noise level (`"sigma"`), e.g., use a value of `0.05`, and compare the two models.

```
fun_control = {"sigma": 0.05}
```

11.5 The Effect of Noise

How does the behavior of the `spotPython` fit changes when the argument `noise` is set to `True`, i.e.,

```
S = Kriging(name='kriging',  seed=123, n_theta=1, noise=True)
```

is used?

12 Expected Improvement

12.1 Example: `Spot` and the 1-dim Sphere Function

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
```

12.1.1 The Objective Function: 1-dim Sphere

- The `spotPython` package provides several classes of objective functions.
- We will use an analytical objective function, i.e., a function that can be described by a (closed) formula:

$$f(x) = x^2$$

```
fun = analytical().fun_sphere
```

```
fun = analytical().fun_sphere
fun_control = {"sigma": 0,
               "seed": 123}
```

- The size of the `lower` bound vector determines the problem dimension.
- Here we will use `np.array([-1])`, i.e., a one-dim function.

```
spot_1 = spot.Spot(fun=fun,
                   lower = np.array([-1]),
                   upper = np.array([1]))
```

```
spot_1.run()
```

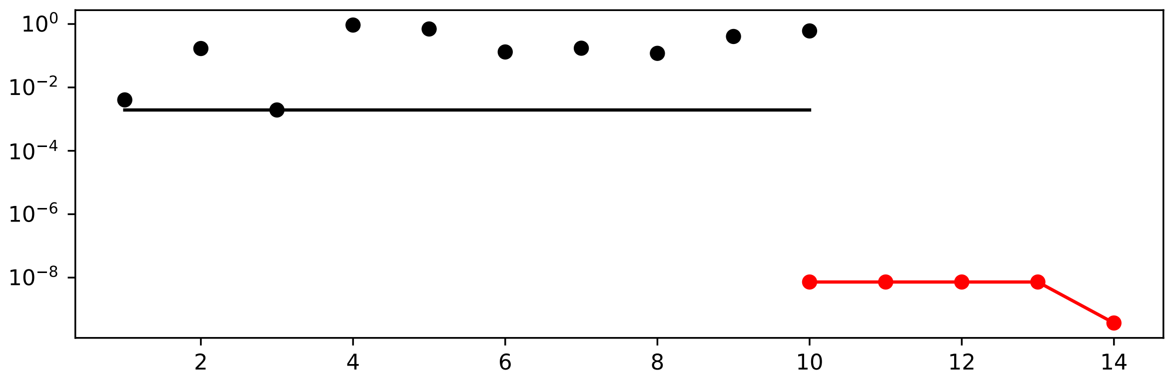
```
<spotPython.spot.spot.Spot at 0x28e09ba60>
```

12.1.2 Results

```
spot_1.print_results()
```

```
min y: 3.696886711914087e-10
x0: 1.922728975158508e-05

[['x0', 1.922728975158508e-05]]
```

```
spot_1.plot_progress(log_y=True)
```

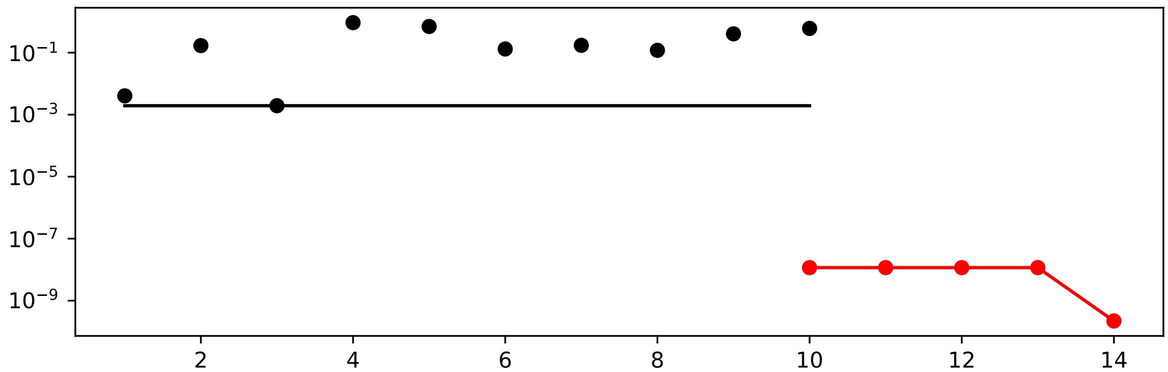


12.2 Same, but with EI as infill_criterion

```
spot_1_ei = spot.Spot(fun=fun,
                   lower = np.array([-1]),
                   upper = np.array([1]),
                   infill_criterion = "ei")
spot_1_ei.run()
```

```
<spotPython.spot.spot.Spot at 0x28fdb20e0>
```

```
spot_1_ei.plot_progress(log_y=True)
```




```
spot_1_ei.print_results()
```

```
min y: 2.207887258868953e-10
x0: 1.4858961130809088e-05

[['x0', 1.4858961130809088e-05]]
```

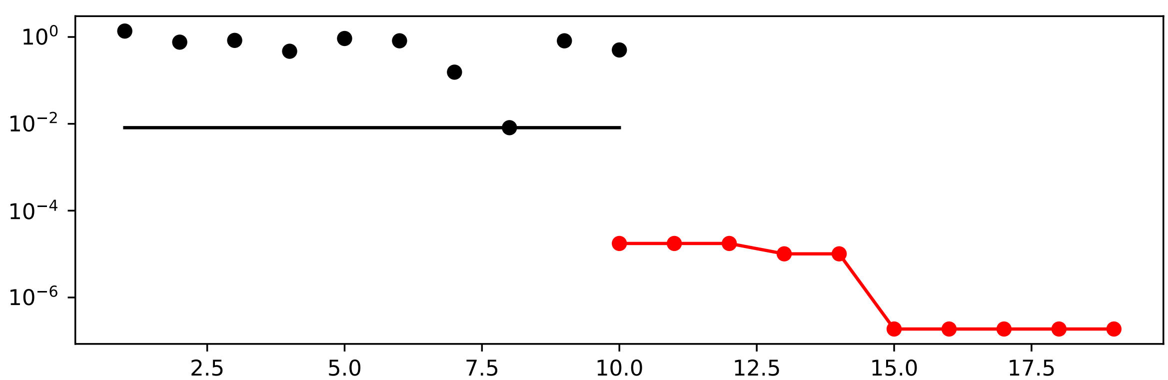
12.3 Non-isotropic Kriging

```
spot_2_ei_noniso = spot.Spot(fun=fun,
                   lower = np.array([-1, -1]),
                   upper = np.array([1, 1]),
                   fun_evals = 20,
                   fun_repeats = 1,
                   max_time = inf,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type=["num"],
                   infill_criterion = "ei",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models=True,
                   fun_control = fun_control,
```

```
                      design_control={"init_size": 10,
                                      "repeats": 1},
                      surrogate_control={"noise": False,
                                         "cod_type": "norm",
                                         "min_theta": -4,
                                         "max_theta": 3,
                                         "n_theta": 2,
                                         "model_optimizer": differential_evolution,
                                         "model_fun_evals": 1000,
                                         })
spot_2_ei_noniso.run()
```

```
<spotPython.spot.spot.Spot at 0x28ff0b8e0>
```

```
spot_2_ei_noniso.plot_progress(log_y=True)
```

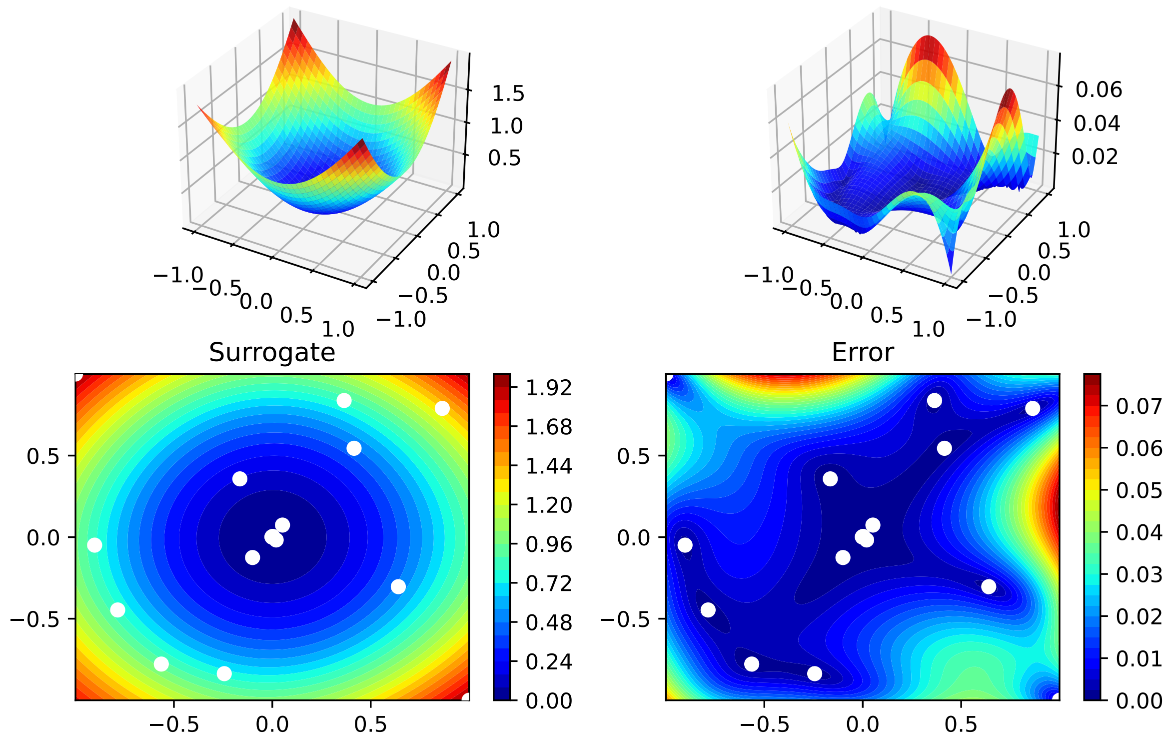



```
spot_2_ei_noniso.print_results()
```

```
min y: 1.8779971830281702e-07
x0: -0.0002783721390529846
x1: 0.0003321274913371111
```

```
[['x0', -0.0002783721390529846], ['x1', 0.0003321274913371111]]
```

```
spot_2_ei_noniso.surrogate.plot()
```



12.4 Using `sklearn` Surrogates

12.4.1 The spot Loop

The `spot` loop consists of the following steps:

1. Init: Build initial design X
2. Evaluate initial design on real objective f: $y = f(X)$
3. Build surrogate: $S = S(X, y)$
4. Optimize on surrogate: $X_0 = \text{optimize}(S)$
5. Evaluate on real objective: $y_0 = f(X_0)$
6. Impute (Infill) new points: $X = X \cup X_0$, $y = y \cup y_0$.
7. Got 3.

The `spot` loop is implemented in `R` as follows:

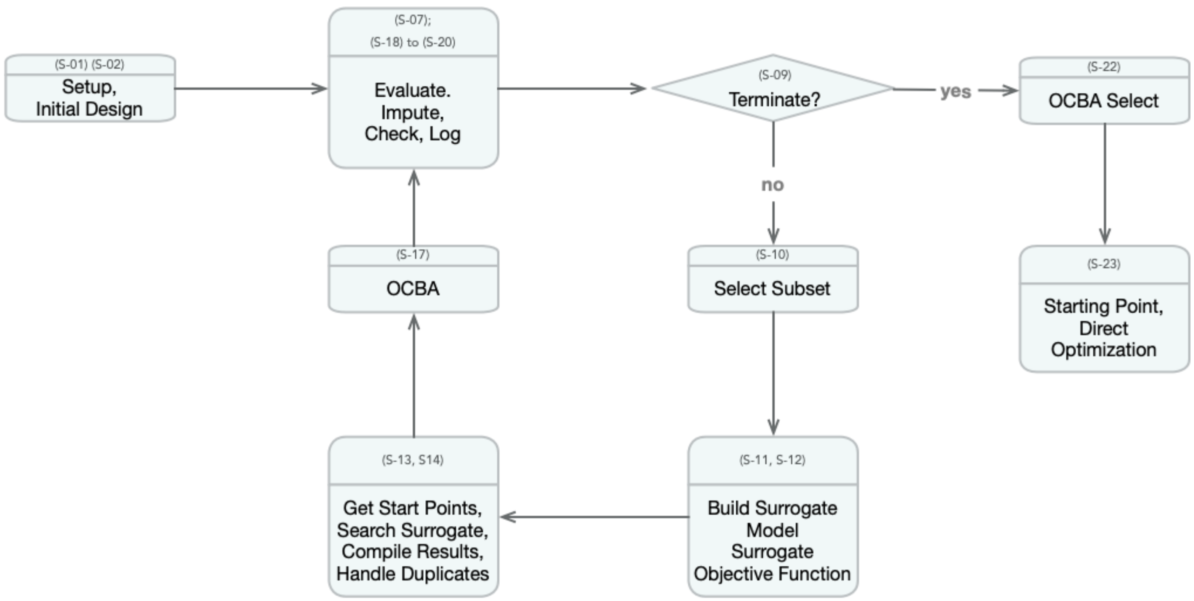


Figure 12.1: Visual representation of the model based search with SPOT. Taken from: Bartz-Beielstein, T., and Zaefferer, M. Hyperparameter tuning approaches. In Hyperparameter Tuning for Machine and Deep Learning with R - A Practical Guide, E. Bartz, T. Bartz-Beielstein, M. Zaefferer, and O. Mersmann, Eds. Springer, 2022, ch. 4, pp. 67–114.

12.4.2 spot: The Initial Model

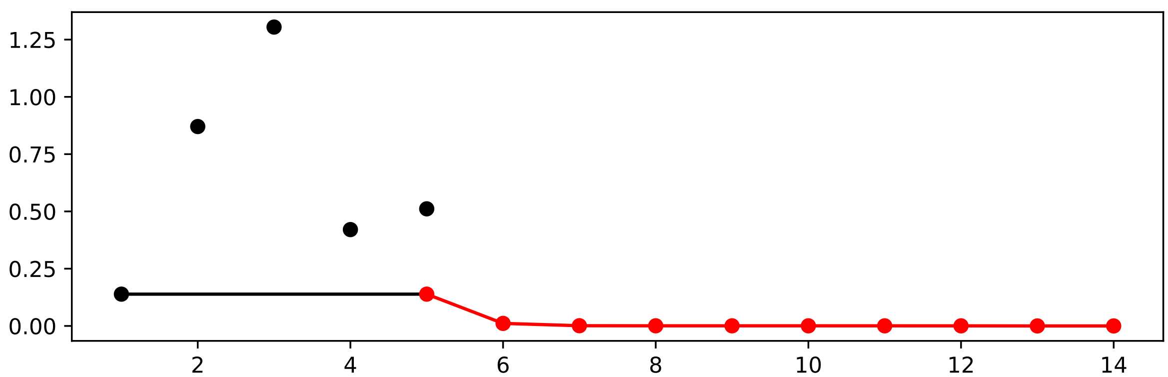
12.4.2.1 Example: Modifying the initial design size

This is the "Example: Modifying the initial design size" from Chapter 4.5.1 in [bart21i].

```
spot_ei = spot.Spot(fun=fun,
               lower = np.array([-1,-1]),
               upper= np.array([1,1]),
               design_control={"init_size": 5})
spot_ei.run()
```

```
<spotPython.spot.spot.Spot at 0x2b7321360>
```

```
spot_ei.plot_progress()
```




```
np.min(spot_1.y), np.min(spot_ei.y)
```

```
(3.696886711914087e-10, 1.7928640814182596e-05)
```

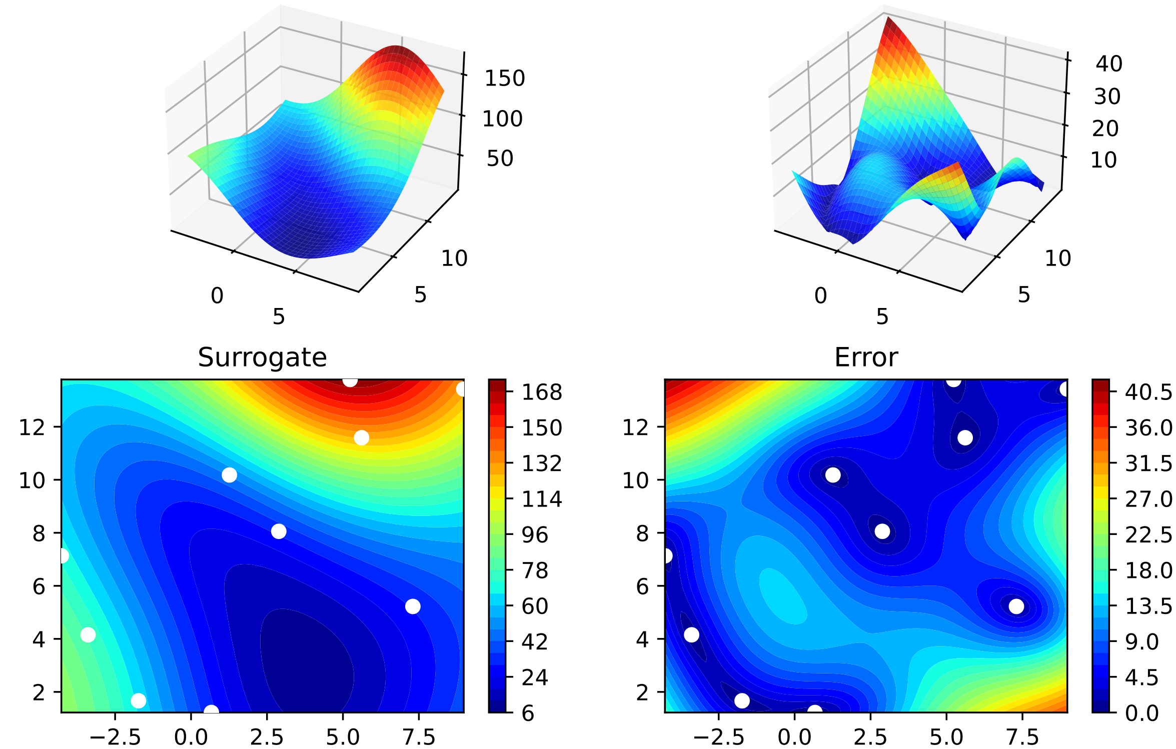
12.4.3 Init: Build Initial Design

```
from spotPython.design.spacefilling import spacefilling
from spotPython.build.kriging import Kriging
from spotPython.fun.objectivefunctions import analytical
gen = spacefilling(2)
```

```python
rng = np.random.RandomState(1)
lower = np.array([-5,-0])
upper = np.array([10,15])
fun = analytical().fun_branin
fun_control = {"sigma": 0,
               "seed": 123}

X = gen.scipy_lhd(10, lower=lower, upper = upper)
print(X)
y = fun(X, fun_control=fun_control)
print(y)
```

```
[[ 8.97647221 13.41926847]
 [ 0.66946019  1.22344228]
 [ 5.23614115 13.78185824]
 [ 5.6149825  11.5851384 ]
 [-1.72963184  1.66516096]
 [-4.26945568  7.1325531 ]
 [ 1.26363761 10.17935555]
 [ 2.88779942  8.05508969]
 [-3.39111089  4.15213772]
 [ 7.30131231  5.22275244]]
[128.95676449  31.73474356 172.89678121 126.71295908  64.34349975
  70.16178611  48.71407916  31.77322887  76.91788181  30.69410529]
```

```python
S = Kriging(name='kriging',  seed=123)
S.fit(X, y)
S.plot()
```




```
gen = spacefilling(2, seed=123)
X0 = gen.scipy_lhd(3)
gen = spacefilling(2, seed=345)
X1 = gen.scipy_lhd(3)
X2 = gen.scipy_lhd(3)
gen = spacefilling(2, seed=123)
X3 = gen.scipy_lhd(3)
X0, X1, X2, X3
```

```
(array([[0.77254938, 0.31539299],
        [0.59321338, 0.93854273],
        [0.27469803, 0.3959685 ]]),
 array([[0.78373509, 0.86811887],
        [0.06692621, 0.6058029 ],
        [0.41374778, 0.00525456]]),
 array([[0.121357  , 0.69043832],
        [0.41906219, 0.32838498],
        [0.86742658, 0.52910374]]),
```

```
array([[0.77254938, 0.31539299],
       [0.59321338, 0.93854273],
       [0.27469803, 0.3959685 ]]))
```

12.4.4 Evaluate

12.4.5 Build Surrogate

12.4.6 A Simple Predictor

The code below shows how to use a simple model for prediction.

- Assume that only two (very costly) measurements are available:
  1. f(0) = 0.5
  2. f(2) = 2.5
- We are interested in the value at $x_0 = 1$, i.e., $f(x_0 = 1)$, but cannot run an additional, third experiment.

```python
from sklearn import linear_model
X = np.array([[0], [2]])
y = np.array([0.5, 2.5])
S_lm = linear_model.LinearRegression()
S_lm = S_lm.fit(X, y)
X0 = np.array([[1]])
y0 = S_lm.predict(X0)
print(y0)
```

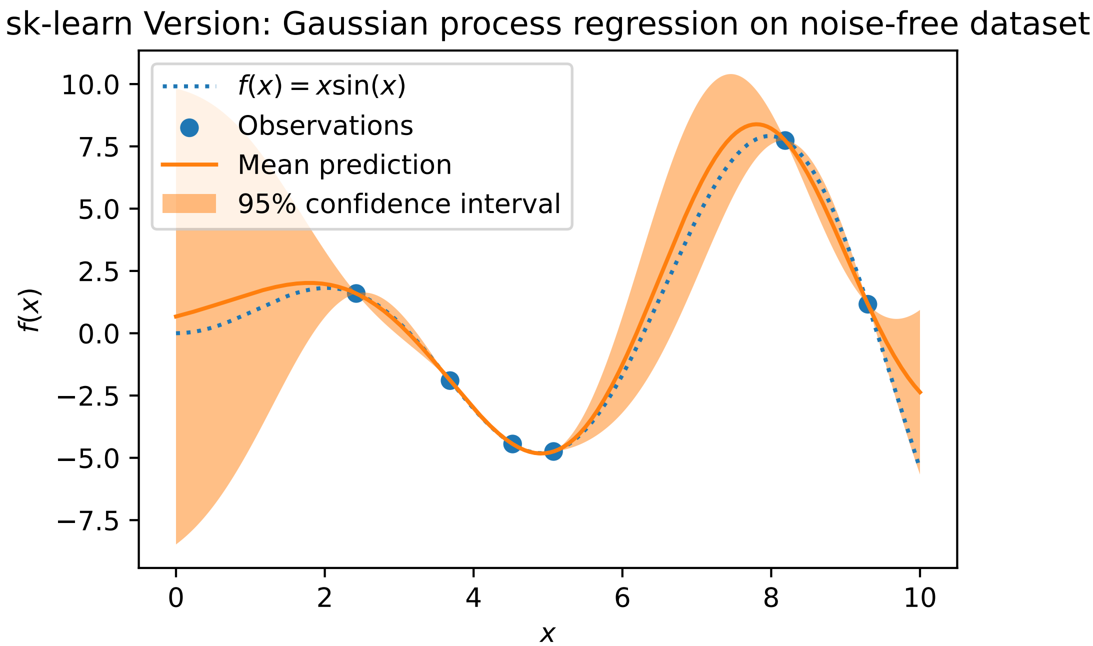
```
[1.5]
```

- Central Idea:
  - Evaluation of the surrogate model `S_lm` is much cheaper (or / and much faster) than running the real-world experiment f.

12.5 Gaussian Processes regression: basic introductory example

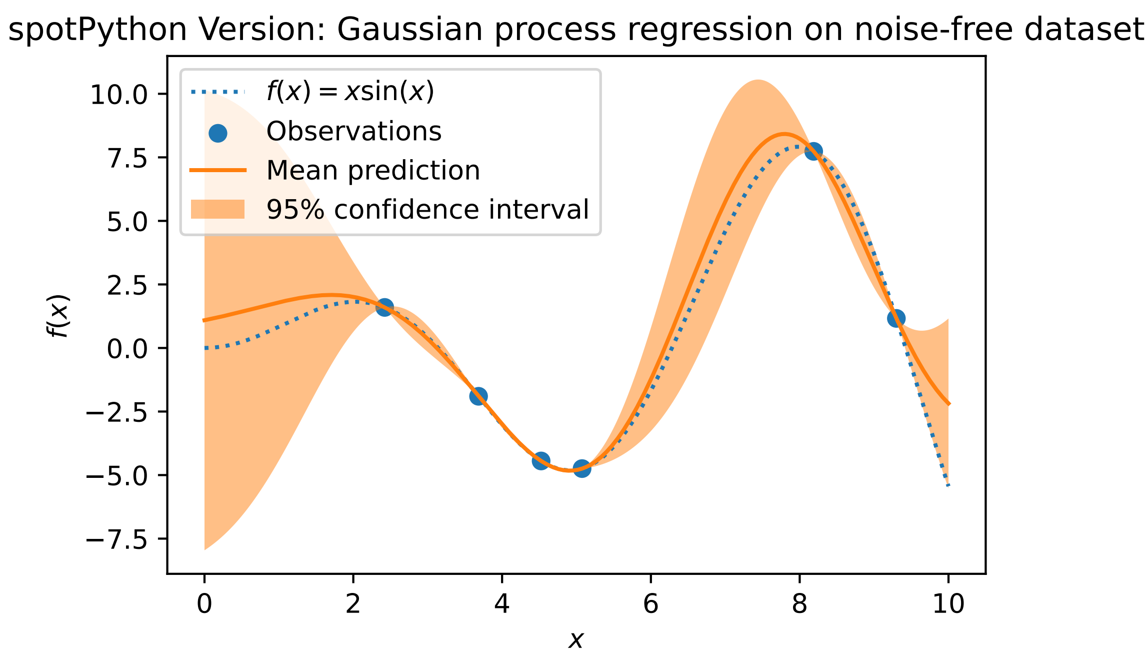
This example was taken from scikit-learn. After fitting our model, we see that the hyperparameters of the kernel have been optimized. Now, we will use our kernel to compute the mean prediction of the full dataset and plot the 95% confidence interval.

```python
import numpy as np
import matplotlib.pyplot as plt
import math as m
from sklearn.gaussian_process import GaussianProcessRegressor
from sklearn.gaussian_process.kernels import RBF

X = np.linspace(start=0, stop=10, num=1_000).reshape(-1, 1)
y = np.squeeze(X * np.sin(X))
rng = np.random.RandomState(1)
training_indices = rng.choice(np.arange(y.size), size=6, replace=False)
X_train, y_train = X[training_indices], y[training_indices]

kernel = 1 * RBF(length_scale=1.0, length_scale_bounds=(1e-2, 1e2))
gaussian_process = GaussianProcessRegressor(kernel=kernel, n_restarts_optimizer=9)
gaussian_process.fit(X_train, y_train)
gaussian_process.kernel_

mean_prediction, std_prediction = gaussian_process.predict(X, return_std=True)

plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, mean_prediction, label="Mean prediction")
plt.fill_between(
    X.ravel(),
    mean_prediction - 1.96 * std_prediction,
    mean_prediction + 1.96 * std_prediction,
    alpha=0.5,
    label=r"95% confidence interval",
)
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("sk-learn Version: Gaussian process regression on noise-free dataset")
```




```
from spotPython.build.kriging import Kriging
import numpy as np
import matplotlib.pyplot as plt
rng = np.random.RandomState(1)
X = np.linspace(start=0, stop=10, num=1_000).reshape(-1, 1)
y = np.squeeze(X * np.sin(X))
training_indices = rng.choice(np.arange(y.size), size=6, replace=False)
X_train, y_train = X[training_indices], y[training_indices]


S = Kriging(name='kriging',  seed=123, log_level=50, cod_type="norm")
S.fit(X_train, y_train)

mean_prediction, std_prediction, ei = S.predict(X, return_val="all")

std_prediction

plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, mean_prediction, label="Mean prediction")
plt.fill_between(
```

```
    X.ravel(),
    mean_prediction - 1.96 * std_prediction,
    mean_prediction + 1.96 * std_prediction,
    alpha=0.5,
    label=r"95% confidence interval",
)
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("spotPython Version: Gaussian process regression on noise-free dataset")
```



12.6 The Surrogate: Using scikit-learn models

Default is the internal `kriging` surrogate.

```
S_0 = Kriging(name='kriging', seed=123)
```

Models from `scikit-learn` can be selected, e.g., Gaussian Process:

```python
# Needed for the sklearn surrogates:
from sklearn.gaussian_process import GaussianProcessRegressor
from sklearn.gaussian_process.kernels import RBF
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn import linear_model
from sklearn import tree
import pandas as pd
```

```python
kernel = 1 * RBF(length_scale=1.0, length_scale_bounds=(1e-2, 1e2))
S_GP = GaussianProcessRegressor(kernel=kernel, n_restarts_optimizer=9)
```

- and many more:

```python
S_Tree = DecisionTreeRegressor(random_state=0)
S_LM = linear_model.LinearRegression()
S_Ridge = linear_model.Ridge()
S_RF = RandomForestRegressor(max_depth=2, random_state=0)
```

- The scikit-learn GP model `S_GP` is selected.

```python
S = S_GP
```

```python
isinstance(S, GaussianProcessRegressor)
```

```
True
```

```python
from spotPython.fun.objectivefunctions import analytical
fun = analytical().fun_branin
lower = np.array([-5,-0])
upper = np.array([10,15])
design_control={"init_size": 5}
surrogate_control={
            "infill_criterion": None,
            "n_points": 1,
        }
spot_GP = spot.Spot(fun=fun, lower = lower, upper= upper, surrogate=S,
                    fun_evals = 15, noise = False, log_level = 50,
                    design_control=design_control,
                    surrogate_control=surrogate_control)
```

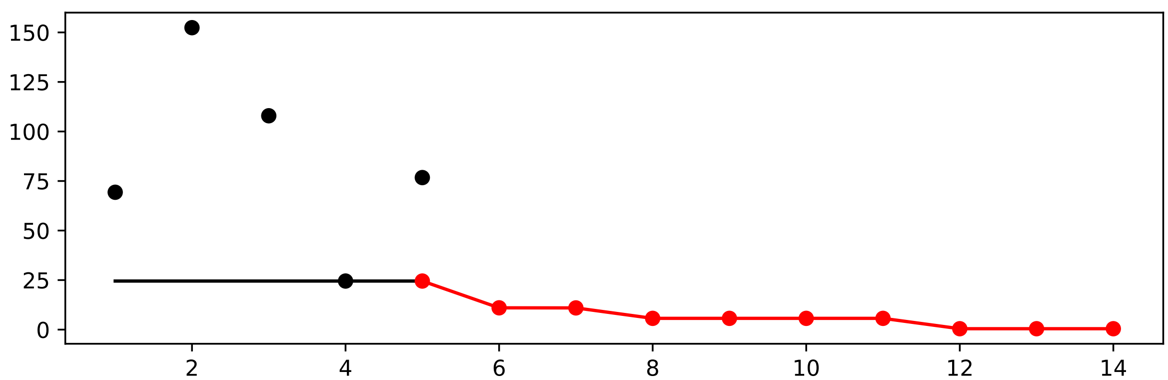
```python
spot_GP.run()
```

```
<spotPython.spot.spot.Spot at 0x28ff79600>
```

```python
spot_GP.y
```

```
array([ 69.32459936, 152.38491454, 107.92560483,  24.51465459,
        76.73500031,  86.30426355,  11.00307722,  10.95958393,
         5.68972825,  18.74450294,  17.74115087,   7.62510633,
         0.45845099,   1.57075843,  10.72595748])
```

```python
spot_GP.plot_progress()
```




```python
spot_GP.print_results()
```

```
min y: 0.4584509926382214
x0: 3.0835520802502288
x1: 2.10999788500675
```

```
[['x0', 3.0835520802502288], ['x1', 2.10999788500675]]
```

12.7 Additional Examples

```python
# Needed for the sklearn surrogates:
from sklearn.gaussian_process import GaussianProcessRegressor
from sklearn.gaussian_process.kernels import RBF
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn import linear_model
from sklearn import tree
import pandas as pd
```

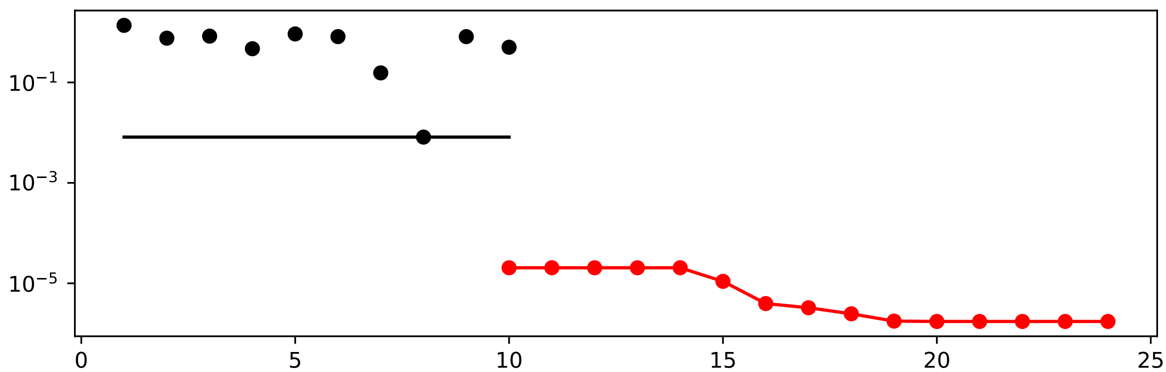
```python
kernel = 1 * RBF(length_scale=1.0, length_scale_bounds=(1e-2, 1e2))
S_GP = GaussianProcessRegressor(kernel=kernel, n_restarts_optimizer=9)
```

```python
from spotPython.build.kriging import Kriging
import numpy as np
import spotPython
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot

S_K = Kriging(name='kriging',
              seed=123,
              log_level=50,
              infill_criterion = "y",
              n_theta=1,
              noise=False,
              cod_type="norm")
fun = analytical().fun_sphere
lower = np.array([-1,-1])
upper = np.array([1,1])

design_control={"init_size": 10}
surrogate_control={
            "n_points": 1,
        }
spot_S_K = spot.Spot(fun=fun,
                     lower = lower,
                     upper= upper,
                     surrogate=S_K,
                     fun_evals = 25,
                     noise = False,
                     log_level = 50,
```

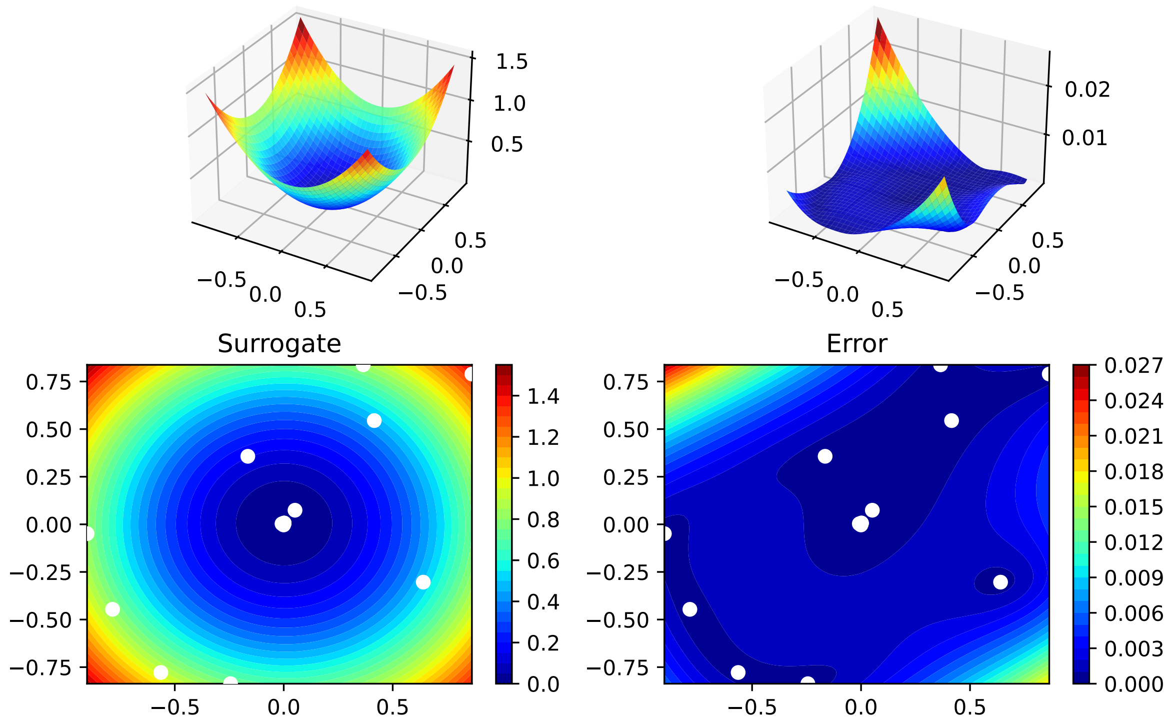
```
                         design_control=design_control,
                         surrogate_control=surrogate_control)
spot_S_K.run()
```

```
<spotPython.spot.spot.Spot at 0x2b484e590>
```

```
spot_S_K.plot_progress(log_y=True)
```




```
spot_S_K.surrogate.plot()
```




```
spot_S_K.print_results()
```

```
min y: 1.7395335905335862e-06
x0: -0.0013044072412622557
x1: 0.0001950777780173277
```

```
[['x0', -0.0013044072412622557], ['x1', 0.0001950777780173277]]
```

12.7.1 Optimize on Surrogate

12.7.2 Evaluate on Real Objective

12.7.3 Impute / Infill new Points

12.8 Tests

```
import numpy as np
from spotPython.spot import spot
from spotPython.fun.objectivefunctions import analytical

fun_sphere = analytical().fun_sphere
spot_1 = spot.Spot(
    fun=fun_sphere,
    lower=np.array([-1, -1]),
    upper=np.array([1, 1]),
    n_points = 2
)

# (S-2) Initial Design:
spot_1.X = spot_1.design.scipy_lhd(
    spot_1.design_control["init_size"], lower=spot_1.lower, upper=spot_1.upper
)
print(spot_1.X)

# (S-3): Eval initial design:
spot_1.y = spot_1.fun(spot_1.X)
print(spot_1.y)

spot_1.surrogate.fit(spot_1.X, spot_1.y)
X0 = spot_1.suggest_new_X()
print(X0)
assert X0.size == spot_1.n_points * spot_1.k
```

```
[[ 0.86352963  0.7892358 ]
 [-0.24407197 -0.83687436]
 [ 0.36481882  0.8375811 ]
 [ 0.415331    0.54468512]
 [-0.56395091 -0.77797854]
 [-0.90259409 -0.04899292]
```

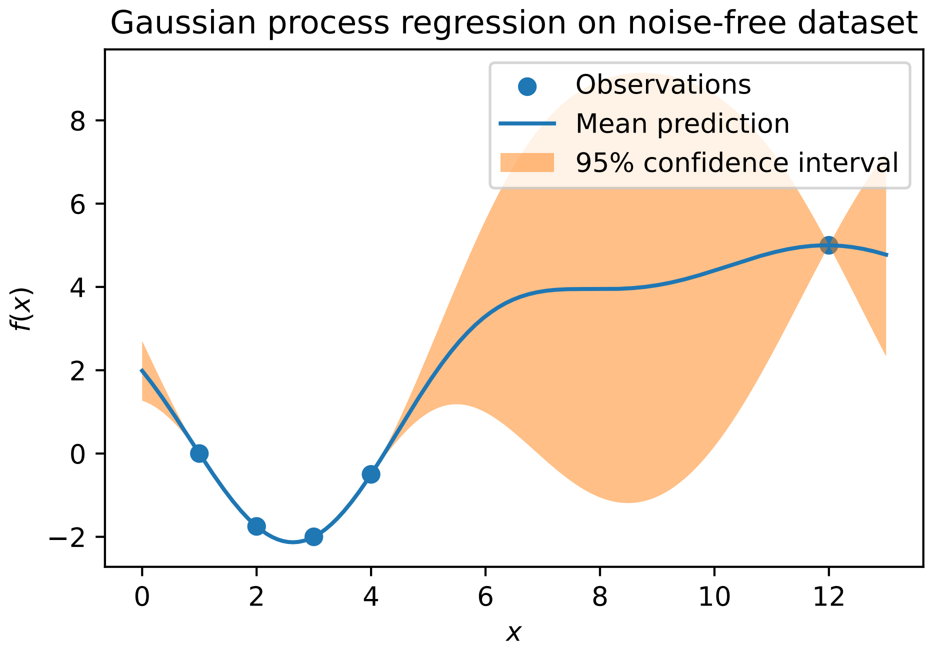
```
 [-0.16484832  0.35724741]
 [ 0.05170659  0.07401196]
 [-0.78548145 -0.44638164]
 [ 0.64017497 -0.30363301]]
[1.36857656 0.75992983 0.83463487 0.46918172 0.92329124 0.8170764
 0.15480068 0.00815134 0.81623768 0.502017  ]
[[0.00160553 0.00428429]
 [0.00160553 0.00428429]]
```

12.9 EI: The Famous Schonlau Example

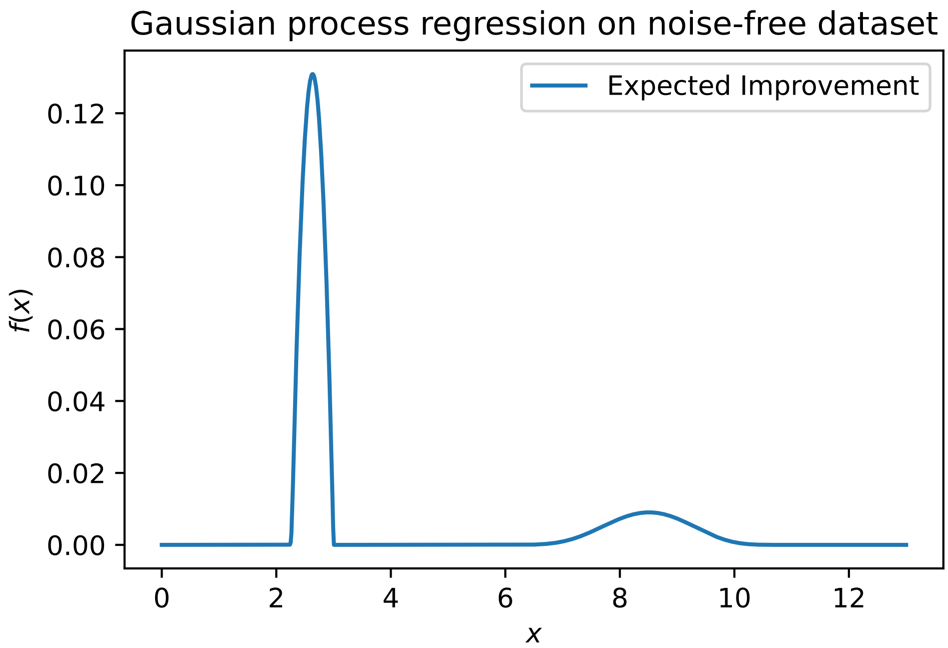
```
X_train0 = np.array([1, 2, 3, 4, 12]).reshape(-1,1)
X_train = np.linspace(start=0, stop=10, num=5).reshape(-1, 1)
```

```
from spotPython.build.kriging import Kriging
import numpy as np
import matplotlib.pyplot as plt

X_train = np.array([1., 2., 3., 4., 12.]).reshape(-1,1)
y_train = np.array([0., -1.75, -2, -0.5, 5.])

S = Kriging(name='kriging',  seed=123, log_level=50, n_theta=1, noise=False, cod_type="nor
S.fit(X_train, y_train)

X = np.linspace(start=0, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, mean_prediction, label="Mean prediction")
if True:
    plt.fill_between(
        X.ravel(),
        mean_prediction - 2 * std_prediction,
        mean_prediction + 2 * std_prediction,
        alpha=0.5,
        label=r"95% confidence interval",
    )
plt.legend()
plt.xlabel("$x$")
```

```
plt.ylabel("$f(x)$")
_ = plt.title("Gaussian process regression on noise-free dataset")
```




```
#plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
# plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, -ei, label="Expected Improvement")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Gaussian process regression on noise-free dataset")
```



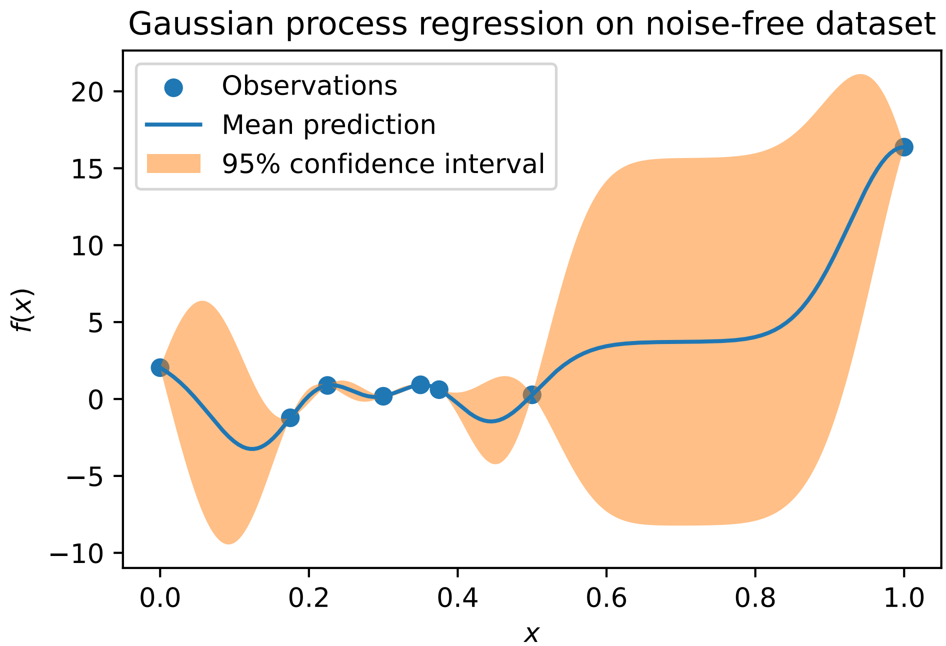

```
S.log
```

```
{'negLnLike': array([1.20788205]),
 'theta': array([1.09276]),
 'p': array([2.]),
 'Lambda': array([None], dtype=object)}
```

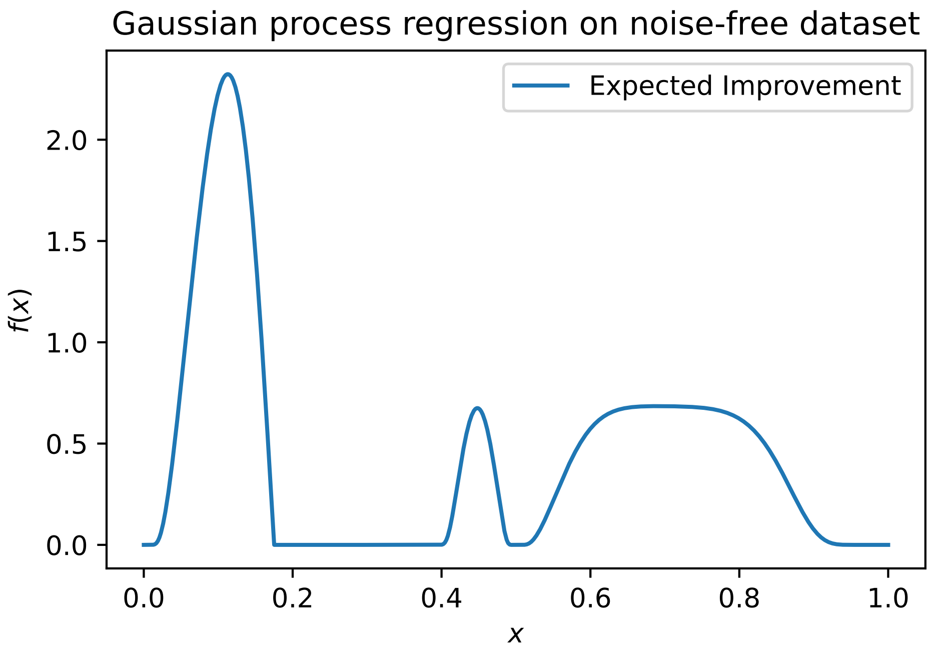
12.10 EI: The Forrester Example

```
from spotPython.build.kriging import Kriging
import numpy as np
import matplotlib.pyplot as plt
import spotPython
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot

# exact x locations are unknown:
X_train = np.array([0.0, 0.175, 0.225, 0.3, 0.35, 0.375, 0.5,1]).reshape(-1,1)
```

```
fun = analytical().fun_forrester
fun_control = {"sigma": 1.0,
               "seed": 123}
y_train = fun(X_train, fun_control=fun_control)

S = Kriging(name='kriging',  seed=123, log_level=50, n_theta=1, noise=False, cod_type="nor
S.fit(X_train, y_train)

X = np.linspace(start=0, stop=1, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, mean_prediction, label="Mean prediction")
if True:
    plt.fill_between(
        X.ravel(),
        mean_prediction - 2 * std_prediction,
        mean_prediction + 2 * std_prediction,
        alpha=0.5,
        label=r"95% confidence interval",
    )
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Gaussian process regression on noise-free dataset")
```




```
#plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
# plt.scatter(X_train, y_train, label="Observations")
plt.plot(X, -ei, label="Expected Improvement")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Gaussian process regression on noise-free dataset")
```

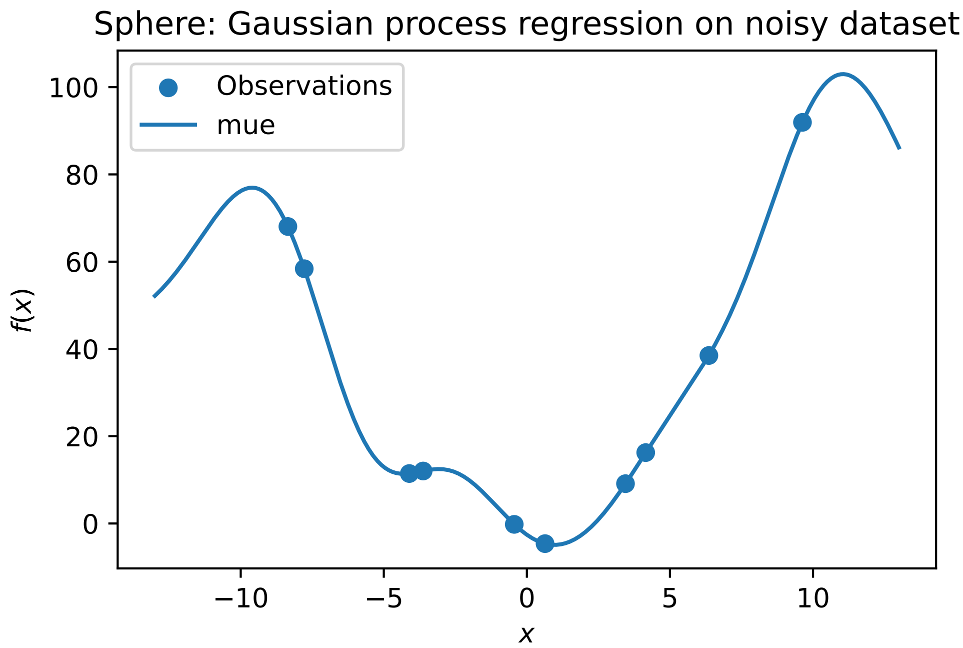


12.11 Noise

```
import numpy as np
import spotPython
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from spotPython.design.spacefilling import spacefilling
from spotPython.build.kriging import Kriging
import matplotlib.pyplot as plt

gen = spacefilling(1)
rng = np.random.RandomState(1)
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_sphere
fun_control = {"sigma": 2,
               "seed": 125}
X = gen.scipy_lhd(10, lower=lower, upper = upper)
print(X)
y = fun(X, fun_control=fun_control)
```

```python
print(y)
y.shape
X_train = X.reshape(-1,1)
y_train = y

S = Kriging(name='kriging',
            seed=123,
            log_level=50,
            n_theta=1,
            noise=False)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

#plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
plt.scatter(X_train, y_train, label="Observations")
#plt.plot(X, ei, label="Expected Improvement")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Sphere: Gaussian process regression on noisy dataset")
```

```
[[ 0.63529627]
 [-4.10764204]
 [-0.44071975]
 [ 9.63125638]
 [-8.3518118 ]
 [-3.62418901]
 [ 4.15331   ]
 [ 3.4468512 ]
 [ 6.36049088]
 [-7.77978539]]
[-4.61635371 11.44873209 -0.19988024 91.92791676 68.05926244 12.02926818
 16.2470957   9.12729929 38.4987029  58.38469104]
```

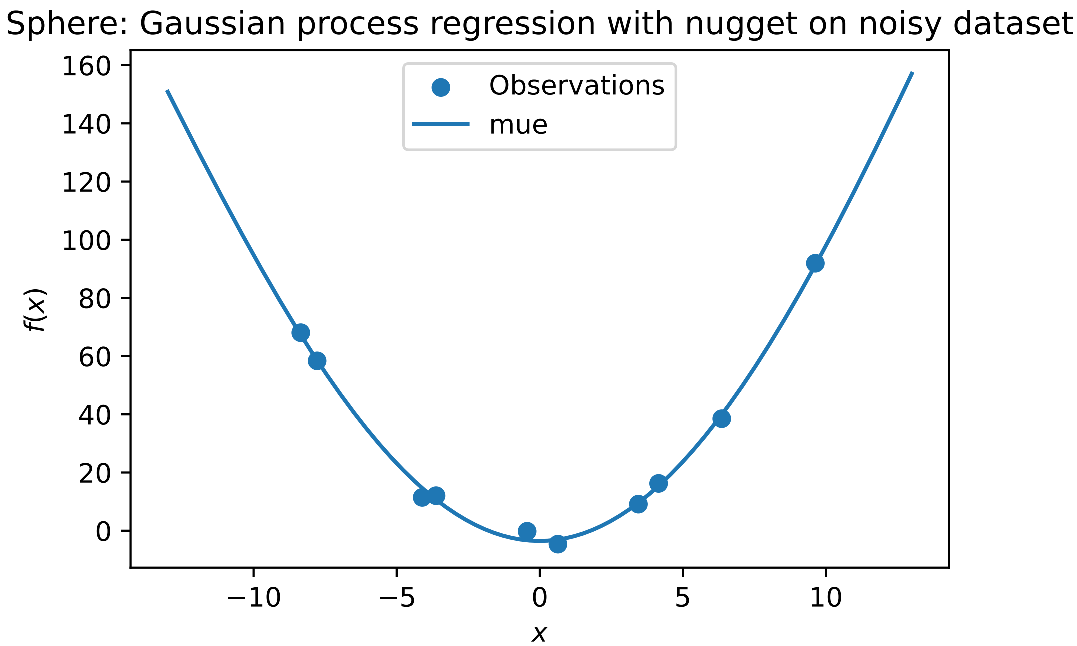



```
S.log
```

```
{'negLnLike': array([24.69806131]),
 'theta': array([1.31023943]),
 'p': array([2.]),
 'Lambda': array([None], dtype=object)}
```

```
S = Kriging(name='kriging',
            seed=123,
            log_level=50,
            n_theta=1,
            noise=True)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

#plt.plot(X, y, label=r"$f(x) = x \sin(x)$", linestyle="dotted")
plt.scatter(X_train, y_train, label="Observations")
#plt.plot(X, ei, label="Expected Improvement")
plt.plot(X_axis, mean_prediction, label="mue")
```

```
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Sphere: Gaussian process regression with nugget on noisy dataset")
```




```
S.log
```

```
{'negLnLike': array([22.14095646]),
 'theta': array([-0.32527397]),
 'p': array([2.]),
 'Lambda': array([9.08815007e-05])}
```

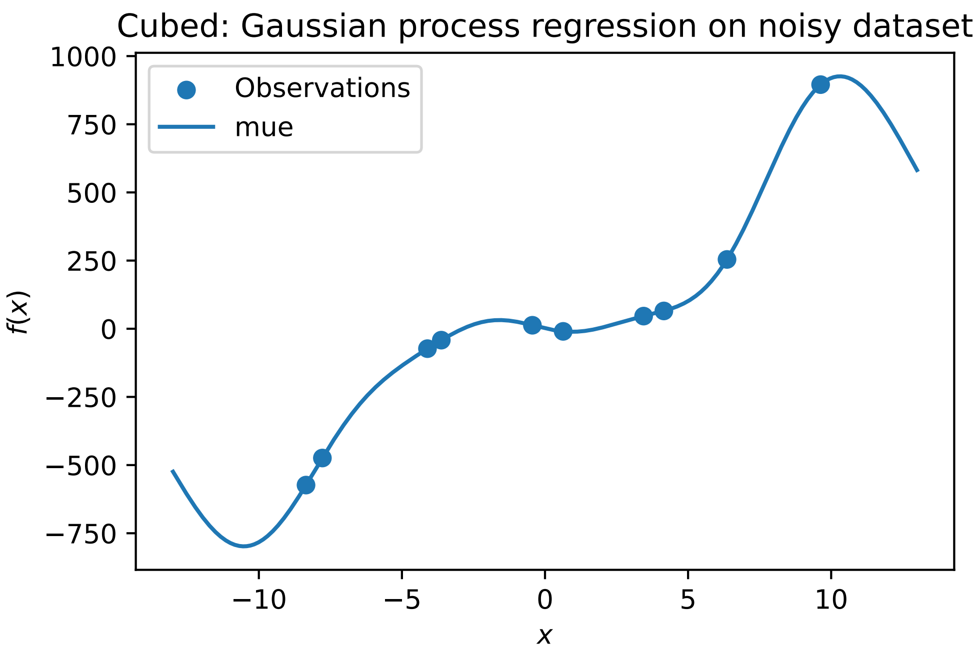
12.12 Cubic Function

```
import numpy as np
import spotPython
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from spotPython.design.spacefilling import spacefilling
```

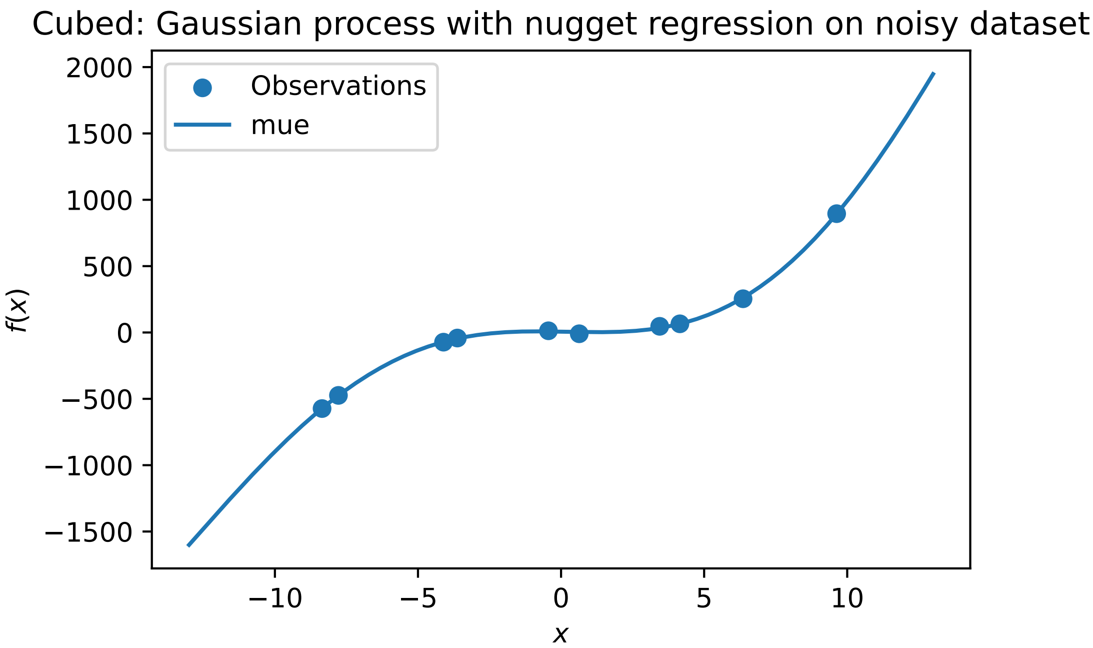
```python
from spotPython.build.kriging import Kriging
import matplotlib.pyplot as plt

gen = spacefilling(1)
rng = np.random.RandomState(1)
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_cubed
fun_control = {"sigma": 10,
               "seed": 123}

X = gen.scipy_lhd(10, lower=lower, upper = upper)
print(X)
y = fun(X, fun_control=fun_control)
print(y)
y.shape
X_train = X.reshape(-1,1)
y_train = y

S = Kriging(name='kriging',  seed=123, log_level=50, n_theta=1, noise=False)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
#plt.plot(X, ei, label="Expected Improvement")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Cubed: Gaussian process regression on noisy dataset")
```

```
[[ 0.63529627]
 [-4.10764204]
 [-0.44071975]
 [ 9.63125638]
 [-8.3518118 ]
 [-3.62418901]
 [ 4.15331   ]
 [ 3.4468512 ]
 [ 6.36049088]
```

```
 [-7.77978539]]
[  -9.63480707  -72.98497325   12.7936499   895.34567477 -573.35961837
  -41.83176425   65.27989461   46.37081417  254.1530734  -474.09587355]
```



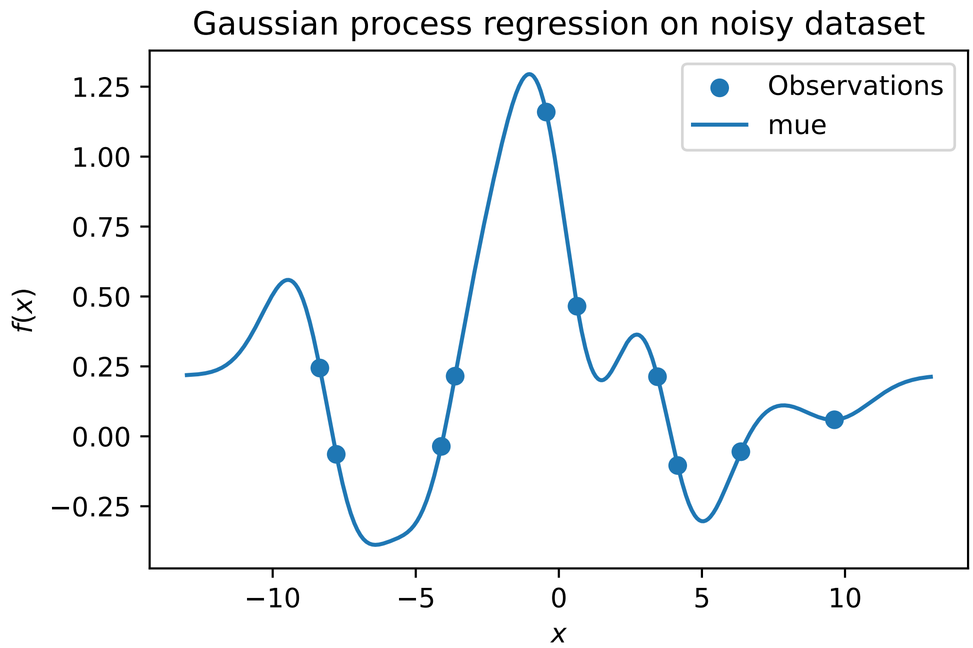

```python
S = Kriging(name='kriging',  seed=123, log_level=0, n_theta=1, noise=True)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
#plt.plot(X, ei, label="Expected Improvement")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Cubed: Gaussian process with nugget regression on noisy dataset")
```



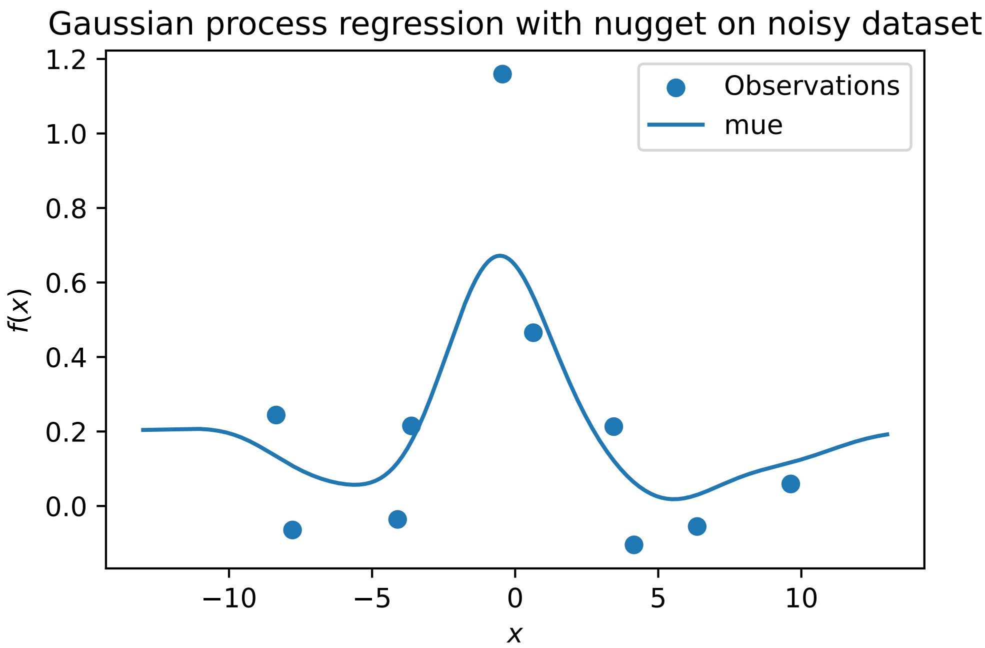

```
import numpy as np
import spotPython
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from spotPython.design.spacefilling import spacefilling
from spotPython.build.kriging import Kriging
import matplotlib.pyplot as plt

gen = spacefilling(1)
rng = np.random.RandomState(1)
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_runge
fun_control = {"sigma": 0.25,
               "seed": 123}

X = gen.scipy_lhd(10, lower=lower, upper = upper)
print(X)
y = fun(X, fun_control=fun_control)
print(y)
y.shape
```

```python
X_train = X.reshape(-1,1)
y_train = y

S = Kriging(name='kriging',  seed=123, log_level=50, n_theta=1, noise=False)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
#plt.plot(X, ei, label="Expected Improvement")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Gaussian process regression on noisy dataset")
```

```
[[ 0.63529627]
 [-4.10764204]
 [-0.44071975]
 [ 9.63125638]
 [-8.3518118 ]
 [-3.62418901]
 [ 4.15331   ]
 [ 3.4468512 ]
 [ 6.36049088]
 [-7.77978539]]
[ 0.46517267 -0.03599548  1.15933822  0.05915901  0.24419145  0.21502359
 -0.10432134  0.21312309 -0.05502681 -0.06434374]
```




```
S = Kriging(name='kriging',
            seed=123,
            log_level=50,
            n_theta=1,
            noise=True)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
#plt.plot(X, ei, label="Expected Improvement")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Gaussian process regression with nugget on noisy dataset")
```



12.13 Factors

```
["num"] * 3
```

```
['num', 'num', 'num']
```

```
from spotPython.design.spacefilling import spacefilling
from spotPython.build.kriging import Kriging
from spotPython.fun.objectivefunctions import analytical
import numpy as np
```

```
gen = spacefilling(2)
n = 30
rng = np.random.RandomState(1)
lower = np.array([-5,-0])
upper = np.array([10,15])
fun = analytical().fun_branin_factor
#fun = analytical(sigma=0).fun_sphere
```

```
X0 = gen.scipy_lhd(n, lower=lower, upper = upper)
X1 = np.random.randint(low=1, high=3, size=(n,))
X = np.c_[X0, X1]
y = fun(X)
S = Kriging(name='kriging',  seed=123, log_level=50, n_theta=3, noise=False, var_type=["nu
S.fit(X, y)
Sf = Kriging(name='kriging',  seed=123, log_level=50, n_theta=3, noise=False, var_type=["n
Sf.fit(X, y)
n = 50
X0 = gen.scipy_lhd(n, lower=lower, upper = upper)
X1 = np.random.randint(low=1, high=3, size=(n,))
X = np.c_[X0, X1]
y = fun(X)
s=np.sum(np.abs(S.predict(X)[0] - y))
sf=np.sum(np.abs(Sf.predict(X)[0] - y))
sf - s
```

```
-31.11428024652605
```

```
# vars(S)
```

```
# vars(Sf)
```

13 Hyperparameter Tuning and Noise

This chapter demonstrates how noisy functions can be handled by `Spot`.

13.1 Example: `Spot` and the Noisy Sphere Function

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
```

```
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '10-sklearn' + "_" + HOSTNAME + "_" + str(start_time).split(".", 1)[0].r
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
10-sklearn_p040025_2023-06-16_09-33-38
```

13.1.1 The Objective Function: Noisy Sphere

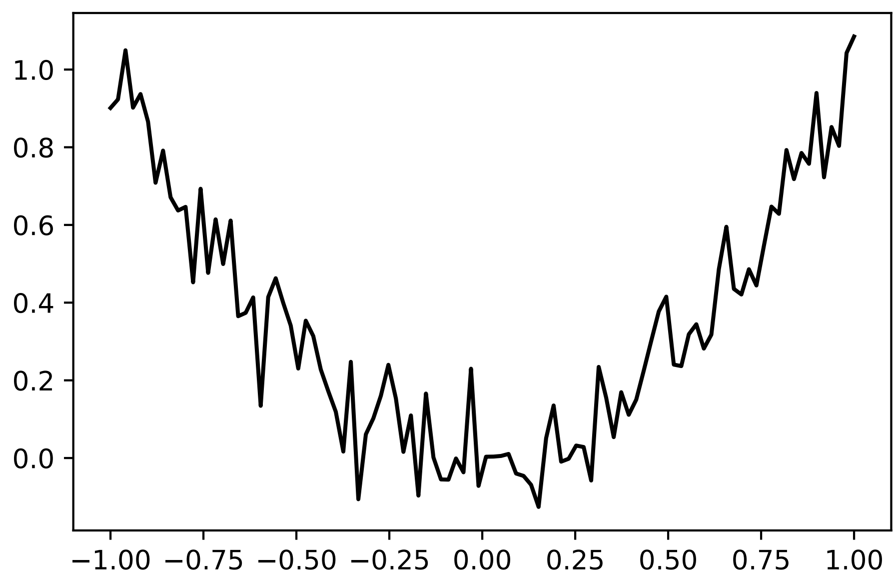
- The `spotPython` package provides several classes of objective functions.

- We will use an analytical objective function with noise, i.e., a function that can be described by a (closed) formula:
$$f(x) = x^2 + \epsilon$$
- Since `sigma` is set to `0.1`, noise is added to the function:

```
fun = analytical().fun_sphere
fun_control = {"sigma": 0.1,
               "seed": 123}
```

- A plot illustrates the noise:

```
x = np.linspace(-1,1,100).reshape(-1,1)
y = fun(x, fun_control=fun_control)
plt.figure()
plt.plot(x,y, "k")
plt.show()
```

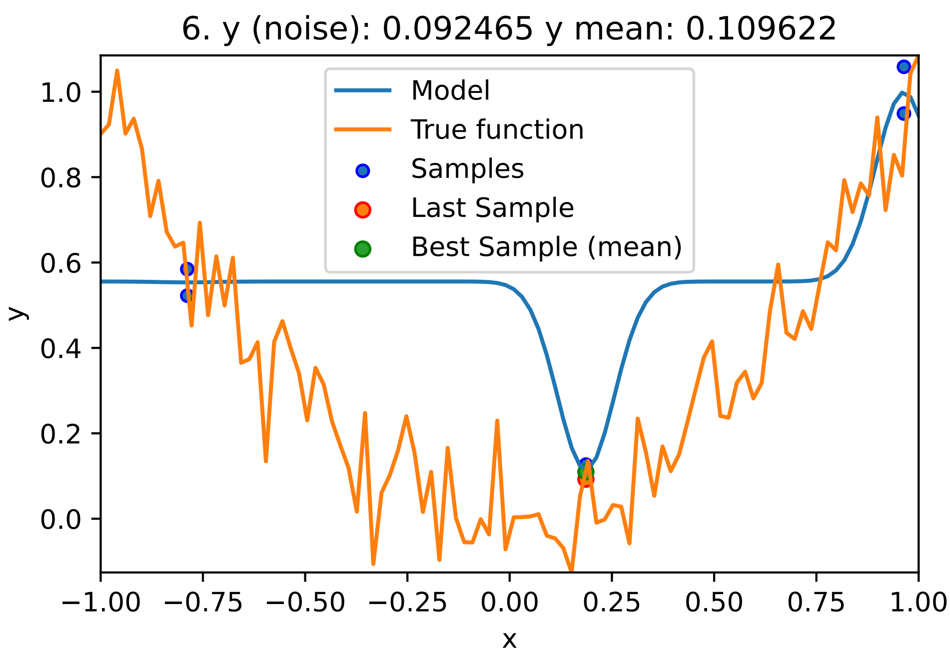


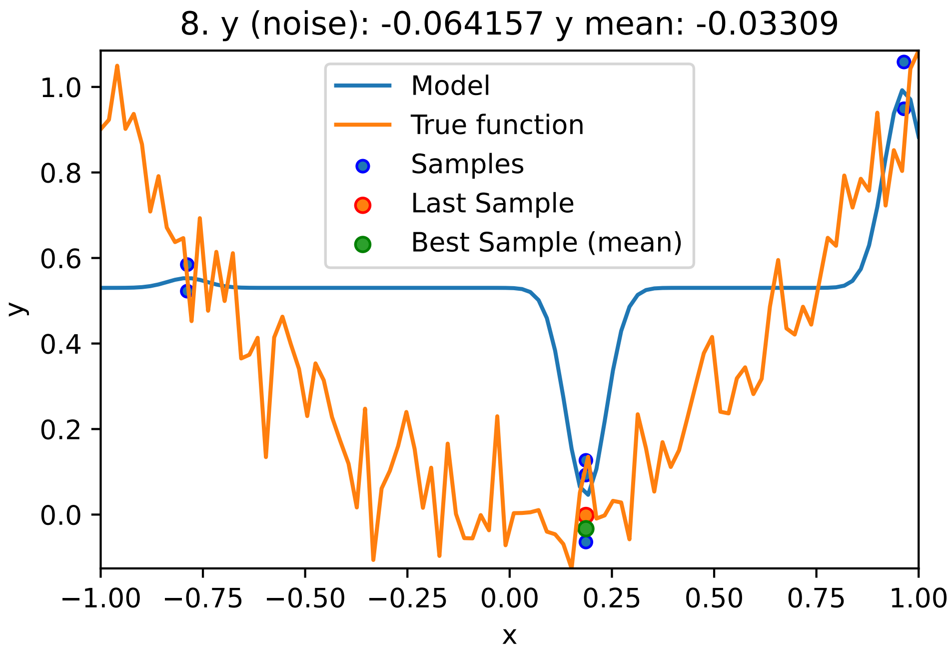
`Spot` is adopted as follows to cope with noisy functions:

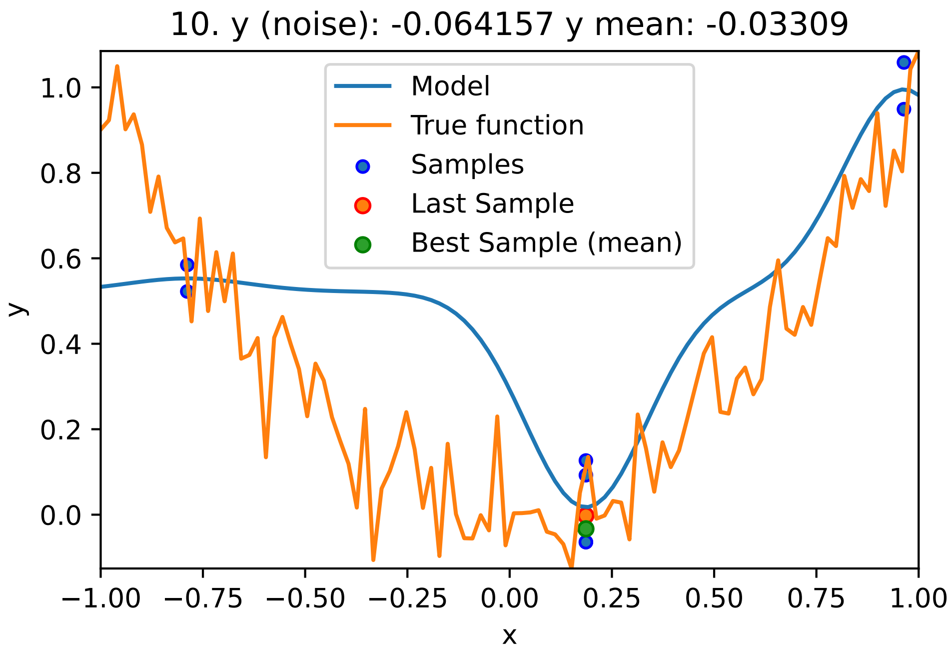
1. `fun_repeats` is set to a value larger than 1 (here: 2)
2. `noise` is set to `true`. Therefore, a nugget (`Lambda`) term is added to the correlation matrix
3. `init size` (of the `design_control` dictionary) is set to a value larger than 1 (here: 2)

```
spot_1_noisy = spot.Spot(fun=fun,
                   lower = np.array([-1]),
                   upper = np.array([1]),
                   fun_evals = 10,
                   fun_repeats = 2,
                   noise = True,
                   seed=123,
                   show_models=True,
                   fun_control = fun_control,
                   design_control={"init_size": 3,
                                   "repeats": 2},
                   surrogate_control={"noise": True})
```

```
spot_1_noisy.run()
```








```
<spotPython.spot.spot.Spot at 0x296aef6d0>
```

13.2 Print the Results

```
spot_1_noisy.print_results()
```

```
min y: -0.06415721594238855
x0: 0.18642671238960512
min mean y: -0.03309048099839016
x0: 0.18642671238960512
```

```
[['x0', 0.18642671238960512], ['x0', 0.18642671238960512]]
```

```
spot_1_noisy.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

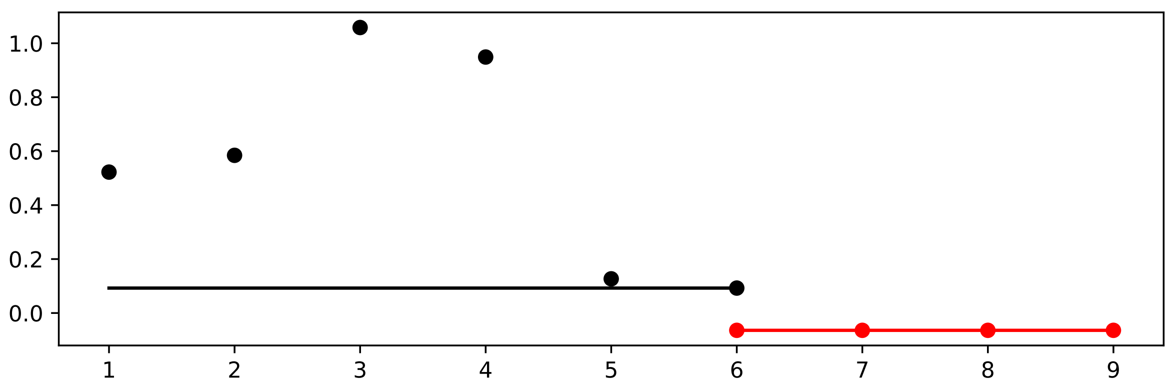


Figure 13.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

13.3 Noise and Surrogates: The Nugget Effect

13.3.1 The Noisy Sphere

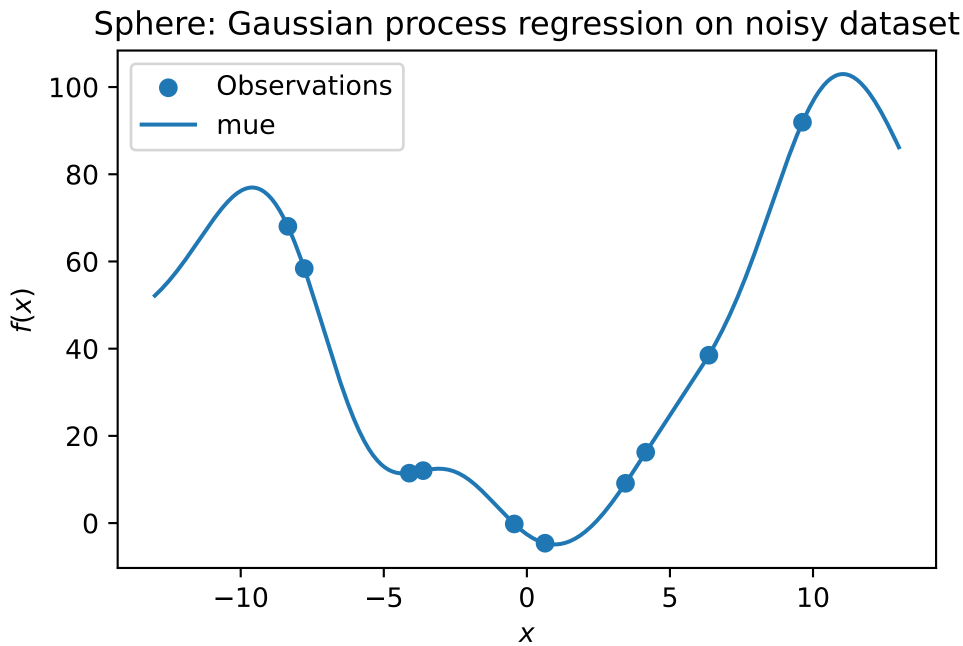
13.3.1.1 The Data

- We prepare some data first:

```python
import numpy as np
import spotPython
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from spotPython.design.spacefilling import spacefilling
from spotPython.build.kriging import Kriging
import matplotlib.pyplot as plt

gen = spacefilling(1)
rng = np.random.RandomState(1)
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_sphere
fun_control = {"sigma": 2,
               "seed": 125}
X = gen.scipy_lhd(10, lower=lower, upper = upper)
y = fun(X, fun_control=fun_control)
X_train = X.reshape(-1,1)
y_train = y
```

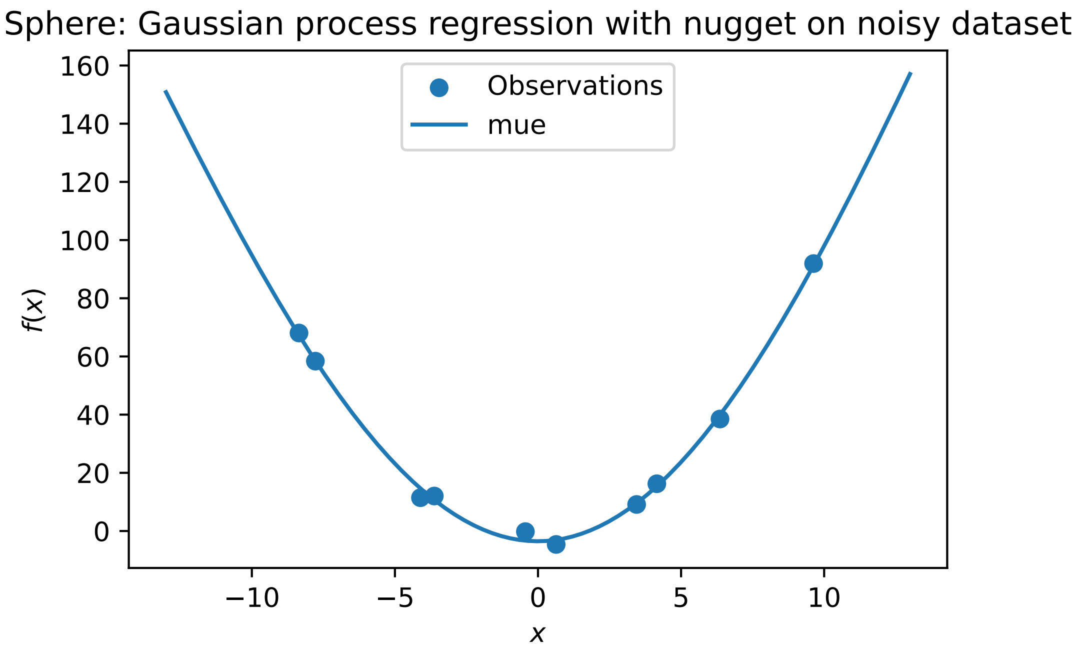
- A surrogate without nugget is fitted to these data:

```python
S = Kriging(name='kriging',
            seed=123,
            log_level=50,
            n_theta=1,
            noise=False)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Sphere: Gaussian process regression on noisy dataset")
```



- In comparison to the surrogate without nugget, we fit a surrogate with nugget to the data:

```
S_nug = Kriging(name='kriging',
            seed=123,
            log_level=50,
            n_theta=1,
            noise=True)
S_nug.fit(X_train, y_train)
X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S_nug.predict(X_axis, return_val="all")
plt.scatter(X_train, y_train, label="Observations")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Sphere: Gaussian process regression with nugget on noisy dataset")
```



- The value of the nugget term can be extracted from the model as follows:

```
S.Lambda
```

```
S_nug.Lambda
```

```
9.088150066416743e-05
```

- We see:
  - the first model `S` has no nugget,
  - whereas the second model has a nugget value (`Lambda`) larger than zero.

13.4 Exercises

13.4.1 Noisy `fun_cubed`

- Analyse the effect of noise on the `fun_cubed` function with the following settings:

```
fun = analytical().fun_cubed
fun_control = {"sigma": 10,
```

```
                  "seed": 123}
lower = np.array([-10])
upper = np.array([10])
```

13.4.2 `fun_runge`

- Analyse the effect of noise on the `fun_runge` function with the following settings:

```
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_runge
fun_control = {"sigma": 0.25,
               "seed": 123}
```

13.4.3 `fun_forrester`

- Analyse the effect of noise on the `fun_forrester` function with the following settings:

```
lower = np.array([0])
upper = np.array([1])
fun = analytical().fun_forrester
fun_control = {"sigma": 5,
               "seed": 123}
```

13.4.4 `fun_xsin`

- Analyse the effect of noise on the `fun_xsin` function with the following settings:

```
lower = np.array([-1.])
upper = np.array([1.])
fun = analytical().fun_xsin
fun_control = {"sigma": 0.5,
               "seed": 123}
```

14 Handling Noise: Optimal Computational Budget Allocation in Spot

This notebook demonstrates how noisy functions can be handled with OCBA by `Spot`.

14.1 Example: `Spot`, OCBA, and the Noisy Sphere Function

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
```

14.1.1 The Objective Function: Noisy Sphere

The `spotPython` package provides several classes of objective functions. We will use an analytical objective function with noise, i.e., a function that can be described by a (closed) formula:

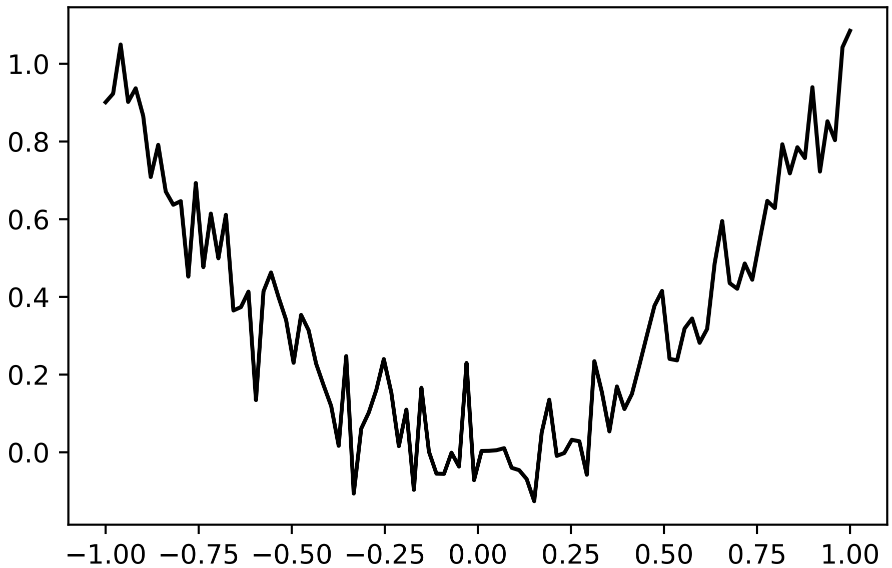
$$f(x) = x^2 + \epsilon$$

Since `sigma` is set to `0.1`, noise is added to the function:

```
fun = analytical().fun_sphere
fun_control = {"sigma": 0.1,
               "seed": 123}
```

A plot illustrates the noise:

```python
x = np.linspace(-1,1,100).reshape(-1,1)
y = fun(x, fun_control=fun_control)
plt.figure()
plt.plot(x,y, "k")
plt.show()
```



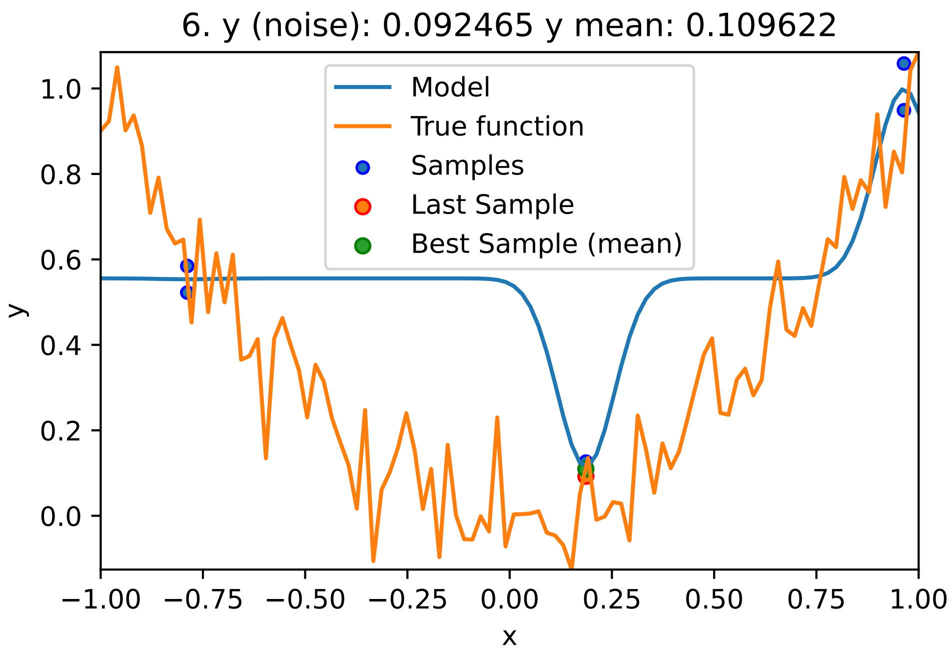
`Spot` is adopted as follows to cope with noisy functions:

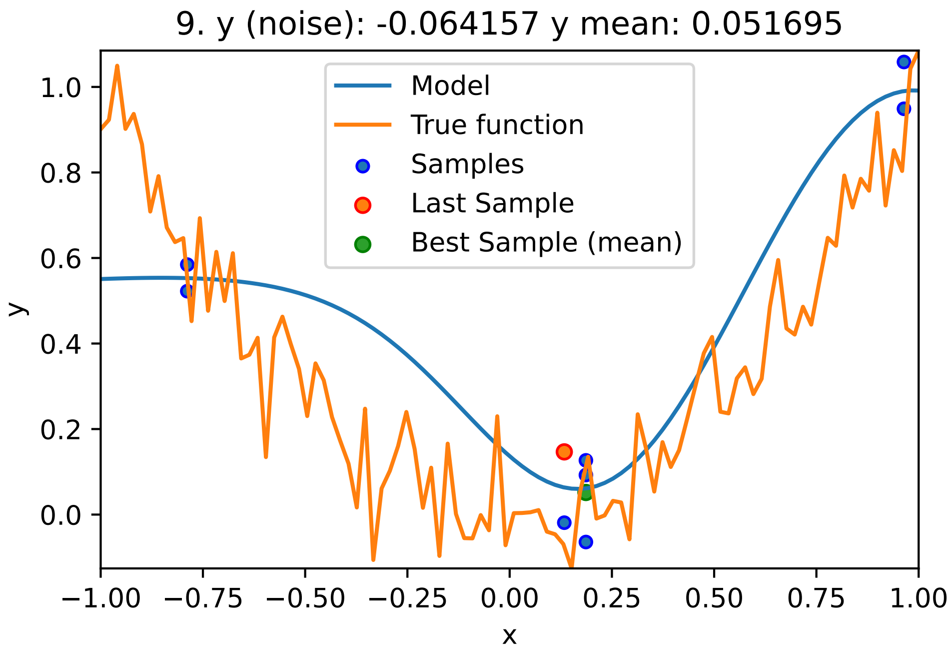
1. `fun_repeats` is set to a value larger than 1 (here: 2)
2. `noise` is set to `true`. Therefore, a nugget (`Lambda`) term is added to the correlation matrix
3. `init size` (of the `design_control` dictionary) is set to a value larger than 1 (here: 2)

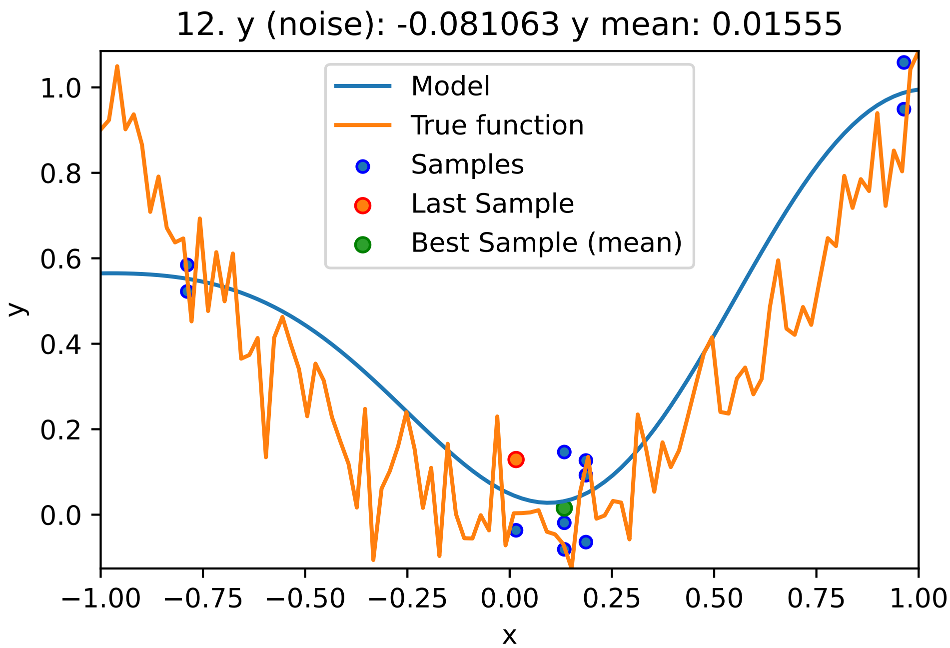
```python
spot_1_noisy = spot.Spot(fun=fun,
                   lower = np.array([-1]),
                   upper = np.array([1]),
                   fun_evals = 50,
                   fun_repeats = 2,
                   infill_criterion="ei",
                   noise = True,
                   tolerance_x=0.0,
                   ocba_delta = 1,
                   seed=123,
```

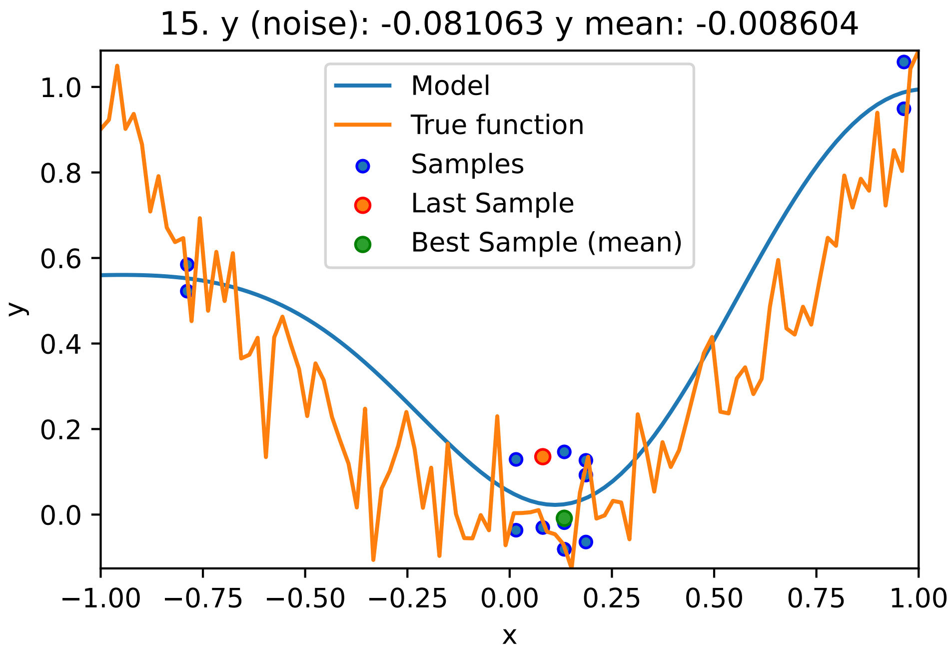
```python
                    show_models=True,
                    fun_control = fun_control,
                    design_control={"init_size": 3,
                                    "repeats": 2},
                    surrogate_control={"noise": True})
```

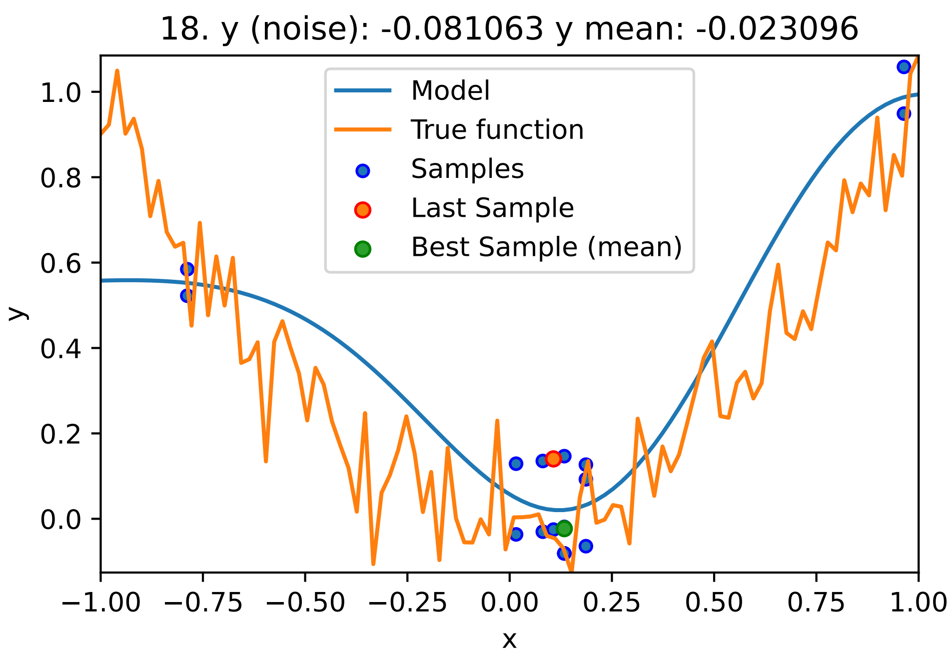
```python
spot_1_noisy.run()
```

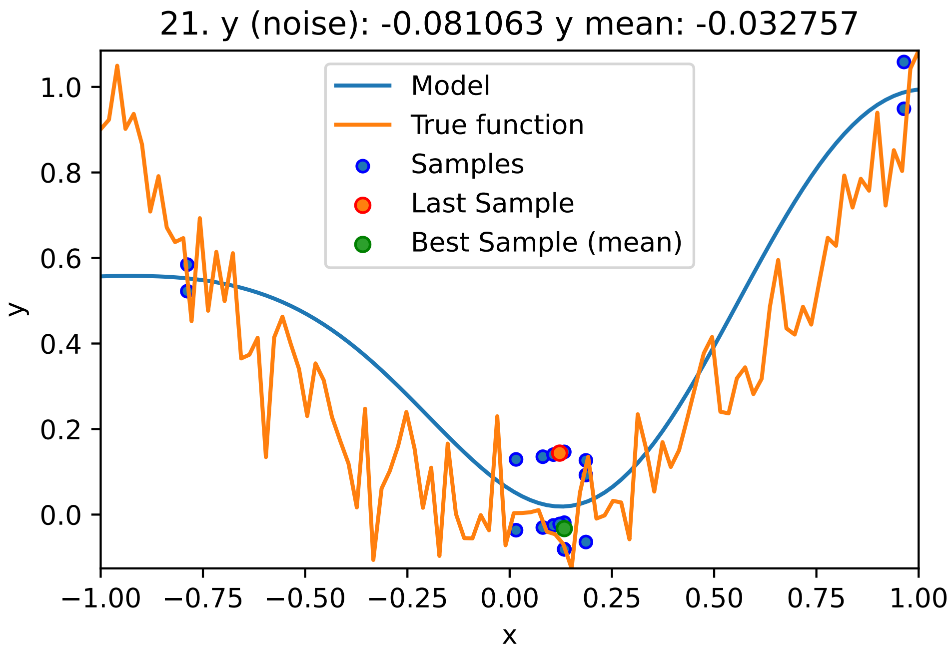


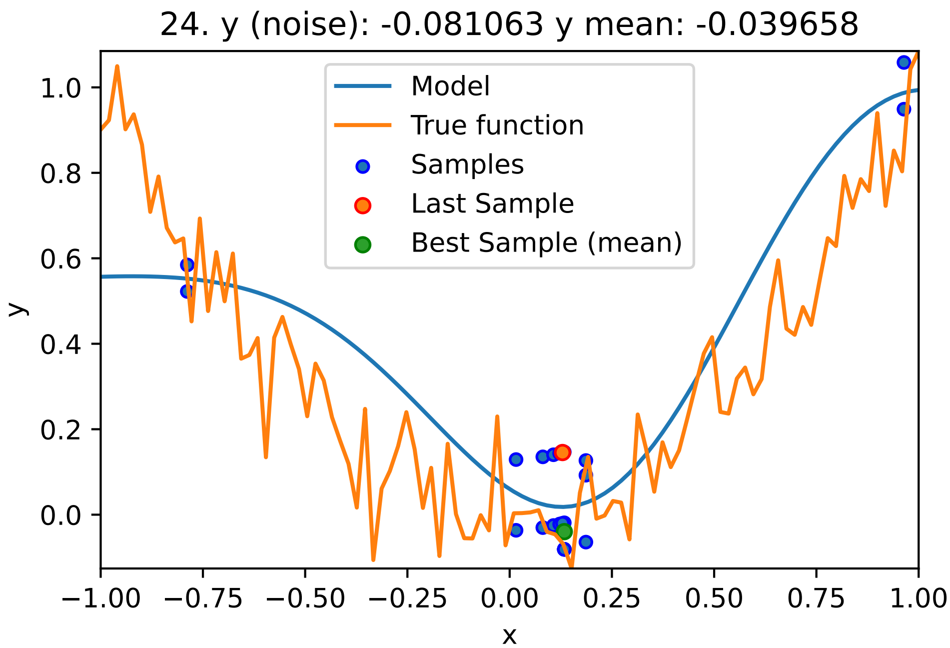

9. y (noise): -0.064157 y mean: 0.051695
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

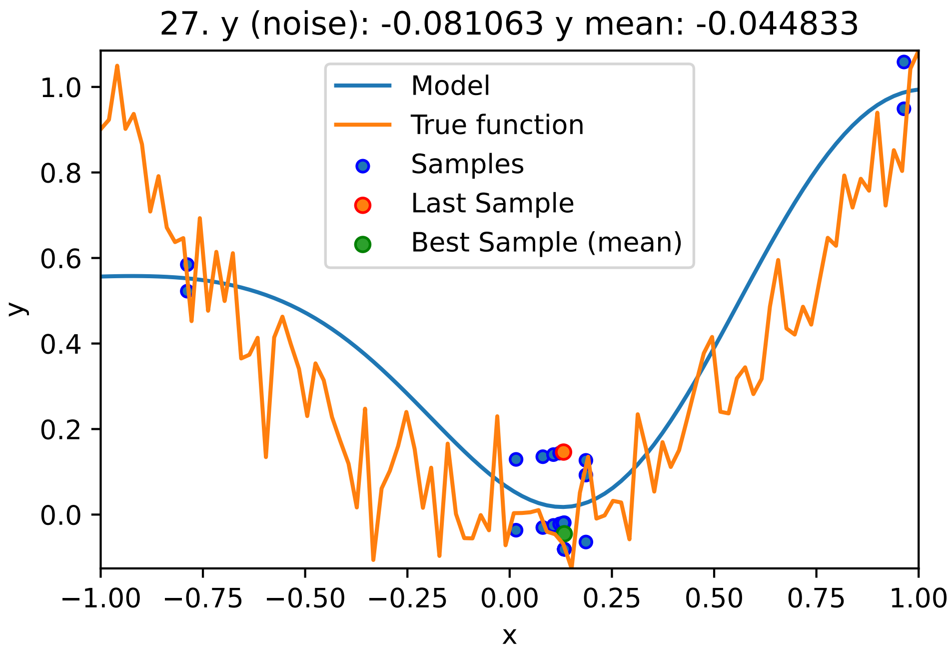

12. y (noise): -0.081063 y mean: 0.01555
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

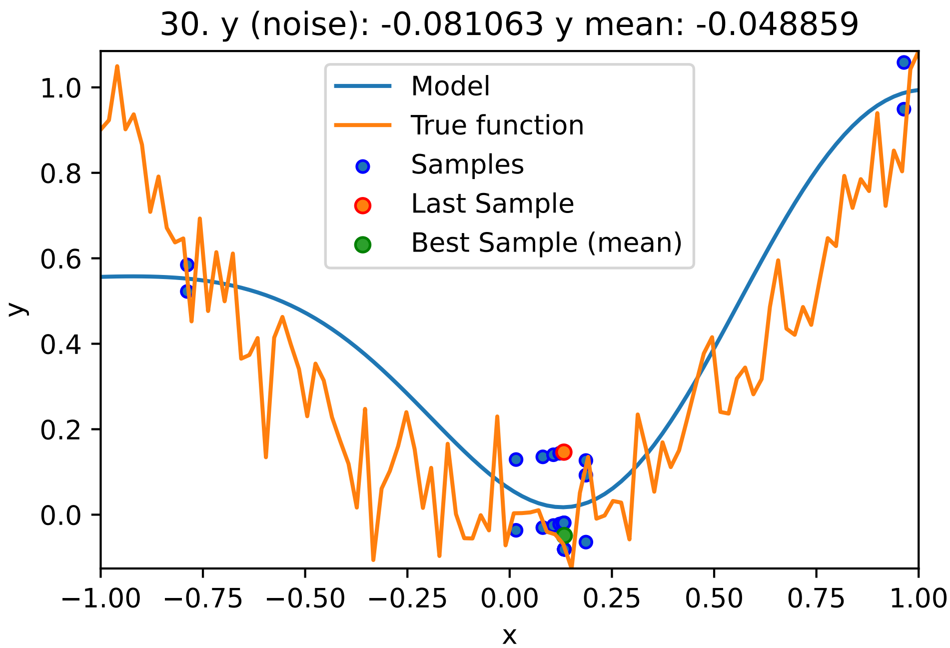

15. y (noise): -0.081063 y mean: -0.008604
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

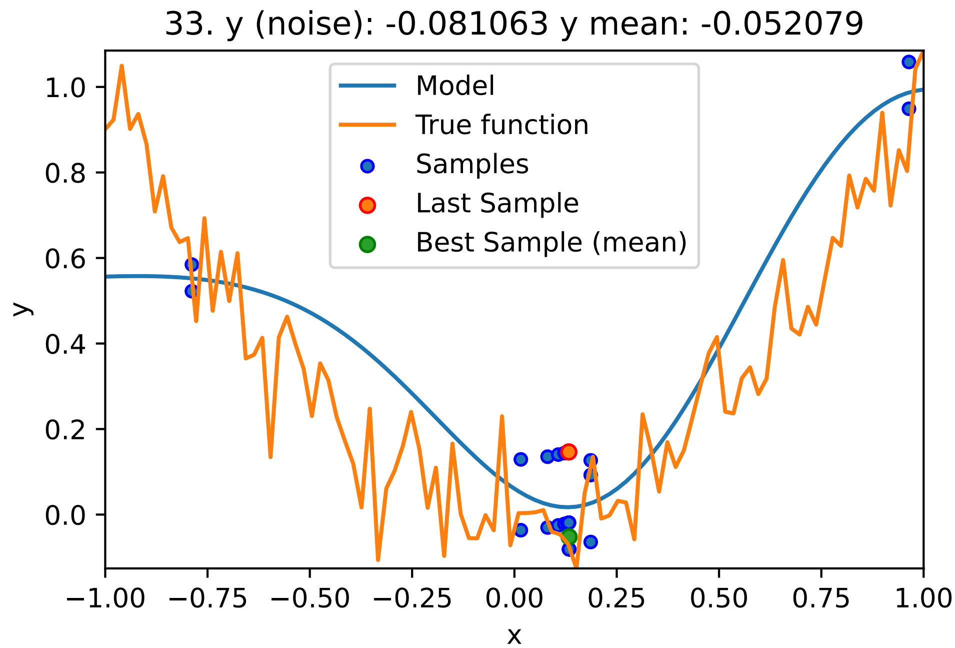

18. y (noise): -0.081063 y mean: -0.023096
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

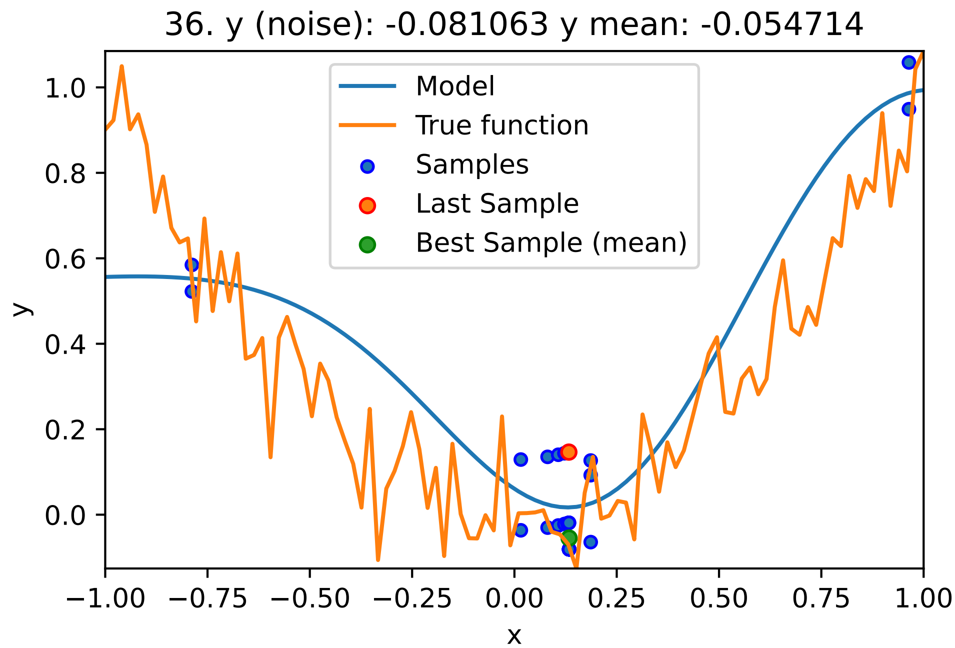

21. y (noise): -0.081063 y mean: -0.032757
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

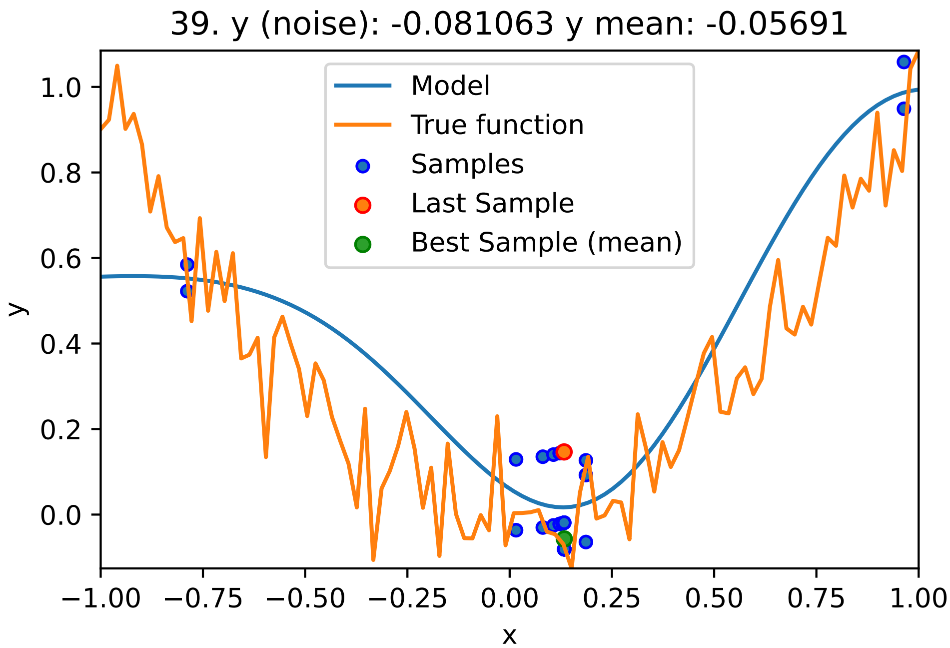

24. y (noise): -0.081063 y mean: -0.039658
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x


27. y (noise): -0.081063 y mean: -0.044833
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x

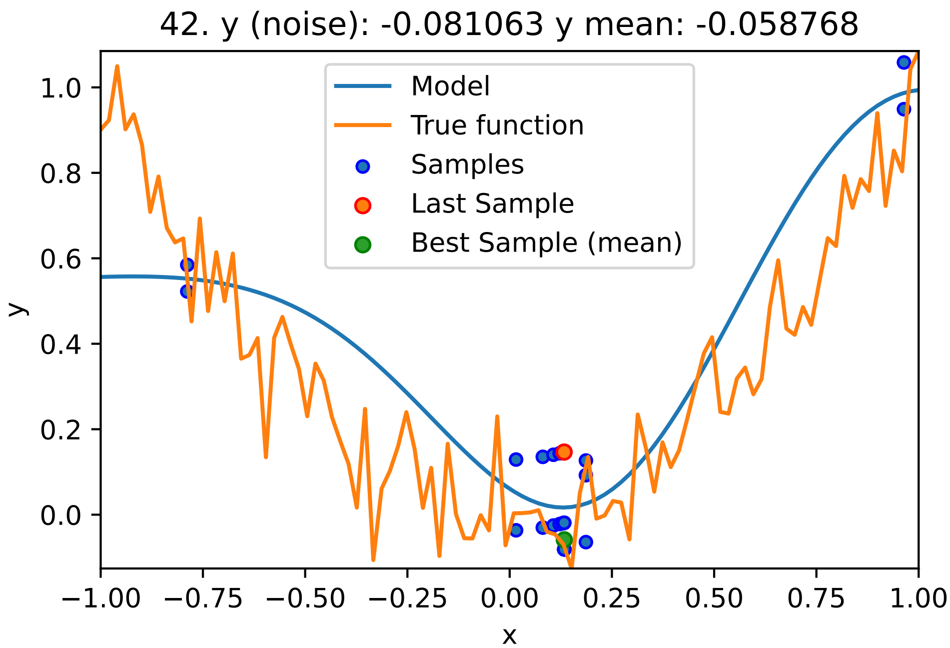

30. y (noise): -0.081063 y mean: -0.048859
Model
True function
Samples
Last Sample
Best Sample (mean)
1.0
0.8
0.6
0.4
0.2
0.0
y
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
x


33. y (noise): -0.081063 y mean: -0.052079
Model
True function
Samples
Last Sample
Best Sample (mean)
y
x
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
0.0
0.2
0.4
0.6
0.8
1.0

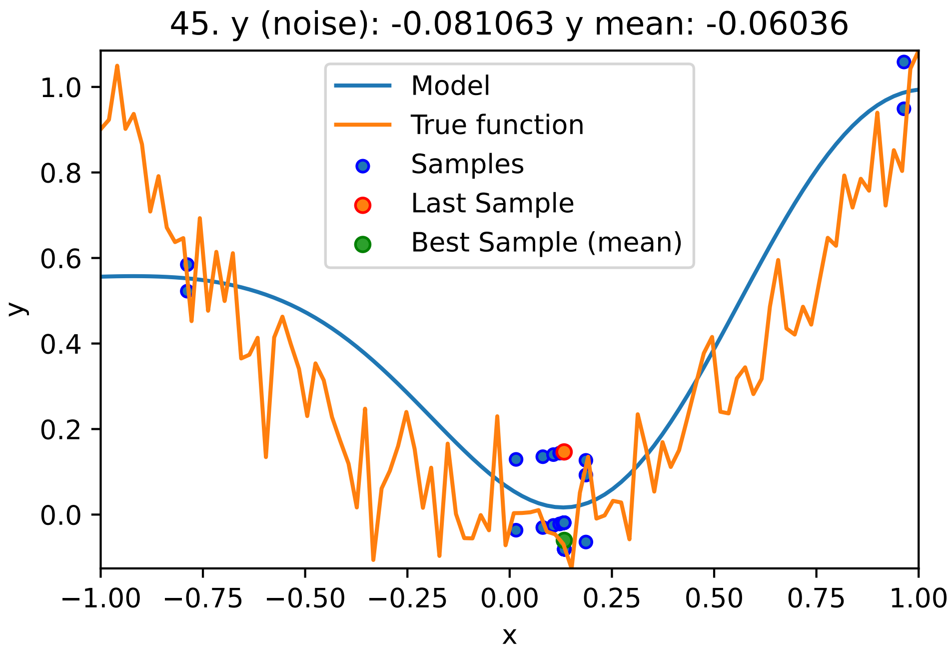

36. y (noise): -0.081063 y mean: -0.054714
Model
True function
Samples
Last Sample
Best Sample (mean)
y
x
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
0.0
0.2
0.4
0.6
0.8
1.0

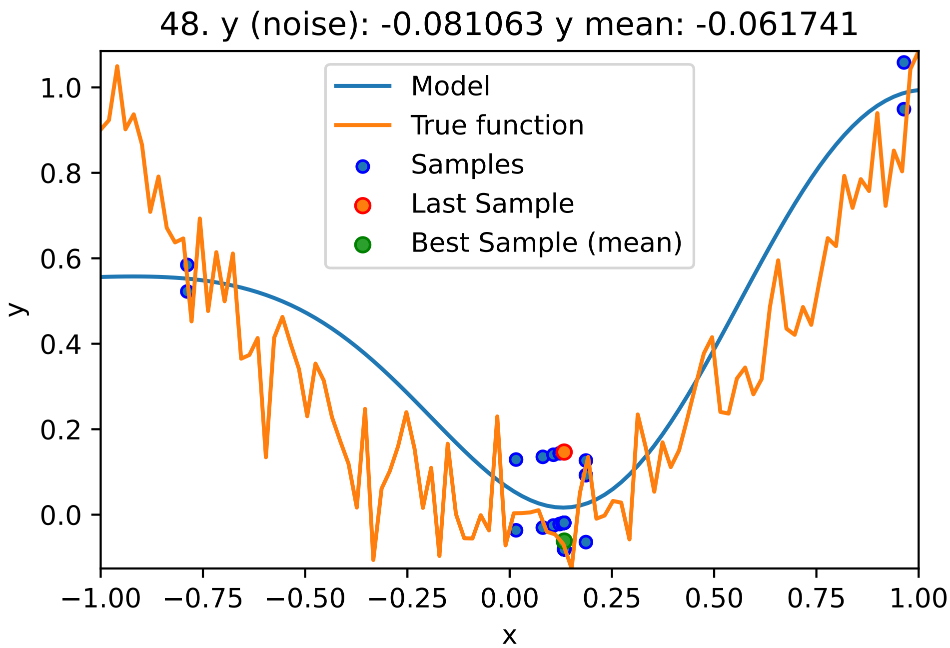


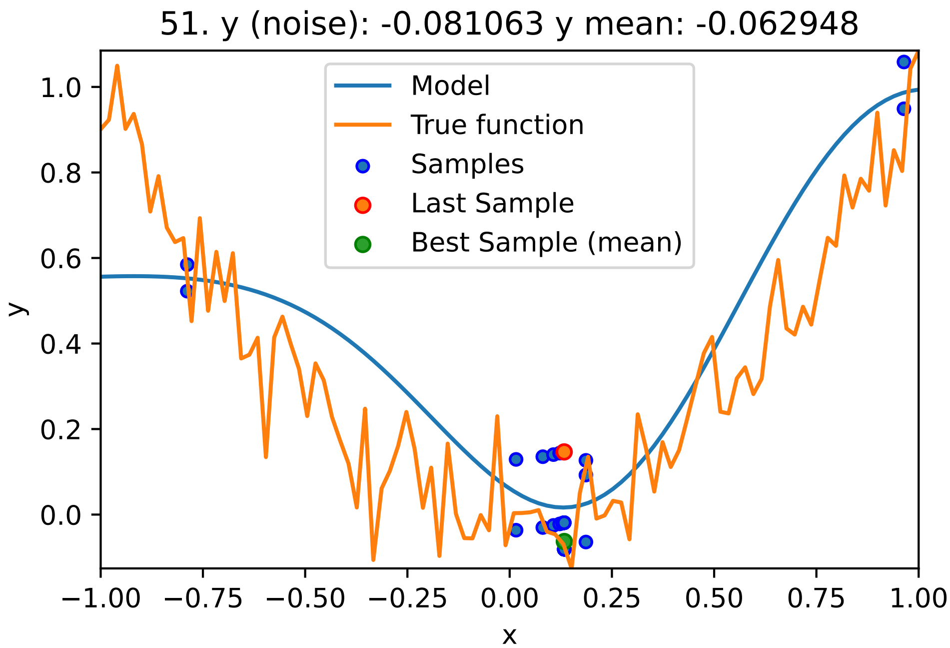
39. y (noise): -0.081063 y mean: -0.05691
Model
True function
Samples
Last Sample
Best Sample (mean)
y
x
1.0
0.8
0.6
0.4
0.2
0.0
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00



42. y (noise): -0.081063 y mean: -0.058768
Model
True function
Samples
Last Sample
Best Sample (mean)
y
x
1.0
0.8
0.6
0.4
0.2
0.0
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00


45. y (noise): -0.081063 y mean: -0.06036
Model
True function
Samples
Last Sample
Best Sample (mean)
y
x
1.0
0.8
0.6
0.4
0.2
0.0
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00


48. y (noise): -0.081063 y mean: -0.061741
Model
True function
Samples
Last Sample
Best Sample (mean)
y
x
1.0
0.8
0.6
0.4
0.2
0.0
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00




```
<spotPython.spot.spot.Spot at 0x13d8f3580>
```

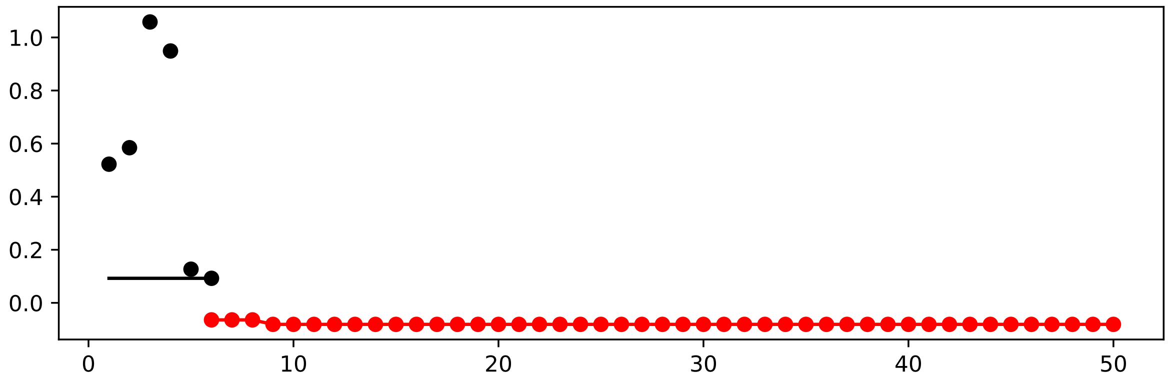
14.2 Print the Results

```
spot_1_noisy.print_results()
```

```
min y: -0.08106318979661208
x0: 0.1335999447536301
min mean y: -0.06294830660588041
x0: 0.1335999447536301
```

```
[['x0', 0.1335999447536301], ['x0', 0.1335999447536301]]
```

```
spot_1_noisy.plot_progress(log_y=False)
```



14.3 Noise and Surrogates: The Nugget Effect

14.3.1 The Noisy Sphere

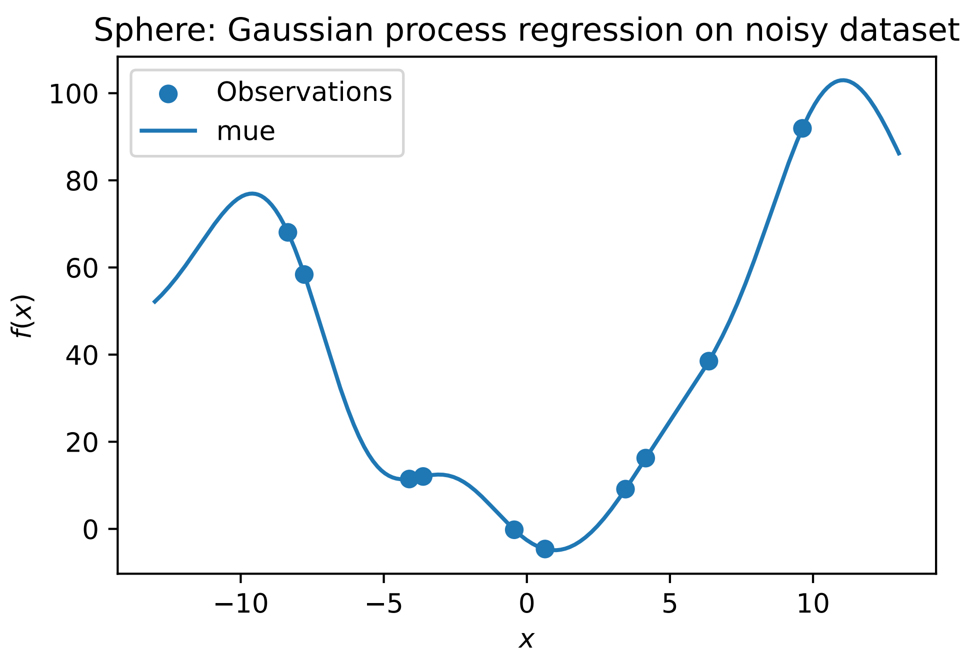
14.3.1.1 The Data

We prepare some data first:

```
import numpy as np
import spotPython
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from spotPython.design.spacefilling import spacefilling
from spotPython.build.kriging import Kriging
import matplotlib.pyplot as plt

gen = spacefilling(1)
rng = np.random.RandomState(1)
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_sphere
fun_control = {"sigma": 2,
               "seed": 125}
X = gen.scipy_lhd(10, lower=lower, upper = upper)
y = fun(X, fun_control=fun_control)
X_train = X.reshape(-1,1)
y_train = y
```

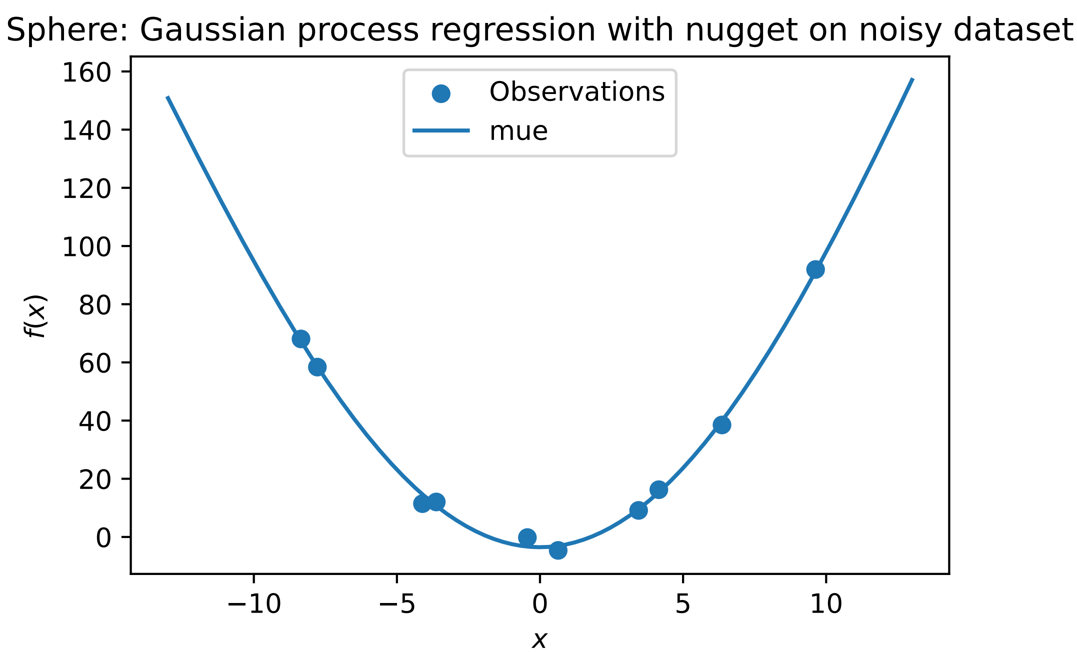
A surrogate without nugget is fitted to these data:

```
S = Kriging(name='kriging',
            seed=123,
            log_level=50,
            n_theta=1,
            noise=False)
S.fit(X_train, y_train)

X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S.predict(X_axis, return_val="all")

plt.scatter(X_train, y_train, label="Observations")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Sphere: Gaussian process regression on noisy dataset")
```



In comparison to the surrogate without nugget, we fit a surrogate with nugget to the data:

```
S_nug = Kriging(name='kriging',
            seed=123,
            log_level=50,
            n_theta=1,
            noise=True)
S_nug.fit(X_train, y_train)
X_axis = np.linspace(start=-13, stop=13, num=1000).reshape(-1, 1)
mean_prediction, std_prediction, ei = S_nug.predict(X_axis, return_val="all")
plt.scatter(X_train, y_train, label="Observations")
plt.plot(X_axis, mean_prediction, label="mue")
plt.legend()
plt.xlabel("$x$")
plt.ylabel("$f(x)$")
_ = plt.title("Sphere: Gaussian process regression with nugget on noisy dataset")
```



The value of the nugget term can be extracted from the model as follows:

```
S.Lambda
```

```
S_nug.Lambda
```

```
9.088150066416743e-05
```

We see:

- the first model `S` has no nugget,
- whereas the second model has a nugget value (`Lambda`) larger than zero.

14.4 Exercises

14.4.1 Noisy `fun_cubed`

Analyse the effect of noise on the `fun_cubed` function with the following settings:

```
fun = analytical().fun_cubed
fun_control = {"sigma": 10,
               "seed": 123}
lower = np.array([-10])
upper = np.array([10])
```

14.4.2 `fun_runge`

Analyse the effect of noise on the `fun_runge` function with the following settings:

```
lower = np.array([-10])
upper = np.array([10])
fun = analytical().fun_runge
fun_control = {"sigma": 0.25,
               "seed": 123}
```

14.4.3 `fun_forrester`

Analyse the effect of noise on the `fun_forrester` function with the following settings:

```
lower = np.array([0])
upper = np.array([1])
fun = analytical().fun_forrester
fun_control = {"sigma": 5,
               "seed": 123}
```

14.4.4 `fun_xsin`

Analyse the effect of noise on the `fun_xsin` function with the following settings:

```
lower = np.array([-1.])
upper = np.array([1.])
fun = analytical().fun_xsin
fun_control = {"sigma": 0.5,
               "seed": 123}
```

```
spot_1_noisy.mean_y.shape[0]
```

```
18
```

15 Hyperparameter Tuning: sklearn SVC on Moons Data

This document refers to the following software versions:

- `python`: 3.10.10

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                    0.2.31
spotRiver                     0.0.93
```

```
Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

15.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time and the initial design size.

```
MAX_TIME = 1
INIT_SIZE = 5
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '10-sklearn' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
10-sklearn_p040025_1min_5init_2023-06-16_09-35-16
```

15.2 Step 1: Initialization of the Empty `fun_control` Dictionary

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/10_spot_hpt_sklearn_classification")
```

15.3 Step 2: SKlearn Load Data (Classification)

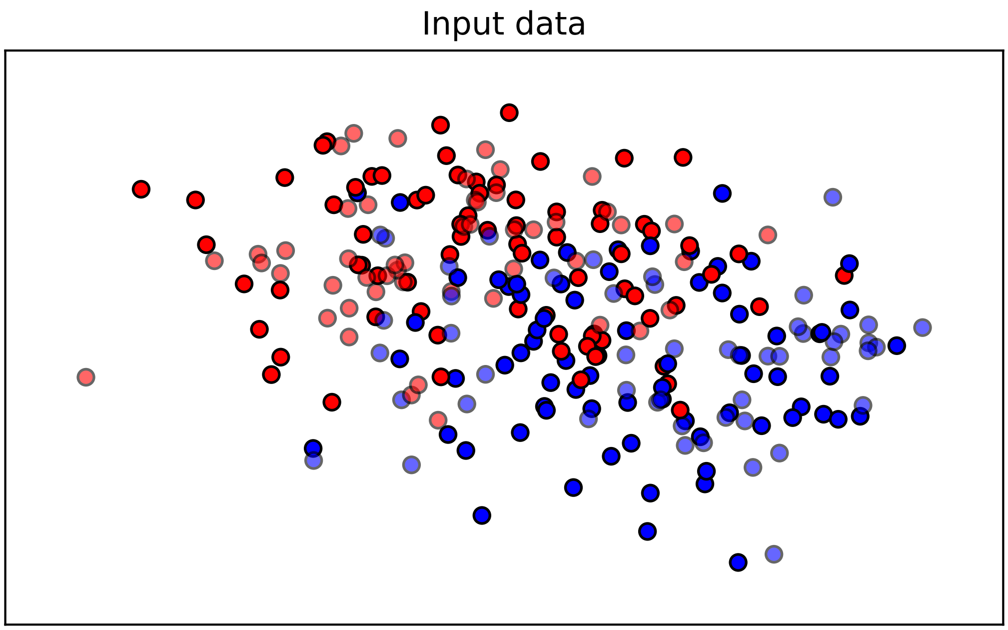
Randomly generate classification data.

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.datasets import make_moons, make_circles, make_classification
n_features = 2
n_samples = 250
target_column = "y"
ds =  make_moons(n_samples, noise=0.5, random_state=0)
X, y = ds
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.4, random_state=42
)
```

```python
train = pd.DataFrame(np.hstack((X_train, y_train.reshape(-1, 1))))
test = pd.DataFrame(np.hstack((X_test, y_test.reshape(-1, 1))))
train.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
test.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
train.head()
```

	x1	x2	y
0	1.083978	-1.246111	1.0
1	0.074916	0.868104	0.0
2	-1.668535	0.751752	0.0
3	1.286597	1.454165	0.0
4	1.387021	0.448355	1.0

```python
import matplotlib.pyplot as plt
from matplotlib.colors import ListedColormap

x_min, x_max = X[:, 0].min() - 0.5, X[:, 0].max() + 0.5
y_min, y_max = X[:, 1].min() - 0.5, X[:, 1].max() + 0.5
cm = plt.cm.RdBu
cm_bright = ListedColormap(["#FF0000", "#0000FF"])
ax = plt.subplot(1, 1, 1)
ax.set_title("Input data")
# Plot the training points
ax.scatter(X_train[:, 0], X_train[:, 1], c=y_train, cmap=cm_bright, edgecolors="k")
# Plot the testing points
ax.scatter(
    X_test[:, 0], X_test[:, 1], c=y_test, cmap=cm_bright, alpha=0.6, edgecolors="k"
)
ax.set_xlim(x_min, x_max)
ax.set_ylim(y_min, y_max)
ax.set_xticks(())
ax.set_yticks(())
plt.tight_layout()
plt.show()
```




```
n_samples = len(train)
# add the dataset to the fun_control
fun_control.update({"data": None, # dataset,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": target_column})
```

15.4 Step 3: Specification of the Preprocessing Model

Data preprocesssing can be very simple, e.g., you can ignore it. Then you would choose the `prep_model` "None":

```
prep_model = None
fun_control.update({"prep_model": prep_model})
```

A default approach for numerical data is the `StandardScaler` (mean 0, variance 1). This can be selected as follows:

```python
from sklearn.preprocessing import StandardScaler
prep_model = StandardScaler()
fun_control.update({"prep_model": prep_model})
```

Even more complicated pre-processing steps are possible, e.g., the follwing pipeline:

```python
# categorical_columns = []
# one_hot_encoder = OneHotEncoder(handle_unknown="ignore", sparse_output=False)
# prep_model = ColumnTransformer(
#         transformers=[
#             ("categorical", one_hot_encoder, categorical_columns),
#         ],
#         remainder=StandardScaler(),
#     )
```

15.5 Step 4: Select `algorithm` and `core_model_hyper_dict`

The selection of the algorithm (ML model) that should be tuned is done by specifying the its name from the `sklearn` implementation. For example, the `SVC` support vector machine classifier is selected as follows:

```python
from sklearn.linear_model import RidgeCV
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.linear_model import ElasticNet
from spotPython.hyperparameters.values import add_core_model_to_fun_control
from spotPython.data.sklearn_hyper_dict import SklearnHyperDict
from spotPython.fun.hypersklearn import HyperSklearn
```

```python
# core_model  = RidgeCV
# core_model = GradientBoostingRegressor
# core_model = ElasticNet
# core_model = RandomForestClassifier
core_model = SVC
# core_model = LogisticRegression
```

```
# core_model = KNeighborsClassifier
# core_model = GradientBoostingClassifier
fun_control = add_core_model_to_fun_control(core_model=core_model,
                              fun_control=fun_control,
                              hyper_dict=SklearnHyperDict,
                              filename=None)
```

Now `fun_control` has the information from the JSON file:

```
    "SVC":
    {
        "C": {
            "type": "float",
            "default": 1.0,
            "transform": "None",
            "lower": 0.1,
            "upper": 10.0},
        "kernel": {
            "levels": ["linear", "poly", "rbf", "sigmoid"],
            "type": "factor",
            "default": "rbf",
            "transform": "None",
            "core_model_parameter_type": "str",
            "lower": 0,
            "upper": 3},
        "degree": {
            "type": "int",
            "default": 3,
            "transform": "None",
            "lower": 3,
            "upper": 3},
        "gamma": {
            "levels": ["scale", "auto"],
            "type": "factor",
            "default": "scale",
            "transform": "None",
            "core_model_parameter_type": "str",
            "lower": 0,
            "upper": 1},
        "coef0": {
            "type": "float",
            "default": 0.0,
```

```
            "transform": "None",
            "lower": 0.0,
            "upper": 0.0},
        "shrinking": {
            "levels": [0, 1],
            "type": "factor",
            "default": 0,
            "transform": "None",
            "core_model_parameter_type": "bool",
            "lower": 0,
            "upper": 1},
        "probability": {
            "levels": [0, 1],
            "type": "factor",
            "default": 0,
            "transform": "None",
            "core_model_parameter_type": "bool",
            "lower": 0,
            "upper": 1},
        "tol": {
            "type": "float",
            "default": 1e-3,
            "transform": "None",
            "lower": 1e-4,
            "upper": 1e-2},
        "cache_size": {
            "type": "float",
            "default": 200,
            "transform": "None",
            "lower": 100,
            "upper": 400},
        "break_ties": {
            "levels": [0, 1],
            "type": "factor",
            "default": 0,
            "transform": "None",
            "core_model_parameter_type": "bool",
            "lower": 0,
            "upper": 1}
}
```

15.6 Step 5: Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

15.6.1 Modify hyperparameter of type numeric and integer (boolean)

Numeric and boolean values can be modified using the `modify_hyper_parameter_bounds` method. For example, to change the `tol` hyperparameter of the `SVC` model to the interval [1e-3, 1e-2], the following code can be used:

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
fun_control = modify_hyper_parameter_bounds(fun_control, "tol", bounds=[1e-3, 1e-2])
# fun_control = modify_hyper_parameter_bounds(fun_control, "min_samples_split", bounds=[3,
#fun_control = modify_hyper_parameter_bounds(fun_control, "merit_preprune", bounds=[0, 0])
fun_control["core_model_hyper_dict"]["tol"]
```

```
{'type': 'float',
 'default': 0.001,
 'transform': 'None',
 'lower': 0.001,
 'upper': 0.01}
```

15.6.2 Modify hyperparameter of type factor

Factors can be modified with the `modify_hyper_parameter_levels` function. For example, to exclude the `sigmoid` kernel from the tuning, the `kernel` hyperparameter of the `SVC` model can be modified as follows:

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
fun_control = modify_hyper_parameter_levels(fun_control, "kernel", ["linear", "poly", "rbf
fun_control["core_model_hyper_dict"]["kernel"]
```

```
{'levels': ['linear', 'poly', 'rbf'],
 'type': 'factor',
 'default': 'rbf',
 'transform': 'None',
```

```
'core_model_parameter_type': 'str',
'lower': 0,
'upper': 2}
```

15.6.3 Optimizers

Optimizers are described in Section 20.6.

15.7 Step 6: Selection of the Objective (Loss) Function

There are two metrics:

1. `metric_river` is used for the river based evaluation via `eval_oml_iter_progressive`.
2. `metric_sklearn` is used for the sklearn based evaluation.

```
from sklearn.metrics import mean_absolute_error, accuracy_score, roc_curve, roc_auc_score,
fun_control.update({
               "metric_sklearn": log_loss,
               })
```

15.7.1 Predict Classes or Class Probabilities

If the key `"predict_proba"` is set to `True`, the class probabilities are predicted. `False` is the default, i.e., the classes are predicted.

```
fun_control.update({
               "predict_proba": False,
               })
```

15.8 Step 7: Calling the SPOT Function

15.9 Preparing the SPOT Call

The following code passes the information about the parameter ranges and bounds to `spot`.

```
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
```

```
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name        | type   | default   |   lower |   upper | transform   |
|-------------|--------|-----------|---------|---------|-------------|
| C           | float  | 1.0       |   0.1   |   10    | None        |
| kernel      | factor | rbf       |   0     |    2    | None        |
| degree      | int    | 3         |   3     |    3    | None        |
| gamma       | factor | scale     |   0     |    1    | None        |
| coef0       | float  | 0.0       |   0     |    0    | None        |
| shrinking   | factor | 0         |   0     |    1    | None        |
| probability | factor | 0         |   0     |    1    | None        |
| tol         | float  | 0.001     |   0.001 |    0.01 | None        |
| cache_size  | float  | 200.0     | 100     |  400    | None        |
| break_ties  | factor | 0         |   0     |    1    | None        |
```

15.10 The Objective Function

The objective function is selected next. It implements an interface from `sklearn`'s training, validation, and testing methods to `spotPython`.

```
from spotPython.fun.hypersklearn import HyperSklearn
fun = HyperSklearn().fun_sklearn
```

15.10.1 Run the `Spot` Optimizer

- Run SPOT for approx. x mins (`max_time`).
- Note: the run takes longer, because the evaluation time of initial design (here: `initi_size`, 20 points) is not considered.

```python
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=SklearnHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
X_start
```

```
array([[1.e+00, 2.e+00, 3.e+00, 0.e+00, 0.e+00, 0.e+00, 0.e+00, 1.e-03,
        2.e+02, 0.e+00]])
```

15.11 Starting the Hyperparameter Tuning

```python
import numpy as np
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models= False,
                   show_progress= True,
                   fun_control = fun_control,
                   design_control={"init_size": INIT_SIZE,
                                   "repeats": 1},
                   surrogate_control={"noise": True,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": len(var_name),
                                      "model_fun_evals": 10_000,
                                      "log_level": 50
```

```
                                              })
spot_tuner.run(X_start=X_start)
```

```
spotPython tuning: 5.691103166702708 [----------] 2.85%

spotPython tuning: 5.691103166702708 [----------] 4.68%

spotPython tuning: 5.691103166702708 [#---------] 6.23%

spotPython tuning: 5.691103166702708 [#---------] 7.71%

spotPython tuning: 5.691103166702708 [#---------] 9.17%

spotPython tuning: 5.691103166702708 [#---------] 11.60%

spotPython tuning: 5.691103166702708 [#---------] 13.94%

spotPython tuning: 5.691103166702708 [##--------] 16.20%

spotPython tuning: 5.691103166702708 [##--------] 18.56%

spotPython tuning: 5.691103166702708 [##--------] 20.82%

spotPython tuning: 5.691103166702708 [##--------] 23.35%

spotPython tuning: 5.691103166702708 [###-------] 26.02%

spotPython tuning: 5.691103166702708 [###-------] 34.07%

spotPython tuning: 5.691103166702708 [#####-----] 45.54%

spotPython tuning: 5.691103166702708 [######----] 57.86%

spotPython tuning: 5.691103166702708 [#######---] 70.80%

spotPython tuning: 5.691103166702708 [########--] 83.94%

spotPython tuning: 5.691103166702708 [##########] 96.65%

spotPython tuning: 5.691103166702708 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x2a5ad4f10>
```

15.11.1 Results

```
SAVE = False
LOAD = False

if SAVE:
    result_file_name = "res_" + experiment_name + ".pkl"
    with open(result_file_name, 'wb') as f:
        pickle.dump(spot_tuner, f)

if LOAD:
    result_file_name = "res_ch10-friedman-hpt-0_maans03_60min_20init_1K_2023-04-14_10-11-1
    with open(result_file_name, 'rb') as f:
        spot_tuner =  pickle.load(f)
```

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

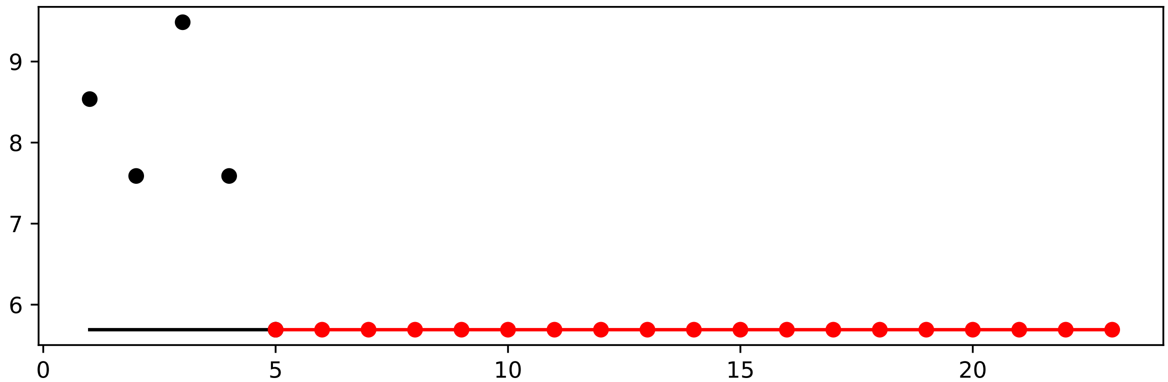


Figure 15.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

- Print the results

```
print(gen_design_table(fun_control=fun_control,
    spot=spot_tuner))
```

```
| name        | type   | default   |   lower |   upper |                tuned | transform
|-------------|--------|-----------|---------|---------|----------------------|-------------
| C           | float  | 1.0       |     0.1 |    10.0 |   3.6280771109650245 | None
| kernel      | factor | rbf       |     0.0 |     2.0 |                  1.0 | None
| degree      | int    | 3         |     3.0 |     3.0 |                  3.0 | None
| gamma       | factor | scale     |     0.0 |     1.0 |                  0.0 | None
| coef0       | float  | 0.0       |     0.0 |     0.0 |                  0.0 | None
| shrinking   | factor | 0         |     0.0 |     1.0 |                  1.0 | None
| probability | factor | 0         |     0.0 |     1.0 |                  0.0 | None
| tol         | float  | 0.001     |   0.001 |    0.01 | 0.006642600916881275 | None
| cache_size  | float  | 200.0     |   100.0 |   400.0 |   202.03372626175258 | None
| break_ties  | factor | 0         |     0.0 |     1.0 |                  1.0 | None
```

15.12 Show variable importance

```
spot_tuner.plot_importance(threshold=0.025, filename="./figures/" + experiment_name+"_impo
```

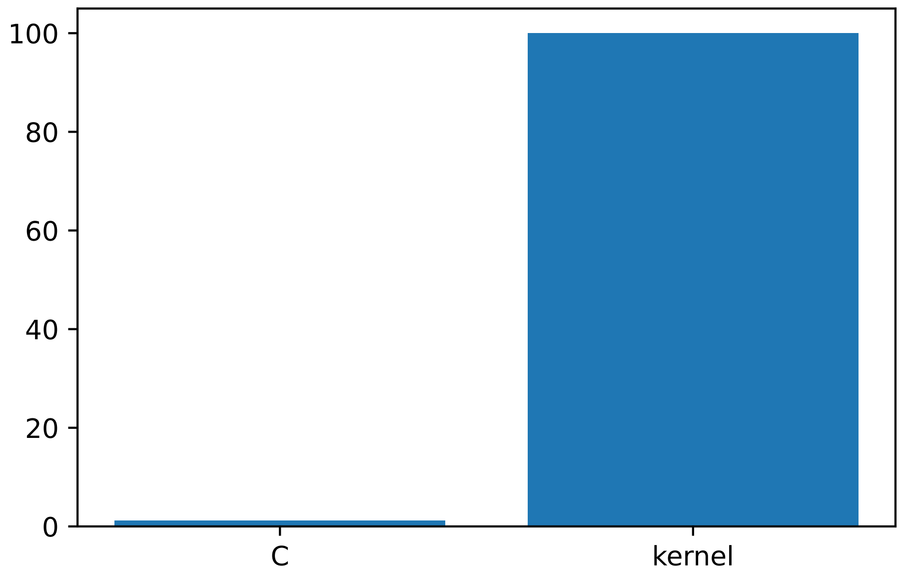


Figure 15.2: Variable importance plot, threshold 0.025.

15.13 Get Default Hyperparameters

```
from spotPython.hyperparameters.values import get_default_values, transform_hyper_paramete
values_default = get_default_values(fun_control)
values_default = transform_hyper_parameter_values(fun_control=fun_control, hyper_parameter
values_default
```

```
{'C': 1.0,
 'kernel': 'rbf',
 'degree': 3,
 'gamma': 'scale',
 'coef0': 0.0,
 'shrinking': 0,
 'probability': 0,
 'tol': 0.001,
 'cache_size': 200.0,
 'break_ties': 0}
```

```
from sklearn.pipeline import make_pipeline
model_default = make_pipeline(fun_control["prep_model"], fun_control["core_model"](**value
model_default
```

```
Pipeline(steps=[('standardscaler', StandardScaler()),
                ('svc',
                 SVC(break_ties=0, cache_size=200.0, probability=0,
                     shrinking=0))])
```

15.14 Get SPOT Results

```
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
print(X)
```

```
[[3.62807711e+00 1.00000000e+00 3.00000000e+00 0.00000000e+00
  0.00000000e+00 1.00000000e+00 0.00000000e+00 6.64260092e-03
  2.02033726e+02 1.00000000e+00]]
```

```python
from spotPython.hyperparameters.values import assign_values, return_conf_list_from_var_dic
v_dict = assign_values(X, fun_control["var_name"])
return_conf_list_from_var_dict(var_dict=v_dict, fun_control=fun_control)
```

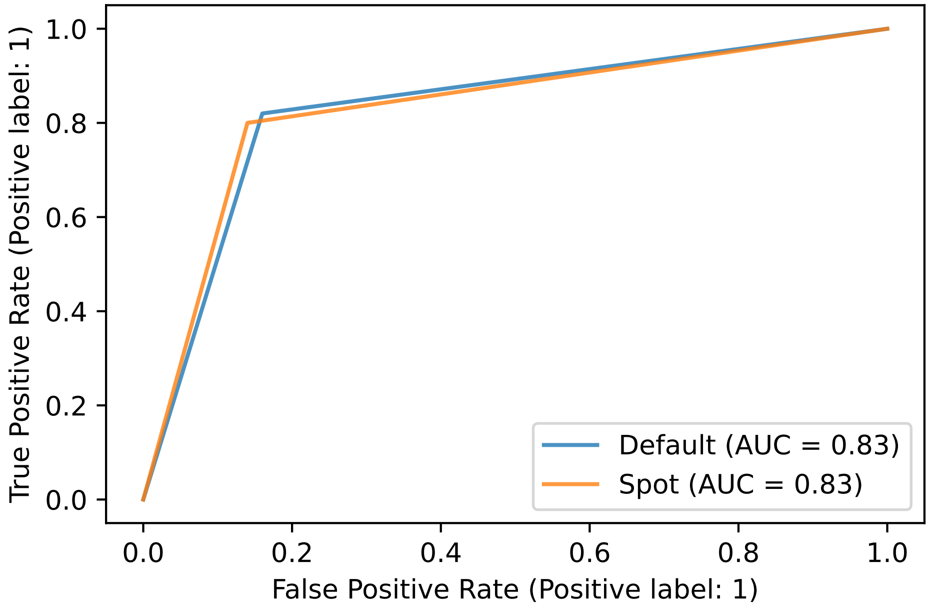
```
[{'C': 3.6280771109650245,
  'kernel': 'poly',
  'degree': 3,
  'gamma': 'scale',
  'coef0': 0.0,
  'shrinking': 1,
  'probability': 0,
  'tol': 0.006642600916881275,
  'cache_size': 202.03372626175258,
  'break_ties': 1}]
```

```python
from spotPython.hyperparameters.values import get_one_sklearn_model_from_X
model_spot = get_one_sklearn_model_from_X(X, fun_control)
model_spot
```

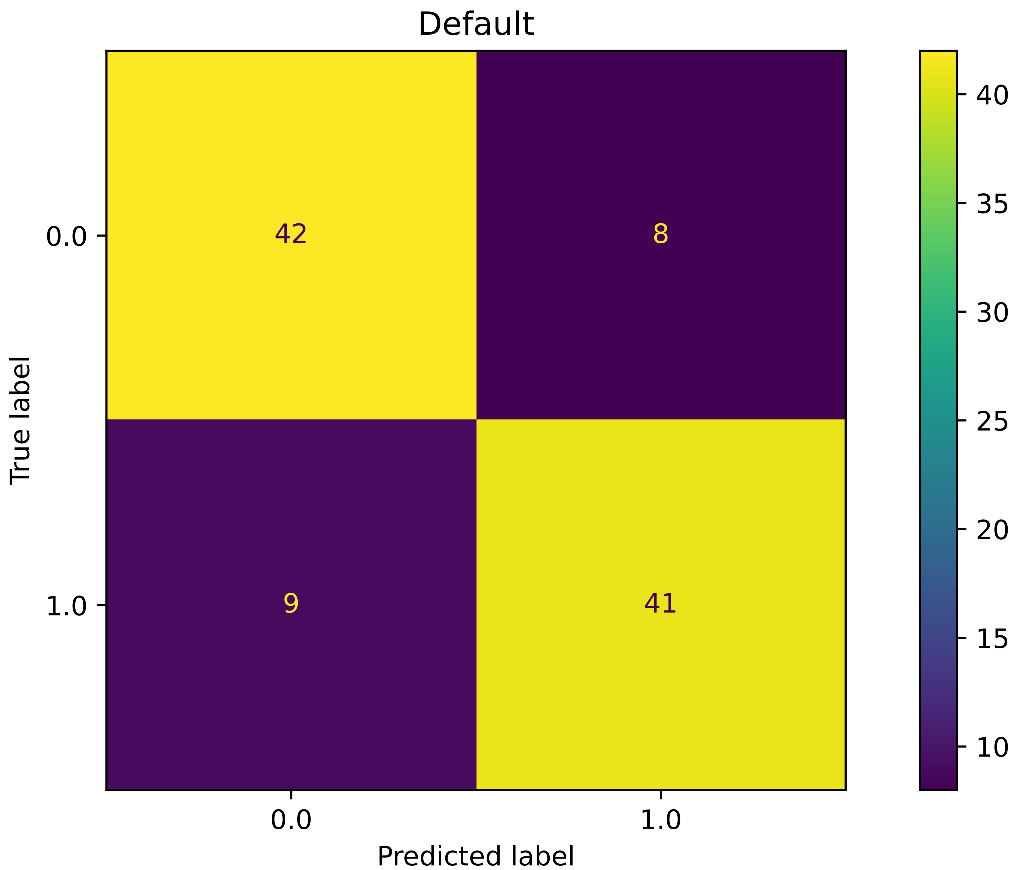
```
Pipeline(steps=[('standardscaler', StandardScaler()),
                ('svc',
                 SVC(C=3.6280771109650245, break_ties=1,
                     cache_size=202.03372626175258, kernel='poly',
                     probability=0, shrinking=1, tol=0.006642600916881275))])
```

15.15 Plot: Compare Predictions

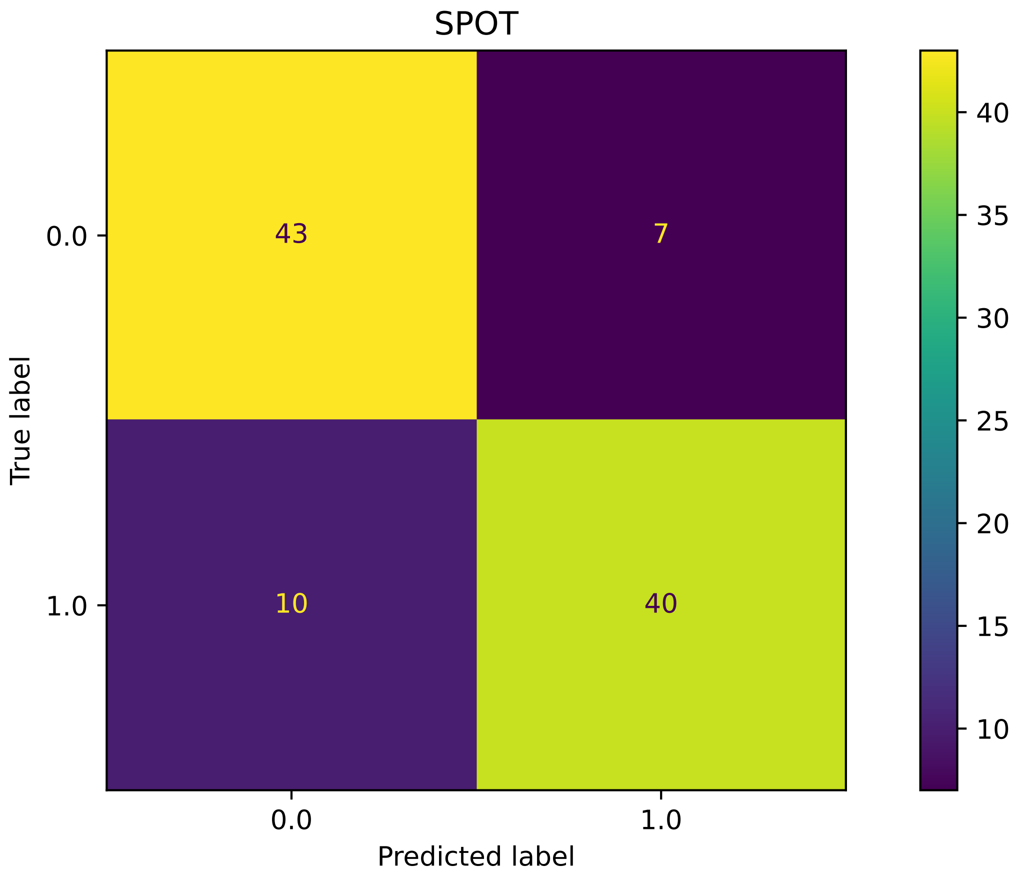
```python
from spotPython.plot.validation import plot_roc
plot_roc([model_default, model_spot], fun_control, model_names=["Default", "Spot"])
```




```
from spotPython.plot.validation import plot_confusion_matrix
plot_confusion_matrix(model_default, fun_control, title = "Default")
```




```
plot_confusion_matrix(model_spot, fun_control, title="SPOT")
```



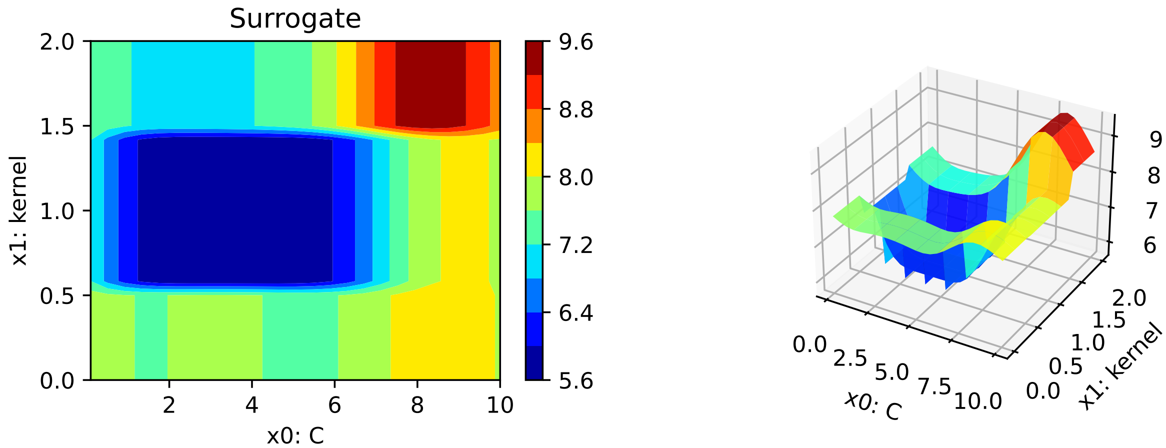

```
min(spot_tuner.y), max(spot_tuner.y)
```

```
(5.691103166702708, 9.485171944504513)
```

15.16 Detailed Hyperparameter Plots

```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

```
C:  1.1399176173997725
kernel:  100.0
```



15.17 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

```
Unable to display output for mime type(s): text/html
```

15.18 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

16 Hyperparameter Tuning: PyTorch With fashionMNIST

In this tutorial, we will show how `spotPython` can be integrated into the `PyTorch` training workflow.

This document refers to the following software versions:

- `python`: 3.10.10
- `torch`: 2.0.1
- `torchvision`: 0.15.0

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                 0.2.31
spotRiver                  0.0.93
```

```
Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

16.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time, initial design size and the device that is used.

```
MAX_TIME = 1
INIT_SIZE = 5
DEVICE = "cpu" # "cuda:0"
```

```
from spotPython.utils.device import getDevice
DEVICE = getDevice(DEVICE)
print(DEVICE)
```

```
cpu
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '11-torch' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_SI
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
11-torch_p040025_1min_5init_2023-06-16_09-40-58
```

16.2 Step 1: Initialization of the Empty `fun_control` Dictionary

`spotPython` uses a Python dictionary for storing the information required for the hyperparameter tuning process, which was described in Section 20.2.

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/11_spot_hpt_torch_fashion_mnist",
```

```
    device=DEVICE)
```

16.3 PyTorch Data Loading

16.4 Step 2: Load fashionMNIST Data

```
from torchvision import datasets, transforms
from torchvision.transforms import ToTensor
def load_data(data_dir="./data"):
    # Download training data from open datasets.
    training_data = datasets.FashionMNIST(
        root=data_dir,
        train=True,
        download=True,
        transform=ToTensor(),
    )
    # Download test data from open datasets.
    test_data = datasets.FashionMNIST(
        root=data_dir,
        train=False,
        download=True,
        transform=ToTensor(),
    )
    return training_data, test_data
```

```
train, test = load_data()
train.data.shape, test.data.shape
```

```
(torch.Size([60000, 28, 28]), torch.Size([10000, 28, 28]))
```

```
n_samples = len(train)
# add the dataset to the fun_control
fun_control.update({"data": None,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": None})
```

16.5 The Model (Algorithm) to be Tuned

16.6 Step 3: Specification of the Preprocessing Model

After the training and test data are specified and added to the `fun_control` dictionary, `spotPython` allows the specification of a data preprocessing pipeline, e.g., for the scaling of the data or for the one-hot encoding of categorical variables, see Section 20.4.1. This feature is not used here, so we do not change the default value (which is `None`).

16.7 Step 4: Select `algorithm` and `core_model_hyper_dict`

`spotPython` implements a class which is similar to the class described in the PyTorch tutorial. The class is called `Net_fashionMNIST` and is implemented in the file `netfashionMNIST.py`. The class is imported here.

```
from torch import nn
import spotPython.torch.netcore as netcore


class Net_fashionMNIST(netcore.Net_Core):
    def __init__(self, l1, l2, lr_mult, batch_size, epochs, k_folds, patience, optimizer,
        super(Net_fashionMNIST, self).__init__(
            lr_mult=lr_mult,
            batch_size=batch_size,
            epochs=epochs,
            k_folds=k_folds,
            patience=patience,
            optimizer=optimizer,
            sgd_momentum=sgd_momentum,
        )
        self.flatten = nn.Flatten()
        self.linear_relu_stack = nn.Sequential(
            nn.Linear(28 * 28, l1),
            nn.ReLU(),
            nn.Linear(l1, l2),
            nn.ReLU(),
            nn.Linear(l2, 10)
        )

    def forward(self, x):
```

```
        x = self.flatten(x)
        logits = self.linear_relu_stack(x)
        return logits
```

This class inherits from the class `Net_Core` which is implemented in the file `netcore.py`, see **?@sec-the-net-core-class-24**.

```
from spotPython.data.torch_hyper_dict import TorchHyperDict
from spotPython.torch.netfashionMNIST import Net_fashionMNIST
from spotPython.hyperparameters.values import add_core_model_to_fun_control
fun_control = add_core_model_to_fun_control(core_model=Net_fashionMNIST,
                              fun_control=fun_control,
                              hyper_dict=TorchHyperDict,
                              filename=None)
```

16.8 The Search Space

16.8.1 Configuring the Search Space With spotPython

16.8.1.1 The `hyper_dict` Hyperparameters for the Selected Algorithm

`spotPython` uses `JSON` files for the specification of the hyperparameters, which were described in Section 20.5.2.

The corresponding entries for the `Net_fashionMNIST` class are shown below.

```
"Net_fashionMNIST":
   {
       "l1": {
           "type": "int",
           "default": 5,
           "transform": "transform_power_2_int",
           "lower": 2,
           "upper": 9},
       "l2": {
           "type": "int",
           "default": 5,
           "transform": "transform_power_2_int",
           "lower": 2,
           "upper": 9},
```

```
        "lr_mult": {
            "type": "float",
            "default": 1.0,
            "transform": "None",
            "lower": 0.1,
            "upper": 10.0},
        "batch_size": {
            "type": "int",
            "default": 4,
            "transform": "transform_power_2_int",
            "lower": 1,
            "upper": 4},
        "epochs": {
                "type": "int",
                "default": 3,
                "transform": "transform_power_2_int",
                "lower": 3,
                "upper": 4},
        "k_folds": {
            "type": "int",
            "default": 1,
            "transform": "None",
            "lower": 1,
            "upper": 1},
        "patience": {
            "type": "int",
            "default": 5,
            "transform": "None",
            "lower": 2,
            "upper": 10
        },
        "optimizer": {
            "levels": ["Adadelta",
                        "Adagrad",
                        "Adam",
                        "AdamW",
                        "SparseAdam",
                        "Adamax",
                        "ASGD",
                        "NAdam",
                        "RAdam",
```

```
                        "RMSprop",
                        "Rprop",
                        "SGD"],
            "type": "factor",
            "default": "SGD",
            "transform": "None",
            "core_model_parameter_type": "str",
            "lower": 0,
            "upper": 12},
        "sgd_momentum": {
            "type": "float",
            "default": 0.0,
            "transform": "None",
            "lower": 0.0,
            "upper": 1.0}
    },
```

16.9 Step 5: Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

16.9.1 Modify hyperparameter of type numeric and integer (boolean)

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
# fun_control = modify_hyper_parameter_bounds(fun_control, "delta", bounds=[1e-10, 1e-6])
# fun_control = modify_hyper_parameter_bounds(fun_control, "min_samples_split", bounds=[3,
#fun_control = modify_hyper_parameter_bounds(fun_control, "merit_preprune", bounds=[0, 0])
# fun_control["core_model_hyper_dict"]
fun_control = modify_hyper_parameter_bounds(fun_control, "k_folds", bounds=[0, 0])
fun_control = modify_hyper_parameter_bounds(fun_control, "patience", bounds=[2, 2])
fun_control = modify_hyper_parameter_bounds(fun_control, "epochs", bounds=[2, 3])
```

16.9.2 Modify hyperparameter of type factor

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
# fun_control = modify_hyper_parameter_levels(fun_control, "leaf_model", ["LinearRegressio
# fun_control["core_model_hyper_dict"]
```

16.9.3 Optimizers

Optimizers are described in Section 20.6.

16.10 Step 6: Selection of the Objective (Loss) Function

16.10.1 Evaluation

The evaluation procedure requires the specification of two elements:

1. the way how the data is split into a train and a test set and
2. the loss function (and a metric).

These are described in Section 25.9.

The key `"loss_function"` specifies the loss function which is used during the optimization, see Section 20.8.

We will use CrossEntropy loss for the multiclass-classification task.

```
from torch.nn import CrossEntropyLoss
loss_function = CrossEntropyLoss()
fun_control.update({
        "loss_function": loss_function,
        "shuffle": True,
        "eval":  "train_hold_out"
        })
```

16.10.2 Metric

```
from torchmetrics import Accuracy
metric_torch = Accuracy(task="multiclass", num_classes=10).to(fun_control["device"])
fun_control.update({"metric_torch": metric_torch})
```

16.11 Preparing the SPOT Call

The following code passes the information about the parameter ranges and bounds to `spot`.

```
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name         | type   | default   |   lower |   upper | transform              |
|--------------|--------|-----------|---------|---------|------------------------|
| l1           | int    | 5         |     2   |       9 | transform_power_2_int |
| l2           | int    | 5         |     2   |       9 | transform_power_2_int |
| lr_mult      | float  | 1.0       |     0.1 |      10 | None                   |
| batch_size   | int    | 4         |     1   |       4 | transform_power_2_int |
| epochs       | int    | 3         |     2   |       3 | transform_power_2_int |
| k_folds      | int    | 1         |     0   |       0 | None                   |
| patience     | int    | 5         |     2   |       2 | None                   |
| optimizer    | factor | SGD       |     0   |      12 | None                   |
| sgd_momentum | float  | 0.0       |     0   |       1 | None                   |
```

16.12 The Objective Function `fun_torch`

The objective function `fun_torch` is selected next. It implements an interface from `PyTorch`'s training, validation, and testing methods to `spotPython`.

```
from spotPython.fun.hypertorch import HyperTorch
fun = HyperTorch().fun_torch
```

16.13 Starting the Hyperparameter Tuning

```
import numpy as np
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models= False,
                   show_progress= True,
                   fun_control = fun_control,
                   design_control={"init_size": INIT_SIZE,
                                   "repeats": 1},
                   surrogate_control={"noise": True,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": len(var_name),
                                      "model_fun_evals": 10_000,
                                      "log_level": 50
                                      })
spot_tuner.run(X_start=X_start)
```

```
config: {'l1': 16, 'l2': 32, 'lr_mult': 9.563687451910228, 'batch_size': 8, 'epochs': 8, 'k_
Epoch: 1

Loss on hold-out set: 0.5750363308298402
Accuracy on hold-out set: 0.8090833333333334
MulticlassAccuracy value on hold-out data: 0.8090833425521851
```

```
Epoch: 2

Loss on hold-out set: 0.6833013310392076
Accuracy on hold-out set: 0.781
MulticlassAccuracy value on hold-out data: 0.781000018119812
Epoch: 3

Loss on hold-out set: 0.7263659135193544
Accuracy on hold-out set: 0.7714166666666666
MulticlassAccuracy value on hold-out data: 0.7714166641235352
Early stopping at epoch 2
Returned to Spot: Validation loss: 0.7263659135193544
----------------------------------------------

config: {'l1': 128, 'l2': 32, 'lr_mult': 6.258012467639852, 'batch_size': 2, 'epochs': 4, 'k
Epoch: 1

Loss on hold-out set: 0.6219902973663665
Accuracy on hold-out set: 0.83925
MulticlassAccuracy value on hold-out data: 0.8392500281333923
Epoch: 2

Loss on hold-out set: 0.6169703635374828
Accuracy on hold-out set: 0.8517916666666666
MulticlassAccuracy value on hold-out data: 0.8517916798591614
Epoch: 3

Loss on hold-out set: 0.5937176911980235
Accuracy on hold-out set: 0.8635416666666667
MulticlassAccuracy value on hold-out data: 0.8635416626930237
Epoch: 4

Loss on hold-out set: 0.5509287033761194
Accuracy on hold-out set: 0.8718333333333333
MulticlassAccuracy value on hold-out data: 0.871833324432373
Returned to Spot: Validation loss: 0.5509287033761194
----------------------------------------------

config: {'l1': 256, 'l2': 256, 'lr_mult': 0.2437336281201693, 'batch_size': 16, 'epochs': 8,
Epoch: 1
```

```
Loss on hold-out set: 0.491322054490447
Accuracy on hold-out set: 0.8282916666666666
MulticlassAccuracy value on hold-out data: 0.828291654586792
Epoch: 2

Loss on hold-out set: 0.4488397885834177
Accuracy on hold-out set: 0.8438333333333333
MulticlassAccuracy value on hold-out data: 0.843833327293396
Epoch: 3

Loss on hold-out set: 0.42920184302081665
Accuracy on hold-out set: 0.851
MulticlassAccuracy value on hold-out data: 0.8510000109672546
Epoch: 4

Loss on hold-out set: 0.41528950092568995
Accuracy on hold-out set: 0.85625
MulticlassAccuracy value on hold-out data: 0.856249988079071
Epoch: 5

Loss on hold-out set: 0.41071159282326697
Accuracy on hold-out set: 0.8543333333333333
MulticlassAccuracy value on hold-out data: 0.8543333411216736
Epoch: 6

Loss on hold-out set: 0.40038577755292254
Accuracy on hold-out set: 0.8603333333333333
MulticlassAccuracy value on hold-out data: 0.8603333234786987
Epoch: 7

Loss on hold-out set: 0.3929624199171861
Accuracy on hold-out set: 0.8628333333333333
MulticlassAccuracy value on hold-out data: 0.8628333210945129
Epoch: 8

Loss on hold-out set: 0.39467713380108277
Accuracy on hold-out set: 0.8600833333333333
MulticlassAccuracy value on hold-out data: 0.8600833415985107
Returned to Spot: Validation loss: 0.39467713380108277
----------------------------------------------
```

```
config: {'l1': 64, 'l2': 8, 'lr_mult': 2.906205211581667, 'batch_size': 8, 'epochs': 4, 'k_fo
Epoch: 1

Loss on hold-out set: 1.060789320419232
Accuracy on hold-out set: 0.6227916666666666
MulticlassAccuracy value on hold-out data: 0.6227916479110718
Epoch: 2

Loss on hold-out set: 0.8578614482134581
Accuracy on hold-out set: 0.6649166666666667
MulticlassAccuracy value on hold-out data: 0.6649166941642761
Epoch: 3

Loss on hold-out set: 0.7850016516769925
Accuracy on hold-out set: 0.6884166666666667
MulticlassAccuracy value on hold-out data: 0.6884166598320007
Epoch: 4

Loss on hold-out set: 0.7303327572966616
Accuracy on hold-out set: 0.728875
MulticlassAccuracy value on hold-out data: 0.7288749814033508
Returned to Spot: Validation loss: 0.7303327572966616
----------------------------------------------

config: {'l1': 4, 'l2': 128, 'lr_mult': 4.224097306355747, 'batch_size': 4, 'epochs': 8, 'k_f
Epoch: 1

Loss on hold-out set: 1.5851507924404384
Accuracy on hold-out set: 0.34279166666666666
MulticlassAccuracy value on hold-out data: 0.34279167652130127
Epoch: 2

Loss on hold-out set: 1.017134292451491
Accuracy on hold-out set: 0.5730416666666667
MulticlassAccuracy value on hold-out data: 0.5730416774749756
Epoch: 3

Loss on hold-out set: 1.0116758003229527
Accuracy on hold-out set: 0.576375
MulticlassAccuracy value on hold-out data: 0.5763750076293945
Epoch: 4
```

```
Loss on hold-out set: 1.0232252284263377
Accuracy on hold-out set: 0.56425
MulticlassAccuracy value on hold-out data: 0.5642499923706055
Epoch: 5

Loss on hold-out set: 1.0163181163913602
Accuracy on hold-out set: 0.568
MulticlassAccuracy value on hold-out data: 0.5680000185966492
Early stopping at epoch 4
Returned to Spot: Validation loss: 1.0163181163913602
----------------------------------------------

config: {'l1': 256, 'l2': 256, 'lr_mult': 0.6871333251331055, 'batch_size': 16, 'epochs': 8,

Epoch: 1

Loss on hold-out set: 0.4315746854568521
Accuracy on hold-out set: 0.8449166666666666
MulticlassAccuracy value on hold-out data: 0.8449166417121887
Epoch: 2

Loss on hold-out set: 0.4008704209836821
Accuracy on hold-out set: 0.8566666666666667
MulticlassAccuracy value on hold-out data: 0.8566666841506958
Epoch: 3

Loss on hold-out set: 0.3782503010388464
Accuracy on hold-out set: 0.863625
MulticlassAccuracy value on hold-out data: 0.8636249899864197
Epoch: 4

Loss on hold-out set: 0.35946712575107814
Accuracy on hold-out set: 0.8698333333333333
MulticlassAccuracy value on hold-out data: 0.8698333501815796
Epoch: 5

Loss on hold-out set: 0.35330349269136785
Accuracy on hold-out set: 0.8716666666666667
MulticlassAccuracy value on hold-out data: 0.871666669845581
Epoch: 6
```

```
Loss on hold-out set: 0.3493550985486557
Accuracy on hold-out set: 0.8751666666666666
MulticlassAccuracy value on hold-out data: 0.875166654586792
Epoch: 7

Loss on hold-out set: 0.34015862775345646
Accuracy on hold-out set: 0.8786666666666667
MulticlassAccuracy value on hold-out data: 0.8786666393280029
Epoch: 8

Loss on hold-out set: 0.3386029969789088
Accuracy on hold-out set: 0.8784583333333333
MulticlassAccuracy value on hold-out data: 0.8784583210945129
Returned to Spot: Validation loss: 0.3386029969789088
----------------------------------------------
spotPython tuning: 0.3386029969789088 [#####-----] 50.09%


config: {'l1': 256, 'l2': 256, 'lr_mult': 1.681349779210516, 'batch_size': 16, 'epochs': 8,
Epoch: 1

Loss on hold-out set: 0.3967412289828062
Accuracy on hold-out set: 0.8545416666666666
MulticlassAccuracy value on hold-out data: 0.8545416593551636
Epoch: 2

Loss on hold-out set: 0.3621240634061396
Accuracy on hold-out set: 0.8694583333333333
MulticlassAccuracy value on hold-out data: 0.8694583177566528
Epoch: 3

Loss on hold-out set: 0.33462190327917535
Accuracy on hold-out set: 0.877
MulticlassAccuracy value on hold-out data: 0.8769999742507935
Epoch: 4

Loss on hold-out set: 0.3437236117882033
Accuracy on hold-out set: 0.8779166666666667
MulticlassAccuracy value on hold-out data: 0.877916693687439
Epoch: 5
```

```
Loss on hold-out set: 0.3223595124930143
Accuracy on hold-out set: 0.884
MulticlassAccuracy value on hold-out data: 0.8840000033378601
Epoch: 6

Loss on hold-out set: 0.3256594865215011
Accuracy on hold-out set: 0.884125
MulticlassAccuracy value on hold-out data: 0.8841249942779541
Epoch: 7

Loss on hold-out set: 0.31620077563418697
Accuracy on hold-out set: 0.888125
MulticlassAccuracy value on hold-out data: 0.8881250023841858
Epoch: 8

Loss on hold-out set: 0.3153327923115964
Accuracy on hold-out set: 0.8892083333333334
MulticlassAccuracy value on hold-out data: 0.8892083168029785
Returned to Spot: Validation loss: 0.3153327923115964
----------------------------------------------

spotPython tuning: 0.3153327923115964 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x13f7ca680>
```

17 Tensorboard

The textual output shown in the console (or code cell) can be visualized with Tensorboard as described in Section 20.13.

17.0.1 Results

After the hyperparameter tuning run is finished, the results can be analyzed as described in Section 20.14.

```
SAVE = False
LOAD = False

if SAVE:
    result_file_name = "res_" + experiment_name + ".pkl"
    with open(result_file_name, 'wb') as f:
        pickle.dump(spot_tuner, f)

if LOAD:
    result_file_name = "ADD THE NAME here, e.g.: res_ch10-friedman-hpt-0_maans03_60min_20i
    with open(result_file_name, 'rb') as f:
        spot_tuner =  pickle.load(f)
```

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

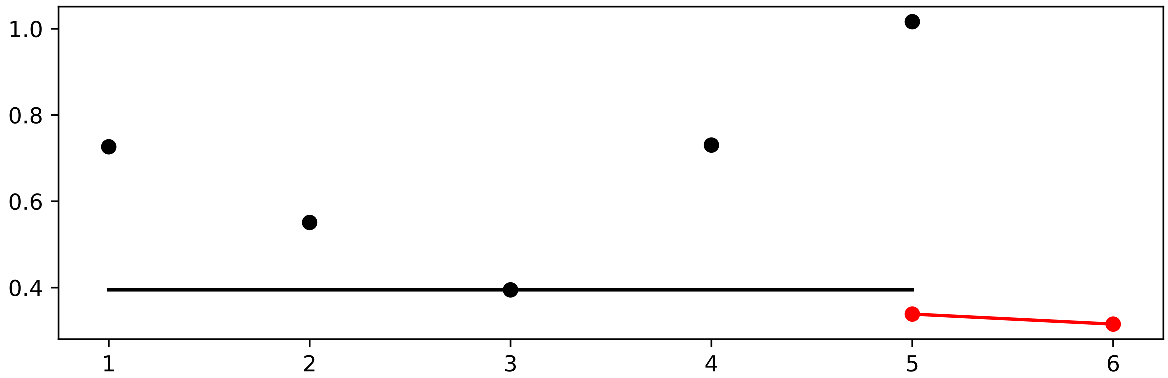


Figure 17.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

- Print the results

```
print(gen_design_table(fun_control=fun_control,
    spot=spot_tuner))
```

```
| name         | type   | default   |    lower |    upper |               tuned | transform
|--------------|--------|-----------|----------|----------|---------------------|--------------
| l1           | int    | 5         |      2.0 |      9.0 |                 8.0 | transform_pow
| l2           | int    | 5         |      2.0 |      9.0 |                 8.0 | transform_pow
| lr_mult      | float  | 1.0       |      0.1 |     10.0 |   1.681349779210516 | None
| batch_size   | int    | 4         |      1.0 |      4.0 |                 4.0 | transform_pow
| epochs       | int    | 3         |      2.0 |      3.0 |                 3.0 | transform_pow
| k_folds      | int    | 1         |      0.0 |      0.0 |                 0.0 | None
| patience     | int    | 5         |      2.0 |      2.0 |                 2.0 | None
| optimizer    | factor | SGD       |      0.0 |     12.0 |                 1.0 | None
| sgd_momentum | float  | 0.0       |      0.0 |      1.0 | 0.31689103394262214 | None
```

17.1 Show variable importance

```
spot_tuner.plot_importance(threshold=0.025, filename="./figures/" + experiment_name+"_impo
```

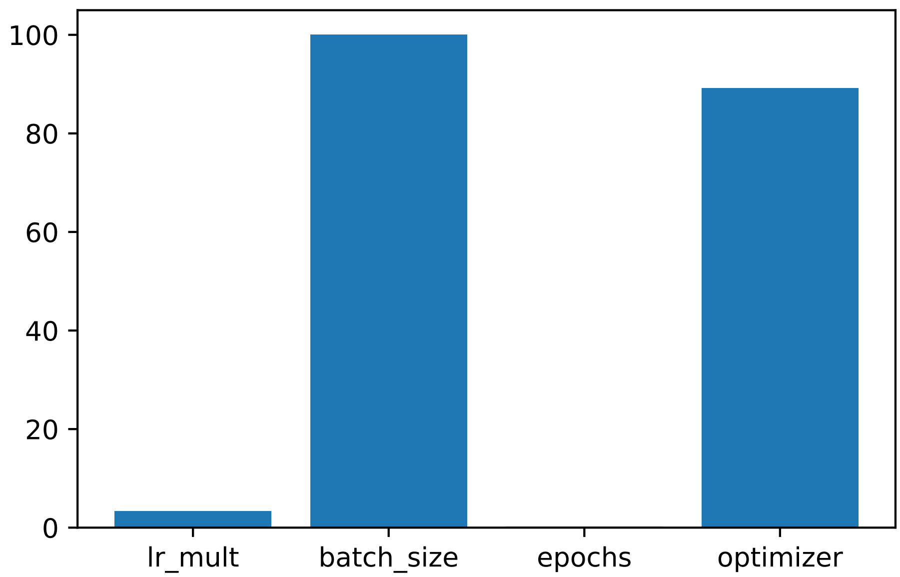


Figure 17.2: Variable importance plot, threshold 0.025.

17.2 Get the Tuned Architecture (SPOT Results)

The architecture of the `spotPython` model can be obtained by the following code:

```python
from spotPython.hyperparameters.values import get_one_core_model_from_X
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
model_spot = get_one_core_model_from_X(X, fun_control)
model_spot
```

```
Net_fashionMNIST(
  (flatten): Flatten(start_dim=1, end_dim=-1)
  (linear_relu_stack): Sequential(
    (0): Linear(in_features=784, out_features=256, bias=True)
    (1): ReLU()
    (2): Linear(in_features=256, out_features=256, bias=True)
    (3): ReLU()
    (4): Linear(in_features=256, out_features=10, bias=True)
  )
)
```

17.3 Get Default Hyperparameters

```
fc = fun_control
fc.update({"core_model_hyper_dict":
    hyper_dict[fun_control["core_model"].__name__]})
model_default = get_one_core_model_from_X(X_start, fun_control=fc)
model_default
```

```
Net_fashionMNIST(
  (flatten): Flatten(start_dim=1, end_dim=-1)
  (linear_relu_stack): Sequential(
    (0): Linear(in_features=784, out_features=32, bias=True)
    (1): ReLU()
    (2): Linear(in_features=32, out_features=32, bias=True)
    (3): ReLU()
    (4): Linear(in_features=32, out_features=10, bias=True)
  )
)
```

17.4 Evaluation of the Default and the Tuned Architectures

The method `train_tuned` takes a model architecture without trained weights and trains this model with the train data. The train data is split into train and validation data. The validation data is used for early stopping. The trained model weights are saved as a dictionary.

```
from spotPython.torch.traintest import train_tuned
train_tuned(net=model_default, train_dataset=train, shuffle=True,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
        device = fun_control["device"],
        show_batch_interval=1_000_000,
        path=None,
        task=fun_control["task"])
```

```
Epoch: 1

Loss on hold-out set: 2.0234846903483072
Accuracy on hold-out set: 0.33870833333333333
MulticlassAccuracy value on hold-out data: 0.3387083411216736
Epoch: 2
```

```
Loss on hold-out set: 1.6065149173736573
Accuracy on hold-out set: 0.5181666666666667
MulticlassAccuracy value on hold-out data: 0.5181666612625122
Epoch: 3

Loss on hold-out set: 1.2940558108886082
Accuracy on hold-out set: 0.5884583333333333
MulticlassAccuracy value on hold-out data: 0.5884583592414856
Epoch: 4

Loss on hold-out set: 1.130084757288297
Accuracy on hold-out set: 0.6272083333333334
MulticlassAccuracy value on hold-out data: 0.6272083520889282
Epoch: 5

Loss on hold-out set: 1.0232854977051418
Accuracy on hold-out set: 0.6588333333333334
MulticlassAccuracy value on hold-out data: 0.6588333249092102
Epoch: 6

Loss on hold-out set: 0.9471172446807226
Accuracy on hold-out set: 0.6720416666666666
MulticlassAccuracy value on hold-out data: 0.672041654586792
Epoch: 7

Loss on hold-out set: 0.8895603310068448
Accuracy on hold-out set: 0.6872083333333333
MulticlassAccuracy value on hold-out data: 0.687208354473114
Epoch: 8

Loss on hold-out set: 0.8473262250026067
Accuracy on hold-out set: 0.7125833333333333
MulticlassAccuracy value on hold-out data: 0.7125833630561829
Returned to Spot: Validation loss: 0.8473262250026067
----------------------------------------------
```

```python
from spotPython.torch.traintest import test_tuned
test_tuned(net=model_default, test_dataset=test,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
```

```
          shuffle=False,
          device = fun_control["device"],
          task=fun_control["task"])
```

```
Loss on hold-out set: 0.8602561806201935
Accuracy on hold-out set: 0.7008
MulticlassAccuracy value on hold-out data: 0.7008000016212463
Final evaluation: Validation loss: 0.8602561806201935
Final evaluation: Validation metric: 0.7008000016212463
----------------------------------------------
```

```
(0.8602561806201935, nan, tensor(0.7008))
```

The following code trains the model `model_spot`. If `path` is set to a filename, e.g., `path = "model_spot_trained.pt"`, the weights of the trained model will be saved to this file.

```
train_tuned(net=model_spot, train_dataset=train,
          loss_function=fun_control["loss_function"],
          metric=fun_control["metric_torch"],
          shuffle=True,
          device = fun_control["device"],
          path=None,
          task=fun_control["task"])
```

```
Epoch: 1

Loss on hold-out set: 0.38687268360331656
Accuracy on hold-out set: 0.8589166666666667
MulticlassAccuracy value on hold-out data: 0.8589166402816772
Epoch: 2

Loss on hold-out set: 0.35993112784375747
Accuracy on hold-out set: 0.8677916666666666
MulticlassAccuracy value on hold-out data: 0.8677916526794434
Epoch: 3

Loss on hold-out set: 0.34400715252632896
Accuracy on hold-out set: 0.8762083333333334
MulticlassAccuracy value on hold-out data: 0.8762083053588867
Epoch: 4
```

```
Loss on hold-out set: 0.3346623807332168
Accuracy on hold-out set: 0.8765833333333334
MulticlassAccuracy value on hold-out data: 0.8765833377838135
Epoch: 5

Loss on hold-out set: 0.3301220408628384
Accuracy on hold-out set: 0.8804166666666666
MulticlassAccuracy value on hold-out data: 0.8804166913032532
Epoch: 6

Loss on hold-out set: 0.3280151573155696
Accuracy on hold-out set: 0.8815
MulticlassAccuracy value on hold-out data: 0.8815000057220459
Epoch: 7

Loss on hold-out set: 0.31929064412748753
Accuracy on hold-out set: 0.8865416666666667
MulticlassAccuracy value on hold-out data: 0.8865416646003723
Epoch: 8

Loss on hold-out set: 0.3231836508658404
Accuracy on hold-out set: 0.8845416666666667
MulticlassAccuracy value on hold-out data: 0.8845416903495789
Returned to Spot: Validation loss: 0.3231836508658404
----------------------------------------------
```

```python
test_tuned(net=model_spot, test_dataset=test,
            shuffle=False,
            loss_function=fun_control["loss_function"],
            metric=fun_control["metric_torch"],
            device = fun_control["device"],
            task=fun_control["task"])
```

```
Loss on hold-out set: 0.35555503343343736
Accuracy on hold-out set: 0.8801
MulticlassAccuracy value on hold-out data: 0.8801000118255615
Final evaluation: Validation loss: 0.35555503343343736
Final evaluation: Validation metric: 0.8801000118255615
----------------------------------------------
```

```
(0.35555503343343736, nan, tensor(0.8801))
```

17.5 Detailed Hyperparameter Plots

```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

```
lr_mult:  3.3880131150503954
batch_size:  100.0
epochs:  0.20865647214144292
optimizer:  89.1550017893635
```

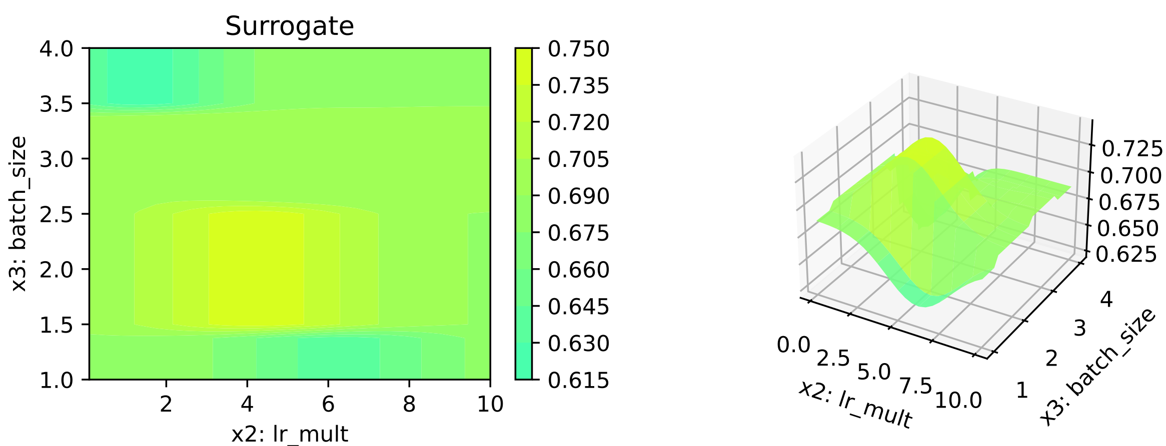
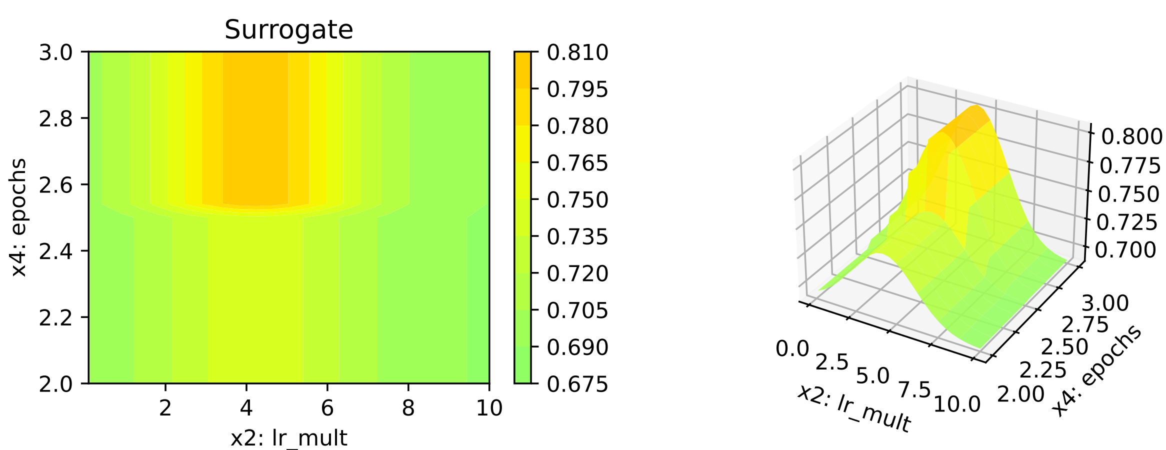
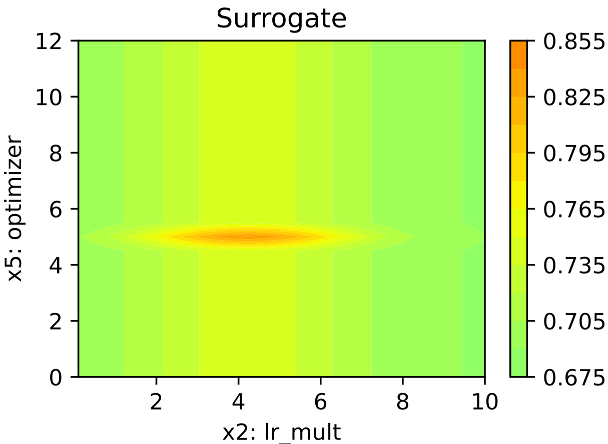
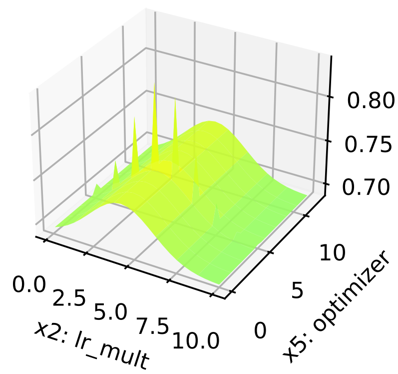
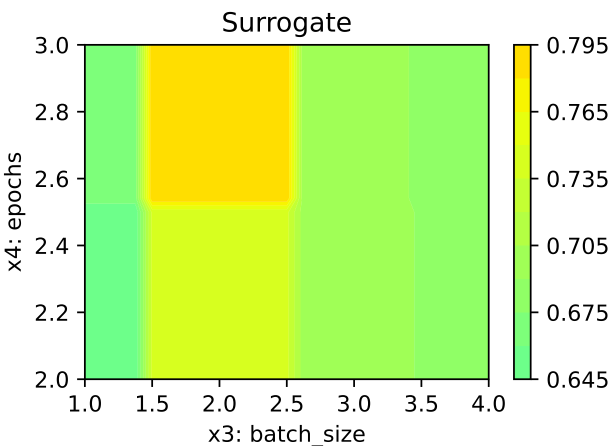


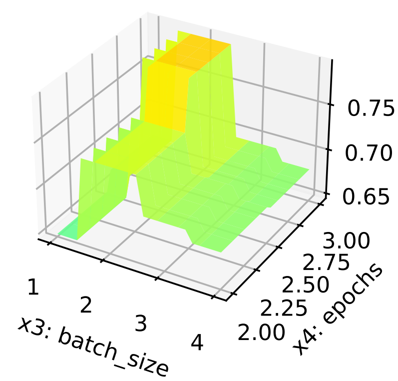
Figure 17.3: Contour plots.

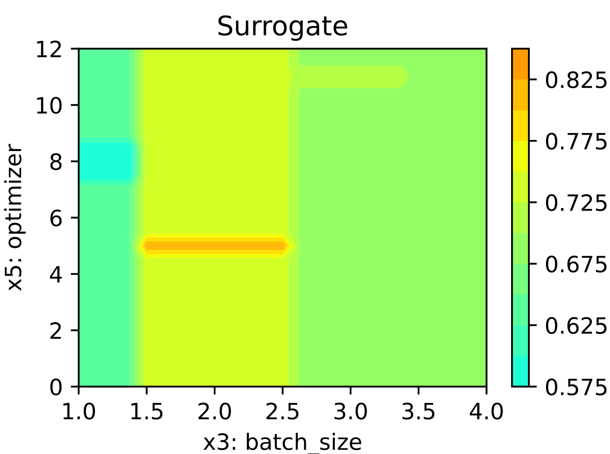


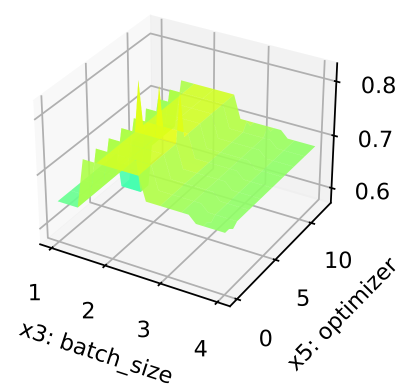

Surrogate
x5: optimizer
x2: lr_mult
0.855
0.825
0.795
0.765
0.735
0.705
0.675

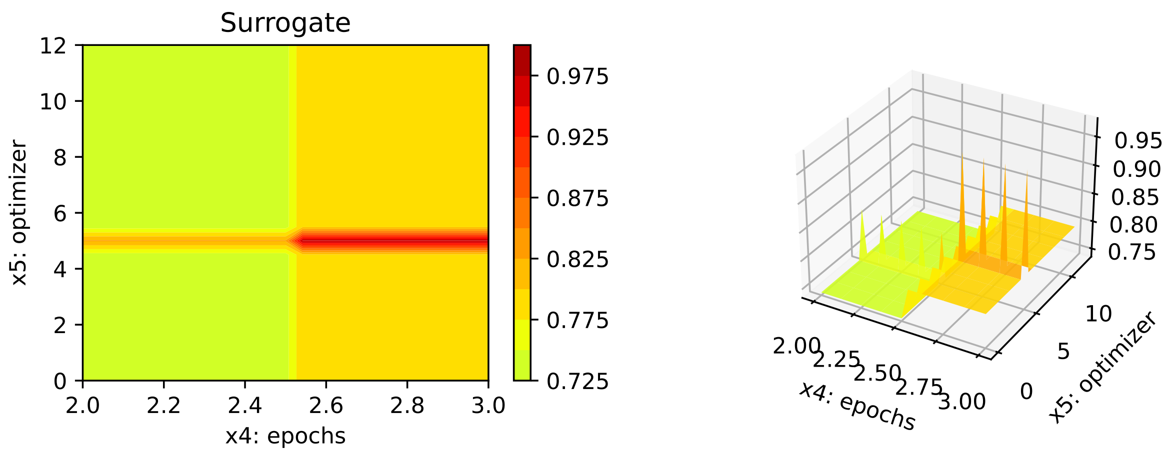

x2: lr_mult
x5: optimizer


Surrogate
x4: epochs
x3: batch_size
0.795
0.765
0.735
0.705
0.675
0.645


x3: batch_size
x4: epochs


Surrogate
x5: optimizer
x3: batch_size
0.825
0.775
0.725
0.675
0.625
0.575


x3: batch_size
x5: optimizer



17.6 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

Parallel coordinates plots

```
Unable to display output for mime type(s): text/html
```

17.7 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

18 Hyperparameter Tuning: PyTorch wth cifar10 Data

In this tutorial, we will show how `spotPython` can be integrated into the `PyTorch` training workflow.

This document refers to the following software versions:

- `python`: 3.10.10
- `torch`: 2.0.1
- `torchvision`: 0.15.0

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                    0.2.31

spotRiver                     0.0.93

Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

18.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time, initial design size and the device that is used.

```
MAX_TIME = 1
INIT_SIZE = 5
DEVICE = None # "cpu" # "cuda:0"
```

```
from spotPython.utils.device import getDevice
DEVICE = getDevice(DEVICE)
print(DEVICE)
```

```
mps
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '12-torch' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_SI
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
12-torch_p040025_1min_5init_2023-06-16_11-35-02
```

18.2 Initialization of the `fun_control` Dictionary

`spotPython` uses a Python dictionary for storing the information required for the hyperparameter tuning process, which was described in Section 20.2.

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/12_spot_hpt_torch_cifar10",
```

```
    device=DEVICE)
```

18.3 PyTorch Data Loading

18.4 1. Load Data Cifar10 Data

```
from torchvision import datasets, transforms
import torchvision
def load_data(data_dir="./data"):
    transform = transforms.Compose([
        transforms.ToTensor(),
        transforms.Normalize((0.5, 0.5, 0.5), (0.5, 0.5, 0.5))
    ])

    trainset = torchvision.datasets.CIFAR10(
        root=data_dir, train=True, download=True, transform=transform)

    testset = torchvision.datasets.CIFAR10(
        root=data_dir, train=False, download=True, transform=transform)

    return trainset, testset
train, test = load_data()
```

```
Files already downloaded and verified
```

```
Files already downloaded and verified
```

- Since this works fine, we can add the data loading to the `fun_control` dictionary:

```
n_samples = len(train)
# add the dataset to the fun_control
fun_control.update({"data": None, # dataset,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": None})
```

18.5 The Model (Algorithm) to be Tuned

18.6 Specification of the Preprocessing Model

After the training and test data are specified and added to the `fun_control` dictionary, `spotPython` allows the specification of a data preprocessing pipeline, e.g., for the scaling of the data or for the one-hot encoding of categorical variables, see Section 20.4.1. This feature is not used here, so we do not change the default value (which is `None`).

18.7 Step 4: Select `algorithm` and `core_model_hyper_dict`

18.7.1 Implementing a Configurable Neural Network With spotPython

`spotPython` includes the `Net_CIFAR10` class which is implemented in the file `netcifar10.py`. The class is imported here.

This class inherits from the class `Net_Core` which is implemented in the file `netcore.py`, see **?@sec-the-net-core-class-24**.

```
from spotPython.torch.netcifar10 import Net_CIFAR10
from spotPython.data.torch_hyper_dict import TorchHyperDict
from spotPython.hyperparameters.values import add_core_model_to_fun_control
fun_control = add_core_model_to_fun_control(core_model=Net_CIFAR10,
                              fun_control=fun_control,
                              hyper_dict=TorchHyperDict,
                              filename=None)
```

18.8 The Search Space

18.8.1 Configuring the Search Space With spotPython

18.8.1.1 The `hyper_dict` Hyperparameters for the Selected Algorithm

`spotPython` uses `JSON` files for the specification of the hyperparameters, which were described in Section 20.5.2.

The corresponding entries for the `Net_CIFAR10` class are shown below.

```
"Net_CIFAR10":
{
    "l1": {
        "type": "int",
        "default": 5,
        "transform": "transform_power_2_int",
        "lower": 2,
        "upper": 9},
    "l2": {
        "type": "int",
        "default": 5,
        "transform": "transform_power_2_int",
        "lower": 2,
        "upper": 9},
    "lr_mult": {
        "type": "float",
        "default": 1.0,
        "transform": "None",
        "lower": 0.1,
        "upper": 10.0},
    "batch_size": {
        "type": "int",
        "default": 4,
        "transform": "transform_power_2_int",
        "lower": 1,
        "upper": 4},
    "epochs": {
        "type": "int",
        "default": 3,
        "transform": "transform_power_2_int",
        "lower": 3,
        "upper": 4},
    "k_folds": {
        "type": "int",
        "default": 1,
        "transform": "None",
        "lower": 1,
        "upper": 1},
    "patience": {
        "type": "int",
        "default": 5,
```

```
            "transform": "None",
            "lower": 2,
            "upper": 10
        },
        "optimizer": {
            "levels": ["Adadelta",
                       "Adagrad",
                       "Adam",
                       "AdamW",
                       "SparseAdam",
                       "Adamax",
                       "ASGD",
                       "NAdam",
                       "RAdam",
                       "RMSprop",
                       "Rprop",
                       "SGD"],
            "type": "factor",
            "default": "SGD",
            "transform": "None",
            "class_name": "torch.optim",
            "core_model_parameter_type": "str",
            "lower": 0,
            "upper": 12},
        "sgd_momentum": {
            "type": "float",
            "default": 0.0,
            "transform": "None",
            "lower": 0.0,
            "upper": 1.0}
    },
```

18.9 Modifying the Hyperparameters

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

18.9.1 Step 5: Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

18.9.1.1 Modify Hyperparameters of Type numeric and integer (boolean)

The hyperparameter `k_folds` is not used, it is de-activated here by setting the lower and upper bound to the same value.

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
# fun_control = modify_hyper_parameter_bounds(fun_control, "delta", bounds=[1e-10, 1e-6])
# fun_control = modify_hyper_parameter_bounds(fun_control, "min_samples_split", bounds=[3,
#fun_control = modify_hyper_parameter_bounds(fun_control, "merit_preprune", bounds=[0, 0])
# fun_control["core_model_hyper_dict"]
fun_control = modify_hyper_parameter_bounds(fun_control, "k_folds", bounds=[2, 2])
```

18.9.2 Modify hyperparameter of type factor

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
fun_control = modify_hyper_parameter_levels(fun_control, "optimizer", ["Adam"])
# fun_control = modify_hyper_parameter_levels(fun_control, "leaf_model", ["LinearRegressio
# fun_control["core_model_hyper_dict"]
```

18.9.3 Optimizers

Optimizers can be selected as described in Section 25.8.2.

Optimizers are described in Section 20.6.

```
fun_control = modify_hyper_parameter_bounds(fun_control,
    "lr_mult", bounds=[1e-3, 1e-3])
fun_control = modify_hyper_parameter_bounds(fun_control,
    "sgd_momentum", bounds=[0.9, 0.9])
```

18.10 Evaluation

The evaluation procedure requires the specification of two elements:

1. the way how the data is split into a train and a test set and
2. the loss function (and a metric).

These are described in Section 25.9.

The key `"loss_function"` specifies the loss function which is used during the optimization, see Section 20.8.

We will use CrossEntropy loss for the multiclass-classification task.

```
from torch.nn import CrossEntropyLoss
loss_function = CrossEntropyLoss()
fun_control.update({
        "loss_function": loss_function,
        "shuffle": True,
        "eval":  "train_hold_out"
        })
```

18.10.1 Metric

```
import torchmetrics
metric_torch = torchmetrics.Accuracy(task="multiclass",
     num_classes=10).to(fun_control["device"])
fun_control.update({"metric_torch": metric_torch})
```

18.11 Preparing the SPOT Call

The following code passes the information about the parameter ranges and bounds to `spot`.

```
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

name	type	default	lower	upper	transform
l1	int	5	2	9	transform_power_2_int
l2	int	5	2	9	transform_power_2_int
lr_mult	float	1.0	0.001	0.001	None
batch_size	int	4	1	4	transform_power_2_int
epochs	int	3	3	4	transform_power_2_int
k_folds	int	1	2	2	None
patience	int	5	2	10	None
optimizer	factor	SGD	0	0	None
sgd_momentum	float	0.0	0.9	0.9	None

18.12 The Objective Function `fun_torch`

The objective function `fun_torch` is selected next. It implements an interface from `PyTorch`'s training, validation, and testing methods to `spotPython`.

```
from spotPython.fun.hypertorch import HyperTorch
fun = HyperTorch().fun_torch
```

18.13 Starting the Hyperparameter Tuning

```
import numpy as np
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
```

```
                     log_level = 50,
                     show_models= False,
                     show_progress= True,
                     fun_control = fun_control,
                     design_control={"init_size": INIT_SIZE,
                                     "repeats": 1},
                     surrogate_control={"noise": True,
                                        "cod_type": "norm",
                                        "min_theta": -4,
                                        "max_theta": 3,
                                        "n_theta": len(var_name),
                                        "model_fun_evals": 10_000,
                                        "log_level": 50
                                        })
spot_tuner.run(X_start=X_start)
```

```
config: {'l1': 128, 'l2': 8, 'lr_mult': 0.001, 'batch_size': 16, 'epochs': 16, 'k_folds': 2,
Epoch: 1

Loss on hold-out set: 2.315166828727722
Accuracy on hold-out set: 0.0989
MulticlassAccuracy value on hold-out data: 0.09889999777078629
Epoch: 2

Loss on hold-out set: 2.312926832008362
Accuracy on hold-out set: 0.0989
MulticlassAccuracy value on hold-out data: 0.09889999777078629
Epoch: 3

Loss on hold-out set: 2.3101555034637453
Accuracy on hold-out set: 0.11065
MulticlassAccuracy value on hold-out data: 0.11065000295639038
Epoch: 4

Loss on hold-out set: 2.306496755981445
Accuracy on hold-out set: 0.14575
MulticlassAccuracy value on hold-out data: 0.1457500010728836
Epoch: 5
```

```
Loss on hold-out set: 2.3018030023574827
Accuracy on hold-out set: 0.15665
MulticlassAccuracy value on hold-out data: 0.15665000677108765
Epoch: 6

Loss on hold-out set: 2.29579501285553
Accuracy on hold-out set: 0.15815
MulticlassAccuracy value on hold-out data: 0.15815000236034393
Epoch: 7

Loss on hold-out set: 2.288461884880066
Accuracy on hold-out set: 0.1582
MulticlassAccuracy value on hold-out data: 0.1581999957561493
Epoch: 8

Loss on hold-out set: 2.2800594570159913
Accuracy on hold-out set: 0.15785
MulticlassAccuracy value on hold-out data: 0.1578499972820282
Epoch: 9

Loss on hold-out set: 2.27084238986969
Accuracy on hold-out set: 0.1574
MulticlassAccuracy value on hold-out data: 0.1573999971151352
Epoch: 10

Loss on hold-out set: 2.2615368682861328
Accuracy on hold-out set: 0.1579
MulticlassAccuracy value on hold-out data: 0.15790000557899475
Epoch: 11

Loss on hold-out set: 2.252559261894226
Accuracy on hold-out set: 0.15785
MulticlassAccuracy value on hold-out data: 0.1578499972820282
Epoch: 12

Loss on hold-out set: 2.2441740781784056
Accuracy on hold-out set: 0.1583
MulticlassAccuracy value on hold-out data: 0.1582999974489212
Epoch: 13
```

```
Loss on hold-out set: 2.2365339831352236
Accuracy on hold-out set: 0.15835
MulticlassAccuracy value on hold-out data: 0.15835000574588776
Epoch: 14

Loss on hold-out set: 2.229588907623291
Accuracy on hold-out set: 0.15865
MulticlassAccuracy value on hold-out data: 0.1586499959230423
Epoch: 15

Loss on hold-out set: 2.2233457695007326
Accuracy on hold-out set: 0.1591
MulticlassAccuracy value on hold-out data: 0.1590999960899353
Epoch: 16

Loss on hold-out set: 2.217693319129944
Accuracy on hold-out set: 0.15925
MulticlassAccuracy value on hold-out data: 0.15925000607967377
Returned to Spot: Validation loss: 2.217693319129944
----------------------------------------------

config: {'l1': 16, 'l2': 16, 'lr_mult': 0.001, 'batch_size': 8, 'epochs': 8, 'k_folds': 2, 'p
Epoch: 1

Loss on hold-out set: 2.3138103380203248
Accuracy on hold-out set: 0.1006
MulticlassAccuracy value on hold-out data: 0.1005999967455864
Epoch: 2

Loss on hold-out set: 2.3128016092300414
Accuracy on hold-out set: 0.1006
MulticlassAccuracy value on hold-out data: 0.1005999967455864
Epoch: 3

Loss on hold-out set: 2.3119753291130065
Accuracy on hold-out set: 0.1006
MulticlassAccuracy value on hold-out data: 0.1005999967455864
Epoch: 4
```

```
Loss on hold-out set: 2.3111275873184205
Accuracy on hold-out set: 0.1006
MulticlassAccuracy value on hold-out data: 0.1005999967455864
Epoch: 5

Loss on hold-out set: 2.3101607865333555
Accuracy on hold-out set: 0.1004
MulticlassAccuracy value on hold-out data: 0.10040000081062317
Epoch: 6

Loss on hold-out set: 2.3090443461418153
Accuracy on hold-out set: 0.10025
MulticlassAccuracy value on hold-out data: 0.1002499982714653
Epoch: 7

Loss on hold-out set: 2.307703311729431
Accuracy on hold-out set: 0.1008
MulticlassAccuracy value on hold-out data: 0.10080000013113022
Epoch: 8

Loss on hold-out set: 2.306101568508148
Accuracy on hold-out set: 0.1025
MulticlassAccuracy value on hold-out data: 0.10249999910593033
Returned to Spot: Validation loss: 2.306101568508148
----------------------------------------------

config: {'l1': 256, 'l2': 128, 'lr_mult': 0.001, 'batch_size': 2, 'epochs': 16, 'k_folds': 2
Epoch: 1

Loss on hold-out set: 2.2931140292406083
Accuracy on hold-out set: 0.1008
MulticlassAccuracy value on hold-out data: 0.10080000013113022
Epoch: 2

Loss on hold-out set: 2.2609577483654024
Accuracy on hold-out set: 0.1966
MulticlassAccuracy value on hold-out data: 0.19660000503063202
Epoch: 3
```

```
Loss on hold-out set: 2.1913439580082894
Accuracy on hold-out set: 0.2598
MulticlassAccuracy value on hold-out data: 0.259799987077713
Epoch: 4

Loss on hold-out set: 2.1133679329276083
Accuracy on hold-out set: 0.2721
MulticlassAccuracy value on hold-out data: 0.2721000015735626
Epoch: 5

Loss on hold-out set: 2.062714744991064
Accuracy on hold-out set: 0.27995
MulticlassAccuracy value on hold-out data: 0.27994999289512634
Epoch: 6

Loss on hold-out set: 2.0314288683474064
Accuracy on hold-out set: 0.28455
MulticlassAccuracy value on hold-out data: 0.2845500111579895
Epoch: 7

Loss on hold-out set: 2.0079026170372964
Accuracy on hold-out set: 0.29195
MulticlassAccuracy value on hold-out data: 0.291949987411499
Epoch: 8

Loss on hold-out set: 1.9876994745016099
Accuracy on hold-out set: 0.29665
MulticlassAccuracy value on hold-out data: 0.2966499924659729
Epoch: 9

Loss on hold-out set: 1.9685534031689167
Accuracy on hold-out set: 0.30375
MulticlassAccuracy value on hold-out data: 0.30375000834465027
Epoch: 10

Loss on hold-out set: 1.9532686003506183
Accuracy on hold-out set: 0.30695
MulticlassAccuracy value on hold-out data: 0.30695000290870667
Epoch: 11
```

```
Loss on hold-out set: 1.9396405784279107
Accuracy on hold-out set: 0.30915
MulticlassAccuracy value on hold-out data: 0.30915001034736633
Epoch: 12

Loss on hold-out set: 1.9287325567096472
Accuracy on hold-out set: 0.30795
MulticlassAccuracy value on hold-out data: 0.3079499900341034
Epoch: 13

Loss on hold-out set: 1.9183972269296645
Accuracy on hold-out set: 0.3144
MulticlassAccuracy value on hold-out data: 0.31439998745918274
Epoch: 14

Loss on hold-out set: 1.9098429028600454
Accuracy on hold-out set: 0.3189
MulticlassAccuracy value on hold-out data: 0.3188999891281128
Epoch: 15

Loss on hold-out set: 1.902248467323184
Accuracy on hold-out set: 0.32295
MulticlassAccuracy value on hold-out data: 0.32295000553131104
Epoch: 16

Loss on hold-out set: 1.8923391370773315
Accuracy on hold-out set: 0.32245
MulticlassAccuracy value on hold-out data: 0.32245001196861267
Returned to Spot: Validation loss: 1.8923391370773315
----------------------------------------------

config: {'l1': 8, 'l2': 32, 'lr_mult': 0.001, 'batch_size': 4, 'epochs': 8, 'k_folds': 2, 'pa
Epoch: 1

Loss on hold-out set: 2.3052296461105346
Accuracy on hold-out set: 0.1122
MulticlassAccuracy value on hold-out data: 0.11219999939203262
Epoch: 2
```

```
Loss on hold-out set: 2.3038574504852294
Accuracy on hold-out set: 0.1251
MulticlassAccuracy value on hold-out data: 0.1251000016927719
Epoch: 3

Loss on hold-out set: 2.3021771721839905
Accuracy on hold-out set: 0.1359
MulticlassAccuracy value on hold-out data: 0.13590000569820404
Epoch: 4

Loss on hold-out set: 2.300217103433609
Accuracy on hold-out set: 0.13875
MulticlassAccuracy value on hold-out data: 0.13875000178813934
Epoch: 5

Loss on hold-out set: 2.2978805005550385
Accuracy on hold-out set: 0.1374
MulticlassAccuracy value on hold-out data: 0.13740000128746033
Epoch: 6

Loss on hold-out set: 2.2950921066761016
Accuracy on hold-out set: 0.13465
MulticlassAccuracy value on hold-out data: 0.13465000689029694
Epoch: 7

Loss on hold-out set: 2.2921087727069853
Accuracy on hold-out set: 0.1333
MulticlassAccuracy value on hold-out data: 0.13330000638961792
Epoch: 8

Loss on hold-out set: 2.2891136432170867
Accuracy on hold-out set: 0.132
MulticlassAccuracy value on hold-out data: 0.13199999928474426
Returned to Spot: Validation loss: 2.2891136432170867
----------------------------------------------

config: {'l1': 64, 'l2': 512, 'lr_mult': 0.001, 'batch_size': 8, 'epochs': 16, 'k_folds': 2,
Epoch: 1
```

```
Loss on hold-out set: 2.299746237850189
Accuracy on hold-out set: 0.1015
MulticlassAccuracy value on hold-out data: 0.1014999970793724
Epoch: 2

Loss on hold-out set: 2.2946672048568724
Accuracy on hold-out set: 0.1142
MulticlassAccuracy value on hold-out data: 0.11420000344514847
Epoch: 3

Loss on hold-out set: 2.2858099168777466
Accuracy on hold-out set: 0.1629
MulticlassAccuracy value on hold-out data: 0.16290000081062317
Epoch: 4

Loss on hold-out set: 2.2712359963417055
Accuracy on hold-out set: 0.1786
MulticlassAccuracy value on hold-out data: 0.1785999983549118
Epoch: 5

Loss on hold-out set: 2.250950101470947
Accuracy on hold-out set: 0.1857
MulticlassAccuracy value on hold-out data: 0.18569999933242798
Epoch: 6

Loss on hold-out set: 2.227020383834839
Accuracy on hold-out set: 0.20655
MulticlassAccuracy value on hold-out data: 0.2065500020980835
Epoch: 7

Loss on hold-out set: 2.2009120007038114
Accuracy on hold-out set: 0.2231
MulticlassAccuracy value on hold-out data: 0.22310000658035278
Epoch: 8

Loss on hold-out set: 2.1746423760890963
Accuracy on hold-out set: 0.23495
MulticlassAccuracy value on hold-out data: 0.2349500060081482
Epoch: 9
```

```
Loss on hold-out set: 2.1500688398361207
Accuracy on hold-out set: 0.2402
MulticlassAccuracy value on hold-out data: 0.2401999980211258
Epoch: 10

Loss on hold-out set: 2.12807179646492
Accuracy on hold-out set: 0.2459
MulticlassAccuracy value on hold-out data: 0.2459000051021576
Epoch: 11

Loss on hold-out set: 2.1089157061576844
Accuracy on hold-out set: 0.2514
MulticlassAccuracy value on hold-out data: 0.2513999938964844
Epoch: 12

Loss on hold-out set: 2.0928015681266783
Accuracy on hold-out set: 0.25405
MulticlassAccuracy value on hold-out data: 0.25404998660087585
Epoch: 13

Loss on hold-out set: 2.0789760998725892
Accuracy on hold-out set: 0.25805
MulticlassAccuracy value on hold-out data: 0.25804999470710754
Epoch: 14

Loss on hold-out set: 2.0668699798583985
Accuracy on hold-out set: 0.262
MulticlassAccuracy value on hold-out data: 0.2619999945163727
Epoch: 15

Loss on hold-out set: 2.0560354369640352
Accuracy on hold-out set: 0.2642
MulticlassAccuracy value on hold-out data: 0.26420000195503235
Epoch: 16

Loss on hold-out set: 2.0461572261810304
Accuracy on hold-out set: 0.26955
MulticlassAccuracy value on hold-out data: 0.26954999566078186
Returned to Spot: Validation loss: 2.0461572261810304
----------------------------------------------
```

```
config: {'l1': 256, 'l2': 128, 'lr_mult': 0.001, 'batch_size': 2, 'epochs': 16, 'k_folds': 2
Epoch: 1

Loss on hold-out set: 2.2936227679491044
Accuracy on hold-out set: 0.1096
MulticlassAccuracy value on hold-out data: 0.1096000000834465
Epoch: 2

Loss on hold-out set: 2.2670296456456183
Accuracy on hold-out set: 0.1429
MulticlassAccuracy value on hold-out data: 0.1429000049829483
Epoch: 3

Loss on hold-out set: 2.223995243871212
Accuracy on hold-out set: 0.19125
MulticlassAccuracy value on hold-out data: 0.1912499964237213
Epoch: 4

Loss on hold-out set: 2.1768747332274914
Accuracy on hold-out set: 0.21825
MulticlassAccuracy value on hold-out data: 0.21825000643730164
Epoch: 5

Loss on hold-out set: 2.134742063009739
Accuracy on hold-out set: 0.237
MulticlassAccuracy value on hold-out data: 0.2370000034570694
Epoch: 6

Loss on hold-out set: 2.1049069699704646
Accuracy on hold-out set: 0.2414
MulticlassAccuracy value on hold-out data: 0.24140000343322754
Epoch: 7

Loss on hold-out set: 2.08544938916564
Accuracy on hold-out set: 0.2477
MulticlassAccuracy value on hold-out data: 0.24770000576972961
Epoch: 8
```

```
Loss on hold-out set: 2.066927281630039
Accuracy on hold-out set: 0.25175
MulticlassAccuracy value on hold-out data: 0.25174999237060547
Epoch: 9

Loss on hold-out set: 2.050719117000699
Accuracy on hold-out set: 0.25965
MulticlassAccuracy value on hold-out data: 0.25964999198913574
Epoch: 10

Loss on hold-out set: 2.03333440900445
Accuracy on hold-out set: 0.26475
MulticlassAccuracy value on hold-out data: 0.26475000381469727
Epoch: 11

Loss on hold-out set: 2.0154796909064054
Accuracy on hold-out set: 0.27135
MulticlassAccuracy value on hold-out data: 0.2713499963283539
Epoch: 12

Loss on hold-out set: 2.0008957836091517
Accuracy on hold-out set: 0.2791
MulticlassAccuracy value on hold-out data: 0.2791000008583069
Epoch: 13

Loss on hold-out set: 1.9867230229705573
Accuracy on hold-out set: 0.2829
MulticlassAccuracy value on hold-out data: 0.28290000557899475
Epoch: 14

Loss on hold-out set: 1.9686687308371067
Accuracy on hold-out set: 0.2885
MulticlassAccuracy value on hold-out data: 0.28850001096725464
Epoch: 15

Loss on hold-out set: 1.9546256691664456
Accuracy on hold-out set: 0.29385
MulticlassAccuracy value on hold-out data: 0.29385000467300415
Epoch: 16
```

```
Loss on hold-out set: 1.9417092046380042
Accuracy on hold-out set: 0.29915
MulticlassAccuracy value on hold-out data: 0.2991499900817871
Returned to Spot: Validation loss: 1.9417092046380042
----------------------------------------------
spotPython tuning: 1.8923391370773315 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x29ff6fb20>
```

19 Tensorboard

The textual output shown in the console (or code cell) can be visualized with Tensorboard as described in Section 20.13.

19.0.1 Results

After the hyperparameter tuning run is finished, the results can be analyzed as described in Section 20.14.

```
SAVE = False
LOAD = False

if SAVE:
    result_file_name = "res_" + experiment_name + ".pkl"
    with open(result_file_name, 'wb') as f:
        pickle.dump(spot_tuner, f)

if LOAD:
    result_file_name = "ADD THE NAME here, e.g.: res_ch10-friedman-hpt-0_maans03_60min_20i
    with open(result_file_name, 'rb') as f:
        spot_tuner =  pickle.load(f)
```

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

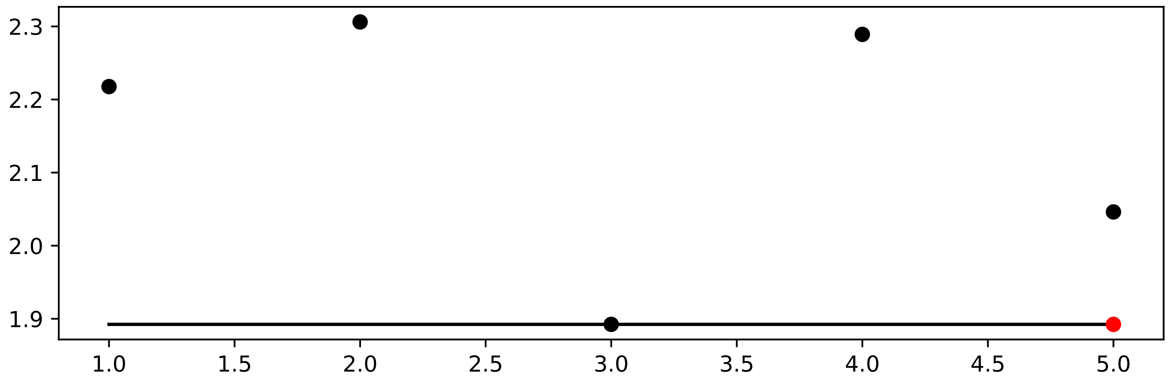


Figure 19.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

- Print the results

```
print(gen_design_table(fun_control=fun_control,
    spot=spot_tuner))
```

```
| name         | type   | default   |   lower |   upper |   tuned | transform              |
|--------------|--------|-----------|---------|---------|---------|------------------------|--
| l1           | int    | 5         |     2.0 |     9.0 |     8.0 | transform_power_2_int  |
| l2           | int    | 5         |     2.0 |     9.0 |     7.0 | transform_power_2_int  |
| lr_mult      | float  | 1.0       |   0.001 |   0.001 |   0.001 | None                   |
| batch_size   | int    | 4         |     1.0 |     4.0 |     1.0 | transform_power_2_int  |
| epochs       | int    | 3         |     3.0 |     4.0 |     4.0 | transform_power_2_int  |
| k_folds      | int    | 1         |     2.0 |     2.0 |     2.0 | None                   |
| patience     | int    | 5         |     2.0 |    10.0 |     9.0 | None                   |
| optimizer    | factor | SGD       |     0.0 |     0.0 |     0.0 | None                   |
| sgd_momentum | float  | 0.0       |     0.9 |     0.9 |     0.9 | None                   |
```

19.1 Show variable importance

```
spot_tuner.plot_importance(threshold=0.025, filename="./figures/" + experiment_name+"_impo
```

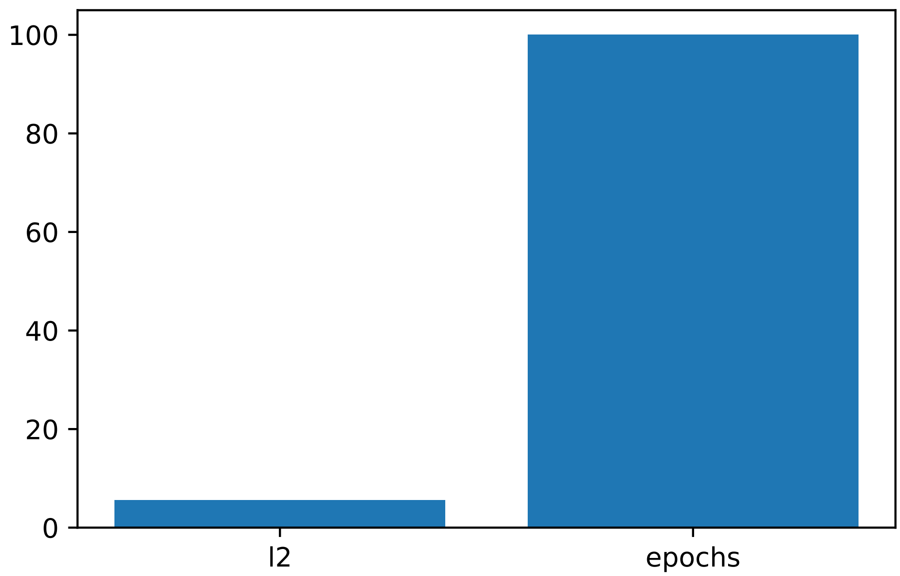


Figure 19.2: Variable importance plot, threshold 0.025.

19.2 Get the Tuned Architecture (SPOT Results)

The architecture of the `spotPython` model can be obtained by the following code:

```
from spotPython.hyperparameters.values import get_one_core_model_from_X
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
model_spot = get_one_core_model_from_X(X, fun_control)
model_spot
```

```
Net_CIFAR10(
  (conv1): Conv2d(3, 6, kernel_size=(5, 5), stride=(1, 1))
  (pool): MaxPool2d(kernel_size=2, stride=2, padding=0, dilation=1, ceil_mode=False)
  (conv2): Conv2d(6, 16, kernel_size=(5, 5), stride=(1, 1))
  (fc1): Linear(in_features=400, out_features=256, bias=True)
  (fc2): Linear(in_features=256, out_features=128, bias=True)
  (fc3): Linear(in_features=128, out_features=10, bias=True)
)
```

19.3 Evaluation of the Tuned Architecture

```python
from spotPython.torch.traintest import (
    train_tuned,
    test_tuned,
    )
```

```python
train_tuned(net=model_spot, train_dataset=train,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
        shuffle=True,
        device = fun_control["device"],
        path=None,
        task=fun_control["task"],)
```

```
Epoch: 1

Batch: 10000. Batch Size: 2. Training Loss (running): 2.302

Loss on hold-out set: 2.295153019142151
Accuracy on hold-out set: 0.1992
MulticlassAccuracy value on hold-out data: 0.19920000433921814
Epoch: 2

Batch: 10000. Batch Size: 2. Training Loss (running): 2.290

Loss on hold-out set: 2.2710027129650117
Accuracy on hold-out set: 0.1953
MulticlassAccuracy value on hold-out data: 0.19529999792575836
Epoch: 3

Batch: 10000. Batch Size: 2. Training Loss (running): 2.255

Loss on hold-out set: 2.2121713756918906
Accuracy on hold-out set: 0.23795
MulticlassAccuracy value on hold-out data: 0.23794999718666077
Epoch: 4

Batch: 10000. Batch Size: 2. Training Loss (running): 2.186
```

```
Loss on hold-out set: 2.125461353337765
Accuracy on hold-out set: 0.2674
MulticlassAccuracy value on hold-out data: 0.26739999651908875
Epoch: 5

Batch: 10000. Batch Size: 2. Training Loss (running): 2.100

Loss on hold-out set: 2.051206931257248
Accuracy on hold-out set: 0.2827
MulticlassAccuracy value on hold-out data: 0.2827000021934509
Epoch: 6

Batch: 10000. Batch Size: 2. Training Loss (running): 2.032

Loss on hold-out set: 2.004692860221863
Accuracy on hold-out set: 0.2924
MulticlassAccuracy value on hold-out data: 0.2924000024795532
Epoch: 7

Batch: 10000. Batch Size: 2. Training Loss (running): 1.992

Loss on hold-out set: 1.9764651341736317
Accuracy on hold-out set: 0.30095
MulticlassAccuracy value on hold-out data: 0.30094999074935913
Epoch: 8

Batch: 10000. Batch Size: 2. Training Loss (running): 1.967

Loss on hold-out set: 1.9570645307600498
Accuracy on hold-out set: 0.30235
MulticlassAccuracy value on hold-out data: 0.3023500144481659
Epoch: 9

Batch: 10000. Batch Size: 2. Training Loss (running): 1.948

Loss on hold-out set: 1.94262140648067
Accuracy on hold-out set: 0.30665
MulticlassAccuracy value on hold-out data: 0.3066500127315521
Epoch: 10
```

```
Batch: 10000. Batch Size: 2. Training Loss (running): 1.936

Loss on hold-out set: 1.9306143396258355
Accuracy on hold-out set: 0.3105
MulticlassAccuracy value on hold-out data: 0.31049999594688416
Epoch: 11

Batch: 10000. Batch Size: 2. Training Loss (running): 1.928

Loss on hold-out set: 1.9203673015236855
Accuracy on hold-out set: 0.31525
MulticlassAccuracy value on hold-out data: 0.3152500092983246
Epoch: 12

Batch: 10000. Batch Size: 2. Training Loss (running): 1.913

Loss on hold-out set: 1.9120105114340782
Accuracy on hold-out set: 0.32005
MulticlassAccuracy value on hold-out data: 0.3200500011444092
Epoch: 13

Batch: 10000. Batch Size: 2. Training Loss (running): 1.904

Loss on hold-out set: 1.9032605736404657
Accuracy on hold-out set: 0.3219
MulticlassAccuracy value on hold-out data: 0.32190001010894775
Epoch: 14

Batch: 10000. Batch Size: 2. Training Loss (running): 1.893

Loss on hold-out set: 1.8963209746956826
Accuracy on hold-out set: 0.3237
MulticlassAccuracy value on hold-out data: 0.3237000107765198
Epoch: 15

Batch: 10000. Batch Size: 2. Training Loss (running): 1.883
```

```
Loss on hold-out set: 1.8890241547077895
Accuracy on hold-out set: 0.3278
MulticlassAccuracy value on hold-out data: 0.3278000056743622
Epoch: 16

Batch: 10000. Batch Size: 2. Training Loss (running): 1.883

Loss on hold-out set: 1.8822800955355168
Accuracy on hold-out set: 0.32885
MulticlassAccuracy value on hold-out data: 0.32885000109672546
Returned to Spot: Validation loss: 1.8822800955355168
----------------------------------------------
```

If path is set to a filename, e.g., `path = "model_spot_trained.pt"`, the weights of the trained model will be loaded from this file.

```
test_tuned(net=model_spot, test_dataset=test,
            shuffle=False,
            loss_function=fun_control["loss_function"],
            metric=fun_control["metric_torch"],
            device = fun_control["device"],
            task=fun_control["task"],)
```

```
Loss on hold-out set: 1.8689832447826862
Accuracy on hold-out set: 0.3344
MulticlassAccuracy value on hold-out data: 0.3343999981880188
Final evaluation: Validation loss: 1.8689832447826862
Final evaluation: Validation metric: 0.3343999981880188
----------------------------------------------
```

```
(1.8689832447826862, nan, tensor(0.3344, device='mps:0'))
```

19.4 Cross-validated Evaluations

```
from spotPython.torch.traintest import evaluate_cv
# modify k-kolds:
setattr(model_spot, "k_folds",  10)
df_eval, df_preds, df_metrics = evaluate_cv(net=model_spot,
            dataset=fun_control["data"],
```

```
                loss_function=fun_control["loss_function"],
                metric=fun_control["metric_torch"],
                task=fun_control["task"],
                writer=fun_control["writer"],
                writerId="model_spot_cv",
                device = fun_control["device"])
```

```
Error in Net_Core. Call to evaluate_cv() failed. err=TypeError("Expected sequence or array-li
```

```
metric_name = type(fun_control["metric_torch"]).__name__
print(f"loss: {df_eval}, Cross-validated {metric_name}: {df_metrics}")
```

```
loss: nan, Cross-validated MulticlassAccuracy: nan
```

19.5 Detailed Hyperparameter Plots

```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

```
l2:  5.596340001145153
epochs:  100.0
```

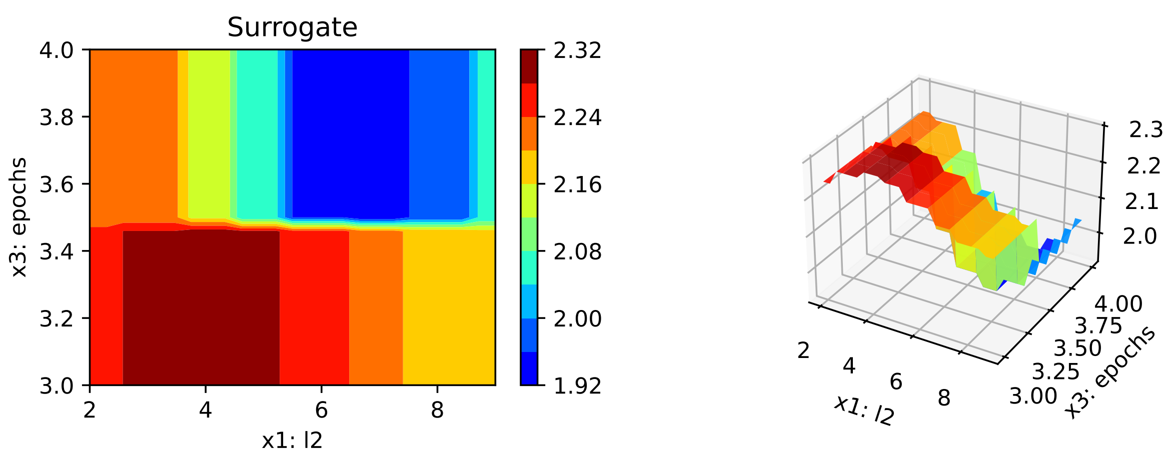


Figure 19.3: Contour plots.

19.6 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

Parallel coordinates plots

```
Unable to display output for mime type(s): text/html
```

19.7 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

20 Hyperparameter Tuning for PyTorch With `spotPython`

In this tutorial, we will show how `spotPython` can be integrated into the `PyTorch` training workflow. It is based on the tutorial "Hyperparameter Tuning with Ray Tune" from the `PyTorch` documentation (PyTorch 2023a), which is an extension of the tutorial "Training a Classifier" (PyTorch 2023b) for training a CIFAR10 image classifier.

This document refers to the following software versions:

- `python`: 3.10.10
- `torch`: 2.0.1
- `torchvision`: 0.15.0

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                    0.2.31

spotRiver                     0.0.93

Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip[1].

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

[1]Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

Results that refer to the `Ray Tune` package are taken from https://PyTorch.org/tutorials/beginner/hyperparameter_tuning_tutorial.html[2].

20.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time, initial design size and the device that is used.

```
MAX_TIME = 30
INIT_SIZE = 10
DEVICE = "cpu" # "cuda:0"
```

```
from spotPython.utils.device import getDevice
DEVICE = getDevice(DEVICE)
print(DEVICE)
```

```
cpu
```

```
import os
import copy
import socket
import warnings
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '14-torch' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_SI
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
warnings.filterwarnings("ignore")
```

```
14-torch_p040025_30min_10init_2023-06-16_14-15-54
```

[2]We were not able to install `Ray Tune` on our system. Therefore, we used the results from the `PyTorch` tutorial.

20.2 Initialization of the fun_control Dictionary

spotPython uses a Python dictionary for storing the information required for the hyperparameter tuning process. This dictionary is called fun_control and is initialized with the function fun_control_init. The function fun_control_init returns a skeleton dictionary. The dictionary is filled with the required information for the hyperparameter tuning process. It stores the hyperparameter tuning settings, e.g., the deep learning network architecture that should be tuned, the classification (or regression) problem, and the data that is used for the tuning. The dictionary is used as an input for the SPOT function.

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/14_spot_ray_hpt_torch_cifar10",
    device=DEVICE,)
```

20.3 PyTorch Data Loading

The data loading process is implemented in the same manner as described in the Section "Data loaders" in PyTorch (2023a). The data loaders are wrapped into the function load_data_cifar10 which is identical to the function load_data in PyTorch (2023a). A global data directory is used, which allows sharing the data directory between different trials. The method load_data_cifar10 is part of the spotPython package and can be imported from spotPython.data.torchdata.

In the following step, the test and train data are added to the dictionary fun_control.

```
from spotPython.data.torchdata import load_data_cifar10
train, test = load_data_cifar10()
n_samples = len(train)
# add the dataset to the fun_control
fun_control.update({
    "train": train,
    "test": test,
    "n_samples": n_samples})
```

```
Files already downloaded and verified
```

```
Files already downloaded and verified
```

20.4 The Model (Algorithm) to be Tuned

20.4.1 Specification of the Preprocessing Model

After the training and test data are specified and added to the `fun_control` dictionary, `spotPython` allows the specification of a data preprocessing pipeline, e.g., for the scaling of the data or for the one-hot encoding of categorical variables. The preprocessing model is called `prep_model` ("preparation" or pre-processing) and includes steps that are not subject to the hyperparameter tuning process. The preprocessing model is specified in the `fun_control` dictionary. The preprocessing model can be implemented as a `sklearn` pipeline. The following code shows a typical preprocessing pipeline:

```
categorical_columns = ["cities", "colors"]
one_hot_encoder = OneHotEncoder(handle_unknown="ignore",
                                    sparse_output=False)
prep_model = ColumnTransformer(
        transformers=[
             ("categorical", one_hot_encoder, categorical_columns),
         ],
         remainder=StandardScaler(),
     )
```

Because the Ray Tune (`ray[tune]`) hyperparameter tuning as described in PyTorch (2023a) does not use a preprocessing model, the preprocessing model is set to `None` here.

```
prep_model = None
fun_control.update({"prep_model": prep_model})
```

20.4.2 Select `algorithm` and `core_model_hyper_dict`

The same neural network model as implemented in the section "Configurable neural network" of the `PyTorch` tutorial (PyTorch 2023a) is used here. We will show the implementation from PyTorch (2023a) in Section 20.4.2.1 first, before the extended implementation with `spotPython` is shown in **?@sec-implementation-with-spotpython**.

20.4.2.1 Implementing a Configurable Neural Network With Ray Tune

We used the same hyperparameters that are implemented as configurable in the `PyTorch` tutorial. We specify the layer sizes, namely `l1` and `l2`, of the fully connected layers:

```
class Net(nn.Module):
    def __init__(self, l1=120, l2=84):
        super(Net, self).__init__()
        self.conv1 = nn.Conv2d(3, 6, 5)
        self.pool = nn.MaxPool2d(2, 2)
        self.conv2 = nn.Conv2d(6, 16, 5)
        self.fc1 = nn.Linear(16 * 5 * 5, l1)
        self.fc2 = nn.Linear(l1, l2)
        self.fc3 = nn.Linear(l2, 10)

    def forward(self, x):
        x = self.pool(F.relu(self.conv1(x)))
        x = self.pool(F.relu(self.conv2(x)))
        x = x.view(-1, 16 * 5 * 5)
        x = F.relu(self.fc1(x))
        x = F.relu(self.fc2(x))
        x = self.fc3(x)
        return x
```

The learning rate, i.e., `lr`, of the optimizer is made configurable, too:

```
optimizer = optim.SGD(net.parameters(), lr=config["lr"], momentum=0.9)
```

20.4.2.2 Implementing a Configurable Neural Network With spotPython

`spotPython` implements a class which is similar to the class described in the `PyTorch` tutorial. The class is called `Net_CIFAR10` and is implemented in the file `netcifar10.py`.

```
from torch import nn
import torch.nn.functional as F
import spotPython.torch.netcore as netcore


class Net_CIFAR10(netcore.Net_Core):
    def __init__(self, l1, l2, lr_mult, batch_size, epochs, k_folds, patience,
    optimizer, sgd_momentum):
        super(Net_CIFAR10, self).__init__(
            lr_mult=lr_mult,
            batch_size=batch_size,
            epochs=epochs,
            k_folds=k_folds,
```

```
            patience=patience,
            optimizer=optimizer,
            sgd_momentum=sgd_momentum,
        )
        self.conv1 = nn.Conv2d(3, 6, 5)
        self.pool = nn.MaxPool2d(2, 2)
        self.conv2 = nn.Conv2d(6, 16, 5)
        self.fc1 = nn.Linear(16 * 5 * 5, l1)
        self.fc2 = nn.Linear(l1, l2)
        self.fc3 = nn.Linear(l2, 10)

    def forward(self, x):
        x = self.pool(F.relu(self.conv1(x)))
        x = self.pool(F.relu(self.conv2(x)))
        x = x.view(-1, 16 * 5 * 5)
        x = F.relu(self.fc1(x))
        x = F.relu(self.fc2(x))
        x = self.fc3(x)
        return x
```

20.4.3 The `Net_Core` class

`Net_CIFAR10` inherits from the class `Net_Core` which is implemented in the file `netcore.py`. It implements the additional attributes that are common to all neural network models. The `Net_Core` class is implemented in the file `netcore.py`. It implements hyperparameters as attributes, that are not used by the `core_model`, e.g.:

- optimizer (`optimizer`),
- learning rate (`lr`),
- batch size (`batch_size`),
- epochs (`epochs`),
- k_folds (`k_folds`), and
- early stopping criterion "patience" (`patience`).

Users can add further attributes to the class. The class `Net_Core` is shown below.

```
from torch import nn


class Net_Core(nn.Module):
    def __init__(self, lr_mult, batch_size, epochs, k_folds, patience,
```

```
        optimizer, sgd_momentum):
        super(Net_Core, self).__init__()
        self.lr_mult = lr_mult
        self.batch_size = batch_size
        self.epochs = epochs
        self.k_folds = k_folds
        self.patience = patience
        self.optimizer = optimizer
        self.sgd_momentum = sgd_momentum
```

20.4.4 Comparison of the Approach Described in the PyTorch Tutorial With spotPython

Comparing the class `Net` from the `PyTorch` tutorial and the class `Net_CIFAR10` from `spotPython`, we see that the class `Net_CIFAR10` has additional attributes and does not inherit from `nn` directly. It adds an additional class, `Net_core`, that takes care of additional attributes that are common to all neural network models, e.g., the learning rate multiplier `lr_mult` or the batch size `batch_size`.

`spotPython`'s `core_model` implements an instance of the `Net_CIFAR10` class. In addition to the basic neural network model, the `core_model` can use these additional attributes. `spotPython` provides methods for handling these additional attributes to guarantee 100% compatibility with the `PyTorch` classes. The method `add_core_model_to_fun_control` adds the hyperparameters and additional attributes to the `fun_control` dictionary. The method is shown below.

```
from spotPython.torch.netcifar10 import Net_CIFAR10
from spotPython.data.torch_hyper_dict import TorchHyperDict
from spotPython.hyperparameters.values import add_core_model_to_fun_control
core_model = Net_CIFAR10
fun_control = add_core_model_to_fun_control(core_model=core_model,
                              fun_control=fun_control,
                              hyper_dict=TorchHyperDict,
                              filename=None)
```

20.5 The Search Space: Hyperparameters

In Section 20.5.1, we first describe how to configure the search space with `ray[tune]` (as shown in PyTorch (2023a)) and then how to configure the search space with `spotPython` in **?@sec-configuring-the-search-space-with-spotpython**.

20.5.1 Configuring the Search Space With Ray Tune

Ray Tune's search space can be configured as follows (PyTorch 2023a):

```
config = {
    "l1": tune.sample_from(lambda _: 2**np.random.randint(2, 9)),
    "l2": tune.sample_from(lambda _: 2**np.random.randint(2, 9)),
    "lr": tune.loguniform(1e-4, 1e-1),
    "batch_size": tune.choice([2, 4, 8, 16])
}
```

The `tune.sample_from()` function enables the user to define sample methods to obtain hyperparameters. In this example, the `l1` and `l2` parameters should be powers of 2 between 4 and 256, so either 4, 8, 16, 32, 64, 128, or 256. The `lr` (learning rate) should be uniformly sampled between 0.0001 and 0.1. Lastly, the batch size is a choice between 2, 4, 8, and 16.

At each trial, `ray[tune]` will randomly sample a combination of parameters from these search spaces. It will then train a number of models in parallel and find the best performing one among these. `ray[tune]` uses the `ASHAScheduler` which will terminate bad performing trials early.

20.5.2 Configuring the Search Space With spotPython

20.5.2.1 The `hyper_dict` Hyperparameters for the Selected Algorithm

`spotPython` uses `JSON` files for the specification of the hyperparameters. Users can specify their individual `JSON` files, or they can use the `JSON` files provided by `spotPython`. The `JSON` file for the `core_model` is called `torch_hyper_dict.json`.

In contrast to `ray[tune]`, `spotPython` can handle numerical, boolean, and categorical hyperparameters. They can be specified in the `JSON` file in a similar way as the numerical hyperparameters as shown below. Each entry in the `JSON` file represents one hyperparameter with the following structure: `type`, `default`, `transform`, `lower`, and `upper`.

```
"factor_hyperparameter": {
    "levels": ["A", "B", "C"],
    "type": "factor",
    "default": "B",
    "transform": "None",
    "core_model_parameter_type": "str",
    "lower": 0,
    "upper": 2},
```

The corresponding entries for the `Net_CIFAR10` class are shown below.

```
{"Net_CIFAR10":
    {
        "l1": {
            "type": "int",
            "default": 5,
            "transform": "transform_power_2_int",
            "lower": 2,
            "upper": 9},
        "l2": {
            "type": "int",
            "default": 5,
            "transform": "transform_power_2_int",
            "lower": 2,
            "upper": 9},
        "lr_mult": {
            "type": "float",
            "default": 1.0,
            "transform": "None",
            "lower": 0.1,
            "upper": 10},
        "batch_size": {
            "type": "int",
            "default": 4,
            "transform": "transform_power_2_int",
            "lower": 1,
            "upper": 4},
        "epochs": {
            "type": "int",
            "default": 3,
            "transform": "transform_power_2_int",
            "lower": 1,
            "upper": 4},
        "k_folds": {
            "type": "int",
            "default": 2,
            "transform": "None",
            "lower": 2,
            "upper": 3},
        "patience": {
            "type": "int",
```

```
            "default": 5,
            "transform": "None",
            "lower": 2,
            "upper": 10},
        "optimizer": {
            "levels": ["Adadelta",
                       "Adagrad",
                       "Adam",
                       "AdamW",
                       "SparseAdam",
                       "Adamax",
                       "ASGD",
                       "LBFGS",
                       "NAdam",
                       "RAdam",
                       "RMSprop",
                       "Rprop",
                       "SGD"],
            "type": "factor",
            "default": "SGD",
            "transform": "None",
            "class_name": "torch.optim",
            "core_model_parameter_type": "str",
            "lower": 0,
            "upper": 12},
        "sgd_momentum": {
            "type": "float",
            "default": 0.0,
            "transform": "None",
            "lower": 0.0,
            "upper": 1.0}
    }
}
```

20.5.3 Modifying the Hyperparameters

Ray tune (PyTorch 2023a) does not provide a way to change the specified hyperparameters without re-compilation. However, `spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions are described in the following.

20.5.3.1 Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

After specifying the model, the corresponding hyperparameters, their types and bounds are loaded from the JSON file `torch_hyper_dict.json`. After loading, the user can modify the hyperparameters, e.g., the bounds. `spotPython` provides a simple rule for de-activating hyperparameters: If the lower and the upper bound are set to identical values, the hyperparameter is de-activated. This is useful for the hyperparameter tuning, because it allows to specify a hyperparameter in the JSON file, but to de-activate it in the `fun_control` dictionary. This is done in the next step.

20.5.3.2 Modify Hyperparameters of Type numeric and integer (boolean)

Since the hyperparameter `k_folds` is not used in the `PyTorch` tutorial, it is de-activated here by setting the lower and upper bound to the same value. Note, `k_folds` is of type "integer".

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
fun_control = modify_hyper_parameter_bounds(fun_control,
    "batch_size", bounds=[1, 5])
fun_control = modify_hyper_parameter_bounds(fun_control,
    "k_folds", bounds=[0, 0])
fun_control = modify_hyper_parameter_bounds(fun_control,
    "patience", bounds=[3, 3])
```

20.5.3.3 Modify Hyperparameter of Type factor

In a similar manner as for the numerical hyperparameters, the categorical hyperparameters can be modified. New configurations can be chosen by adding or deleting levels. For example, the hyperparameter `optimizer` can be re-configured as follows:

In the following setting, two optimizers (`"SGD"` and `"Adam"`) will be compared during the `spotPython` hyperparameter tuning. The hyperparameter `optimizer` is active.

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
fun_control = modify_hyper_parameter_levels(fun_control,
     "optimizer", ["SGD", "Adam"])
```

The hyperparameter `optimizer` can be de-activated by choosing only one value (level), here: `"SGD"`.

```
fun_control = modify_hyper_parameter_levels(fun_control, "optimizer", ["SGD"])
```

As discussed in **?@sec-optimizers**, there are some issues with the LBFGS optimizer. Therefore, the usage of the LBFGS optimizer is not deactivated in `spotPython` by default. However, the LBFGS optimizer can be activated by adding it to the list of optimizers. `Rprop` was removed, because it does perform very poorly (as some pre-tests have shown). However, it can also be activated by adding it to the list of optimizers. Since `SparseAdam` does not support dense gradients, `Adam` was used instead. Therefore, there are 10 default optimizers:

```
fun_control = modify_hyper_parameter_levels(fun_control, "optimizer",
    ["Adadelta", "Adagrad", "Adam", "AdamW", "Adamax", "ASGD",
    "NAdam", "RAdam", "RMSprop", "SGD"])
```

20.6 Optimizers

Table 20.1 shows some of the optimizers available in `PyTorch`:

a denotes (0.9,0.999), b (0.5,1.2), and c (1e-6, 50), respectively. R denotes `required, but unspecified`. "m" denotes `momentum`, "w_d" `weight_decay`, "d" `dampening`, "n" `nesterov`, "r" `rho`, "l_s" `learning rate for scaling delta`, "l_d" `lr_decay`, "b" `betas`, "l" `lambd`, "a" `alpha`, "m_d" for `momentum_decay`, "e" `etas`, and "s_s" for `step_sizes`.

Table 20.1: Optimizers available in PyTorch (selection). The default values are shown in the table.

Optimizer	lr	m	w_d	d	n	r	l_s	l_d	b	l	a	m_d	e	s_s
Adadelta	-	-	0.	-	-	0.9	1.	-	-	-	-	-	-	-
Adagrad	1e-2	-	0.	-	-	-	-	0.	-	-	-	-	-	-
Adam	1e-3	-	0.	-	-	-	-	-	a	-	-	-	-	-
AdamW	1e-3	-	1e-2	-	-	-	-	-	a	-	-	-	-	-
SparseAdam	1e-3	-	-	-	-	-	-	-	a	-	-	-	-	-
Adamax	2e-3	-	0.	-	-	-	-	-	a	-	-	-	-	-
ASGD	1e-2	.9	0.	-	F	-	-	-	-	1e-4	.75	-	-	-
LBFGS	1.	-	-	-	-	-	-	-	-	-	-	-	-	-
NAdam	2e-3	-	0.	-	-	-	-	-	a	-	-	0	-	-
RAdam	1e-3	-	0.	-	-	-	-	-	a	-	-	-	-	-
RMSprop	1e-2	0.	0.	-	-	-	-	-	a	-	-	-	-	-
Rprop	1e-2	-	-	-	-	-	-	-	-	-	b	c	-	-
SGD	R	0.	0.	0.	F	-	-	-	-	-	-	-	-	-

`spotPython` implements an `optimization` handler that maps the optimizer names to the corresponding `PyTorch` optimizers.

A note on LBFGS

We recommend deactivating PyTorch's LBFGS optimizer, because it does not perform very well. The PyTorch documentation, see https://pytorch.org/docs/stable/generated/torch.optim.LBFGS.html#torch.optim.LBFGS, states:

> This is a very memory intensive optimizer (it requires additional `param_bytes * (history_size + 1)` bytes). If it doesn't fit in memory try reducing the history size, or use a different algorithm.

Furthermore, the LBFGS optimizer is not compatible with the PyTorch tutorial. The reason is that the LBFGS optimizer requires the `closure` function, which is not implemented in the PyTorch tutorial. Therefore, the `LBFGS` optimizer is recommended here. Since there are ten optimizers in the portfolio, it is not recommended tuning the hyperparameters that effect one single optimizer only.

A note on the learning rate

`spotPython` provides a multiplier for the default learning rates, `lr_mult`, because optimizers use different learning rates. Using a multiplier for the learning rates might enable a simultaneous tuning of the learning rates for all optimizers. However, this is not recommended, because the learning rates are not comparable across optimizers. Therefore, we recommend fixing the learning rate for all optimizers if multiple optimizers are used. This can be done by setting the lower and upper bounds of the learning rate multiplier to the same value as shown below.
Thus, the learning rate, which affects the `SGD` optimizer, will be set to a fixed value. We choose the default value of `1e-3` for the learning rate, because it is used in other `PyTorch` examples (it is also the default value used by `spotPython` as defined in the `optimizer_handler()` method). We recommend tuning the learning rate later, when a reduced set of optimizers is fixed. Here, we will demonstrate how to select in a screening phase the optimizers that should be used for the hyperparameter tuning.

For the same reason, we will fix the `sgd_momentum` to `0.9`.

```
fun_control = modify_hyper_parameter_bounds(fun_control,
    "lr_mult", bounds=[1.0, 1.0])
fun_control = modify_hyper_parameter_bounds(fun_control,
    "sgd_momentum", bounds=[0.9, 0.9])
```

20.7 Evaluation: Data Splitting

The evaluation procedure requires the specification of the way how the data is split into a train and a test set and the loss function (and a metric). As a default, `spotPython` provides a standard hold-out data split and cross validation.

20.7.1 Hold-out Data Split

If a hold-out data split is used, the data will be partitioned into a training, a validation, and a test data set. The split depends on the setting of the `eval` parameter. If `eval` is set to `train_hold_out`, one data set, usually the original training data set, is split into a new training and a validation data set. The training data set is used for training the model. The validation data set is used for the evaluation of the hyperparameter configuration and early stopping to prevent overfitting. In this case, the original test data set is not used.

> **Note**
>
> `spotPython` returns the hyperparameters of the machine learning and deep learning models, e.g., number of layers, learning rate, or optimizer, but not the model weights. Therefore, after the SPOT run is finished, the corresponding model with the optimized architecture has to be trained again with the best hyperparameter configuration. The training is performed on the training data set. The test data set is used for the final evaluation of the model.
> Summarizing, the following splits are performed in the hold-out setting:
>
> 1. Run `spotPython` with `eval` set to `train_hold_out` to determine the best hyperparameter configuration.
> 2. Train the model with the best hyperparameter configuration ("architecture") on the training data set: `train_tuned(model_spot, train, "model_spot.pt")`.
> 3. Test the model on the test data: `test_tuned(model_spot, test, "model_spot.pt")`
>
> These steps will be exemplified in the following sections.

In addition to this `hold-out` setting, `spotPython` provides another hold-out setting, where an explicit test data is specified by the user that will be used as the validation set. To choose this option, the `eval` parameter is set to `test_hold_out`. In this case, the training data set is used for the model training. Then, the explicitly defined test data set is used for the evaluation of the hyperparameter configuration (the validation).

20.7.2 Cross-Validation

The cross validation setting is used by setting the `eval` parameter to `train_cv` or `test_cv`. In both cases, the data set is split into k folds. The model is trained on $k-1$ folds and evaluated on the remaining fold. This is repeated k times, so that each fold is used exactly once for evaluation. The final evaluation is performed on the test data set. The cross validation setting is useful for small data sets, because it allows to use all data for training and evaluation. However, it is computationally expensive, because the model has to be trained k times.

> **Note**
>
> Combinations of the above settings are possible, e.g., cross validation can be used for training and hold-out for evaluation or *vice versa*. Also, cross validation can be used for training and testing. Because cross validation is not used in the `PyTorch` tutorial (PyTorch 2023a), it is not considered further here.

20.7.3 Overview of the Evaluation Settings

20.7.3.1 Settings for the Hyperparameter Tuning

An overview of the training evaluations is shown in Table 20.2. `"train_cv"` and `"test_cv"` use `sklearn.model_selection.KFold()` internally. More details on the data splitting are provided in Section 29.14 (in the Appendix).

Table 20.2: Overview of the evaluation settings.

`eval`	`train`	`test`	function	comment
`"train_hold_out"`	✓		`train_one_epoch()`, `validate_one_epoch()` for early stopping	splits the `train` data set internally
`"test_hold_out"`	✓	✓	`train_one_epoch()`, `validate_one_epoch()` for early stopping	use the `test data set` for `validate_one_epoch()`
`"train_cv"`	✓		`evaluate_cv(net, train)`	CV using the `train` data set
`"test_cv"`		✓	`evaluate_cv(net, test)`	CV using the `test` data set . Identical to `"train_cv"`, uses only test data.

20.7.3.2 Settings for the Final Evaluation of the Tuned Architecture

20.7.3.2.1 Training of the Tuned Architecture

`train_tuned(model, train)`: train the model with the best hyperparameter configuration (or simply the default) on the training data set. It splits the `train`data into new `train` and `validation` sets using `create_train_val_data_loaders()`, which calls `torch.utils.data.random_split()` internally. Currently, 60% of the data is used for training and 40% for validation. The `train` data is used for training the model with `train_hold_out()`. The `validation` data is used for early stopping using `validate_fold_or_hold_out()` on the `validation` data set.

20.7.3.2.2 Testing of the Tuned Architecture

`test_tuned(model, test)`: test the model on the test data set. No data splitting is performed. The (trained) model is evaluated using the `validate_fold_or_hold_out()` function. Note: During training, `"shuffle"` is set to `True`, whereas during testing, `"shuffle"` is set to `False`.

Section 29.14.1.4 describes the final evaluation of the tuned architecture.

```
fun_control.update({
    "eval": "train_hold_out",
    "path": "torch_model.pt",
    "shuffle": True})
```

20.8 Evaluation: Loss Functions and Metrics

The key `"loss_function"` specifies the loss function which is used during the optimization. There are several different loss functions under `PyTorch`'s `nn` package. For example, a simple loss is `MSELoss`, which computes the mean-squared error between the output and the target. In this tutorial we will use `CrossEntropyLoss`, because it is also used in the `PyTorch` tutorial.

```
from torch.nn import CrossEntropyLoss
loss_function = CrossEntropyLoss()
fun_control.update({"loss_function": loss_function})
```

In addition to the loss functions, `spotPython` provides access to a large number of metrics.

- The key `"metric_sklearn"` is used for metrics that follow the `scikit-learn` conventions.
- The key `"river_metric"` is used for the river based evaluation (Montiel et al. 2021) via `eval_oml_iter_progressive`, and

- the key "metric_torch" is used for the metrics from TorchMetrics.

TorchMetrics is a collection of more than 90 PyTorch metrics, see https://torchmetrics.readthedocs.io/en/latest/. Because the PyTorch tutorial uses the accuracy as metric, we use the same metric here. Currently, accuracy is computed in the tutorial's example code. We will use TorchMetrics instead, because it offers more flexibilty, e.g., it can be used for regression and classification. Furthermore, TorchMetrics offers the following advantages:

```
* A standardized interface to increase reproducibility
* Reduces Boilerplate
* Distributed-training compatible
* Rigorously tested
* Automatic accumulation over batches
* Automatic synchronization between multiple devices
```

Therefore, we set

```
import torchmetrics
metric_torch = torchmetrics.Accuracy(task="multiclass", num_classes=10).to(fun_control["de
fun_control.update({"metric_torch": metric_torch})
```

20.9 Preparing the SPOT Call

The following code passes the information about the parameter ranges and bounds to spot.

```
from spotPython.hyperparameters.values import (
    get_var_type,
    get_var_name,
    get_bound_values
    )
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})

lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

Now, the dictionary fun_control contains all information needed for the hyperparameter tuning. Before the hyperparameter tuning is started, it is recommended to take a look at the experimental design. The method gen_design_table generates a design table as follows:

```python
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name         | type   | default   |   lower |   upper | transform             |
|--------------|--------|-----------|---------|---------|-----------------------|
| l1           | int    | 5         |     2   |     9   | transform_power_2_int |
| l2           | int    | 5         |     2   |     9   | transform_power_2_int |
| lr_mult      | float  | 1.0       |     1   |     1   | None                  |
| batch_size   | int    | 4         |     1   |     5   | transform_power_2_int |
| epochs       | int    | 3         |     3   |     4   | transform_power_2_int |
| k_folds      | int    | 1         |     0   |     0   | None                  |
| patience     | int    | 5         |     3   |     3   | None                  |
| optimizer    | factor | SGD       |     0   |     9   | None                  |
| sgd_momentum | float  | 0.0       |     0.9 |     0.9 | None                  |
```

This allows to check if all information is available and if the information is correct. **?@tbl-design** shows the experimental design for the hyperparameter tuning. The table shows the hyperparameters, their types, default values, lower and upper bounds, and the transformation function. The transformation function is used to transform the hyperparameter values from the unit hypercube to the original domain. The transformation function is applied to the hyperparameter values before the evaluation of the objective function. Hyperparameter transformations are shown in the column "transform", e.g., the `l1` default is `5`, which results in the value $2^5 = 32$ for the network, because the transformation `transform_power_2_int` was selected in the `JSON` file. The default value of the `batch_size` is set to `4`, which results in a batch size of $2^4 = 16$.

20.10 The Objective Function `fun_torch`

The objective function `fun_torch` is selected next. It implements an interface from `PyTorch`'s training, validation, and testing methods to `spotPython`.

```python
from spotPython.fun.hypertorch import HyperTorch
fun = HyperTorch().fun_torch
```

20.11 Using Default Hyperparameters or Results from Previous Runs

We add the default setting to the initial design:

```
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=TorchHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
```

20.12 Starting the Hyperparameter Tuning

The `spotPython` hyperparameter tuning is started by calling the `Spot` function. Here, we will run the tuner for approximately 30 minutes (`max_time`). Note: the initial design is always evaluated in the `spotPython` run. As a consequence, the run may take longer than specified by `max_time`, because the evaluation time of initial design (here: `init_size`, 10 points) is performed independently of `max_time`. During the run, results from the training is shown. These results can be visualized with Tensorboard as will be shown in Section 20.13.

```
from spotPython.spot import spot
from math import inf
import numpy as np
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models= False,
                   show_progress= True,
                   fun_control = fun_control,
                   design_control={"init_size": INIT_SIZE,
                                   "repeats": 1},
                   surrogate_control={"noise": True,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": len(var_name),
```

```
                                        "model_fun_evals": 10_000,
                                        "log_level": 50
                                        })
spot_tuner.run(X_start=X_start)
```

```
config: {'l1': 64, 'l2': 16, 'lr_mult': 1.0, 'batch_size': 16, 'epochs': 16, 'k_folds': 0, 'p
Epoch: 1

Loss on hold-out set: 1.4533459280490875
Accuracy on hold-out set: 0.4688
MulticlassAccuracy value on hold-out data: 0.46880000829696655
Epoch: 2

Loss on hold-out set: 1.3543185011386871
Accuracy on hold-out set: 0.51095
MulticlassAccuracy value on hold-out data: 0.5109500288963318
Epoch: 3

Loss on hold-out set: 1.2743724973917008
Accuracy on hold-out set: 0.54305
MulticlassAccuracy value on hold-out data: 0.5430499911308289
Epoch: 4

Loss on hold-out set: 1.2902719797134399
Accuracy on hold-out set: 0.54035
MulticlassAccuracy value on hold-out data: 0.5403500199317932
Epoch: 5

Loss on hold-out set: 1.2333198446273803
Accuracy on hold-out set: 0.5628
MulticlassAccuracy value on hold-out data: 0.5627999901771545
Epoch: 6

Loss on hold-out set: 1.280766237258911
Accuracy on hold-out set: 0.55625
MulticlassAccuracy value on hold-out data: 0.5562499761581421
Epoch: 7
```

```
Loss on hold-out set: 1.258249668955803
Accuracy on hold-out set: 0.5612
MulticlassAccuracy value on hold-out data: 0.5612000226974487
Epoch: 8

Loss on hold-out set: 1.2707242632627487
Accuracy on hold-out set: 0.5613
MulticlassAccuracy value on hold-out data: 0.5612999796867371
Early stopping at epoch 7
Returned to Spot: Validation loss: 1.2707242632627487
----------------------------------------------

config: {'l1': 16, 'l2': 128, 'lr_mult': 1.0, 'batch_size': 4, 'epochs': 16, 'k_folds': 0, '
Epoch: 1

Loss on hold-out set: 1.5839048205137254
Accuracy on hold-out set: 0.42995
MulticlassAccuracy value on hold-out data: 0.4299499988555908
Epoch: 2

Loss on hold-out set: 1.4826234470888973
Accuracy on hold-out set: 0.4737
MulticlassAccuracy value on hold-out data: 0.47369998693466187
Epoch: 3

Loss on hold-out set: 1.4910136413872241
Accuracy on hold-out set: 0.47595
MulticlassAccuracy value on hold-out data: 0.4759500026702881
Epoch: 4

Loss on hold-out set: 1.4517937265843153
Accuracy on hold-out set: 0.48355
MulticlassAccuracy value on hold-out data: 0.4835500121116638
Epoch: 5

Loss on hold-out set: 1.420182870873809
Accuracy on hold-out set: 0.49855
MulticlassAccuracy value on hold-out data: 0.4985499978065491
Epoch: 6
```

```
Loss on hold-out set: 1.4000949948847294
Accuracy on hold-out set: 0.50305
MulticlassAccuracy value on hold-out data: 0.5030500292778015
Epoch: 7

Loss on hold-out set: 1.390150349238515
Accuracy on hold-out set: 0.5191
MulticlassAccuracy value on hold-out data: 0.51910001039505
Epoch: 8

Loss on hold-out set: 1.4102775582864882
Accuracy on hold-out set: 0.5114
MulticlassAccuracy value on hold-out data: 0.5113999843597412
Epoch: 9

Loss on hold-out set: 1.3829834556549787
Accuracy on hold-out set: 0.53655
MulticlassAccuracy value on hold-out data: 0.536549985408783
Epoch: 10

Loss on hold-out set: 1.3840368529889733
Accuracy on hold-out set: 0.53385
MulticlassAccuracy value on hold-out data: 0.5338500142097473
Epoch: 11

Loss on hold-out set: 1.4369625036354177
Accuracy on hold-out set: 0.52725
MulticlassAccuracy value on hold-out data: 0.5272499918937683
Epoch: 12

Loss on hold-out set: 1.3552821906451136
Accuracy on hold-out set: 0.5347
MulticlassAccuracy value on hold-out data: 0.5346999764442444
Epoch: 13

Loss on hold-out set: 1.4660265823645517
Accuracy on hold-out set: 0.52895
MulticlassAccuracy value on hold-out data: 0.5289499759674072
Epoch: 14
```

```
Loss on hold-out set: 1.4357987512470223
Accuracy on hold-out set: 0.5315
MulticlassAccuracy value on hold-out data: 0.531499981880188
Epoch: 15

Loss on hold-out set: 1.3949318072281778
Accuracy on hold-out set: 0.5406
MulticlassAccuracy value on hold-out data: 0.5406000018119812
Early stopping at epoch 14
Returned to Spot: Validation loss: 1.3949318072281778
----------------------------------------------

config: {'l1': 32, 'l2': 8, 'lr_mult': 1.0, 'batch_size': 8, 'epochs': 8, 'k_folds': 0, 'pat
Epoch: 1

Loss on hold-out set: 1.9359466921329498
Accuracy on hold-out set: 0.2874
MulticlassAccuracy value on hold-out data: 0.2874000072479248
Epoch: 2

Loss on hold-out set: 1.7834792288064956
Accuracy on hold-out set: 0.34745
MulticlassAccuracy value on hold-out data: 0.34744998812675476
Epoch: 3

Loss on hold-out set: 1.7023904726028443
Accuracy on hold-out set: 0.3764
MulticlassAccuracy value on hold-out data: 0.3763999938964844
Epoch: 4

Loss on hold-out set: 1.6323350637674332
Accuracy on hold-out set: 0.39745
MulticlassAccuracy value on hold-out data: 0.3974500000476837
Epoch: 5

Loss on hold-out set: 1.5795104023456574
Accuracy on hold-out set: 0.4202
MulticlassAccuracy value on hold-out data: 0.420199990272522
Epoch: 6
```

```
Loss on hold-out set: 1.5650491503477097
Accuracy on hold-out set: 0.4316
MulticlassAccuracy value on hold-out data: 0.43160000443458557
Epoch: 7

Loss on hold-out set: 1.497686283183098
Accuracy on hold-out set: 0.44895
MulticlassAccuracy value on hold-out data: 0.44894999265670776
Epoch: 8

Loss on hold-out set: 1.4964021678686141
Accuracy on hold-out set: 0.44555
MulticlassAccuracy value on hold-out data: 0.44554999470710754
Returned to Spot: Validation loss: 1.4964021678686141
----------------------------------------------

config: {'l1': 8, 'l2': 64, 'lr_mult': 1.0, 'batch_size': 4, 'epochs': 8, 'k_folds': 0, 'pat
Epoch: 1

Loss on hold-out set: 1.6656724346399308
Accuracy on hold-out set: 0.36385
MulticlassAccuracy value on hold-out data: 0.3638499975204468
Epoch: 2

Loss on hold-out set: 1.5518029561161995
Accuracy on hold-out set: 0.4232
MulticlassAccuracy value on hold-out data: 0.42320001125335693
Epoch: 3

Loss on hold-out set: 1.5199136155843735
Accuracy on hold-out set: 0.4325
MulticlassAccuracy value on hold-out data: 0.4325000047683716
Epoch: 4

Loss on hold-out set: 1.43228360119462
Accuracy on hold-out set: 0.48015
MulticlassAccuracy value on hold-out data: 0.4801500141620636
Epoch: 5
```

```
Loss on hold-out set: 1.3894472444042563
Accuracy on hold-out set: 0.4983
MulticlassAccuracy value on hold-out data: 0.4982999861240387
Epoch: 6

Loss on hold-out set: 1.3293603819712996
Accuracy on hold-out set: 0.5284
MulticlassAccuracy value on hold-out data: 0.5284000039100647
Epoch: 7

Loss on hold-out set: 1.3685478227280081
Accuracy on hold-out set: 0.51885
MulticlassAccuracy value on hold-out data: 0.5188500285148621
Epoch: 8

Loss on hold-out set: 1.2731714204836637
Accuracy on hold-out set: 0.56385
MulticlassAccuracy value on hold-out data: 0.5638499855995178
Returned to Spot: Validation loss: 1.2731714204836637
----------------------------------------------

config: {'l1': 128, 'l2': 32, 'lr_mult': 1.0, 'batch_size': 8, 'epochs': 16, 'k_folds': 0, '
Epoch: 1

Loss on hold-out set: 1.5100641992807389
Accuracy on hold-out set: 0.4533
MulticlassAccuracy value on hold-out data: 0.45329999923706055
Epoch: 2

Loss on hold-out set: 1.4458374650478363
Accuracy on hold-out set: 0.48185
MulticlassAccuracy value on hold-out data: 0.4818499982357025
Epoch: 3

Loss on hold-out set: 1.333872334986925
Accuracy on hold-out set: 0.5351
MulticlassAccuracy value on hold-out data: 0.535099983215332
Epoch: 4
```

```
Loss on hold-out set: 1.1950968085706235
Accuracy on hold-out set: 0.58135
MulticlassAccuracy value on hold-out data: 0.5813500285148621
Epoch: 5

Loss on hold-out set: 1.1993954418182373
Accuracy on hold-out set: 0.5838
MulticlassAccuracy value on hold-out data: 0.5838000178337097
Epoch: 6

Loss on hold-out set: 1.1778290982067585
Accuracy on hold-out set: 0.59615
MulticlassAccuracy value on hold-out data: 0.5961499810218811
Epoch: 7

Loss on hold-out set: 1.1976451940864326
Accuracy on hold-out set: 0.5983
MulticlassAccuracy value on hold-out data: 0.5982999801635742
Epoch: 8

Loss on hold-out set: 1.180733152270317
Accuracy on hold-out set: 0.61015
MulticlassAccuracy value on hold-out data: 0.6101499795913696
Epoch: 9

Loss on hold-out set: 1.2060580384768547
Accuracy on hold-out set: 0.6094
MulticlassAccuracy value on hold-out data: 0.6093999743461609
Early stopping at epoch 8
Returned to Spot: Validation loss: 1.2060580384768547
----------------------------------------------

config: {'l1': 512, 'l2': 16, 'lr_mult': 1.0, 'batch_size': 4, 'epochs': 16, 'k_folds': 0, 'p
Epoch: 1

Loss on hold-out set: 2.3056133961200715
Accuracy on hold-out set: 0.09685
MulticlassAccuracy value on hold-out data: 0.09685000032186508
Epoch: 2
```

```
Loss on hold-out set: 2.305367127275467
Accuracy on hold-out set: 0.102
MulticlassAccuracy value on hold-out data: 0.10199999809265137
Epoch: 3

Loss on hold-out set: 2.3106455521583555
Accuracy on hold-out set: 0.102
MulticlassAccuracy value on hold-out data: 0.10199999809265137
Epoch: 4

Loss on hold-out set: 2.3041080660820006
Accuracy on hold-out set: 0.09685
MulticlassAccuracy value on hold-out data: 0.09685000032186508
Epoch: 5

Loss on hold-out set: 2.305434985208511
Accuracy on hold-out set: 0.09975
MulticlassAccuracy value on hold-out data: 0.09974999725818634
Epoch: 6

Loss on hold-out set: 2.307910087633133
Accuracy on hold-out set: 0.09685
MulticlassAccuracy value on hold-out data: 0.09685000032186508
Epoch: 7

Loss on hold-out set: 2.3063840475559236
Accuracy on hold-out set: 0.10035
MulticlassAccuracy value on hold-out data: 0.10034999996423721
Early stopping at epoch 6
Returned to Spot: Validation loss: 2.3063840475559236
----------------------------------------------

config: {'l1': 8, 'l2': 8, 'lr_mult': 1.0, 'batch_size': 16, 'epochs': 8, 'k_folds': 0, 'pati
Epoch: 1

Loss on hold-out set: 1.7928279613494873
Accuracy on hold-out set: 0.32045
MulticlassAccuracy value on hold-out data: 0.3204500079154968
Epoch: 2
```

```
Loss on hold-out set: 1.7255279724121093
Accuracy on hold-out set: 0.3504
MulticlassAccuracy value on hold-out data: 0.35040000081062317
Epoch: 3

Loss on hold-out set: 1.6957986786842347
Accuracy on hold-out set: 0.3657
MulticlassAccuracy value on hold-out data: 0.36570000648498535
Epoch: 4

Loss on hold-out set: 1.6629261387825012
Accuracy on hold-out set: 0.38185
MulticlassAccuracy value on hold-out data: 0.381850004196167
Epoch: 5

Loss on hold-out set: 1.6437727040290833
Accuracy on hold-out set: 0.3898
MulticlassAccuracy value on hold-out data: 0.3898000121116638
Epoch: 6

Loss on hold-out set: 1.6237261445999145
Accuracy on hold-out set: 0.39805
MulticlassAccuracy value on hold-out data: 0.3980500102043152
Epoch: 7

Loss on hold-out set: 1.6106377116203308
Accuracy on hold-out set: 0.40325
MulticlassAccuracy value on hold-out data: 0.4032500088214874
Epoch: 8

Loss on hold-out set: 1.5937108884811402
Accuracy on hold-out set: 0.40965
MulticlassAccuracy value on hold-out data: 0.4096499979496002
Returned to Spot: Validation loss: 1.5937108884811402
----------------------------------------------

config: {'l1': 256, 'l2': 64, 'lr_mult': 1.0, 'batch_size': 16, 'epochs': 8, 'k_folds': 0, '
Epoch: 1
```

```
Loss on hold-out set: 2.3025583984375
Accuracy on hold-out set: 0.10215
MulticlassAccuracy value on hold-out data: 0.10215000063180923
Epoch: 2

Loss on hold-out set: 2.303578217315674
Accuracy on hold-out set: 0.1013
MulticlassAccuracy value on hold-out data: 0.10130000114440918
Epoch: 3

Loss on hold-out set: 2.303986617088318
Accuracy on hold-out set: 0.1031
MulticlassAccuracy value on hold-out data: 0.1031000018119812
Epoch: 4

Loss on hold-out set: 2.3044695474624635
Accuracy on hold-out set: 0.09575
MulticlassAccuracy value on hold-out data: 0.09574999660253525
Early stopping at epoch 3
Returned to Spot: Validation loss: 2.3044695474624635
----------------------------------------------

config: {'l1': 256, 'l2': 512, 'lr_mult': 1.0, 'batch_size': 2, 'epochs': 8, 'k_folds': 0, '
Epoch: 1

Loss on hold-out set: 1.5440511220141664
Accuracy on hold-out set: 0.45545
MulticlassAccuracy value on hold-out data: 0.45544999837875366
Epoch: 2

Loss on hold-out set: 1.5171328100105048
Accuracy on hold-out set: 0.47675
MulticlassAccuracy value on hold-out data: 0.476749986410141
Epoch: 3

Loss on hold-out set: 1.588555173834465
Accuracy on hold-out set: 0.52855
MulticlassAccuracy value on hold-out data: 0.5285500288009644
Epoch: 4
```

```
Loss on hold-out set: 1.5260059313789136
Accuracy on hold-out set: 0.521
MulticlassAccuracy value on hold-out data: 0.5210000276565552
Epoch: 5

Loss on hold-out set: 1.4987520136272852
Accuracy on hold-out set: 0.55745
MulticlassAccuracy value on hold-out data: 0.557449996471405
Epoch: 6

Loss on hold-out set: 1.5072337730454133
Accuracy on hold-out set: 0.54905
MulticlassAccuracy value on hold-out data: 0.549049973487854
Epoch: 7

Loss on hold-out set: 1.7528297861946198
Accuracy on hold-out set: 0.5135
MulticlassAccuracy value on hold-out data: 0.5134999752044678
Epoch: 8

Loss on hold-out set: 1.5040124534547226
Accuracy on hold-out set: 0.58065
MulticlassAccuracy value on hold-out data: 0.5806499719619751
Early stopping at epoch 7
Returned to Spot: Validation loss: 1.5040124534547226
----------------------------------------------

config: {'l1': 4, 'l2': 256, 'lr_mult': 1.0, 'batch_size': 32, 'epochs': 16, 'k_folds': 0, '
Epoch: 1

Loss on hold-out set: 1.6759454921722412
Accuracy on hold-out set: 0.3653
MulticlassAccuracy value on hold-out data: 0.3652999997138977
Epoch: 2

Loss on hold-out set: 1.579386364555359
Accuracy on hold-out set: 0.40105
MulticlassAccuracy value on hold-out data: 0.40105000138282776
Epoch: 3
```

```
Loss on hold-out set: 1.5982798414230346
Accuracy on hold-out set: 0.4072
MulticlassAccuracy value on hold-out data: 0.40720000863075256
Epoch: 4

Loss on hold-out set: 1.49624329328537
Accuracy on hold-out set: 0.45665
MulticlassAccuracy value on hold-out data: 0.4566499888896942
Epoch: 5

Loss on hold-out set: 1.411609566116333
Accuracy on hold-out set: 0.48815
MulticlassAccuracy value on hold-out data: 0.4881500005722046
Epoch: 6

Loss on hold-out set: 1.3717064184188843
Accuracy on hold-out set: 0.5023
MulticlassAccuracy value on hold-out data: 0.5023000240325928
Epoch: 7

Loss on hold-out set: 1.4055356158256531
Accuracy on hold-out set: 0.48655
MulticlassAccuracy value on hold-out data: 0.4865500032901764
Epoch: 8

Loss on hold-out set: 1.373749681854248
Accuracy on hold-out set: 0.4911
MulticlassAccuracy value on hold-out data: 0.491100013256073
Epoch: 9

Loss on hold-out set: 1.366012912273407
Accuracy on hold-out set: 0.5019
MulticlassAccuracy value on hold-out data: 0.5019000172615051
Epoch: 10

Loss on hold-out set: 1.3109573903083802
Accuracy on hold-out set: 0.5289
MulticlassAccuracy value on hold-out data: 0.5289000272750854
Epoch: 11
```

```
Loss on hold-out set: 1.309958598613739
Accuracy on hold-out set: 0.5282
MulticlassAccuracy value on hold-out data: 0.5281999707221985
Epoch: 12

Loss on hold-out set: 1.3464134722709655
Accuracy on hold-out set: 0.5088
MulticlassAccuracy value on hold-out data: 0.5088000297546387
Epoch: 13

Loss on hold-out set: 1.3445185299873352
Accuracy on hold-out set: 0.5209
MulticlassAccuracy value on hold-out data: 0.5209000110626221
Epoch: 14

Loss on hold-out set: 1.345049767780304
Accuracy on hold-out set: 0.5188
MulticlassAccuracy value on hold-out data: 0.5188000202178955
Early stopping at epoch 13
Returned to Spot: Validation loss: 1.345049767780304
----------------------------------------------


config: {'l1': 8, 'l2': 4, 'lr_mult': 1.0, 'batch_size': 32, 'epochs': 16, 'k_folds': 0, 'pa
Epoch: 1

Loss on hold-out set: 1.785424986076355
Accuracy on hold-out set: 0.31995
MulticlassAccuracy value on hold-out data: 0.31995001435279846
Epoch: 2

Loss on hold-out set: 1.6596245168685912
Accuracy on hold-out set: 0.3724
MulticlassAccuracy value on hold-out data: 0.3723999857902527
Epoch: 3

Loss on hold-out set: 1.5921710216522216
Accuracy on hold-out set: 0.39725
MulticlassAccuracy value on hold-out data: 0.3972499966621399
Epoch: 4
```

```
Loss on hold-out set: 1.5331209363937377
Accuracy on hold-out set: 0.42705
MulticlassAccuracy value on hold-out data: 0.42704999446868896
Epoch: 5

Loss on hold-out set: 1.499526797103882
Accuracy on hold-out set: 0.43595
MulticlassAccuracy value on hold-out data: 0.43595001101493835
Epoch: 6

Loss on hold-out set: 1.4782956325531005
Accuracy on hold-out set: 0.4492
MulticlassAccuracy value on hold-out data: 0.44920000433921814
Epoch: 7

Loss on hold-out set: 1.4934663246154785
Accuracy on hold-out set: 0.44385
MulticlassAccuracy value on hold-out data: 0.44385001063346863
Epoch: 8

Loss on hold-out set: 1.479158119392395
Accuracy on hold-out set: 0.4518
MulticlassAccuracy value on hold-out data: 0.45179998874664307
Epoch: 9

Loss on hold-out set: 1.3796422342300414
Accuracy on hold-out set: 0.4908
MulticlassAccuracy value on hold-out data: 0.49079999327659607
Epoch: 10

Loss on hold-out set: 1.3654342952728271
Accuracy on hold-out set: 0.49375
MulticlassAccuracy value on hold-out data: 0.4937500059604645
Epoch: 11

Loss on hold-out set: 1.3259358848571778
Accuracy on hold-out set: 0.51455
MulticlassAccuracy value on hold-out data: 0.514549970626831
Epoch: 12
```

```
Loss on hold-out set: 1.3169078248023987
Accuracy on hold-out set: 0.5157
MulticlassAccuracy value on hold-out data: 0.5156999826431274
Epoch: 13

Loss on hold-out set: 1.297392312812805
Accuracy on hold-out set: 0.52915
MulticlassAccuracy value on hold-out data: 0.5291500091552734
Epoch: 14

Loss on hold-out set: 1.284620029449463
Accuracy on hold-out set: 0.53305
MulticlassAccuracy value on hold-out data: 0.533050000667572
Epoch: 15

Loss on hold-out set: 1.272847442340851
Accuracy on hold-out set: 0.54255
MulticlassAccuracy value on hold-out data: 0.5425500273704529
Epoch: 16

Loss on hold-out set: 1.2801040723800658
Accuracy on hold-out set: 0.5353
MulticlassAccuracy value on hold-out data: 0.5353000164031982
Returned to Spot: Validation loss: 1.2801040723800658
----------------------------------------------
spotPython tuning: 1.2060580384768547 [#---------] 9.70%


config: {'l1': 32, 'l2': 4, 'lr_mult': 1.0, 'batch_size': 32, 'epochs': 16, 'k_folds': 0, 'pa

Epoch: 1

Loss on hold-out set: 2.3048736854553225
Accuracy on hold-out set: 0.0993
MulticlassAccuracy value on hold-out data: 0.09929999709129333
Epoch: 2

Loss on hold-out set: 2.303108511352539
Accuracy on hold-out set: 0.098
MulticlassAccuracy value on hold-out data: 0.09799999743700027
Epoch: 3
```

```
Loss on hold-out set: 2.302958345413208
Accuracy on hold-out set: 0.098
MulticlassAccuracy value on hold-out data: 0.09799999743700027
Epoch: 4

Loss on hold-out set: 2.302915610122681
Accuracy on hold-out set: 0.098
MulticlassAccuracy value on hold-out data: 0.09799999743700027
Epoch: 5

Loss on hold-out set: 2.302935892868042
Accuracy on hold-out set: 0.098
MulticlassAccuracy value on hold-out data: 0.09799999743700027
Epoch: 6

Loss on hold-out set: 2.30297506980896
Accuracy on hold-out set: 0.0974
MulticlassAccuracy value on hold-out data: 0.09740000218153
Epoch: 7

Loss on hold-out set: 2.3029598041534425
Accuracy on hold-out set: 0.098
MulticlassAccuracy value on hold-out data: 0.09799999743700027
Early stopping at epoch 6
Returned to Spot: Validation loss: 2.3029598041534425
----------------------------------------------

spotPython tuning: 1.2060580384768547 [#---------] 13.95%


config: {'l1': 512, 'l2': 512, 'lr_mult': 1.0, 'batch_size': 2, 'epochs': 16, 'k_folds': 0,
Epoch: 1

Loss on hold-out set: 1.6042210477377288
Accuracy on hold-out set: 0.44235
MulticlassAccuracy value on hold-out data: 0.44235000014305115
Epoch: 2

Loss on hold-out set: 1.519325821846508
Accuracy on hold-out set: 0.4996
MulticlassAccuracy value on hold-out data: 0.49959999322891235
Epoch: 3
```

```
Loss on hold-out set: 1.4479503571517998
Accuracy on hold-out set: 0.53255
MulticlassAccuracy value on hold-out data: 0.5325499773025513
Epoch: 4

Loss on hold-out set: 1.5118462938514956
Accuracy on hold-out set: 0.56325
MulticlassAccuracy value on hold-out data: 0.5632500052452087
Epoch: 5

Loss on hold-out set: 1.5579894256121225
Accuracy on hold-out set: 0.5602
MulticlassAccuracy value on hold-out data: 0.5601999759674072
Epoch: 6

Loss on hold-out set: 1.8642168173908846
Accuracy on hold-out set: 0.5242
MulticlassAccuracy value on hold-out data: 0.5242000222206116
Early stopping at epoch 5
Returned to Spot: Validation loss: 1.8642168173908846
----------------------------------------------
spotPython tuning: 1.2060580384768547 [###-------] 28.32%


config: {'l1': 4, 'l2': 128, 'lr_mult': 1.0, 'batch_size': 4, 'epochs': 8, 'k_folds': 0, 'pa
Epoch: 1

Loss on hold-out set: 1.7072867959737779
Accuracy on hold-out set: 0.34375
MulticlassAccuracy value on hold-out data: 0.34375
Epoch: 2

Loss on hold-out set: 1.5535677586376666
Accuracy on hold-out set: 0.4206
MulticlassAccuracy value on hold-out data: 0.4205999970436096
Epoch: 3

Loss on hold-out set: 1.5061209825217723
Accuracy on hold-out set: 0.44865
MulticlassAccuracy value on hold-out data: 0.4486500024795532
Epoch: 4
```

```
Loss on hold-out set: 1.4325175951451063
Accuracy on hold-out set: 0.48
MulticlassAccuracy value on hold-out data: 0.47999998927116394
Epoch: 5

Loss on hold-out set: 1.3515913600176572
Accuracy on hold-out set: 0.51095
MulticlassAccuracy value on hold-out data: 0.5109500288963318
Epoch: 6

Loss on hold-out set: 1.3942304025672376
Accuracy on hold-out set: 0.50315
MulticlassAccuracy value on hold-out data: 0.5031499862670898
Epoch: 7

Loss on hold-out set: 1.3445417340770365
Accuracy on hold-out set: 0.51395
MulticlassAccuracy value on hold-out data: 0.513949990272522
Epoch: 8

Loss on hold-out set: 1.4020154412977397
Accuracy on hold-out set: 0.5108
MulticlassAccuracy value on hold-out data: 0.5108000040054321
Returned to Spot: Validation loss: 1.4020154412977397
----------------------------------------------
spotPython tuning: 1.2060580384768547 [###-------] 33.92%


config: {'l1': 128, 'l2': 64, 'lr_mult': 1.0, 'batch_size': 4, 'epochs': 16, 'k_folds': 0, '
Epoch: 1

Loss on hold-out set: 1.5104816174358129
Accuracy on hold-out set: 0.4614
MulticlassAccuracy value on hold-out data: 0.46140000224113464
Epoch: 2

Loss on hold-out set: 1.3345469617344439
Accuracy on hold-out set: 0.5275
MulticlassAccuracy value on hold-out data: 0.5274999737739563
Epoch: 3
```

```
Loss on hold-out set: 1.329972892858833
Accuracy on hold-out set: 0.5314
MulticlassAccuracy value on hold-out data: 0.5314000248908997
Epoch: 4

Loss on hold-out set: 1.2465838433970697
Accuracy on hold-out set: 0.5724
MulticlassAccuracy value on hold-out data: 0.5723999738693237
Epoch: 5

Loss on hold-out set: 1.2713360312769189
Accuracy on hold-out set: 0.57
MulticlassAccuracy value on hold-out data: 0.5699999928474426
Epoch: 6

Loss on hold-out set: 1.3333210912026465
Accuracy on hold-out set: 0.57195
MulticlassAccuracy value on hold-out data: 0.5719500184059143
Epoch: 7

Loss on hold-out set: 1.267273509691935
Accuracy on hold-out set: 0.58395
MulticlassAccuracy value on hold-out data: 0.5839499831199646
Early stopping at epoch 6
Returned to Spot: Validation loss: 1.267273509691935
----------------------------------------------
spotPython tuning: 1.2060580384768547 [####------] 39.56%


config: {'l1': 128, 'l2': 4, 'lr_mult': 1.0, 'batch_size': 32, 'epochs': 16, 'k_folds': 0, 'p
Epoch: 1

Loss on hold-out set: 1.8657101013183595
Accuracy on hold-out set: 0.29625
MulticlassAccuracy value on hold-out data: 0.29624998569488525
Epoch: 2

Loss on hold-out set: 1.6615139099121095
Accuracy on hold-out set: 0.38925
MulticlassAccuracy value on hold-out data: 0.3892500102519989
Epoch: 3
```

```
Loss on hold-out set: 1.5544162321090698
Accuracy on hold-out set: 0.4317
MulticlassAccuracy value on hold-out data: 0.4316999912261963
Epoch: 4

Loss on hold-out set: 1.5242192388534546
Accuracy on hold-out set: 0.4442
MulticlassAccuracy value on hold-out data: 0.4442000091075897
Epoch: 5

Loss on hold-out set: 1.4380771465301514
Accuracy on hold-out set: 0.48305
MulticlassAccuracy value on hold-out data: 0.48304998874664307
Epoch: 6

Loss on hold-out set: 1.4010445168495178
Accuracy on hold-out set: 0.48405
MulticlassAccuracy value on hold-out data: 0.4840500056743622
Epoch: 7

Loss on hold-out set: 1.3362335715293885
Accuracy on hold-out set: 0.51625
MulticlassAccuracy value on hold-out data: 0.5162500143051147
Epoch: 8

Loss on hold-out set: 1.327301898097992
Accuracy on hold-out set: 0.5151
MulticlassAccuracy value on hold-out data: 0.5151000022888184
Epoch: 9

Loss on hold-out set: 1.3296207401275635
Accuracy on hold-out set: 0.52505
MulticlassAccuracy value on hold-out data: 0.5250499844551086
Epoch: 10

Loss on hold-out set: 1.2743944716453552
Accuracy on hold-out set: 0.53855
MulticlassAccuracy value on hold-out data: 0.5385500192642212
Epoch: 11
```

```
Loss on hold-out set: 1.2765432415008544
Accuracy on hold-out set: 0.5394
MulticlassAccuracy value on hold-out data: 0.5393999814987183
Epoch: 12

Loss on hold-out set: 1.2675728783607483
Accuracy on hold-out set: 0.546
MulticlassAccuracy value on hold-out data: 0.5460000038146973
Epoch: 13

Loss on hold-out set: 1.2724045463562013
Accuracy on hold-out set: 0.55
MulticlassAccuracy value on hold-out data: 0.550000011920929
Epoch: 14

Loss on hold-out set: 1.2440720779418946
Accuracy on hold-out set: 0.5567
MulticlassAccuracy value on hold-out data: 0.5566999912261963
Epoch: 15

Loss on hold-out set: 1.2791069781303406
Accuracy on hold-out set: 0.55005
MulticlassAccuracy value on hold-out data: 0.5500500202178955
Epoch: 16

Loss on hold-out set: 1.2385637810707093
Accuracy on hold-out set: 0.57475
MulticlassAccuracy value on hold-out data: 0.5747500061988831
Returned to Spot: Validation loss: 1.2385637810707093
----------------------------------------------

spotPython tuning: 1.2060580384768547 [#####-----] 49.49%


config: {'l1': 64, 'l2': 32, 'lr_mult': 1.0, 'batch_size': 16, 'epochs': 16, 'k_folds': 0, '
Epoch: 1

Loss on hold-out set: 1.4864705220222474
Accuracy on hold-out set: 0.45435
MulticlassAccuracy value on hold-out data: 0.45434999465942383
Epoch: 2
```

```
Loss on hold-out set: 1.3671040131092072
Accuracy on hold-out set: 0.5133
MulticlassAccuracy value on hold-out data: 0.5133000016212463
Epoch: 3

Loss on hold-out set: 1.3098377366065979
Accuracy on hold-out set: 0.5388
MulticlassAccuracy value on hold-out data: 0.5388000011444092
Epoch: 4

Loss on hold-out set: 1.2982841246128083
Accuracy on hold-out set: 0.5464
MulticlassAccuracy value on hold-out data: 0.5464000105857849
Epoch: 5

Loss on hold-out set: 1.3388746437072754
Accuracy on hold-out set: 0.54935
MulticlassAccuracy value on hold-out data: 0.5493500232696533
Epoch: 6

Loss on hold-out set: 1.3200563648700714
Accuracy on hold-out set: 0.54945
MulticlassAccuracy value on hold-out data: 0.5494499802589417
Epoch: 7

Loss on hold-out set: 1.2988259907484054
Accuracy on hold-out set: 0.55425
MulticlassAccuracy value on hold-out data: 0.5542500019073486
Early stopping at epoch 6
Returned to Spot: Validation loss: 1.2988259907484054
----------------------------------------------

spotPython tuning: 1.2060580384768547 [#####-----] 54.53%


config: {'l1': 16, 'l2': 32, 'lr_mult': 1.0, 'batch_size': 4, 'epochs': 16, 'k_folds': 0, 'pa
Epoch: 1

Loss on hold-out set: 1.5323357136130333
Accuracy on hold-out set: 0.4404
MulticlassAccuracy value on hold-out data: 0.44040000438690186
Epoch: 2
```

```
Loss on hold-out set: 1.4054866034638136
Accuracy on hold-out set: 0.4919
MulticlassAccuracy value on hold-out data: 0.4918999969959259
Epoch: 3

Loss on hold-out set: 1.332687971842289
Accuracy on hold-out set: 0.5226
MulticlassAccuracy value on hold-out data: 0.522599995136261
Epoch: 4

Loss on hold-out set: 1.2992084073796868
Accuracy on hold-out set: 0.5373
MulticlassAccuracy value on hold-out data: 0.5372999906539917
Epoch: 5

Loss on hold-out set: 1.2631432989254594
Accuracy on hold-out set: 0.54675
MulticlassAccuracy value on hold-out data: 0.546750009059906
Epoch: 6

Loss on hold-out set: 1.2502352864533663
Accuracy on hold-out set: 0.56175
MulticlassAccuracy value on hold-out data: 0.5617499947547913
Epoch: 7

Loss on hold-out set: 1.2265723949566483
Accuracy on hold-out set: 0.57025
MulticlassAccuracy value on hold-out data: 0.5702499747276306
Epoch: 8

Loss on hold-out set: 1.2351035243600608
Accuracy on hold-out set: 0.5775
MulticlassAccuracy value on hold-out data: 0.5774999856948853
Epoch: 9

Loss on hold-out set: 1.234901387825422
Accuracy on hold-out set: 0.57965
MulticlassAccuracy value on hold-out data: 0.5796499848365784
Epoch: 10
```

```
Loss on hold-out set: 1.2307040532397107
Accuracy on hold-out set: 0.5829
MulticlassAccuracy value on hold-out data: 0.5828999876976013
Early stopping at epoch 9
Returned to Spot: Validation loss: 1.2307040532397107
----------------------------------------------

spotPython tuning: 1.2060580384768547 [######----] 61.53%


config: {'l1': 32, 'l2': 128, 'lr_mult': 1.0, 'batch_size': 8, 'epochs': 8, 'k_folds': 0, 'pa
Epoch: 1

Loss on hold-out set: 1.4691625814437865
Accuracy on hold-out set: 0.46105
MulticlassAccuracy value on hold-out data: 0.46105000376701355
Epoch: 2

Loss on hold-out set: 1.378717707824707
Accuracy on hold-out set: 0.5033
MulticlassAccuracy value on hold-out data: 0.5033000111579895
Epoch: 3

Loss on hold-out set: 1.3299803791165352
Accuracy on hold-out set: 0.5299
MulticlassAccuracy value on hold-out data: 0.5299000144004822
Epoch: 4

Loss on hold-out set: 1.3247949757158757
Accuracy on hold-out set: 0.53485
MulticlassAccuracy value on hold-out data: 0.534850001335144
Epoch: 5

Loss on hold-out set: 1.284211967897415
Accuracy on hold-out set: 0.5533
MulticlassAccuracy value on hold-out data: 0.5533000230789185
Epoch: 6

Loss on hold-out set: 1.2369804341554642
Accuracy on hold-out set: 0.5711
MulticlassAccuracy value on hold-out data: 0.5710999965667725
Epoch: 7
```

```
Loss on hold-out set: 1.1965979921102523
Accuracy on hold-out set: 0.582
MulticlassAccuracy value on hold-out data: 0.5820000171661377
Epoch: 8

Loss on hold-out set: 1.1973829561293126
Accuracy on hold-out set: 0.58635
MulticlassAccuracy value on hold-out data: 0.5863500237464905
Returned to Spot: Validation loss: 1.1973829561293126
----------------------------------------------

spotPython tuning: 1.1973829561293126 [#######---] 66.05%


config: {'l1': 16, 'l2': 64, 'lr_mult': 1.0, 'batch_size': 2, 'epochs': 8, 'k_folds': 0, 'pa
Epoch: 1

Loss on hold-out set: 1.4617420201927422
Accuracy on hold-out set: 0.47175
MulticlassAccuracy value on hold-out data: 0.4717499911785126
Epoch: 2

Loss on hold-out set: 1.4374732819343101
Accuracy on hold-out set: 0.5122
MulticlassAccuracy value on hold-out data: 0.5121999979019165
Epoch: 3

Loss on hold-out set: 1.3424791668074745
Accuracy on hold-out set: 0.5438
MulticlassAccuracy value on hold-out data: 0.5437999963760376
Epoch: 4

Loss on hold-out set: 1.3185055309855758
Accuracy on hold-out set: 0.55965
MulticlassAccuracy value on hold-out data: 0.5596500039100647
Epoch: 5

Loss on hold-out set: 1.3930499170688124
Accuracy on hold-out set: 0.55915
MulticlassAccuracy value on hold-out data: 0.559149980545044
Epoch: 6
```

```
Loss on hold-out set: 1.3855957502935041
Accuracy on hold-out set: 0.56115
MulticlassAccuracy value on hold-out data: 0.5611500144004822
Epoch: 7

Loss on hold-out set: 1.4972498456198038
Accuracy on hold-out set: 0.564
MulticlassAccuracy value on hold-out data: 0.5640000104904175
Early stopping at epoch 6
Returned to Spot: Validation loss: 1.4972498456198038
----------------------------------------------

spotPython tuning: 1.1973829561293126 [#######---] 73.95%


config: {'l1': 4, 'l2': 8, 'lr_mult': 1.0, 'batch_size': 16, 'epochs': 8, 'k_folds': 0, 'pat
Epoch: 1

Loss on hold-out set: 1.7811643815994262
Accuracy on hold-out set: 0.28945
MulticlassAccuracy value on hold-out data: 0.2894499897956848
Epoch: 2

Loss on hold-out set: 1.7388515953063965
Accuracy on hold-out set: 0.31795
MulticlassAccuracy value on hold-out data: 0.3179500102996826
Epoch: 3

Loss on hold-out set: 1.679481352710724
Accuracy on hold-out set: 0.334
MulticlassAccuracy value on hold-out data: 0.33399999141693115
Epoch: 4

Loss on hold-out set: 1.6487693655967712
Accuracy on hold-out set: 0.34685
MulticlassAccuracy value on hold-out data: 0.3468500077724457
Epoch: 5

Loss on hold-out set: 1.643136413002014
Accuracy on hold-out set: 0.34605
MulticlassAccuracy value on hold-out data: 0.3460499942302704
Epoch: 6
```

```
Loss on hold-out set: 1.605872128534317
Accuracy on hold-out set: 0.3657
MulticlassAccuracy value on hold-out data: 0.36570000648498535
Epoch: 7

Loss on hold-out set: 1.5488117588996888
Accuracy on hold-out set: 0.40965
MulticlassAccuracy value on hold-out data: 0.4096499979496002
Epoch: 8

Loss on hold-out set: 1.4892793525218964
Accuracy on hold-out set: 0.43335
MulticlassAccuracy value on hold-out data: 0.43334999680519104
Returned to Spot: Validation loss: 1.4892793525218964
----------------------------------------------

spotPython tuning: 1.1973829561293126 [########--] 79.64%


config: {'l1': 64, 'l2': 16, 'lr_mult': 1.0, 'batch_size': 16, 'epochs': 16, 'k_folds': 0, '
Epoch: 1

Loss on hold-out set: 1.5489931118965148
Accuracy on hold-out set: 0.43
MulticlassAccuracy value on hold-out data: 0.4300000071525574
Epoch: 2

Loss on hold-out set: 1.460147880935669
Accuracy on hold-out set: 0.4738
MulticlassAccuracy value on hold-out data: 0.47380000352859497
Epoch: 3

Loss on hold-out set: 1.3107678723812104
Accuracy on hold-out set: 0.52995
MulticlassAccuracy value on hold-out data: 0.5299500226974487
Epoch: 4

Loss on hold-out set: 1.2643516914844513
Accuracy on hold-out set: 0.5502
MulticlassAccuracy value on hold-out data: 0.5501999855041504
Epoch: 5
```

```
Loss on hold-out set: 1.2679585530281068
Accuracy on hold-out set: 0.5488
MulticlassAccuracy value on hold-out data: 0.548799991607666
Epoch: 6

Loss on hold-out set: 1.1958980781555175
Accuracy on hold-out set: 0.57855
MulticlassAccuracy value on hold-out data: 0.5785499811172485
Epoch: 7

Loss on hold-out set: 1.185061479115486
Accuracy on hold-out set: 0.5849
MulticlassAccuracy value on hold-out data: 0.5849000215530396
Epoch: 8

Loss on hold-out set: 1.1399025770187379
Accuracy on hold-out set: 0.6007
MulticlassAccuracy value on hold-out data: 0.6007000207901001
Epoch: 9

Loss on hold-out set: 1.1475638659000398
Accuracy on hold-out set: 0.59985
MulticlassAccuracy value on hold-out data: 0.5998499989509583
Epoch: 10

Loss on hold-out set: 1.159564760375023
Accuracy on hold-out set: 0.6048
MulticlassAccuracy value on hold-out data: 0.6047999858856201
Epoch: 11

Loss on hold-out set: 1.150424925351143
Accuracy on hold-out set: 0.60685
MulticlassAccuracy value on hold-out data: 0.6068500280380249
Early stopping at epoch 10
Returned to Spot: Validation loss: 1.150424925351143
----------------------------------------------

spotPython tuning: 1.150424925351143 [#########-] 87.58%
```

```
config: {'l1': 64, 'l2': 32, 'lr_mult': 1.0, 'batch_size': 8, 'epochs': 8, 'k_folds': 0, 'pa
Epoch: 1

Loss on hold-out set: 1.4577045643806457
Accuracy on hold-out set: 0.47735
MulticlassAccuracy value on hold-out data: 0.47734999656677246
Epoch: 2

Loss on hold-out set: 1.3991892664194108
Accuracy on hold-out set: 0.5062
MulticlassAccuracy value on hold-out data: 0.5062000155448914
Epoch: 3

Loss on hold-out set: 1.2753006386995316
Accuracy on hold-out set: 0.5469
MulticlassAccuracy value on hold-out data: 0.5468999743461609
Epoch: 4

Loss on hold-out set: 1.21146244212389
Accuracy on hold-out set: 0.5725
MulticlassAccuracy value on hold-out data: 0.5724999904632568
Epoch: 5

Loss on hold-out set: 1.2873198517680169
Accuracy on hold-out set: 0.5618
MulticlassAccuracy value on hold-out data: 0.5618000030517578
Epoch: 6

Loss on hold-out set: 1.184621515494585
Accuracy on hold-out set: 0.5884
MulticlassAccuracy value on hold-out data: 0.5884000062942505
Epoch: 7

Loss on hold-out set: 1.1533514801323415
Accuracy on hold-out set: 0.5993
MulticlassAccuracy value on hold-out data: 0.5993000268936157
Epoch: 8
```

```
Loss on hold-out set: 1.1814239351511002
Accuracy on hold-out set: 0.5945
MulticlassAccuracy value on hold-out data: 0.5945000052452087
Returned to Spot: Validation loss: 1.1814239351511002
----------------------------------------------

spotPython tuning: 1.150424925351143 [#########-] 92.15%


config: {'l1': 64, 'l2': 512, 'lr_mult': 1.0, 'batch_size': 16, 'epochs': 16, 'k_folds': 0,
Epoch: 1

Loss on hold-out set: 1.4169073784828186
Accuracy on hold-out set: 0.48355
MulticlassAccuracy value on hold-out data: 0.4835500121116638
Epoch: 2

Loss on hold-out set: 1.3334610491275787
Accuracy on hold-out set: 0.5148
MulticlassAccuracy value on hold-out data: 0.5148000121116638
Epoch: 3

Loss on hold-out set: 1.254371067762375
Accuracy on hold-out set: 0.5497
MulticlassAccuracy value on hold-out data: 0.5497000217437744
Epoch: 4

Loss on hold-out set: 1.279649605679512
Accuracy on hold-out set: 0.55445
MulticlassAccuracy value on hold-out data: 0.5544499754905701
Epoch: 5

Loss on hold-out set: 1.1562654968976975
Accuracy on hold-out set: 0.59225
MulticlassAccuracy value on hold-out data: 0.5922499895095825
Epoch: 6

Loss on hold-out set: 1.1797694581985474
Accuracy on hold-out set: 0.58325
MulticlassAccuracy value on hold-out data: 0.5832499861717224
Epoch: 7
```

```
Loss on hold-out set: 1.1983103514432907
Accuracy on hold-out set: 0.5803
MulticlassAccuracy value on hold-out data: 0.580299973487854
Epoch: 8

Loss on hold-out set: 1.2048660673856735
Accuracy on hold-out set: 0.58365
MulticlassAccuracy value on hold-out data: 0.5836499929428101
Early stopping at epoch 7
Returned to Spot: Validation loss: 1.2048660673856735
----------------------------------------------

spotPython tuning: 1.150424925351143 [##########] 98.09%


config: {'l1': 32, 'l2': 4, 'lr_mult': 1.0, 'batch_size': 8, 'epochs': 16, 'k_folds': 0, 'pa
Epoch: 1

Loss on hold-out set: 1.7044141180753707
Accuracy on hold-out set: 0.3691
MulticlassAccuracy value on hold-out data: 0.36910000443458557
Epoch: 2

Loss on hold-out set: 1.572597537612915
Accuracy on hold-out set: 0.39625
MulticlassAccuracy value on hold-out data: 0.39625000953674316
Epoch: 3

Loss on hold-out set: 1.4828918751955031
Accuracy on hold-out set: 0.4425
MulticlassAccuracy value on hold-out data: 0.4424999952316284
Epoch: 4

Loss on hold-out set: 1.440593514084816
Accuracy on hold-out set: 0.4648
MulticlassAccuracy value on hold-out data: 0.46480000019073486
Epoch: 5

Loss on hold-out set: 1.4383191660881043
Accuracy on hold-out set: 0.47415
MulticlassAccuracy value on hold-out data: 0.47415000200271606
Epoch: 6
```

```
Loss on hold-out set: 1.455618459546566
Accuracy on hold-out set: 0.48195
MulticlassAccuracy value on hold-out data: 0.4819500148296356
Epoch: 7

Loss on hold-out set: 1.3043816946983338
Accuracy on hold-out set: 0.52885
MulticlassAccuracy value on hold-out data: 0.5288500189781189
Epoch: 8

Loss on hold-out set: 1.3239234745025634
Accuracy on hold-out set: 0.5239
MulticlassAccuracy value on hold-out data: 0.5238999724388123
Epoch: 9

Loss on hold-out set: 1.2871528642356396
Accuracy on hold-out set: 0.54825
MulticlassAccuracy value on hold-out data: 0.5482500195503235
Epoch: 10

Loss on hold-out set: 1.255108424758911
Accuracy on hold-out set: 0.55905
MulticlassAccuracy value on hold-out data: 0.5590500235557556
Epoch: 11

Loss on hold-out set: 1.2821522222280501
Accuracy on hold-out set: 0.5514
MulticlassAccuracy value on hold-out data: 0.5514000058174133
Epoch: 12

Loss on hold-out set: 1.2327721772432327
Accuracy on hold-out set: 0.5676
MulticlassAccuracy value on hold-out data: 0.5676000118255615
Epoch: 13

Loss on hold-out set: 1.303263712143898
Accuracy on hold-out set: 0.5563
MulticlassAccuracy value on hold-out data: 0.5562999844551086
Epoch: 14
```

```
Loss on hold-out set: 1.2431918095052241
Accuracy on hold-out set: 0.56965
MulticlassAccuracy value on hold-out data: 0.5696499943733215
Epoch: 15

Loss on hold-out set: 1.3662245687782764
Accuracy on hold-out set: 0.5527
MulticlassAccuracy value on hold-out data: 0.5526999831199646
Early stopping at epoch 14
Returned to Spot: Validation loss: 1.3662245687782764
----------------------------------------------

spotPython tuning: 1.150424925351143 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x292ae70d0>
```

20.13 Tensorboard

The textual output shown in the console (or code cell) can be visualized with Tensorboard.

20.13.1 Tensorboard: Start Tensorboard

Start TensorBoard through the command line to visualize data you logged. Specify the root log directory as used in `fun_control = fun_control_init(task="regression", tensorboard_path="runs/24_spot_torch_regression")` as the `tensorboard_path`. The argument logdir points to directory where TensorBoard will look to find event files that it can display. TensorBoard will recursively walk the directory structure rooted at logdir, looking for *.tfevents.* files.

```
tensorboard --logdir=runs
```

Go to the URL it provides or to http://localhost:6006/. The following figures show some screenshots of Tensorboard.

20.13.2 Saving the State of the Notebook

The state of the notebook can be saved and reloaded as follows:

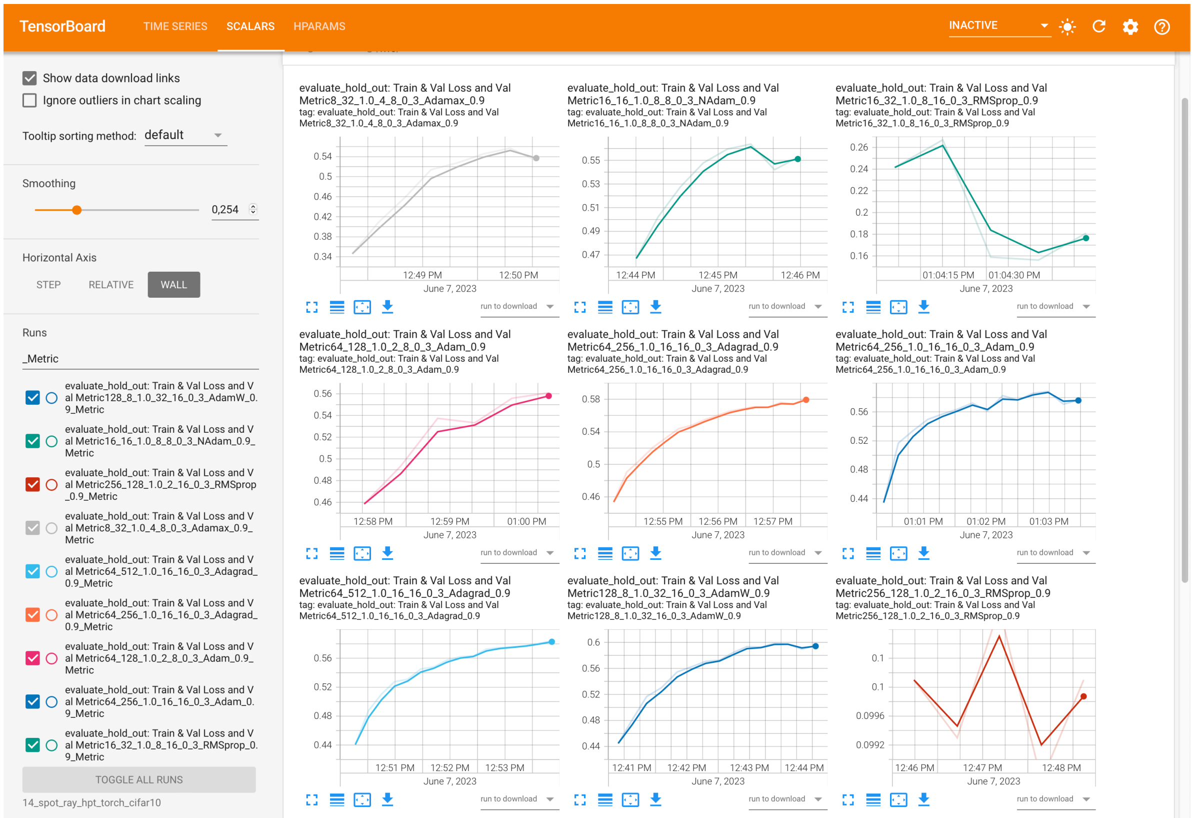
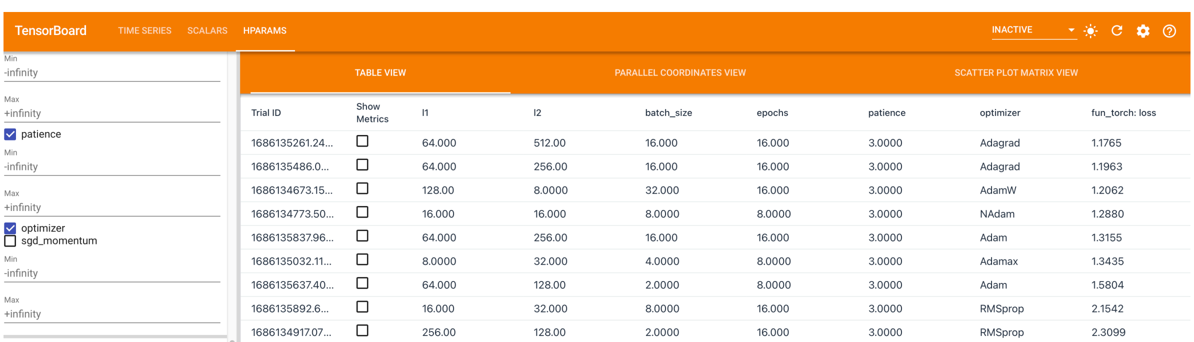


Figure 20.1: Tensorboard



Trial ID	Show Metrics	l1	l2	batch_size	epochs	patience	optimizer	fun_torch: loss
1686135261.24...	☐	64.000	512.00	16.000	16.000	3.0000	Adagrad	1.1765
1686135486.0...	☐	64.000	256.00	16.000	16.000	3.0000	Adagrad	1.1963
1686134673.15...	☐	128.00	8.0000	32.000	16.000	3.0000	AdamW	1.2062
1686134773.50...	☐	16.000	16.000	8.0000	8.0000	3.0000	NAdam	1.2880
1686135837.96...	☐	64.000	256.00	16.000	16.000	3.0000	Adam	1.3155
1686135032.11...	☐	8.0000	32.000	4.0000	8.0000	3.0000	Adamax	1.3435
1686135637.40...	☐	64.000	128.00	2.0000	8.0000	3.0000	Adam	1.5804
1686135892.6...	☐	16.000	32.000	8.0000	16.000	3.0000	RMSprop	2.1542
1686134917.07...	☐	256.00	128.00	2.0000	16.000	3.0000	RMSprop	2.3099

Figure 20.2: Tensorboard

```
import pickle
SAVE = False
LOAD = False

if SAVE:
    result_file_name = "res_" + experiment_name + ".pkl"
    with open(result_file_name, 'wb') as f:
        pickle.dump(spot_tuner, f)

if LOAD:
    result_file_name = "add_the_name_of_the_result_file_here.pkl"
    with open(result_file_name, 'rb') as f:
        spot_tuner =  pickle.load(f)
```

20.14 Results

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

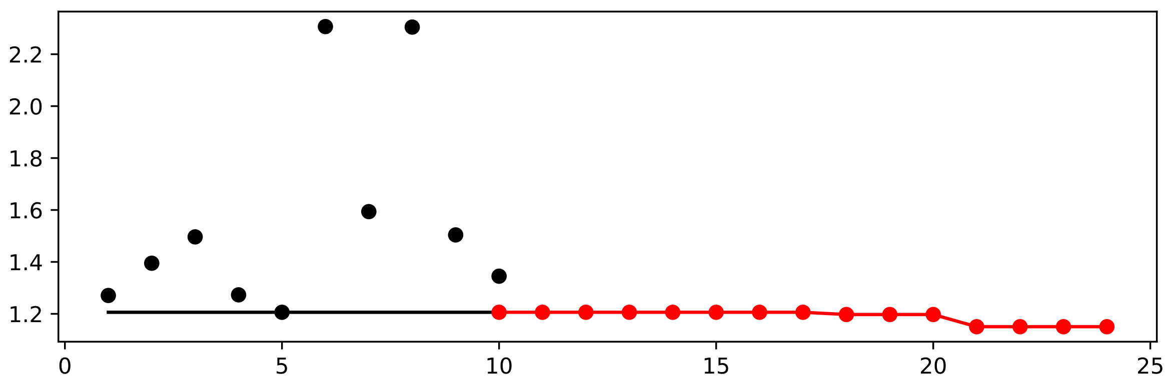


Figure 20.3: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

?@fig-progress shows a typical behaviour that can be observed in many hyperparameter studies (Bartz et al. 2022): the largest improvement is obtained during the evaluation of the initial design. The surrogate model based optimization-optimization with the surrogate refines the results. **?@fig-progress** also illustrates one major difference between `ray[tune]` as used in PyTorch (2023a) and `spotPython`: the `ray[tune]` uses a random search and will generate results similar to the *black* dots, whereas `spotPython` uses a surrogate model based optimization and presents results represented by *red* dots in **?@fig-progress**. The surrogate model based optimization is considered to be more efficient than a random search, because the surrogate model guides the search towards promising regions in the hyperparameter space.

In addition to the improved ("optimized") hyperparameter values, `spotPython` allows a statistical analysis, e.g., a sensitivity analysis, of the results. We can print the results of the hyperparameter tuning, see **?@tbl-results**. The table shows the hyperparameters, their types, default values, lower and upper bounds, and the transformation function. The column "tuned" shows the tuned values. The column "importance" shows the importance of the hyperparameters. The column "stars" shows the importance of the hyperparameters in stars. The importance is computed by the SPOT software.

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control=fun_control, spot=spot_tuner))
```

```
| name         | type   | default   |   lower |   upper |   tuned | transform             |
|--------------|--------|-----------|---------|---------|---------|-----------------------|-
| l1           | int    | 5         |     2.0 |     9.0 |     6.0 | transform_power_2_int |
| l2           | int    | 5         |     2.0 |     9.0 |     4.0 | transform_power_2_int |
| lr_mult      | float  | 1.0       |     1.0 |     1.0 |     1.0 | None                  |
| batch_size   | int    | 4         |     1.0 |     5.0 |     4.0 | transform_power_2_int |
| epochs       | int    | 3         |     3.0 |     4.0 |     4.0 | transform_power_2_int |
| k_folds      | int    | 1         |     0.0 |     0.0 |     0.0 | None                  |
| patience     | int    | 5         |     3.0 |     3.0 |     3.0 | None                  |
| optimizer    | factor | SGD       |     0.0 |     9.0 |     3.0 | None                  |
| sgd_momentum | float  | 0.0       |     0.9 |     0.9 |     0.9 | None                  |
```

To visualize the most important hyperparameters, `spotPython` provides the function `plot_importance`. The following code generates the importance plot from **?@fig-importance**.

```
spot_tuner.plot_importance(threshold=0.025,
    filename="./figures/" + experiment_name+"_importance.png")
```

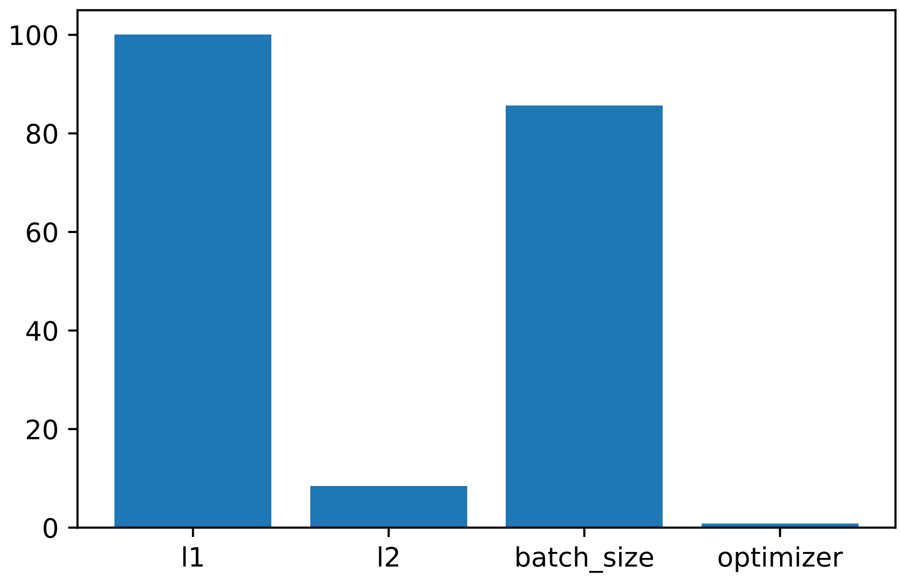


Figure 20.4: Variable importance plot, threshold 0.025.

20.14.1 Get the Tuned Architecture (SPOT Results)

The architecture of the `spotPython` model can be obtained as follows. First, the numerical representation of the hyperparameters are obtained, i.e., the numpy array `X` is generated. This array is then used to generate the model `model_spot` by the function `get_one_core_model_from_X`. The model `model_spot` has the following architecture:

```
from spotPython.hyperparameters.values import get_one_core_model_from_X
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
model_spot = get_one_core_model_from_X(X, fun_control)
model_spot
```

```
Net_CIFAR10(
  (conv1): Conv2d(3, 6, kernel_size=(5, 5), stride=(1, 1))
  (pool): MaxPool2d(kernel_size=2, stride=2, padding=0, dilation=1, ceil_mode=False)
  (conv2): Conv2d(6, 16, kernel_size=(5, 5), stride=(1, 1))
  (fc1): Linear(in_features=400, out_features=64, bias=True)
  (fc2): Linear(in_features=64, out_features=16, bias=True)
  (fc3): Linear(in_features=16, out_features=10, bias=True)
)
```

20.14.2 Get Default Hyperparameters

In a similar manner as in **?@sec-get-spot-results**, the default hyperparameters can be obtained.

```
# fun_control was modified, we generate a new one with the original
# default hyperparameters
from spotPython.hyperparameters.values import get_one_core_model_from_X
fc = fun_control
fc.update({"core_model_hyper_dict":
    hyper_dict[fun_control["core_model"].__name__]})
model_default = get_one_core_model_from_X(X_start, fun_control=fc)
model_default
```

```
Net_CIFAR10(
  (conv1): Conv2d(3, 6, kernel_size=(5, 5), stride=(1, 1))
  (pool): MaxPool2d(kernel_size=2, stride=2, padding=0, dilation=1, ceil_mode=False)
  (conv2): Conv2d(6, 16, kernel_size=(5, 5), stride=(1, 1))
  (fc1): Linear(in_features=400, out_features=32, bias=True)
  (fc2): Linear(in_features=32, out_features=32, bias=True)
  (fc3): Linear(in_features=32, out_features=10, bias=True)
)
```

20.14.3 Evaluation of the Default Architecture

The method `train_tuned` takes a model architecture without trained weights and trains this model with the train data. The train data is split into train and validation data. The validation data is used for early stopping. The trained model weights are saved as a dictionary.

This evaluation is similar to the final evaluation in PyTorch (2023a).

```
from spotPython.torch.traintest import (
    train_tuned,
    test_tuned,
    )
train_tuned(net=model_default, train_dataset=train, shuffle=True,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
        device = fun_control["device"], show_batch_interval=1_000_000,
        path=None,
        task=fun_control["task"],)
```

```python
test_tuned(net=model_default, test_dataset=test,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
        shuffle=False,
        device = fun_control["device"],
        task=fun_control["task"],)
```

```
Epoch: 1

Loss on hold-out set: 2.300257224845886
Accuracy on hold-out set: 0.12175
MulticlassAccuracy value on hold-out data: 0.12174999713897705
Epoch: 2

Loss on hold-out set: 2.2848702610015867
Accuracy on hold-out set: 0.1329
MulticlassAccuracy value on hold-out data: 0.13289999961853027
Epoch: 3

Loss on hold-out set: 2.241229739379883
Accuracy on hold-out set: 0.1543
MulticlassAccuracy value on hold-out data: 0.1543000042438507
Epoch: 4

Loss on hold-out set: 2.182645471572876
Accuracy on hold-out set: 0.18525
MulticlassAccuracy value on hold-out data: 0.18524999916553497
Epoch: 5

Loss on hold-out set: 2.126187257766724
Accuracy on hold-out set: 0.2275
MulticlassAccuracy value on hold-out data: 0.22750000655651093
Epoch: 6

Loss on hold-out set: 2.0878332607269288
Accuracy on hold-out set: 0.2353
MulticlassAccuracy value on hold-out data: 0.2353000044822693
Epoch: 7
```

```
Loss on hold-out set: 2.0605135400772094
Accuracy on hold-out set: 0.24665
MulticlassAccuracy value on hold-out data: 0.24664999544620514
Epoch: 8

Loss on hold-out set: 2.037888253116608
Accuracy on hold-out set: 0.2513
MulticlassAccuracy value on hold-out data: 0.25130000710487366
Returned to Spot: Validation loss: 2.037888253116608
----------------------------------------------

Loss on hold-out set: 2.0167819957733153
Accuracy on hold-out set: 0.2632
MulticlassAccuracy value on hold-out data: 0.2632000148296356
Final evaluation: Validation loss: 2.0167819957733153
Final evaluation: Validation metric: 0.2632000148296356
----------------------------------------------

(2.0167819957733153, nan, tensor(0.2632))
```

20.14.4 Evaluation of the Tuned Architecture

The following code trains the model `model_spot`.

If `path` is set to a filename, e.g., `path = "model_spot_trained.pt"`, the weights of the trained model will be saved to this file.

If `path` is set to a filename, e.g., `path = "model_spot_trained.pt"`, the weights of the trained model will be loaded from this file.

```
train_tuned(net=model_spot, train_dataset=train,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
        shuffle=True,
        device = fun_control["device"],
        path=None,
        task=fun_control["task"],)
test_tuned(net=model_spot, test_dataset=test,
            shuffle=False,
            loss_function=fun_control["loss_function"],
            metric=fun_control["metric_torch"],
            device = fun_control["device"],
```

```
                task=fun_control["task"],)
```

```
Epoch: 1

Loss on hold-out set: 1.558149233531952
Accuracy on hold-out set: 0.4387
MulticlassAccuracy value on hold-out data: 0.43869999051094055
Epoch: 2

Loss on hold-out set: 1.378355217885971
Accuracy on hold-out set: 0.4989
MulticlassAccuracy value on hold-out data: 0.49889999628067017
Epoch: 3

Loss on hold-out set: 1.3061749006271361
Accuracy on hold-out set: 0.52665
MulticlassAccuracy value on hold-out data: 0.5266500115394592
Epoch: 4

Loss on hold-out set: 1.3043512459039688
Accuracy on hold-out set: 0.5381
MulticlassAccuracy value on hold-out data: 0.538100004196167
Epoch: 5

Loss on hold-out set: 1.2110985610723495
Accuracy on hold-out set: 0.57325
MulticlassAccuracy value on hold-out data: 0.5732499957084656
Epoch: 6

Loss on hold-out set: 1.2161308309316634
Accuracy on hold-out set: 0.57175
MulticlassAccuracy value on hold-out data: 0.5717499852180481
Epoch: 7

Loss on hold-out set: 1.1540690086126328
Accuracy on hold-out set: 0.59505
MulticlassAccuracy value on hold-out data: 0.5950499773025513
Epoch: 8
```

```
Loss on hold-out set: 1.1637938582420349
Accuracy on hold-out set: 0.59405
MulticlassAccuracy value on hold-out data: 0.5940499901771545
Epoch: 9

Loss on hold-out set: 1.1440208910465242
Accuracy on hold-out set: 0.603
MulticlassAccuracy value on hold-out data: 0.6029999852180481
Epoch: 10

Loss on hold-out set: 1.1721751145601274
Accuracy on hold-out set: 0.60175
MulticlassAccuracy value on hold-out data: 0.6017500162124634
Epoch: 11

Loss on hold-out set: 1.1665453822851182
Accuracy on hold-out set: 0.6021
MulticlassAccuracy value on hold-out data: 0.6021000146865845
Epoch: 12

Loss on hold-out set: 1.1374821581363679
Accuracy on hold-out set: 0.6151
MulticlassAccuracy value on hold-out data: 0.6151000261306763
Epoch: 13

Loss on hold-out set: 1.165605967092514
Accuracy on hold-out set: 0.60565
MulticlassAccuracy value on hold-out data: 0.605650007724762
Epoch: 14

Loss on hold-out set: 1.2085530945539475
Accuracy on hold-out set: 0.59525
MulticlassAccuracy value on hold-out data: 0.5952500104904175
Epoch: 15

Loss on hold-out set: 1.1548666001081467
Accuracy on hold-out set: 0.6063
MulticlassAccuracy value on hold-out data: 0.6062999963760376
Early stopping at epoch 14
Returned to Spot: Validation loss: 1.1548666001081467
----------------------------------------------
```

```
Loss on hold-out set: 1.1454311431884765
Accuracy on hold-out set: 0.6124
MulticlassAccuracy value on hold-out data: 0.6123999953269958
Final evaluation: Validation loss: 1.1454311431884765
Final evaluation: Validation metric: 0.6123999953269958
----------------------------------------------
```

```
(1.1454311431884765, nan, tensor(0.6124))
```

20.14.5 Detailed Hyperparameter Plots

The contour plots in this section visualize the interactions of the three most important hyperparameters. Since some of these hyperparameters take fatorial or integer values, sometimes step-like fitness landcapes (or response surfaces) are generated. SPOT draws the interactions of the main hyperparameters by default. It is also possible to visualize all interactions.

```python
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

```
l1:  100.0
l2:  8.398814791105355
batch_size:  85.59291385863513
optimizer:  0.8016597261963017
```

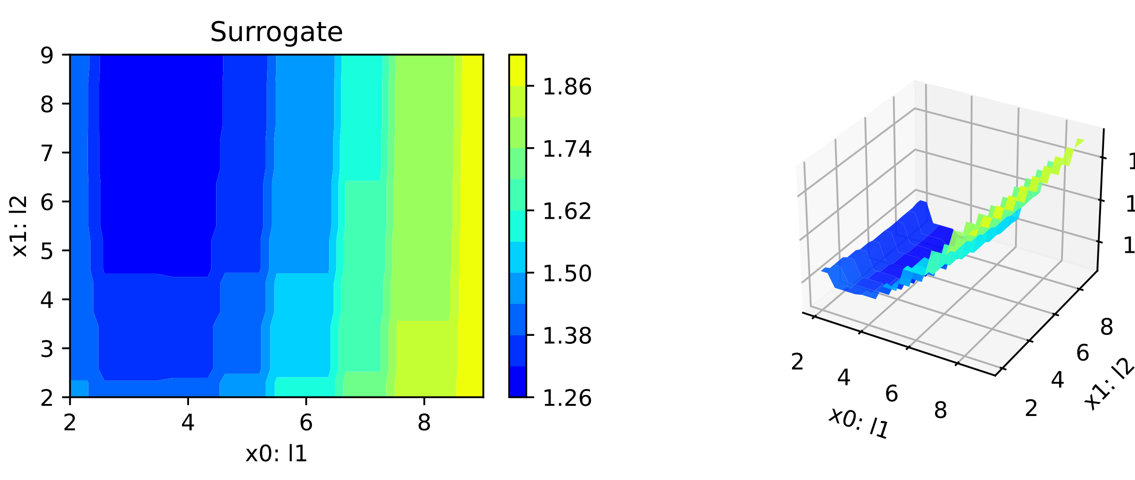
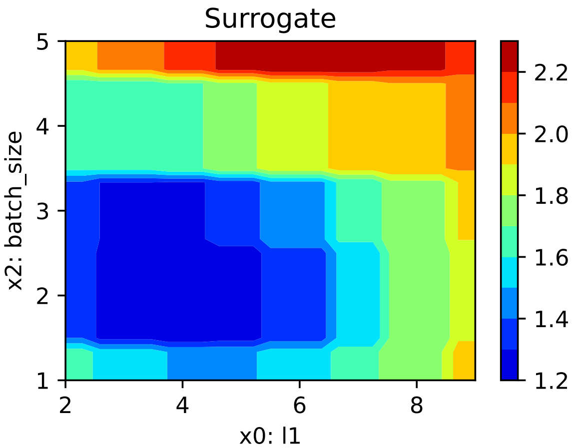
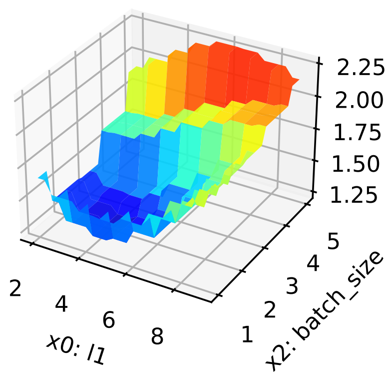
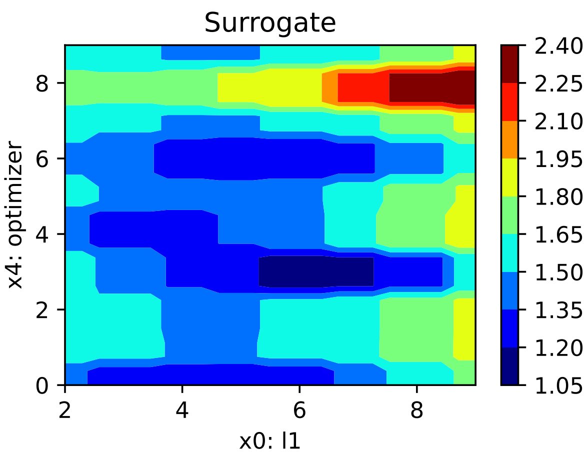
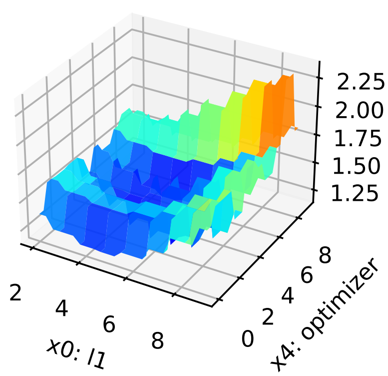


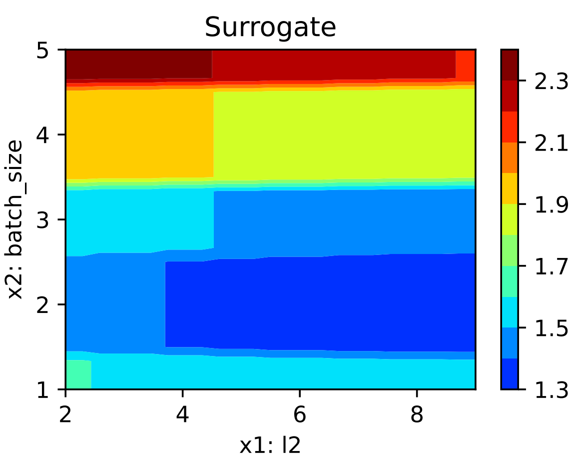
Figure 20.5: Contour plots.

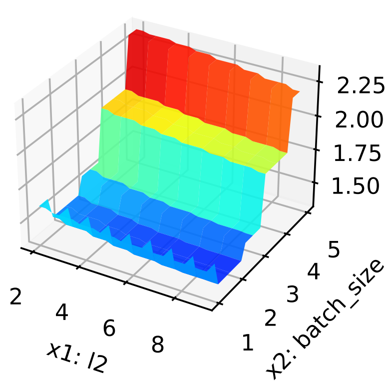

Surrogate
x2: batch_size
x0: l1
1 2 3 4 5
2 4 6 8
1.2 1.4 1.6 1.8 2.0 2.2

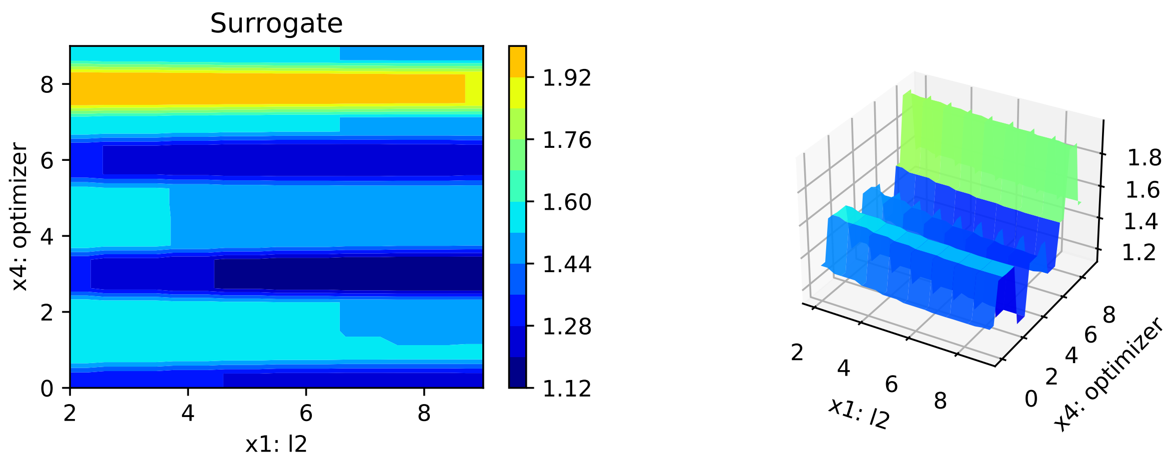

x0: l1
x2: batch_size
2 4 6 8
1 2 3 4 5
1.25 1.50 1.75 2.00 2.25

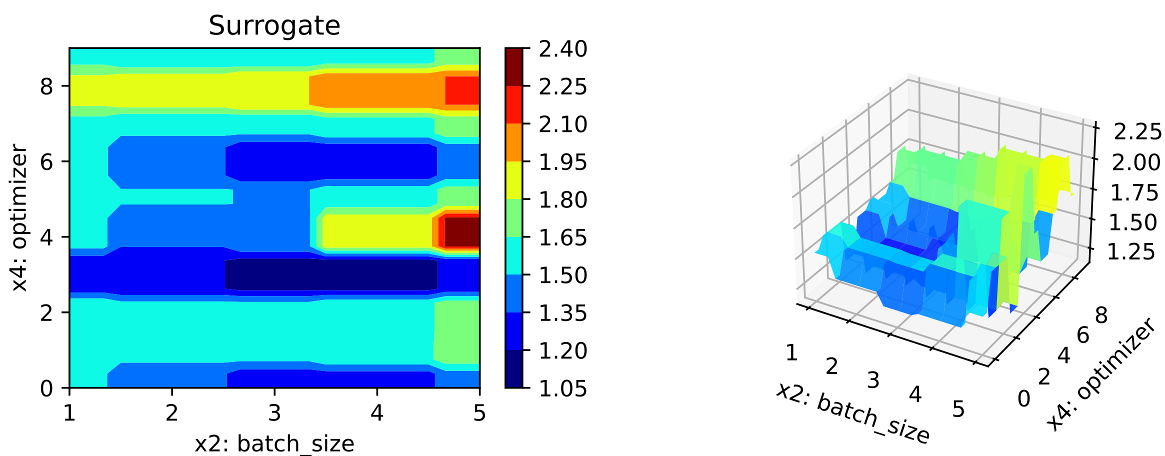

Surrogate
x4: optimizer
x0: l1
0 2 4 6 8
2 4 6 8
1.05 1.20 1.35 1.50 1.65 1.80 1.95 2.10 2.25 2.40


x0: l1
x4: optimizer
2 4 6 8
0 2 4 6 8
1.25 1.50 1.75 2.00 2.25


Surrogate
x2: batch_size
x1: l2
1 2 3 4 5
2 4 6 8
1.3 1.5 1.7 1.9 2.1 2.3


x1: l2
x2: batch_size
2 4 6 8
1 2 3 4 5
1.50 1.75 2.00 2.25





The figures (**?@fig-contour**) show the contour plots of the loss as a function of the hyperparameters. These plots are very helpful for benchmark studies and for understanding neural networks. `spotPython` provides additional tools for a visual inspection of the results and give valuable insights into the hyperparameter tuning process. This is especially useful for model explainability, transparency, and trustworthiness. In addition to the contour plots, **?@fig-parallel** shows the parallel plot of the hyperparameters.

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

Parallel coordinates plots

```
Unable to display output for mime type(s): text/html
```

20.15 Summary and Outlook

This tutorial presents the hyperparameter tuning open source software `spotPython` for `PyTorch`. To show its basic features, a comparison with the "official" `PyTorch` hyperparameter tuning tutorial (PyTorch 2023a) is presented. Some of the advantages of `spotPython` are:

- Numerical and categorical hyperparameters.
- Powerful surrogate models.
- Flexible approach and easy to use.
- Simple JSON files for the specification of the hyperparameters.
- Extension of default and user specified network classes.
- Noise handling techniques.
- Interaction with `tensorboard`.

Currently, only rudimentary parallel and distributed neural network training is possible, but these capabilities will be extended in the future. The next version of `spotPython` will also include a more detailed documentation and more examples.

> **!** Important
>
> Important: This tutorial does not present a complete benchmarking study (Bartz-Beielstein et al. 2020). The results are only preliminary and highly dependent on the local configuration (hard- and software). Our goal is to provide a first impression of the performance of the hyperparameter tuning package `spotPython`. To demonstrate its capabilities, a quick comparison with `ray[tune]` was performed. `ray[tune]` was chosen, because it is presented as "an industry standard tool for distributed hyperparameter tuning." The results should be interpreted with care.

20.16 Appendix

20.16.1 Sample Output From Ray Tune's Run

The output from `ray[tune]` could look like this (PyTorch 2023b):

```
Number of trials: 10 (10 TERMINATED)
------+------+-------------+--------------+---------+------------+--------------------+
|   l1 |   l2 |          lr |   batch_size |    loss |   accuracy | training_iteration |
```

```
+------+------+-------------+--------------+---------+------------+--------------------|
|   64 |    4 | 0.00011629  |            2 | 1.87273 |     0.244  |                  2 |
|   32 |   64 | 0.000339763 |            8 | 1.23603 |     0.567  |                  8 |
|    8 |   16 | 0.00276249  |           16 | 1.1815  |     0.5836 |                 10 |
|    4 |   64 | 0.000648721 |            4 | 1.31131 |     0.5224 |                  8 |
|   32 |   16 | 0.000340753 |            8 | 1.26454 |     0.5444 |                  8 |
|    8 |    4 | 0.000699775 |            8 | 1.99594 |     0.1983 |                  2 |
|  256 |    8 | 0.0839654   |           16 | 2.3119  |     0.0993 |                  1 |
|   16 |  128 | 0.0758154   |           16 | 2.33575 |     0.1327 |                  1 |
|   16 |    8 | 0.0763312   |           16 | 2.31129 |     0.1042 |                  4 |
|  128 |   16 | 0.000124903 |            4 | 2.26917 |     0.1945 |                  1 |
+-----+------+------+-------------+--------------+---------+------------+-----------------
Best trial config: {'l1': 8, 'l2': 16, 'lr': 0.00276249, 'batch_size': 16, 'data_dir': '..
Best trial final validation loss: 1.181501
Best trial final validation accuracy: 0.5836
Best trial test set accuracy: 0.5806
```

21 Hyperparameter Tuning: sklearn RandomForestClassifier VBDP Data

This document refers to the following software versions:

- `python`: 3.10.10

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                0.2.31
spotRiver                 0.0.93
```

```
Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

21.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time and the initial design size.

```
MAX_TIME = 1
INIT_SIZE = 5
ORIGINAL = False
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '16-sklearn' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
16-sklearn_p040025_1min_5init_2023-06-16_15-15-14
```

```
import warnings
warnings.filterwarnings("ignore")
```

21.2 Step 1: Initialization of the Empty `fun_control` Dictionary

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/16_spot_hpt_sklearn_classification")
```

21.3 1. Load Data: Classification

21.4 VBDP

```
import pandas as pd
if ORIGINAL == True:
    train_df = pd.read_csv('./data/VBDP/trainn.csv')
    test_df = pd.read_csv('./data/VBDP/testt.csv')
```

```
else:
    train_df = pd.read_csv('./data/VBDP/train.csv')
    # remove the id column
    train_df = train_df.drop(columns=['id'])
```

```
from sklearn.preprocessing import OrdinalEncoder
n_samples = train_df.shape[0]
n_features = train_df.shape[1] - 1
target_column = "prognosis"
# Encoder our prognosis labels as integers for easier decoding later
enc = OrdinalEncoder()
train_df[target_column] = enc.fit_transform(train_df[[target_column]])
train_df.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train_df.shape)
train_df.head()
```

```
(707, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	...	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0
3	0.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	...	0.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0

The full data set `train_df` 64 features. The target column is labeled as `prognosis`.

21.5 Holdout Train and Test Data

We split out a hold-out test set (25% of the data) so we can calculate an example MAP@K

```
import numpy as np
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(train_df.drop(target_column, axis=1),
                                                    random_state=42,
                                                    test_size=0.25,
                                                    stratify=train_df[target_column])
train = pd.DataFrame(np.hstack((X_train, np.array(y_train).reshape(-1, 1))))
```

```
test = pd.DataFrame(np.hstack((X_test, np.array(y_test).reshape(-1, 1))))
train.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
test.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train.shape)
print(test.shape)
train.head()
```

```
(530, 65)
(177, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0
3	1.0	1.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
# add the dataset to the fun_control
fun_control.update({"data": train_df, # full dataset,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": target_column})
```

21.6 Step 3: Specification of the Preprocessing Model

Data preprocesssing can be very simple, e.g., you can ignore it. Then you would choose the `prep_model` "None":

```
prep_model = None
fun_control.update({"prep_model": prep_model})
```

A default approach for numerical data is the `StandardScaler` (mean 0, variance 1). This can be selected as follows:

```
# prep_model = StandardScaler()
# fun_control.update({"prep_model": prep_model})
```

Even more complicated pre-processing steps are possible, e.g., the follwing pipeline:

```
# categorical_columns = []
# one_hot_encoder = OneHotEncoder(handle_unknown="ignore", sparse_output=False)
# prep_model = ColumnTransformer(
#         transformers=[
#             ("categorical", one_hot_encoder, categorical_columns),
#         ],
#         remainder=StandardScaler(),
#     )
```

21.7 Step 4: Select `algorithm` and `core_model_hyper_dict`

The selection of the algorithm (ML model) that should be tuned is done by specifying the its name from the `sklearn` implementation. For example, the `SVC` support vector machine classifier is selected as follows:

`fun_control = add_core_model_to_fun_control(SVC, fun_control, SklearnHyperDict)`

Other core_models are, e.g.,:

- RidgeCV
- GradientBoostingRegressor
- ElasticNet
- RandomForestClassifier
- LogisticRegression
- KNeighborsClassifier
- RandomForestClassifier
- GradientBoostingClassifier
- HistGradientBoostingClassifier

We will use the `RandomForestClassifier` classifier in this example.

```
from sklearn.linear_model import RidgeCV
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.linear_model import ElasticNet
from spotPython.hyperparameters.values import add_core_model_to_fun_control
```

```python
from spotPython.data.sklearn_hyper_dict import SklearnHyperDict
from spotPython.fun.hypersklearn import HyperSklearn
```

```python
# core_model  = RidgeCV
# core_model = GradientBoostingRegressor
# core_model = ElasticNet
core_model = RandomForestClassifier
# core_model = SVC
# core_model = LogisticRegression
# core_model = KNeighborsClassifier
# core_model = GradientBoostingClassifier
fun_control = add_core_model_to_fun_control(core_model=core_model,
                              fun_control=fun_control,
                              hyper_dict=SklearnHyperDict,
                              filename=None)
```

Now `fun_control` has the information from the JSON file. The available hyperparameters are:

```python
print(*fun_control["core_model_hyper_dict"].keys(), sep="\n")
```

```
n_estimators
criterion
max_depth
min_samples_split
min_samples_leaf
min_weight_fraction_leaf
max_features
max_leaf_nodes
min_impurity_decrease
bootstrap
oob_score
```

21.8 Step 5: Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

21.8.1 Modify hyperparameter of type numeric and integer (boolean)

Numeric and boolean values can be modified using the `modify_hyper_parameter_bounds` method. For example, to change the `tol` hyperparameter of the `SVC` model to the interval

[1e-3, 1e-2], the following code can be used:

`fun_control = modify_hyper_parameter_bounds(fun_control, "tol", bounds=[1e-3, 1e-2])`

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
# fun_control = modify_hyper_parameter_bounds(fun_control, "tol", bounds=[1e-3, 1e-2])
# fun_control = modify_hyper_parameter_bounds(fun_control, "min_samples_split", bounds=[3,
# fun_control = modify_hyper_parameter_bounds(fun_control, "dual", bounds=[0, 0])
# fun_control = modify_hyper_parameter_bounds(fun_control, "probability", bounds=[1, 1])
# fun_control["core_model_hyper_dict"]["tol"]
# fun_control = modify_hyper_parameter_bounds(fun_control, "min_samples_leaf", bounds=[1,
# fun_control = modify_hyper_parameter_bounds(fun_control, "n_estimators", bounds=[5, 10])
```

21.8.2 Modify hyperparameter of type factor

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

Factors can be modified with the `modify_hyper_parameter_levels` function. For example, to exclude the `sigmoid` kernel from the tuning, the `kernel` hyperparameter of the `SVC` model can be modified as follows:

`fun_control = modify_hyper_parameter_levels(fun_control, "kernel", ["linear", "rbf"])`

The new setting can be controlled via:

`fun_control["core_model_hyper_dict"]["kernel"]`

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
# XGBoost:
# fun_control = modify_hyper_parameter_levels(fun_control, "loss", ["log_loss"])
```

> **Note: RandomForestClassifier and Out-of-bag Estimation**
>
> Since `oob_score` requires the `bootstrap` hyperparameter to `True`, we set the `oob_score` parameter to `False`. The `oob_score` is later discussed in Section 24.11.1.

```
fun_control = modify_hyper_parameter_bounds(fun_control, "bootstrap", bounds=[0, 1])
fun_control = modify_hyper_parameter_bounds(fun_control, "oob_score", bounds=[0, 0])
```

21.8.3 Optimizers

Optimizers are described in Section 20.6.

21.9 5. Selection of the Objective: Metric and Loss Functions

- Machine learning models are optimized with respect to a metric, for example, the `accuracy` function.
- Deep learning, e.g., neural networks are optimized with respect to a loss function, for example, the `cross_entropy` function and evaluated with respect to a metric, for example, the `accuracy` function.

21.10 Step 6: Selection of the Objective (Loss) Function

The loss function, that is usually used in deep learning for optimizing the weights of the net, is stored in the `fun_control` dictionary as `"loss_function"`.

21.10.1 Metric Function

There are two different types of metrics in `spotPython`:

1. `"metric_river"` is used for the river based evaluation via `eval_oml_iter_progressive`.
2. `"metric_sklearn"` is used for the sklearn based evaluation.

We will consider multi-class classification metrics, e.g., `mapk_score` and `top_k_accuracy_score`.

> **Predict Probabilities**
>
> In this multi-class classification example the machine learning algorithm should return the probabilities of the specific classes (`"predict_proba"`) instead of the predicted values.

We set `"predict_proba"` to `True` in the `fun_control` dictionary.

21.10.1.1 The MAPK Metric

To select the MAPK metric, the following two entries can be added to the `fun_control` dictionary:

`"metric_sklearn": mapk_score"`

`"metric_params": {"k": 3}`.

21.10.1.2 Other Metrics

Alternatively, other metrics for multi-class classification can be used, e.g.,: * top_k_accuracy_score or * roc_auc_score

The metric `roc_auc_score` requires the parameter `"multi_class"`, e.g.,

`"multi_class": "ovr"`.

This is set in the `fun_control` dictionary.

> **Weights**
>
> `spotPython` performs a minimization, therefore, metrics that should be maximized have to be multiplied by -1. This is done by setting `"weights"` to `-1`.

- The complete setup for the metric in our example is:

```
from spotPython.utils.metrics import mapk_score
fun_control.update({
               "weights": -1,
               "metric_sklearn": mapk_score,
               "predict_proba": True,
               "metric_params": {"k": 3},
               })
```

21.11 Evaluation on Hold-out Data

- The default method for computing the performance is `"eval_holdout"`.
- Alternatively, cross-validation can be used for every machine learning model.
- Specifically for RandomForests, the OOB-score can be used.

```
fun_control.update({
    "eval": "train_hold_out",
})
```

21.11.1 OOB Score

Using the OOB-Score is a very efficient way to estimate the performance of a random forest classifier. The OOB-Score is calculated on the training data and does not require a hold-out

test set. If the OOB-Score is used, the key "eval" in the `fun_control` dictionary should be set to `"oob_score"` as shown below.

> **OOB-Score**
>
> In addition to setting the key `"eval"` in the `fun_control` dictionary to `"oob_score"`, the keys `"oob_score"` and `"bootstrap"` have to be set to `True`, because the OOB-Score requires the bootstrap method.

- Uncomment the following lines to use the OOB-Score:

```
fun_control.update({
    "eval": "eval_oob_score",
})
fun_control = modify_hyper_parameter_bounds(fun_control, "bootstrap", bounds=[1, 1])
fun_control = modify_hyper_parameter_bounds(fun_control, "oob_score", bounds=[1, 1])
```

21.11.1.1 Cross Validation

Instead of using the OOB-score, the classical cross validation can be used. The number of folds is set by the key `"k_folds"`. For example, to use 5-fold cross validation, the key `"k_folds"` is set to `5`. Uncomment the following line to use cross validation:

```
# fun_control.update({
#      "eval": "train_cv",
#      "k_folds": 10,
# })
```

21.12 6. Calling the SPOT Function

21.13 Preparing the SPOT Call

- Get types and variable names as well as lower and upper bounds for the hyperparameters.

```
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
```

```python
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```python
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name                     | type   | default   |   lower |   upper | transform
|--------------------------|--------|-----------|---------|---------|------------------------
| n_estimators             | int    | 7         |       5 |   10    | transform_power_2_int
| criterion                | factor | gini      |       0 |    2    | None
| max_depth                | int    | 10        |       1 |   20    | transform_power_2_int
| min_samples_split        | int    | 2         |       2 |  100    | None
| min_samples_leaf         | int    | 1         |       1 |   25    | None
| min_weight_fraction_leaf | float  | 0.0       |       0 |    0.01 | None
| max_features             | factor | sqrt      |       0 |    1    | transform_none_to_None
| max_leaf_nodes           | int    | 10        |       7 |   12    | transform_power_2_int
| min_impurity_decrease    | float  | 0.0       |       0 |    0.01 | None
| bootstrap                | factor | 1         |       1 |    1    | None
| oob_score                | factor | 0         |       1 |    1    | None
```

21.14 The Objective Function

The objective function is selected next. It implements an interface from `sklearn`'s training, validation, and testing methods to `spotPython`.

```python
from spotPython.fun.hypersklearn import HyperSklearn
fun = HyperSklearn().fun_sklearn
```

21.14.1 Run the `Spot` Optimizer

- Run SPOT for approx. x mins (`max_time`).
- Note: the run takes longer, because the evaluation time of initial design (here: `initi_size`, 20 points) is not considered.

```python
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=SklearnHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
X_start
```

```
array([[ 7.,  0., 10.,  2.,  1.,  0.,  0., 10.,  0.,  1.,  0.]])
```

```python
import numpy as np
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models= False,
                   show_progress= True,
                   fun_control = fun_control,
                   design_control={"init_size": INIT_SIZE,
                                   "repeats": 1},
                   surrogate_control={"noise": True,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": len(var_name),
                                      "model_fun_evals": 10_000,
                                      "log_level": 50
                                      })
spot_tuner.run(X_start=X_start)
```

```
spotPython tuning: -0.33050314465408803 [----------] 1.40%
```

```
spotPython tuning: -0.33050314465408803 [----------] 3.44%

spotPython tuning: -0.33333333333333337 [----------] 4.56%

spotPython tuning: -0.3396226415094339 [#---------] 5.47%

spotPython tuning: -0.3396226415094339 [#---------] 6.46%

spotPython tuning: -0.3396226415094339 [#---------] 7.43%

spotPython tuning: -0.3396226415094339 [#---------] 8.31%

spotPython tuning: -0.3396226415094339 [#---------] 9.25%

spotPython tuning: -0.3462264150943396 [#---------] 10.02%

spotPython tuning: -0.3462264150943396 [#---------] 11.17%

spotPython tuning: -0.3462264150943396 [#---------] 12.68%

spotPython tuning: -0.3462264150943396 [#---------] 14.49%

spotPython tuning: -0.3462264150943396 [##--------] 16.85%

spotPython tuning: -0.3462264150943396 [##--------] 19.13%

spotPython tuning: -0.3462264150943396 [##--------] 21.41%

spotPython tuning: -0.3462264150943396 [##--------] 23.71%

spotPython tuning: -0.3462264150943396 [###-------] 25.81%

spotPython tuning: -0.3462264150943396 [###-------] 27.70%

spotPython tuning: -0.3462264150943396 [###-------] 29.41%

spotPython tuning: -0.3462264150943396 [###-------] 31.44%
```

```
spotPython tuning: -0.3462264150943396 [###-------] 32.68%

spotPython tuning: -0.3462264150943396 [###-------] 34.05%

spotPython tuning: -0.3462264150943396 [####------] 35.74%

spotPython tuning: -0.3462264150943396 [####------] 37.32%

spotPython tuning: -0.3462264150943396 [####------] 38.37%

spotPython tuning: -0.34874213836477985 [####------] 40.32%

spotPython tuning: -0.34874213836477985 [####------] 42.62%

spotPython tuning: -0.34874213836477985 [#####-----] 45.69%

spotPython tuning: -0.34874213836477985 [#####-----] 49.47%

spotPython tuning: -0.34874213836477985 [#####-----] 52.63%

spotPython tuning: -0.34874213836477985 [######----] 55.12%

spotPython tuning: -0.3606918238993711 [######----] 59.18%

spotPython tuning: -0.3606918238993711 [######----] 63.72%

spotPython tuning: -0.3606918238993711 [#######---] 69.39%

spotPython tuning: -0.3606918238993711 [#######---] 74.97%

spotPython tuning: -0.3606918238993711 [########--] 81.57%

spotPython tuning: -0.3606918238993711 [#########-] 86.53%

spotPython tuning: -0.3606918238993711 [#########-] 91.60%

spotPython tuning: -0.3606918238993711 [##########] 95.96%

spotPython tuning: -0.3606918238993711 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x168ae8f40>
```

21.14.2 Results

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

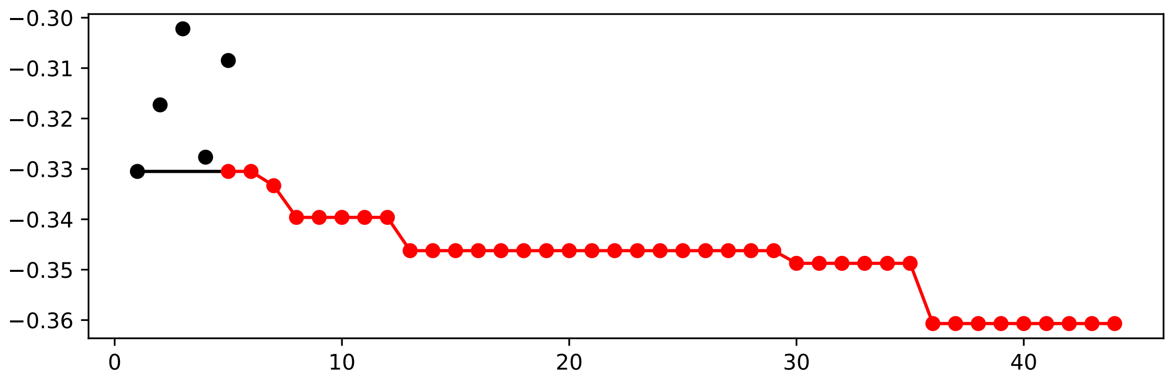


Figure 21.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

- Print the results

```
print(gen_design_table(fun_control=fun_control,
    spot=spot_tuner))
```

name	type	default	lower	upper	tuned
n_estimators	int	7	5.0	10.0	8.0
criterion	factor	gini	0.0	2.0	2.0
max_depth	int	10	1.0	20.0	7.0
min_samples_split	int	2	2.0	100.0	5.0
min_samples_leaf	int	1	1.0	25.0	5.0
min_weight_fraction_leaf	float	0.0	0.0	0.01	0.009373150611341424
max_features	factor	sqrt	0.0	1.0	0.0
max_leaf_nodes	int	10	7.0	12.0	9.0
min_impurity_decrease	float	0.0	0.0	0.01	0.0
bootstrap	factor	1	1.0	1.0	1.0
oob_score	factor	0	1.0	1.0	1.0

21.15 Show variable importance

```
spot_tuner.plot_importance(threshold=0.025, filename="./figures/" + experiment_name+"_impo
```

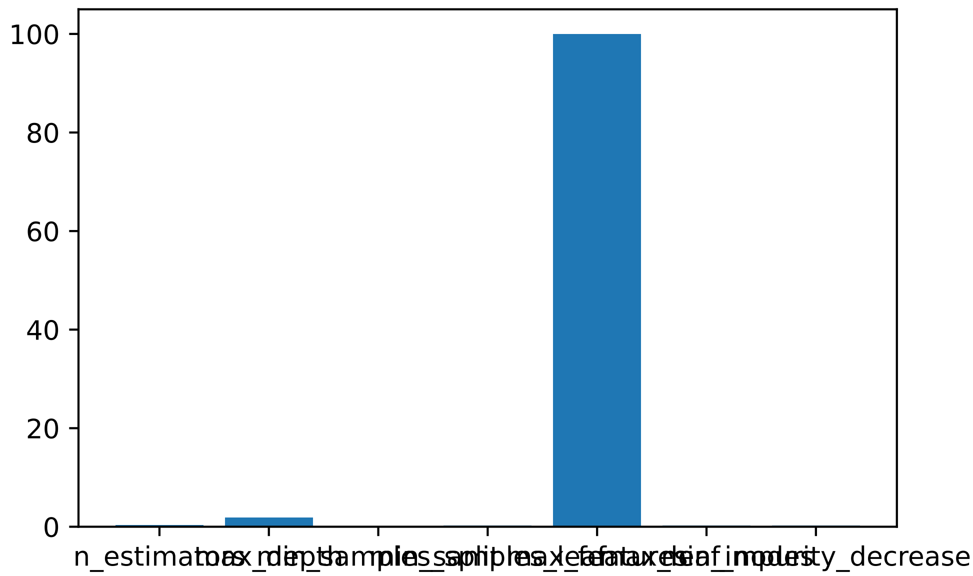


Figure 21.2: Variable importance plot, threshold 0.025.

21.16 Get Default Hyperparameters

```
from spotPython.hyperparameters.values import get_default_values, transform_hyper_paramete
values_default = get_default_values(fun_control)
values_default = transform_hyper_parameter_values(fun_control=fun_control, hyper_parameter
values_default
```

```
{'n_estimators': 128,
 'criterion': 'gini',
 'max_depth': 1024,
 'min_samples_split': 2,
 'min_samples_leaf': 1,
 'min_weight_fraction_leaf': 0.0,
 'max_features': 'sqrt',
 'max_leaf_nodes': 1024,
```

 'min_impurity_decrease': 0.0,
 'bootstrap': 1,
 'oob_score': 0}

```
from sklearn.pipeline import make_pipeline
model_default = make_pipeline(fun_control["prep_model"], fun_control["core_model"](**value
model_default
```

```
Pipeline(steps=[('nonetype', None),
                ('randomforestclassifier',
                 RandomForestClassifier(bootstrap=1, max_depth=1024,
                                        max_leaf_nodes=1024, n_estimators=128,
                                        oob_score=0))])
```

21.17 Get SPOT Results

```
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
print(X)
```

```
[[8.          2.          7.          5.          5.          0.00937315
  0.          9.          0.          1.          1.        ]]
```

```
from spotPython.hyperparameters.values import assign_values, return_conf_list_from_var_dic
v_dict = assign_values(X, fun_control["var_name"])
return_conf_list_from_var_dict(var_dict=v_dict, fun_control=fun_control)
```

```
[{'n_estimators': 256,
  'criterion': 'log_loss',
  'max_depth': 128,
  'min_samples_split': 5,
  'min_samples_leaf': 5,
  'min_weight_fraction_leaf': 0.009373150611341424,
  'max_features': 'sqrt',
  'max_leaf_nodes': 512,
  'min_impurity_decrease': 0.0,
  'bootstrap': 1,
  'oob_score': 1}]
```

```python
from spotPython.hyperparameters.values import get_one_sklearn_model_from_X
model_spot = get_one_sklearn_model_from_X(X, fun_control)
model_spot
```

```
RandomForestClassifier(bootstrap=1, criterion='log_loss', max_depth=128,
                       max_leaf_nodes=512, min_samples_leaf=5,
                       min_samples_split=5,
                       min_weight_fraction_leaf=0.009373150611341424,
                       n_estimators=256, oob_score=1)
```

21.18 Evaluate SPOT Results

- Fetch the data.

```python
from spotPython.utils.convert import get_Xy_from_df
X_train, y_train = get_Xy_from_df(fun_control["train"], fun_control["target_column"])
X_test, y_test = get_Xy_from_df(fun_control["test"], fun_control["target_column"])
X_test.shape, y_test.shape
```

```
((177, 64), (177,))
```

- Fit the model with the tuned hyperparameters. This gives one result:

```python
model_spot.fit(X_train, y_train)
y_pred = model_spot.predict_proba(X_test)
res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
res
```

```
0.36534839924670426
```

```python
def repeated_eval(n, model):
    res_values = []
    for i in range(n):
        model.fit(X_train, y_train)
        y_pred = model.predict_proba(X_test)
        res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
        res_values.append(res)
    mean_res = np.mean(res_values)
```

```
    print(f"mean_res: {mean_res}")
    std_res = np.std(res_values)
    print(f"std_res: {std_res}")
    min_res = np.min(res_values)
    print(f"min_res: {min_res}")
    max_res = np.max(res_values)
    print(f"max_res: {max_res}")
    median_res = np.median(res_values)
    print(f"median_res: {median_res}")
    return mean_res, std_res, min_res, max_res, median_res
```

21.18.1 Handling Non-deterministic Results

- Because the model is non-determinstic, we perform $n = 30$ runs and calculate the mean and standard deviation of the performance metric.

```
_ = repeated_eval(30, model_spot)
```

```
mean_res: 0.35841180163214065
std_res: 0.007090269735312092
min_res: 0.3446327683615819
max_res: 0.37193973634651606
median_res: 0.358286252354049
```

21.18.2 Evalution of the Default Hyperparameters

```
model_default.fit(X_train, y_train)["randomforestclassifier"]
```

```
RandomForestClassifier(bootstrap=1, max_depth=1024, max_leaf_nodes=1024,
                       n_estimators=128, oob_score=0)
```

- One evaluation of the default hyperparameters is performed on the hold-out test set.

```
y_pred = model_default.predict_proba(X_test)
mapk_score(y_true=y_test, y_pred=y_pred, k=3)
```

```
0.3389830508474576
```

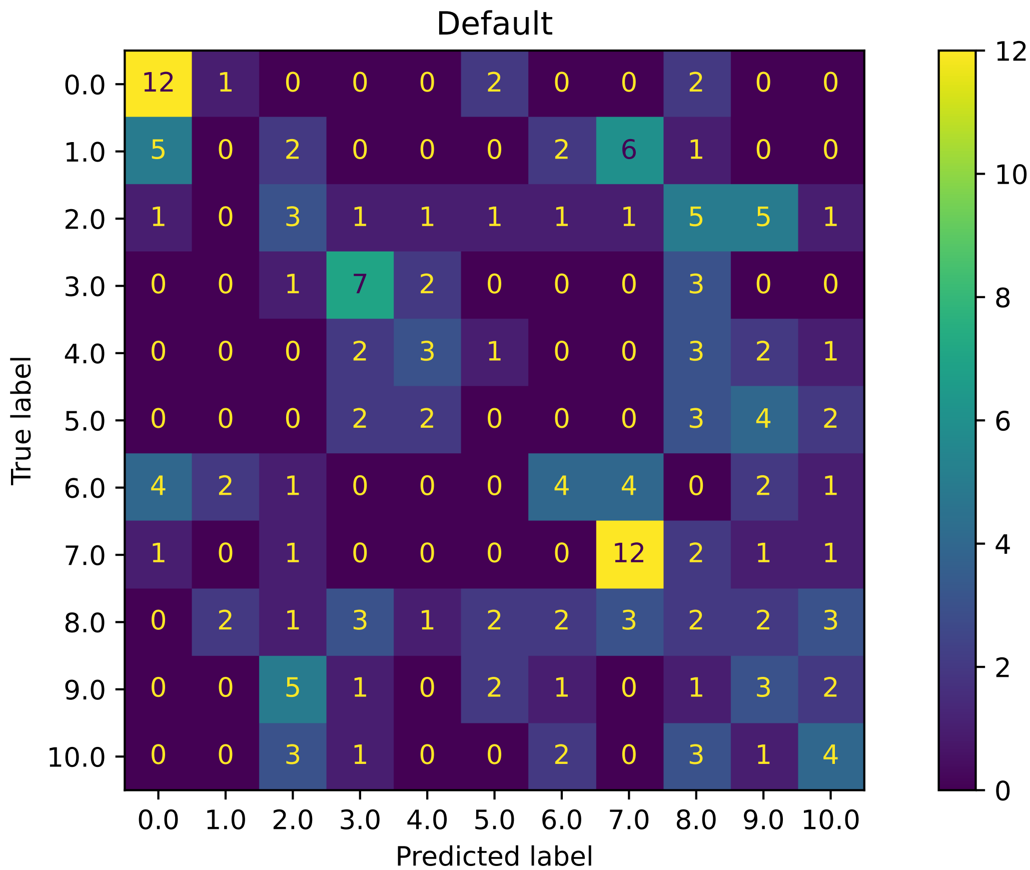
Since one single evaluation is not meaningful, we perform, similar to the evaluation of the SPOT results, $n = 30$ runs of the default setting and and calculate the mean and standard deviation of the performance metric.

```
_ = repeated_eval(30, model_default)
```

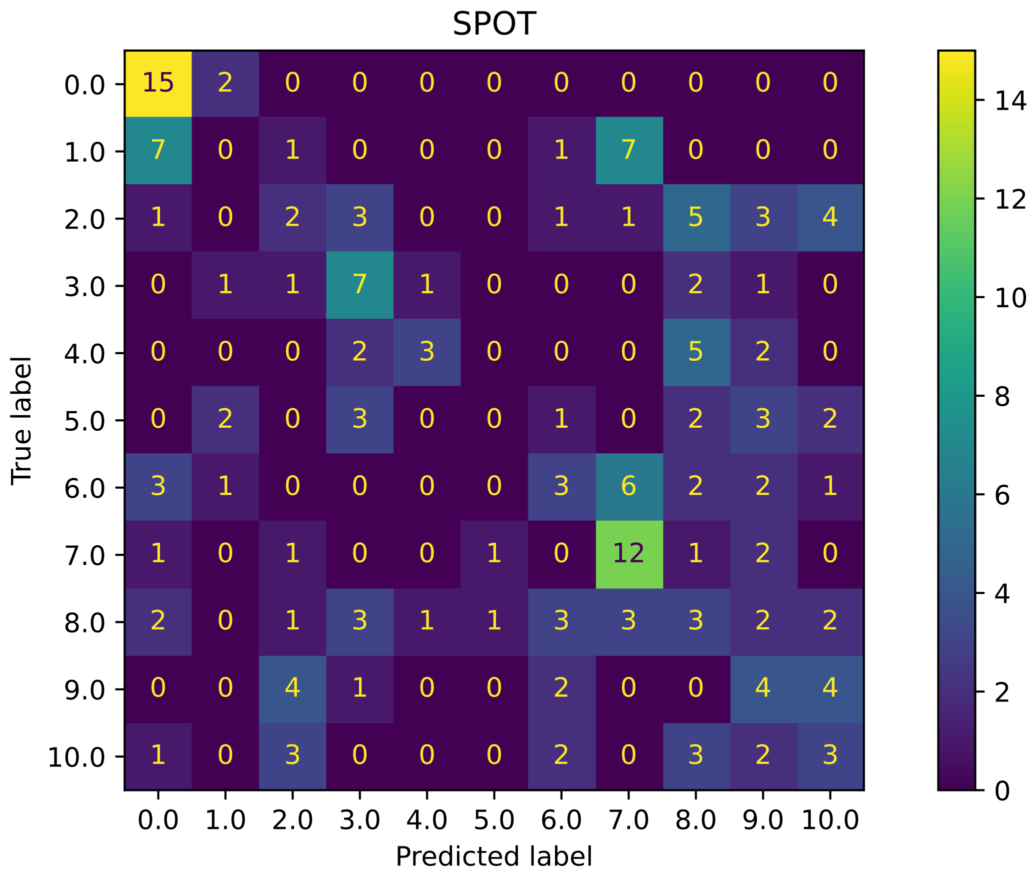
```
mean_res: 0.3409918392969241
std_res: 0.014327340144443429
min_res: 0.3060263653483993
max_res: 0.37099811676082856
median_res: 0.34086629001883234
```

21.19 Plot: Compare Predictions

```
from spotPython.plot.validation import plot_confusion_matrix
plot_confusion_matrix(model_default, fun_control, title = "Default")
```




```
plot_confusion_matrix(model_spot, fun_control, title="SPOT")
```




```
min(spot_tuner.y), max(spot_tuner.y)
```

```
(-0.3606918238993711, -0.2940251572327044)
```

21.20 Cross-validated Evaluations

```
from spotPython.sklearn.traintest import evaluate_cv
fun_control.update({
     "eval": "train_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.36132075471698116, None)
```

```
fun_control.update({
     "eval": "test_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.31029411764705883, None)
```

- This is the evaluation that will be used in the comparison:

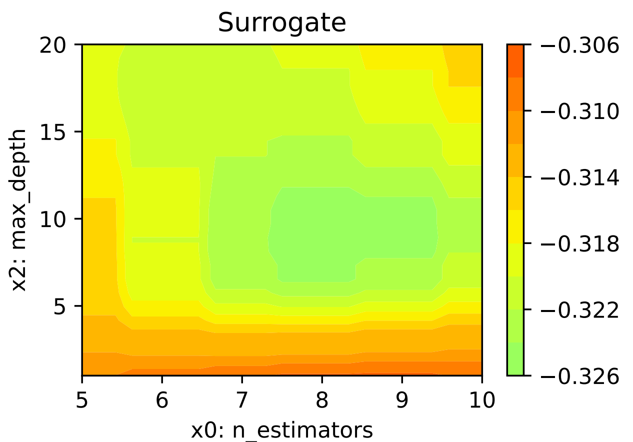
```
fun_control.update({
     "eval": "data_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

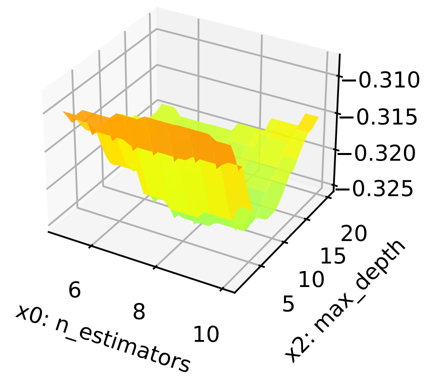
```
(0.3621998658618377, None)
```

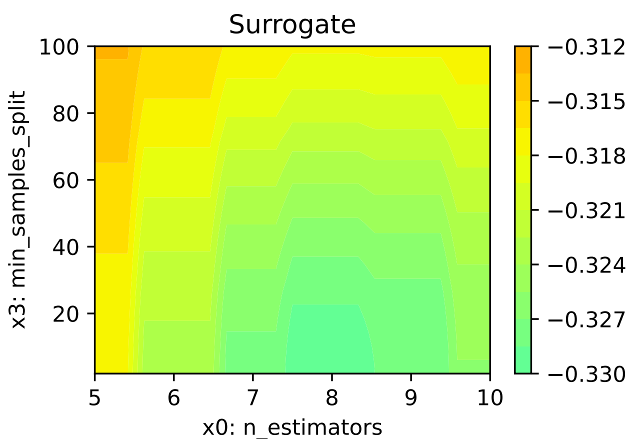
21.20.1 Detailed Hyperparameter Plots

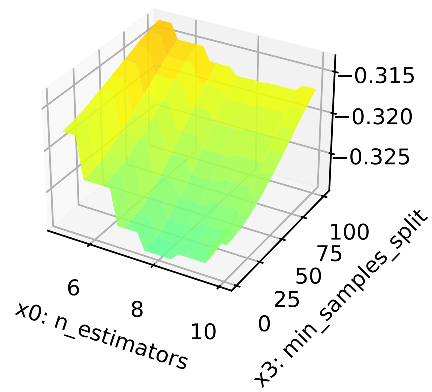
```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

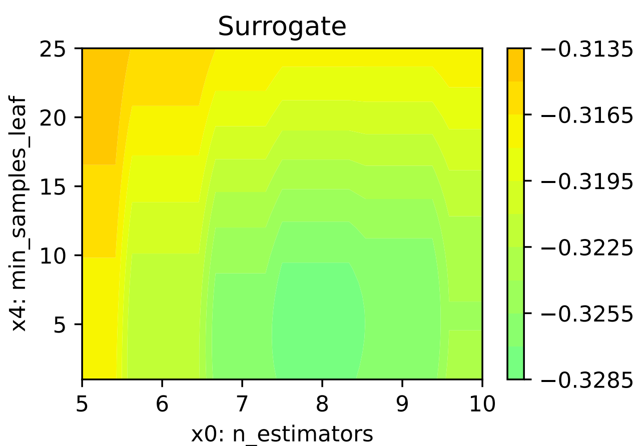
```
n_estimators:  0.3739814096978277
max_depth:  1.862280414684443
min_samples_split:  0.1601572734005499
min_samples_leaf:  0.2890651361036975
max_features:  100.0
max_leaf_nodes:  0.24051536702579265
min_impurity_decrease:  0.20063916669903173
```

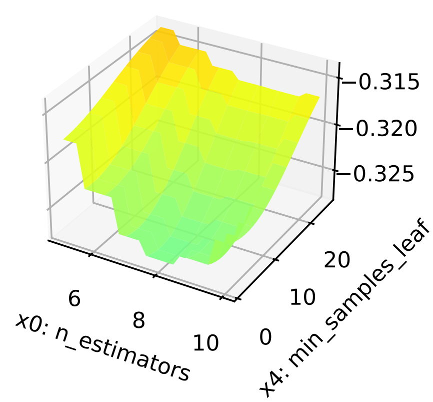

Surrogate
x2: max_depth
x0: n_estimators
20
15
10
5
5
6
7
8
9
10
−0.306
−0.310
−0.314
−0.318
−0.322
−0.326

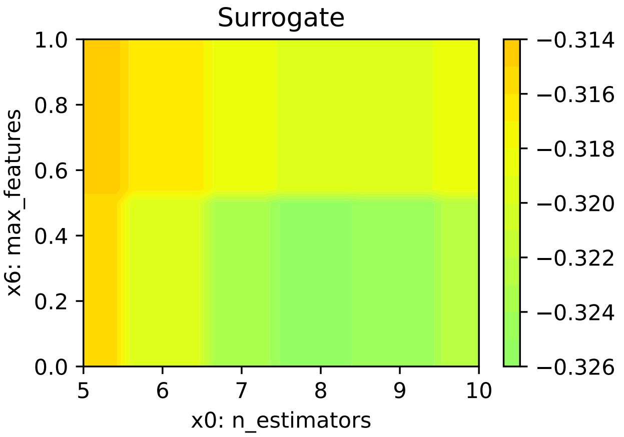

x0: n_estimators
x2: max_depth
6
8
10
5
10
15
20
−0.310
−0.315
−0.320
−0.325

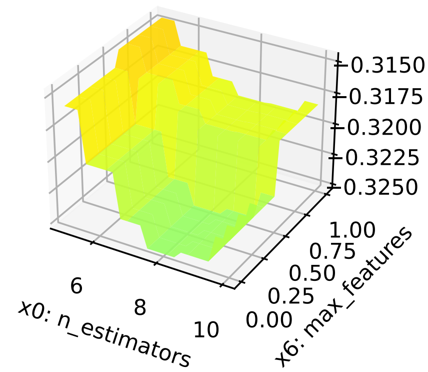

Surrogate
x3: min_samples_split
x0: n_estimators
100
80
60
40
20
5
6
7
8
9
10
−0.312
−0.315
−0.318
−0.321
−0.324
−0.327
−0.330

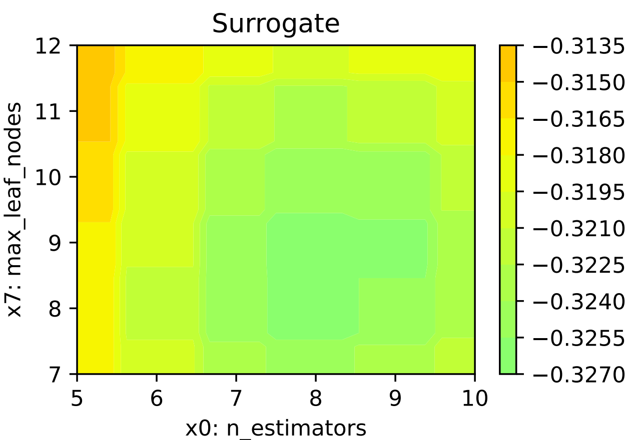

x0: n_estimators
x3: min_samples_split
6
8
10
0
25
50
75
100
−0.315
−0.320
−0.325

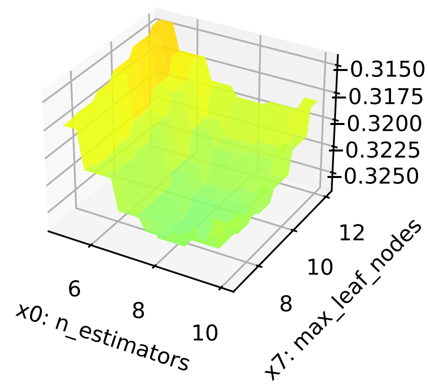

Surrogate
x4: min_samples_leaf
x0: n_estimators
25
20
15
10
5
5
6
7
8
9
10
−0.3135
−0.3165
−0.3195
−0.3225
−0.3255
−0.3285

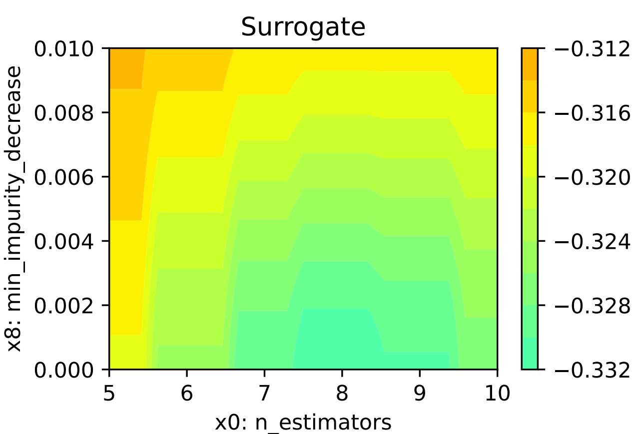

x0: n_estimators
x4: min_samples_leaf
6
8
10
0
10
20
−0.315
−0.320
−0.325

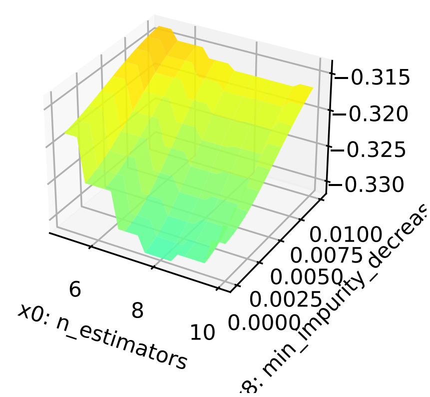

Surrogate
x6: max_features
x0: n_estimators
−0.314
−0.316
−0.318
−0.320
−0.322
−0.324
−0.326

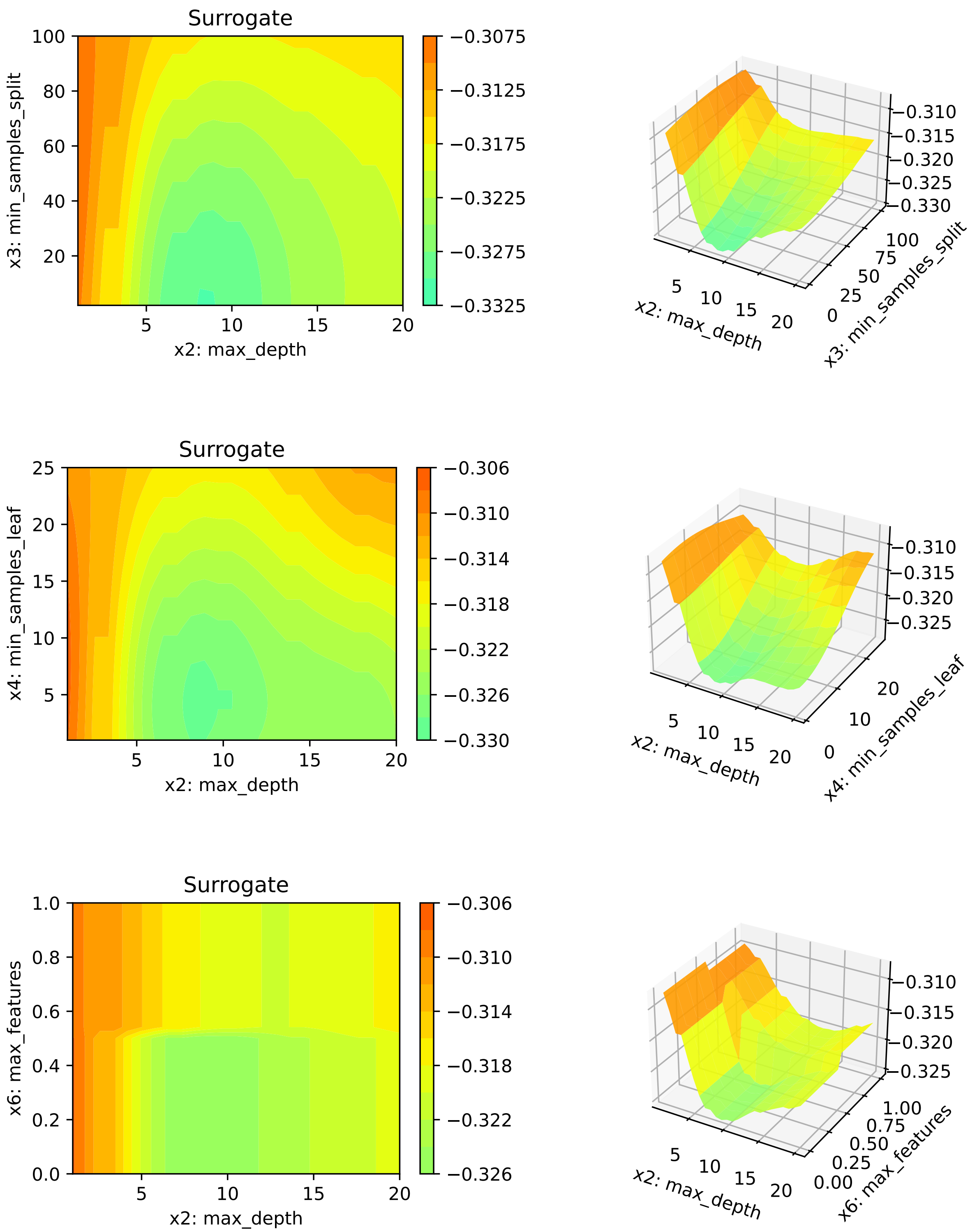

x0: n_estimators
x6: max_features
−0.3150
−0.3175
−0.3200
−0.3225
−0.3250

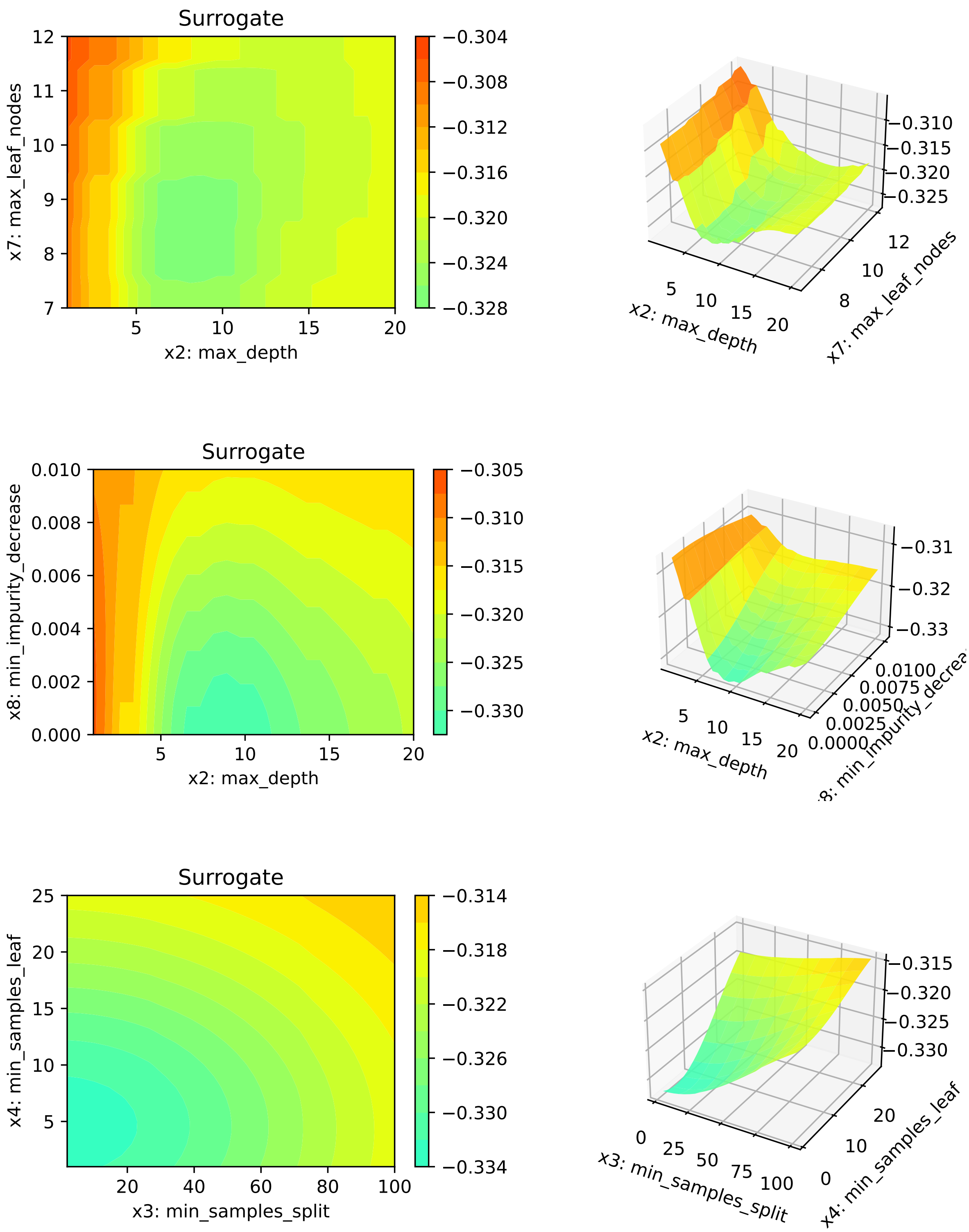

Surrogate
x7: max_leaf_nodes
x0: n_estimators
−0.3135
−0.3150
−0.3165
−0.3180
−0.3195
−0.3210
−0.3225
−0.3240
−0.3255
−0.3270


x0: n_estimators
x7: max_leaf_nodes
−0.3150
−0.3175
−0.3200
−0.3225
−0.3250

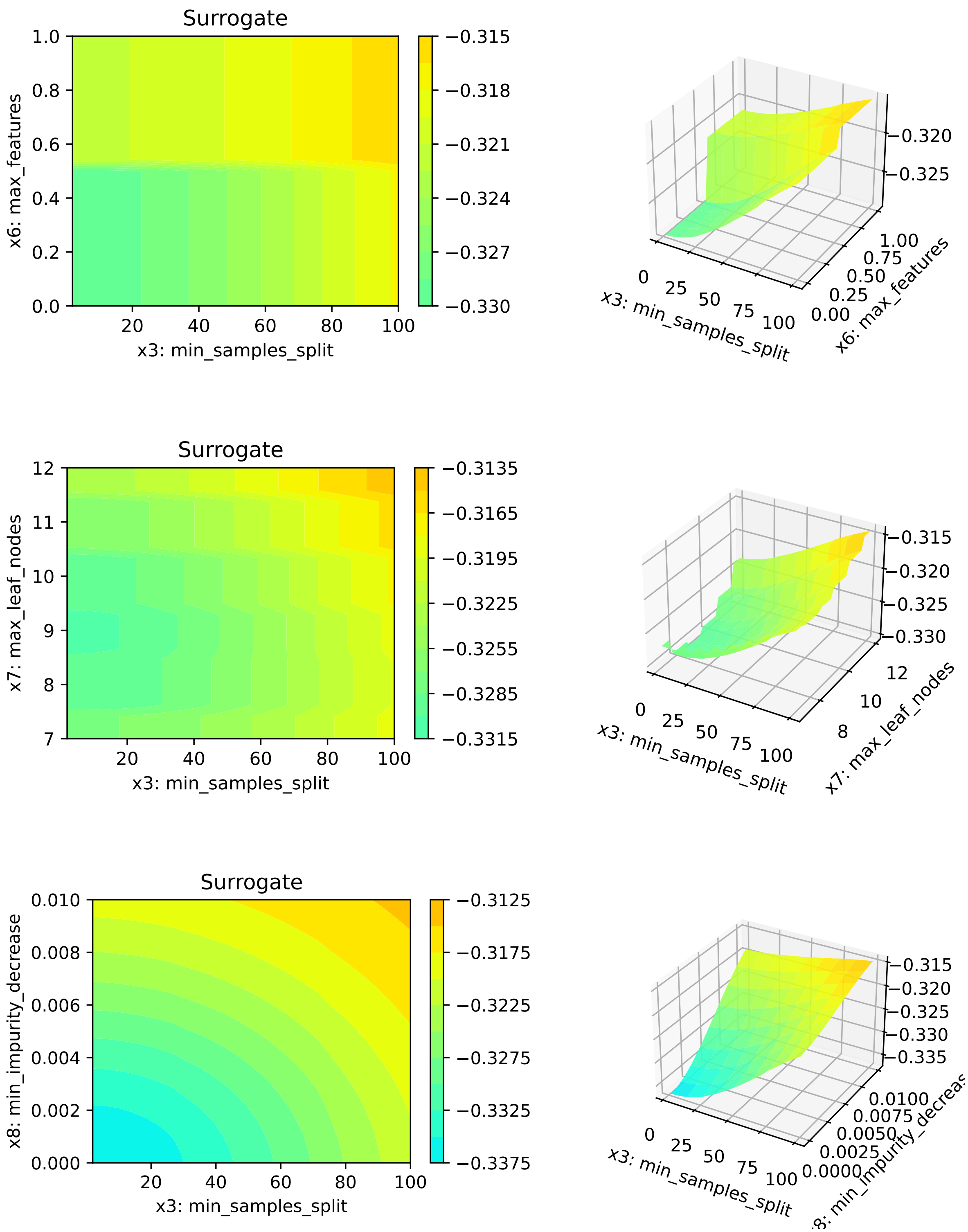

Surrogate
x8: min_impurity_decrease
x0: n_estimators
−0.312
−0.316
−0.320
−0.324
−0.328
−0.332

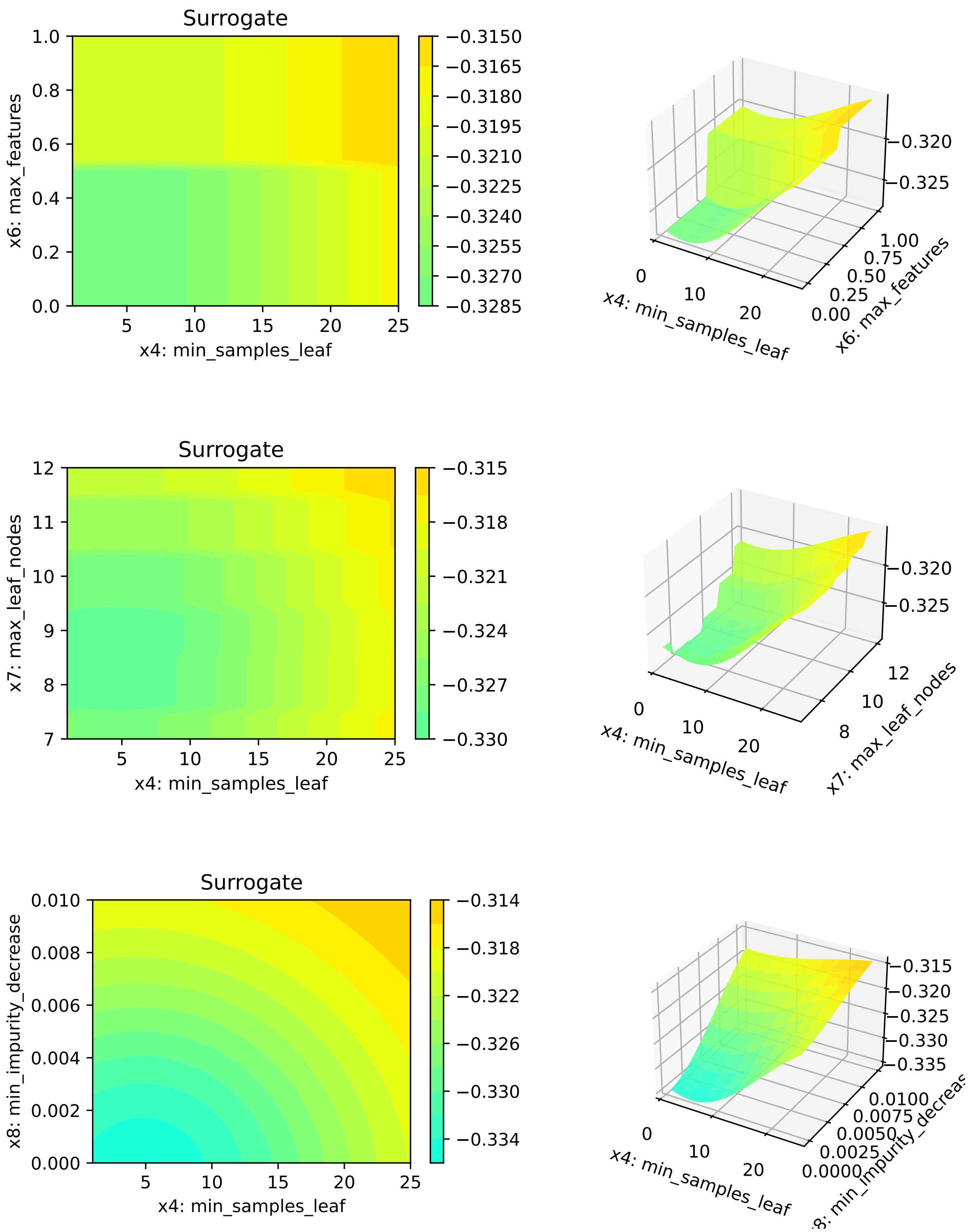

x0: n_estimators
−0.315
−0.320
−0.325
−0.330

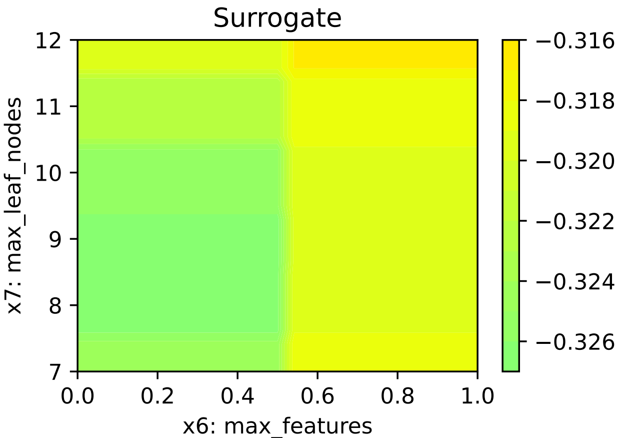

Surrogate
x3: min_samples_split
x2: max_depth
x3: min_samples_split
x2: max_depth
Surrogate
x4: min_samples_leaf
x2: max_depth
x4: min_samples_leaf
x2: max_depth
Surrogate
x6: max_features
x2: max_depth
x6: max_features
x2: max_depth

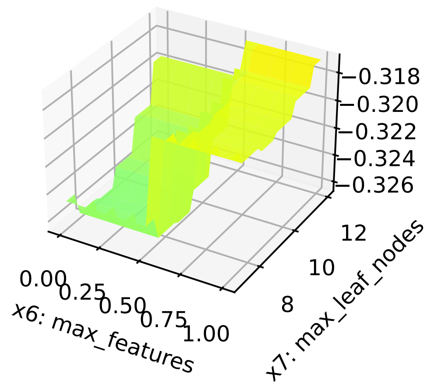


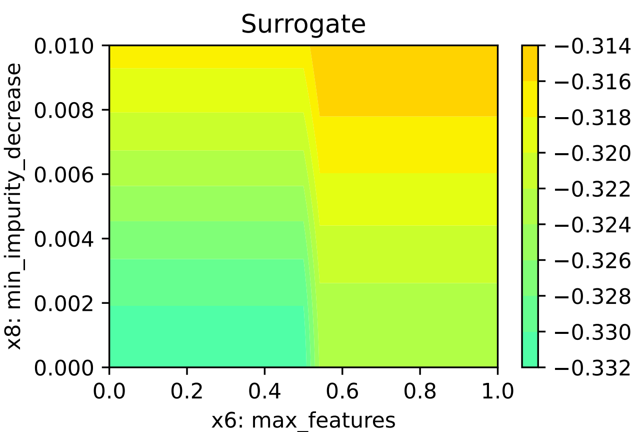
Surrogate
x7: max_leaf_nodes
x2: max_depth
x7: max_leaf_nodes
x2: max_depth
Surrogate
x8: min_impurity_decrease
x2: max_depth
x2: max_depth
Surrogate
x4: min_samples_leaf
x3: min_samples_split
x3: min_samples_split
x4: min_samples_leaf

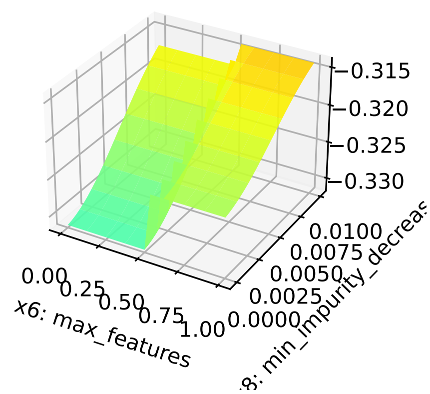

Surrogate
x6: max_features
x3: min_samples_split
−0.315
−0.318
−0.321
−0.324
−0.327
−0.330
Surrogate
x7: max_leaf_nodes
x3: min_samples_split
−0.3135
−0.3165
−0.3195
−0.3225
−0.3255
−0.3285
−0.3315
Surrogate
x8: min_impurity_decrease
x3: min_samples_split
−0.3125
−0.3175
−0.3225
−0.3275
−0.3325
−0.3375

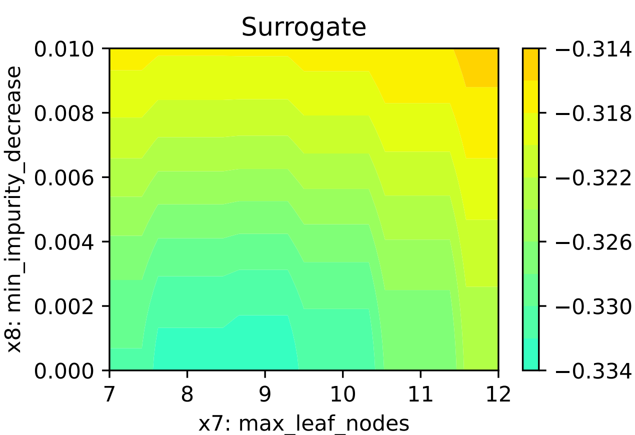

Surrogate
x4: min_samples_leaf
x6: max_features
−0.3150
−0.3165
−0.3180
−0.3195
−0.3210
−0.3225
−0.3240
−0.3255
−0.3270
−0.3285
Surrogate
x4: min_samples_leaf
x7: max_leaf_nodes
−0.315
−0.318
−0.321
−0.324
−0.327
−0.330
Surrogate
x4: min_samples_leaf
x8: min_impurity_decrease
−0.314
−0.318
−0.322
−0.326
−0.330
−0.334

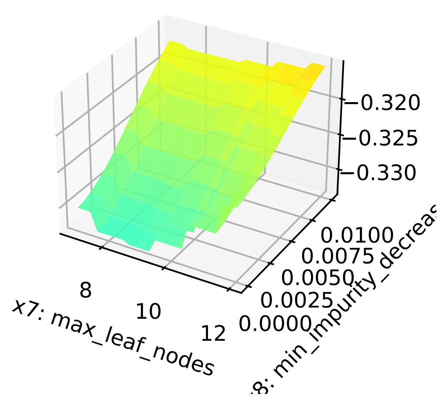

Surrogate
x7: max_leaf_nodes
x6: max_features
−0.316
−0.318
−0.320
−0.322
−0.324
−0.326


x6: max_features
x7: max_leaf_nodes


Surrogate
x8: min_impurity_decrease
x6: max_features
−0.314
−0.316
−0.318
−0.320
−0.322
−0.324
−0.326
−0.328
−0.330
−0.332


x6: max_features


Surrogate
x8: min_impurity_decrease
x7: max_leaf_nodes
−0.314
−0.318
−0.322
−0.326
−0.330
−0.334


x7: max_leaf_nodes

21.21 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

```
Unable to display output for mime type(s): text/html
```

21.22 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

22 Hyperparameter Tuning: sklearn RandomForestClassifier VBDP Data

This document refers to the following software versions:

- `python`: 3.10.10

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                    0.2.31
spotRiver                     0.0.93
```

```
Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

22.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time and the initial design size.

```python
MAX_TIME = 1
INIT_SIZE = 5
ORIGINAL = False
```

```python
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '17-sklearn' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
17-sklearn_p040025_1min_5init_2023-06-16_15-20-50
```

```python
import warnings
warnings.filterwarnings("ignore")
```

22.2 Step 1: Initialization of the Empty `fun_control` Dictionary

```python
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/16_spot_hpt_sklearn_classification")
```

22.3 1. Load Data: Classification

22.4 VBDP

```python
import pandas as pd
if ORIGINAL == True:
    train_df = pd.read_csv('./data/VBDP/trainn.csv')
    test_df = pd.read_csv('./data/VBDP/testt.csv')
```

```
else:
    train_df = pd.read_csv('./data/VBDP/train.csv')
    # remove the id column
    train_df = train_df.drop(columns=['id'])
```

```
from sklearn.preprocessing import OrdinalEncoder
n_samples = train_df.shape[0]
n_features = train_df.shape[1] - 1
target_column = "prognosis"
# Encoder our prognosis labels as integers for easier decoding later
enc = OrdinalEncoder()
train_df[target_column] = enc.fit_transform(train_df[[target_column]])
train_df.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train_df.shape)
train_df.head()
```

```
(707, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	...	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0
3	0.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	...	0.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0

The full data set `train_df` 64 features. The target column is labeled as `prognosis`.

22.5 Holdout Train and Test Data

We split out a hold-out test set (25% of the data) so we can calculate an example MAP@K

```
import numpy as np
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(train_df.drop(target_column, axis=1),
                                                    random_state=42,
                                                    test_size=0.25,
                                                    stratify=train_df[target_column])
train = pd.DataFrame(np.hstack((X_train, np.array(y_train).reshape(-1, 1))))
```

```
test = pd.DataFrame(np.hstack((X_test, np.array(y_test).reshape(-1, 1))))
train.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
test.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train.shape)
print(test.shape)
train.head()
```

```
(530, 65)
(177, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0
3	1.0	1.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
# add the dataset to the fun_control
fun_control.update({"data": train_df, # full dataset,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": target_column})
```

22.6 Step 3: Specification of the Preprocessing Model

Data preprocesssing can be very simple, e.g., you can ignore it. Then you would choose the `prep_model` “None”:

```
prep_model = None
fun_control.update({"prep_model": prep_model})
```

A default approach for numerical data is the `StandardScaler` (mean 0, variance 1). This can be selected as follows:

```
# prep_model = StandardScaler()
# fun_control.update({"prep_model": prep_model})
```

Even more complicated pre-processing steps are possible, e.g., the follwing pipeline:

```
# categorical_columns = []
# one_hot_encoder = OneHotEncoder(handle_unknown="ignore", sparse_output=False)
# prep_model = ColumnTransformer(
#         transformers=[
#             ("categorical", one_hot_encoder, categorical_columns),
#         ],
#         remainder=StandardScaler(),
#     )
```

22.7 Step 4: Select `algorithm` and `core_model_hyper_dict`

The selection of the algorithm (ML model) that should be tuned is done by specifying the its name from the `sklearn` implementation. For example, the `SVC` support vector machine classifier is selected as follows:

`fun_control = add_core_model_to_fun_control(SVC, fun_control, SklearnHyperDict)`

Other core_models are, e.g.,:

- RidgeCV
- GradientBoostingRegressor
- ElasticNet
- RandomForestClassifier
- LogisticRegression
- KNeighborsClassifier
- RandomForestClassifier
- GradientBoostingClassifier
- HistGradientBoostingClassifier

We will use the `RandomForestClassifier` classifier in this example.

```
from sklearn.linear_model import RidgeCV
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.ensemble import HistGradientBoostingClassifier
from sklearn.linear_model import ElasticNet
```

```python
from spotPython.hyperparameters.values import add_core_model_to_fun_control
from spotPython.data.sklearn_hyper_dict import SklearnHyperDict
from spotPython.fun.hypersklearn import HyperSklearn
```

```python
# core_model  = RidgeCV
# core_model = GradientBoostingRegressor
# core_model = ElasticNet
core_model = RandomForestClassifier
# core_model = SVC
# core_model = LogisticRegression
# core_model = KNeighborsClassifier
# core_model = GradientBoostingClassifier
core_model = HistGradientBoostingClassifier
fun_control = add_core_model_to_fun_control(core_model=core_model,
                              fun_control=fun_control,
                              hyper_dict=SklearnHyperDict,
                              filename=None)
```

Now `fun_control` has the information from the JSON file. The available hyperparameters are:

```python
print(*fun_control["core_model_hyper_dict"].keys(), sep="\n")
```

```
loss
learning_rate
max_iter
max_leaf_nodes
max_depth
min_samples_leaf
l2_regularization
max_bins
early_stopping
n_iter_no_change
tol
```

22.8 Step 5: Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

22.8.1 Modify hyperparameter of type numeric and integer (boolean)

Numeric and boolean values can be modified using the `modify_hyper_parameter_bounds` method. For example, to change the `tol` hyperparameter of the `SVC` model to the interval [1e-3, 1e-2], the following code can be used:

`fun_control = modify_hyper_parameter_bounds(fun_control, "tol", bounds=[1e-3, 1e-2])`

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
# fun_control = modify_hyper_parameter_bounds(fun_control, "tol", bounds=[1e-3, 1e-2])
# fun_control = modify_hyper_parameter_bounds(fun_control, "min_samples_split", bounds=[3,
# fun_control = modify_hyper_parameter_bounds(fun_control, "dual", bounds=[0, 0])
# fun_control = modify_hyper_parameter_bounds(fun_control, "probability", bounds=[1, 1])
# fun_control["core_model_hyper_dict"]["tol"]
# fun_control = modify_hyper_parameter_bounds(fun_control, "min_samples_leaf", bounds=[1,
# fun_control = modify_hyper_parameter_bounds(fun_control, "n_estimators", bounds=[5, 10])
```

22.8.2 Modify hyperparameter of type factor

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

Factors can be modified with the `modify_hyper_parameter_levels` function. For example, to exclude the `sigmoid` kernel from the tuning, the `kernel` hyperparameter of the `SVC` model can be modified as follows:

`fun_control = modify_hyper_parameter_levels(fun_control, "kernel", ["linear", "rbf"])`

The new setting can be controlled via:

`fun_control["core_model_hyper_dict"]["kernel"]`

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
# XGBoost:
fun_control = modify_hyper_parameter_levels(fun_control, "loss", ["log_loss"])
```

22.8.3 Optimizers

Optimizers are described in Section 20.6.

22.9 5. Selection of the Objective: Metric and Loss Functions

- Machine learning models are optimized with respect to a metric, for example, the `accuracy` function.
- Deep learning, e.g., neural networks are optimized with respect to a loss function, for example, the `cross_entropy` function and evaluated with respect to a metric, for example, the `accuracy` function.

22.10 Step 6: Selection of the Objective (Loss) Function

The loss function, that is usually used in deep learning for optimizing the weights of the net, is stored in the `fun_control` dictionary as `"loss_function"`.

22.10.1 Metric Function

There are two different types of metrics in `spotPython`:

1. `"metric_river"` is used for the river based evaluation via `eval_oml_iter_progressive`.
2. `"metric_sklearn"` is used for the sklearn based evaluation.

We will consider multi-class classification metrics, e.g., `mapk_score` and `top_k_accuracy_score`.

> **Predict Probabilities**
>
> In this multi-class classification example the machine learning algorithm should return the probabilities of the specific classes (`"predict_proba"`) instead of the predicted values.

We set `"predict_proba"` to `True` in the `fun_control` dictionary.

22.10.1.1 The MAPK Metric

To select the MAPK metric, the following two entries can be added to the `fun_control` dictionary:

`"metric_sklearn": mapk_score"`

`"metric_params": {"k": 3}`.

22.10.1.2 Other Metrics

Alternatively, other metrics for multi-class classification can be used, e.g.,: * top_k_accuracy_score or * roc_auc_score

The metric `roc_auc_score` requires the parameter `"multi_class"`, e.g.,

`"multi_class": "ovr"`.

This is set in the `fun_control` dictionary.

> **Weights**
>
> `spotPython` performs a minimization, therefore, metrics that should be maximized have to be multiplied by -1. This is done by setting `"weights"` to `-1`.

- The complete setup for the metric in our example is:

```
from spotPython.utils.metrics import mapk_score
fun_control.update({
               "weights": -1,
               "metric_sklearn": mapk_score,
               "predict_proba": True,
               "metric_params": {"k": 3},
               })
```

22.11 Evaluation on Hold-out Data

- The default method for computing the performance is `"eval_holdout"`.
- Alternatively, cross-validation can be used for every machine learning model.
- Specifically for RandomForests, the OOB-score can be used.

```
fun_control.update({
    "eval": "train_hold_out",
})
```

22.11.1 OOB Score

Using the OOB-Score is a very efficient way to estimate the performance of a random forest classifier. The OOB-Score is calculated on the training data and does not require a hold-out

test set. If the OOB-Score is used, the key "eval" in the `fun_control` dictionary should be set to `"oob_score"` as shown below.

22.11.1.1 Cross Validation

Instead of using the OOB-score, the classical cross validation can be used. The number of folds is set by the key `"k_folds"`. For example, to use 5-fold cross validation, the key `"k_folds"` is set to `5`. Uncomment the following line to use cross validation:

```
# fun_control.update({
#      "eval": "train_cv",
#      "k_folds": 10,
# })
```

22.12 6. Calling the SPOT Function

22.13 Preparing the SPOT Call

- Get types and variable names as well as lower and upper bounds for the hyperparameters.

```
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name               | type   | default   |   lower |   upper | transform              |
|--------------------|--------|-----------|---------|---------|------------------------|
| loss               | factor | log_loss  |    0    |    0    | None                   |
| learning_rate      | float  | -1.0      |   -5    |    0    | transform_power_10     |
```

```
| max_iter            | int    | 7          |   3     |  10      | transform_power_2_int |
| max_leaf_nodes      | int    | 5          |   1     |  12      | transform_power_2_int |
| max_depth           | int    | 2          |   1     |  20      | transform_power_2_int |
| min_samples_leaf    | int    | 4          |   2     |  10      | transform_power_2_int |
| l2_regularization   | float  | 0.0        |   0     |  10      | None                  |
| max_bins            | int    | 255        | 127     | 255      | None                  |
| early_stopping      | factor | 1          |   0     |   1      | None                  |
| n_iter_no_change    | int    | 10         |   5     |  20      | None                  |
| tol                 | float  | 0.0001     |   1e-05 |   0.001  | None                  |
```

22.14 The Objective Function

The objective function is selected next. It implements an interface from `sklearn`'s training, validation, and testing methods to `spotPython`.

```
from spotPython.fun.hypersklearn import HyperSklearn
fun = HyperSklearn().fun_sklearn
```

22.14.1 Run the `Spot` Optimizer

- Run SPOT for approx. x mins (`max_time`).
- Note: the run takes longer, because the evaluation time of initial design (here: `initi_size`, 20 points) is not considered.

```
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=SklearnHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
X_start
```

```
array([[ 0.00e+00, -1.00e+00,  7.00e+00,  5.00e+00,  2.00e+00,  4.00e+00,
         0.00e+00,  2.55e+02,  1.00e+00,  1.00e+01,  1.00e-04]])
```

```
import numpy as np
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
```

```python
                    fun_repeats = 1,
                    max_time = MAX_TIME,
                    noise = False,
                    tolerance_x = np.sqrt(np.spacing(1)),
                    var_type = var_type,
                    var_name = var_name,
                    infill_criterion = "y",
                    n_points = 1,
                    seed=123,
                    log_level = 50,
                    show_models= False,
                    show_progress= True,
                    fun_control = fun_control,
                    design_control={"init_size": INIT_SIZE,
                                    "repeats": 1},
                    surrogate_control={"noise": True,
                                       "cod_type": "norm",
                                       "min_theta": -4,
                                       "max_theta": 3,
                                       "n_theta": len(var_name),
                                       "model_fun_evals": 10_000,
                                       "log_level": 50
                                       })
spot_tuner.run(X_start=X_start)
```

```
spotPython tuning: -0.3634085213032581 [----------] 2.66%

spotPython tuning: -0.3634085213032581 [#---------] 5.30%

spotPython tuning: -0.3634085213032581 [#---------] 8.26%

spotPython tuning: -0.3634085213032581 [##--------] 15.61%

spotPython tuning: -0.3634085213032581 [##--------] 17.79%

spotPython tuning: -0.3746867167919799 [##--------] 20.76%

spotPython tuning: -0.3746867167919799 [##--------] 24.06%

spotPython tuning: -0.3746867167919799 [###-------] 28.10%
```

```
spotPython tuning: -0.3746867167919799 [###-------] 32.44%

spotPython tuning: -0.3746867167919799 [####------] 37.80%

spotPython tuning: -0.3746867167919799 [####------] 42.77%

spotPython tuning: -0.3746867167919799 [#####-----] 46.31%

spotPython tuning: -0.3746867167919799 [#####-----] 50.79%

spotPython tuning: -0.38345864661654133 [######----] 55.42%

spotPython tuning: -0.38345864661654133 [######----] 58.94%

spotPython tuning: -0.38345864661654133 [#######---] 65.32%

spotPython tuning: -0.38345864661654133 [#######---] 70.82%

spotPython tuning: -0.38345864661654133 [########--] 75.49%

spotPython tuning: -0.38345864661654133 [########--] 82.17%

spotPython tuning: -0.38345864661654133 [#########-] 88.19%

spotPython tuning: -0.38345864661654133 [#########-] 92.82%

spotPython tuning: -0.38345864661654133 [##########] 97.30%

spotPython tuning: -0.38345864661654133 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x2824ed870>
```

22.14.2 Results

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```python
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

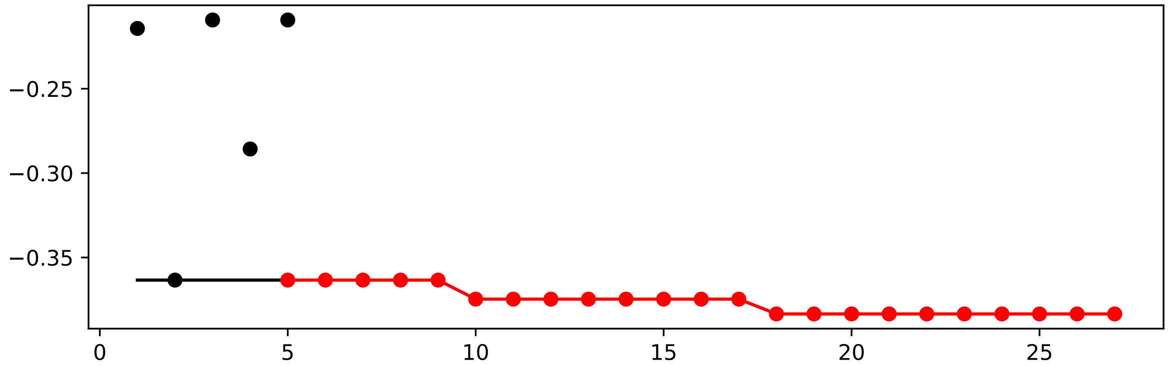


Figure 22.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

- Print the results

```python
print(gen_design_table(fun_control=fun_control,
    spot=spot_tuner))
```

```
| name                | type   | default  |   lower |   upper |                  tuned | trans
|---------------------|--------|----------|---------|---------|------------------------|------
| loss                | factor | log_loss |     0.0 |     0.0 |                    0.0 | None
| learning_rate       | float  | -1.0     |    -5.0 |     0.0 |    -0.4619621318377519 | trans
| max_iter            | int    | 7        |     3.0 |    10.0 |                   10.0 | trans
| max_leaf_nodes      | int    | 5        |     1.0 |    12.0 |                    4.0 | trans
| max_depth           | int    | 2        |     1.0 |    20.0 |                   16.0 | trans
| min_samples_leaf    | int    | 4        |     2.0 |    10.0 |                    3.0 | trans
| l2_regularization   | float  | 0.0      |     0.0 |    10.0 |       9.63236295367755 | None
| max_bins            | int    | 255      |   127.0 |   255.0 |                  168.0 | None
| early_stopping      | factor | 1        |     0.0 |     1.0 |                    1.0 | None
| n_iter_no_change    | int    | 10       |     5.0 |    20.0 |                   10.0 | None
| tol                 | float  | 0.0001   |   1e-05 |   0.001 | 0.0009525077068207476 | None
```

22.15 Show variable importance

```
spot_tuner.plot_importance(threshold=0.025, filename="./figures/" + experiment_name+"_impo
```

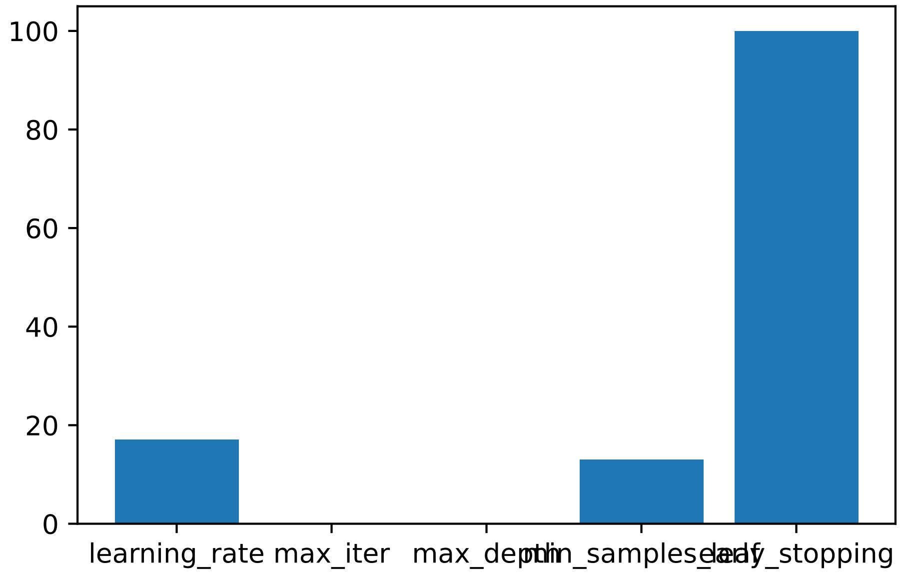


Figure 22.2: Variable importance plot, threshold 0.025.

22.16 Get Default Hyperparameters

```
from spotPython.hyperparameters.values import get_default_values, transform_hyper_paramete
values_default = get_default_values(fun_control)
values_default = transform_hyper_parameter_values(fun_control=fun_control, hyper_parameter
values_default
```

```
{'loss': 'log_loss',
 'learning_rate': 0.1,
 'max_iter': 128,
 'max_leaf_nodes': 32,
 'max_depth': 4,
 'min_samples_leaf': 16,
 'l2_regularization': 0.0,
 'max_bins': 255,
```

```
 'early_stopping': 1,
 'n_iter_no_change': 10,
 'tol': 0.0001}
```

```
from sklearn.pipeline import make_pipeline
model_default = make_pipeline(fun_control["prep_model"], fun_control["core_model"](**value
model_default
```

```
Pipeline(steps=[('nonetype', None),
                ('histgradientboostingclassifier',
                 HistGradientBoostingClassifier(early_stopping=1, max_depth=4,
                                                max_iter=128, max_leaf_nodes=32,
                                                min_samples_leaf=16,
                                                tol=0.0001))])
```

22.17 Get SPOT Results

```
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
print(X)
```

```
[[ 0.00000000e+00 -4.61962132e-01  1.00000000e+01  4.00000000e+00
   1.60000000e+01  3.00000000e+00  9.63236295e+00  1.68000000e+02
   1.00000000e+00  1.00000000e+01  9.52507707e-04]]
```

```
from spotPython.hyperparameters.values import assign_values, return_conf_list_from_var_dic
v_dict = assign_values(X, fun_control["var_name"])
return_conf_list_from_var_dict(var_dict=v_dict, fun_control=fun_control)
```

```
[{'loss': 'log_loss',
  'learning_rate': 0.3451738353409787,
  'max_iter': 1024,
  'max_leaf_nodes': 16,
  'max_depth': 65536,
  'min_samples_leaf': 8,
  'l2_regularization': 9.63236295367755,
  'max_bins': 168,
  'early_stopping': 1,
  'n_iter_no_change': 10,
  'tol': 0.0009525077068207476}]
```

```python
from spotPython.hyperparameters.values import get_one_sklearn_model_from_X
model_spot = get_one_sklearn_model_from_X(X, fun_control)
model_spot
```

```
HistGradientBoostingClassifier(early_stopping=1,
                               l2_regularization=9.63236295367755,
                               learning_rate=0.3451738353409787, max_bins=168,
                               max_depth=65536, max_iter=1024,
                               max_leaf_nodes=16, min_samples_leaf=8,
                               tol=0.0009525077068207476)
```

22.18 Evaluate SPOT Results

- Fetch the data.

```python
from spotPython.utils.convert import get_Xy_from_df
X_train, y_train = get_Xy_from_df(fun_control["train"], fun_control["target_column"])
X_test, y_test = get_Xy_from_df(fun_control["test"], fun_control["target_column"])
X_test.shape, y_test.shape
```

```
((177, 64), (177,))
```

- Fit the model with the tuned hyperparameters. This gives one result:

```python
model_spot.fit(X_train, y_train)
y_pred = model_spot.predict_proba(X_test)
res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
res
```

```
0.3436911487758945
```

```python
def repeated_eval(n, model):
    res_values = []
    for i in range(n):
        model.fit(X_train, y_train)
        y_pred = model.predict_proba(X_test)
        res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
        res_values.append(res)
```

```python
    mean_res = np.mean(res_values)
    print(f"mean_res: {mean_res}")
    std_res = np.std(res_values)
    print(f"std_res: {std_res}")
    min_res = np.min(res_values)
    print(f"min_res: {min_res}")
    max_res = np.max(res_values)
    print(f"max_res: {max_res}")
    median_res = np.median(res_values)
    print(f"median_res: {median_res}")
    return mean_res, std_res, min_res, max_res, median_res
```

22.18.1 Handling Non-deterministic Results

- Because the model is non-determinstic, we perform $n = 30$ runs and calculate the mean and standard deviation of the performance metric.

```python
_ = repeated_eval(30, model_spot)
```

```
mean_res: 0.3407093534212179
std_res: 0.012759051554292274
min_res: 0.3088512241054614
max_res: 0.3691148775894538
median_res: 0.34227871939736343
```

22.18.2 Evalution of the Default Hyperparameters

```python
model_default.fit(X_train, y_train)["histgradientboostingclassifier"]
```

```
HistGradientBoostingClassifier(early_stopping=1, max_depth=4, max_iter=128,
                               max_leaf_nodes=32, min_samples_leaf=16,
                               tol=0.0001)
```

- One evaluation of the default hyperparameters is performed on the hold-out test set.

```python
y_pred = model_default.predict_proba(X_test)
mapk_score(y_true=y_test, y_pred=y_pred, k=3)
```

```
0.3568738229755179
```

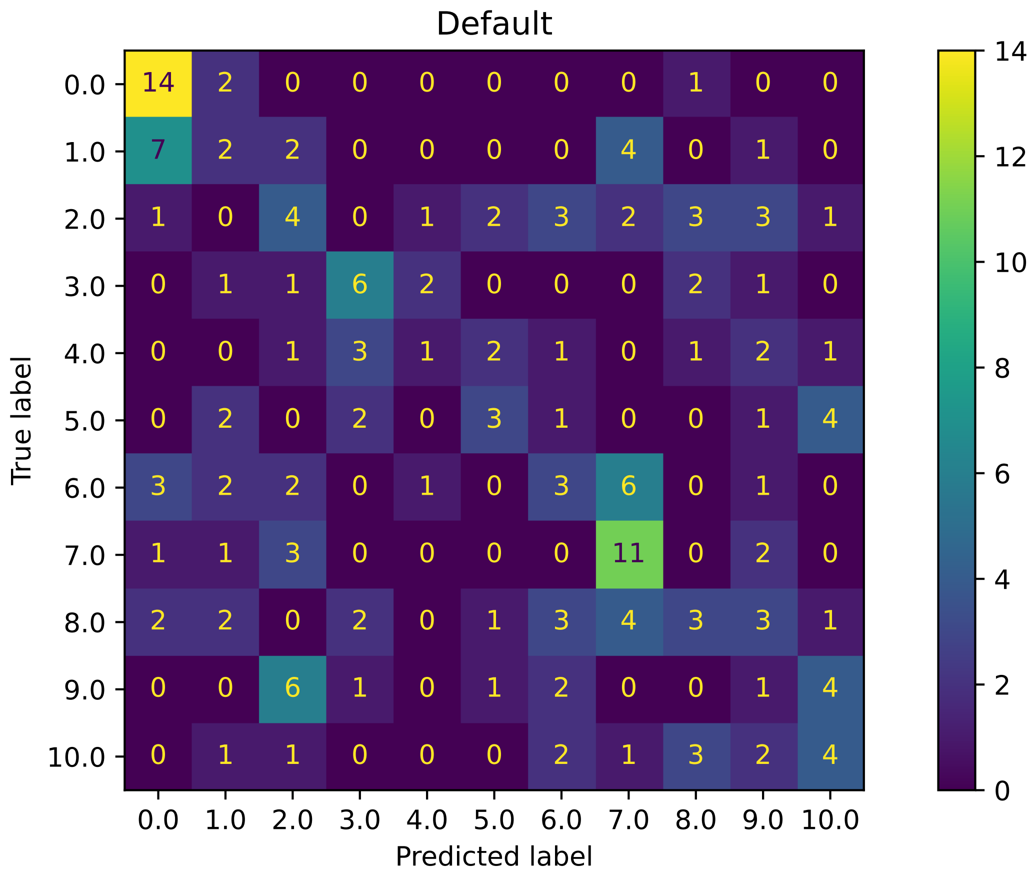
Since one single evaluation is not meaningful, we perform, similar to the evaluation of the SPOT results, $n = 30$ runs of the default setting and and calculate the mean and standard deviation of the performance metric.

```
_ = repeated_eval(30, model_default)
```

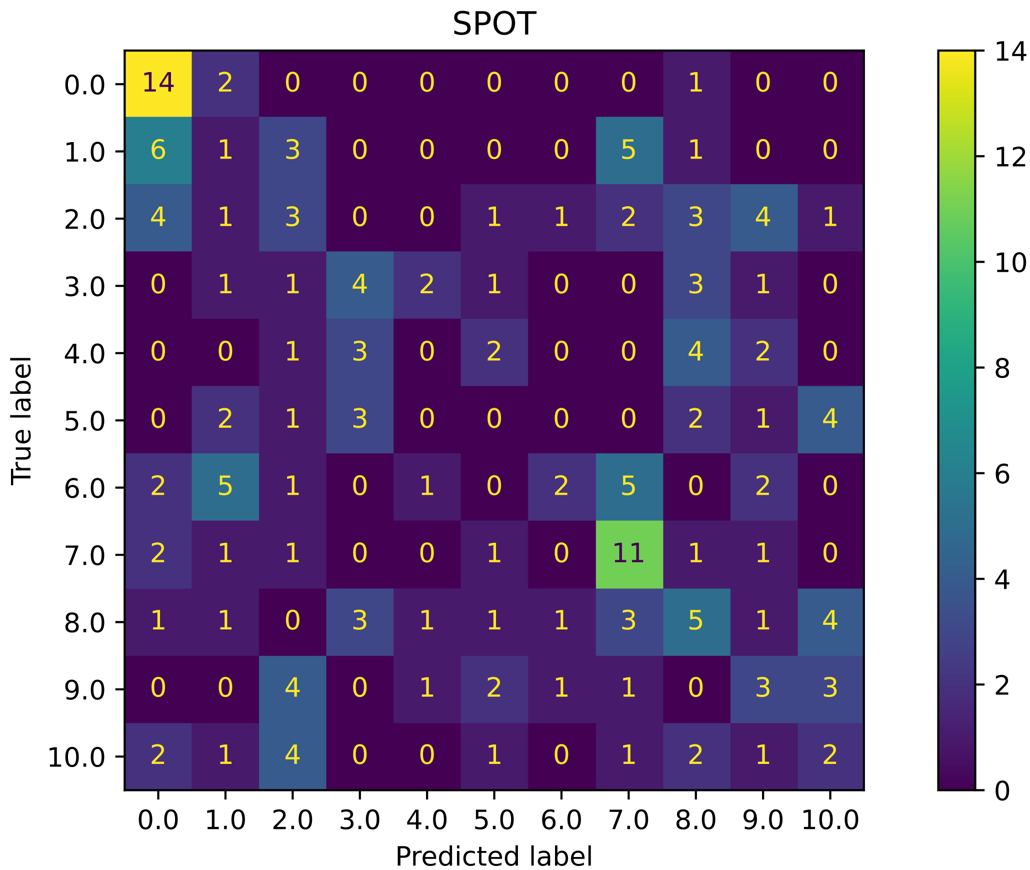
```
mean_res: 0.34510357815442566
std_res: 0.016045798213980507
min_res: 0.3088512241054614
max_res: 0.3813559322033898
median_res: 0.34745762711864403
```

22.19 Plot: Compare Predictions

```
from spotPython.plot.validation import plot_confusion_matrix
plot_confusion_matrix(model_default, fun_control, title = "Default")
```




```
plot_confusion_matrix(model_spot, fun_control, title="SPOT")
```




```
min(spot_tuner.y), max(spot_tuner.y)
```

```
(-0.38345864661654133, -0.20927318295739344)
```

22.20 Cross-validated Evaluations

```
from spotPython.sklearn.traintest import evaluate_cv
fun_control.update({
     "eval": "train_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.3330188679245283, None)
```

```
fun_control.update({
     "eval": "test_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.31998910675381265, None)
```

- This is the evaluation that will be used in the comparison:

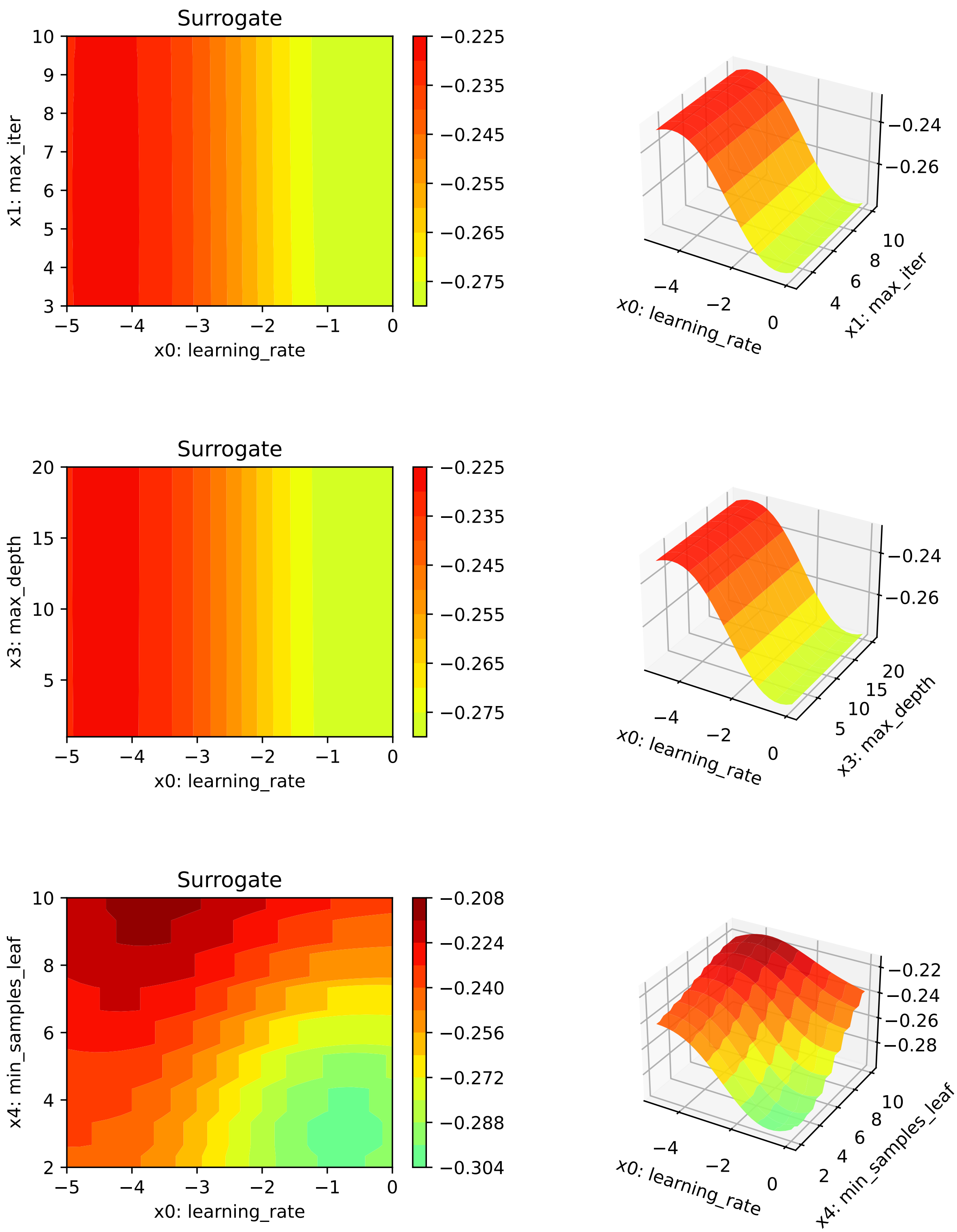
```
fun_control.update({
     "eval": "data_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

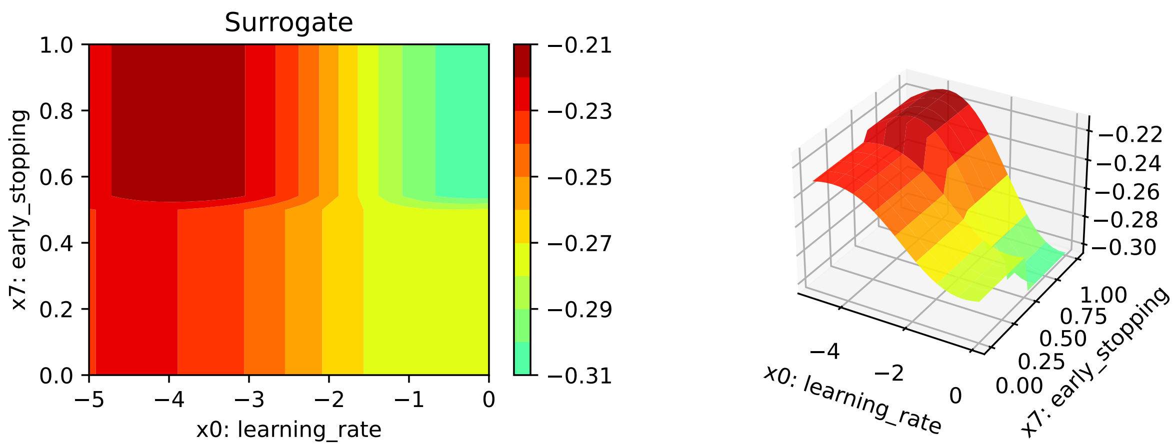
```
(0.3505399061032864, None)
```

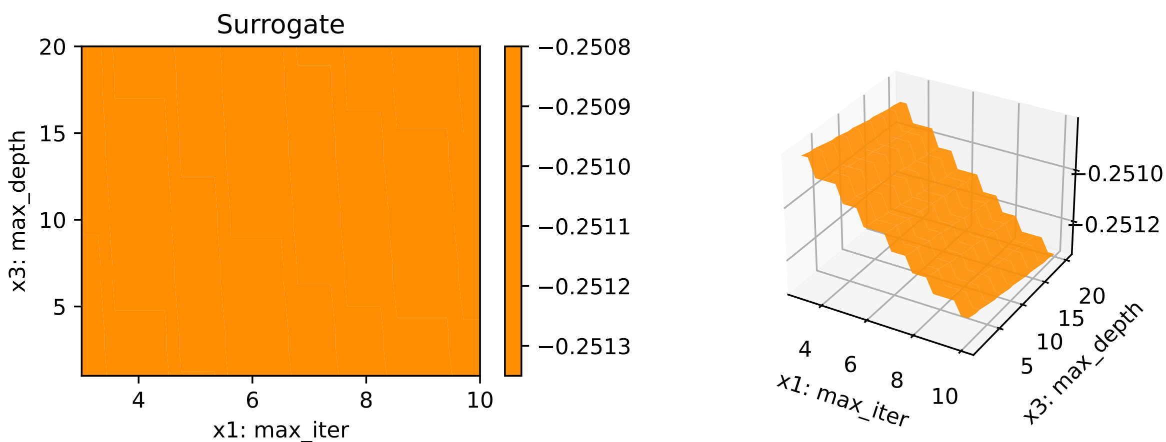
22.20.1 Detailed Hyperparameter Plots

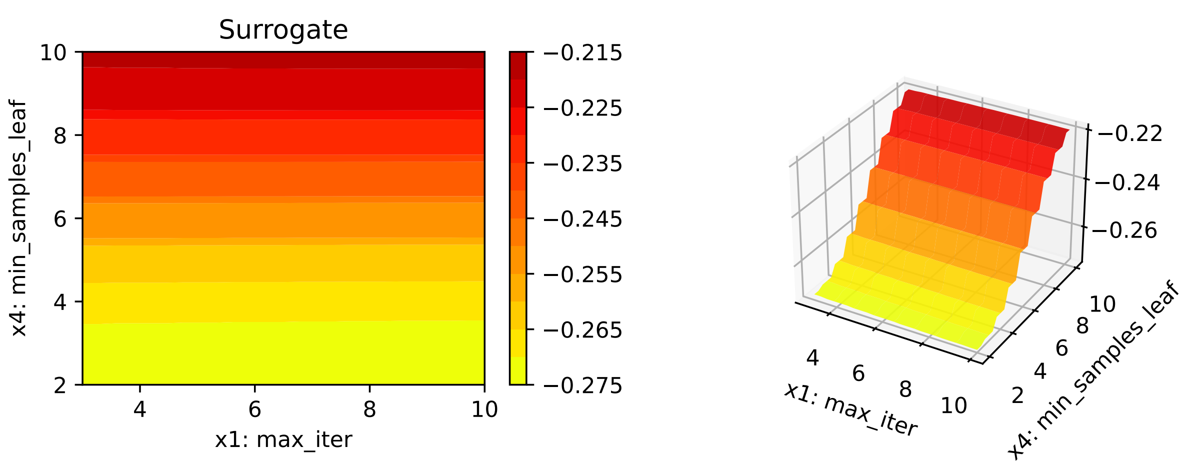
```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

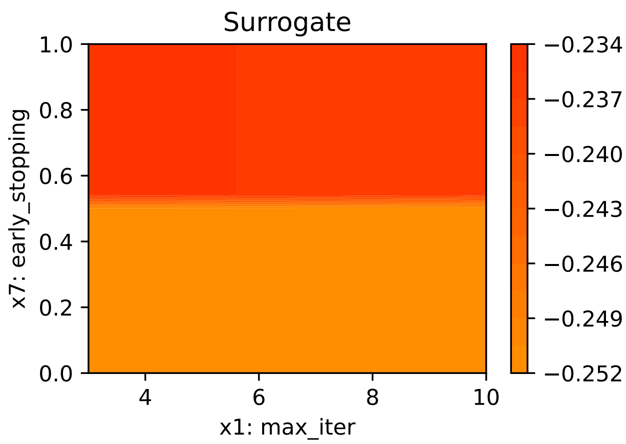
```
learning_rate:  17.115253963118203
max_iter:  0.12288422364672845
max_depth:  0.027269486998521462
min_samples_leaf:  13.021697738828518
early_stopping:  100.0
```

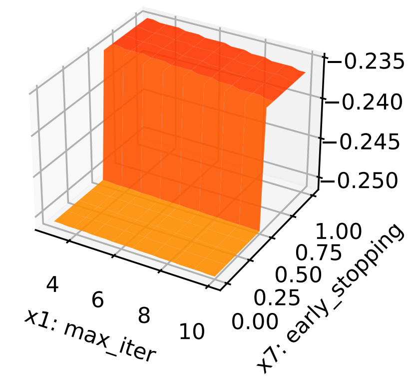

Surrogate
x1: max_iter
x0: learning_rate
−0.225
−0.235
−0.245
−0.255
−0.265
−0.275
−0.24
−0.26
Surrogate
x3: max_depth
x0: learning_rate
−0.225
−0.235
−0.245
−0.255
−0.265
−0.275
−0.24
−0.26
Surrogate
x4: min_samples_leaf
x0: learning_rate
−0.208
−0.224
−0.240
−0.256
−0.272
−0.288
−0.304
−0.22
−0.24
−0.26
−0.28

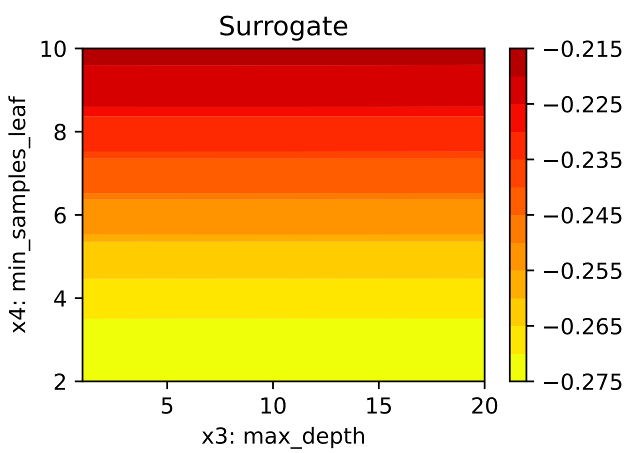

Surrogate
x7: early_stopping
x0: learning_rate
−0.21
−0.23
−0.25
−0.27
−0.29
−0.31
−0.22
−0.24
−0.26
−0.28
−0.30

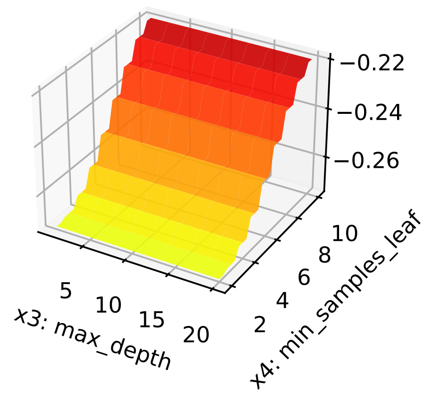

Surrogate
x3: max_depth
x1: max_iter
−0.2508
−0.2509
−0.2510
−0.2511
−0.2512
−0.2513

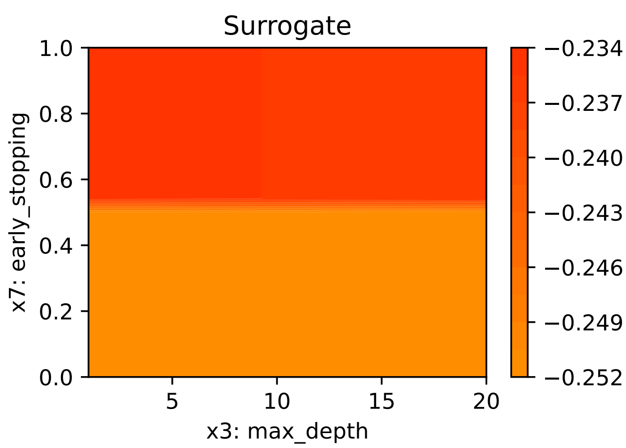

Surrogate
x4: min_samples_leaf
x1: max_iter
−0.215
−0.225
−0.235
−0.245
−0.255
−0.265
−0.275
−0.22
−0.24
−0.26

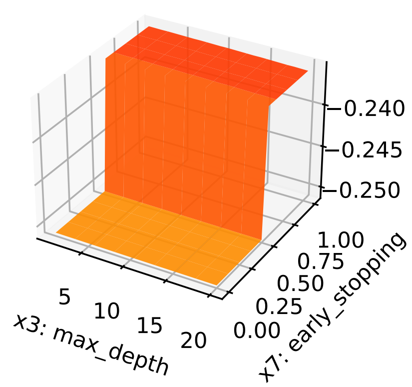

Surrogate
x7: early_stopping
x1: max_iter
−0.234
−0.237
−0.240
−0.243
−0.246
−0.249
−0.252

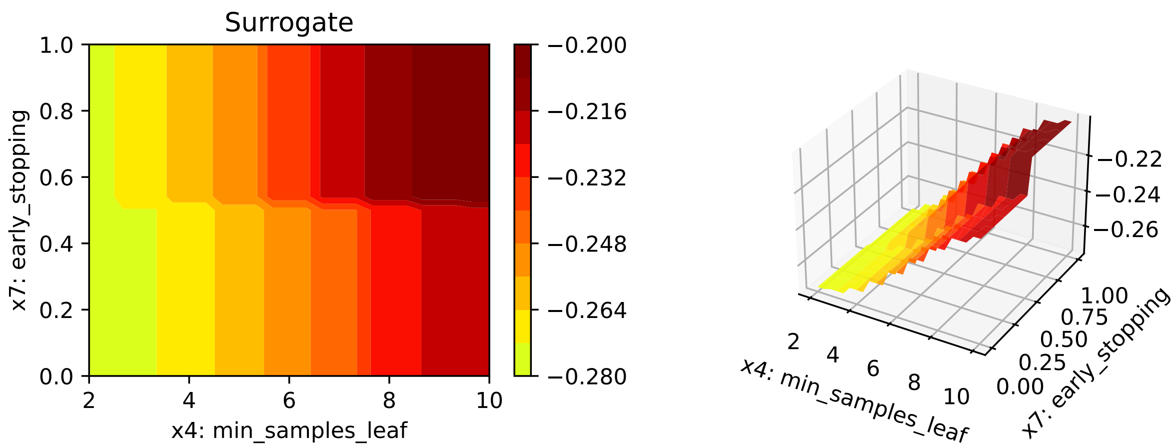

x1: max_iter
x7: early_stopping
−0.235
−0.240
−0.245
−0.250


Surrogate
x4: min_samples_leaf
x3: max_depth
−0.215
−0.225
−0.235
−0.245
−0.255
−0.265
−0.275


x3: max_depth
x4: min_samples_leaf
−0.22
−0.24
−0.26


Surrogate
x7: early_stopping
x3: max_depth
−0.234
−0.237
−0.240
−0.243
−0.246
−0.249
−0.252


x3: max_depth
x7: early_stopping
−0.240
−0.245
−0.250



22.21 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

```
Unable to display output for mime type(s): text/html
```

22.22 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

23 Hyperparameter Tuning: sklearn RandomForestClassifier VBDP Data

This document refers to the following software versions:

- `python`: 3.10.10

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                    0.2.31
spotRiver                     0.0.93
```

```
Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

23.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time and the initial design size.

```
MAX_TIME = 1
INIT_SIZE = 5
ORIGINAL = False
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '18-sklearn' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
18-sklearn_p040025_1min_5init_2023-06-16_15-25-23
```

```
import warnings
warnings.filterwarnings("ignore")
```

23.2 Step 1: Initialization of the Empty `fun_control` Dictionary

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/16_spot_hpt_sklearn_classification")
```

23.3 1. Load Data: Classification

23.4 VBDP

```
import pandas as pd
if ORIGINAL == True:
    train_df = pd.read_csv('./data/VBDP/trainn.csv')
    test_df = pd.read_csv('./data/VBDP/testt.csv')
```

```
else:
    train_df = pd.read_csv('./data/VBDP/train.csv')
    # remove the id column
    train_df = train_df.drop(columns=['id'])
```

```
from sklearn.preprocessing import OrdinalEncoder
n_samples = train_df.shape[0]
n_features = train_df.shape[1] - 1
target_column = "prognosis"
# Encoder our prognosis labels as integers for easier decoding later
enc = OrdinalEncoder()
train_df[target_column] = enc.fit_transform(train_df[[target_column]])
train_df.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train_df.shape)
train_df.head()
```

```
(707, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	...	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0
3	0.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	...	0.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0

The full data set `train_df` 64 features. The target column is labeled as `prognosis`.

23.5 Holdout Train and Test Data

We split out a hold-out test set (25% of the data) so we can calculate an example MAP@K

```
import numpy as np
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(train_df.drop(target_column, axis=1),
                                                    random_state=42,
                                                    test_size=0.25,
                                                    stratify=train_df[target_column])
train = pd.DataFrame(np.hstack((X_train, np.array(y_train).reshape(-1, 1))))
```

```
test = pd.DataFrame(np.hstack((X_test, np.array(y_test).reshape(-1, 1))))
train.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
test.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train.shape)
print(test.shape)
train.head()
```

```
(530, 65)
(177, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0
3	1.0	1.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
# add the dataset to the fun_control
fun_control.update({"data": train_df, # full dataset,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": target_column})
```

23.6 Step 3: Specification of the Preprocessing Model

Data preprocesssing can be very simple, e.g., you can ignore it. Then you would choose the `prep_model` "None":

```
prep_model = None
fun_control.update({"prep_model": prep_model})
```

A default approach for numerical data is the `StandardScaler` (mean 0, variance 1). This can be selected as follows:

```
# prep_model = StandardScaler()
# fun_control.update({"prep_model": prep_model})
```

Even more complicated pre-processing steps are possible, e.g., the follwing pipeline:

```
# categorical_columns = []
# one_hot_encoder = OneHotEncoder(handle_unknown="ignore", sparse_output=False)
# prep_model = ColumnTransformer(
#         transformers=[
#             ("categorical", one_hot_encoder, categorical_columns),
#         ],
#         remainder=StandardScaler(),
#     )
```

23.7 Step 4: Select `algorithm` and `core_model_hyper_dict`

The selection of the algorithm (ML model) that should be tuned is done by specifying the its name from the `sklearn` implementation. For example, the `SVC` support vector machine classifier is selected as follows:

`fun_control = add_core_model_to_fun_control(SVC, fun_control, SklearnHyperDict)`

Other core_models are, e.g.,:

- RidgeCV
- GradientBoostingRegressor
- ElasticNet
- RandomForestClassifier
- LogisticRegression
- KNeighborsClassifier
- RandomForestClassifier
- GradientBoostingClassifier
- HistGradientBoostingClassifier

We will use the `RandomForestClassifier` classifier in this example.

```
from sklearn.linear_model import RidgeCV
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.ensemble import HistGradientBoostingClassifier
from sklearn.linear_model import ElasticNet
```

```python
from spotPython.hyperparameters.values import add_core_model_to_fun_control
from spotPython.data.sklearn_hyper_dict import SklearnHyperDict
from spotPython.fun.hypersklearn import HyperSklearn
```

```python
# core_model  = RidgeCV
# core_model = GradientBoostingRegressor
# core_model = ElasticNet
# core_model = RandomForestClassifier
core_model = SVC
# core_model = LogisticRegression
# core_model = KNeighborsClassifier
# core_model = GradientBoostingClassifier
# core_model = HistGradientBoostingClassifier
fun_control = add_core_model_to_fun_control(core_model=core_model,
                              fun_control=fun_control,
                              hyper_dict=SklearnHyperDict,
                              filename=None)
```

Now `fun_control` has the information from the JSON file. The available hyperparameters are:

```python
print(*fun_control["core_model_hyper_dict"].keys(), sep="\n")
```

```
C
kernel
degree
gamma
coef0
shrinking
probability
tol
cache_size
break_ties
```

23.8 Step 5: Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

23.8.1 Modify hyperparameter of type numeric and integer (boolean)

Numeric and boolean values can be modified using the `modify_hyper_parameter_bounds` method. For example, to change the `tol` hyperparameter of the `SVC` model to the interval [1e-3, 1e-2], the following code can be used:

`fun_control = modify_hyper_parameter_bounds(fun_control, "tol", bounds=[1e-3, 1e-2])`

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
fun_control = modify_hyper_parameter_bounds(fun_control, "probability", bounds=[1, 1])
```

23.8.2 Modify hyperparameter of type factor

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

Factors can be modified with the `modify_hyper_parameter_levels` function. For example, to exclude the `sigmoid` kernel from the tuning, the `kernel` hyperparameter of the `SVC` model can be modified as follows:

`fun_control = modify_hyper_parameter_levels(fun_control, "kernel", ["linear", "rbf"])`

The new setting can be controlled via:

`fun_control["core_model_hyper_dict"]["kernel"]`

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
fun_control = modify_hyper_parameter_levels(fun_control, "kernel", ["rbf"])
```

23.8.3 Optimizers

Optimizers are described in Section 20.6.

23.9 5. Selection of the Objective: Metric and Loss Functions

- Machine learning models are optimized with respect to a metric, for example, the `accuracy` function.
- Deep learning, e.g., neural networks are optimized with respect to a loss function, for example, the `cross_entropy` function and evaluated with respect to a metric, for example, the `accuracy` function.

23.10 Step 6: Selection of the Objective (Loss) Function

The loss function, that is usually used in deep learning for optimizing the weights of the net, is stored in the `fun_control` dictionary as `"loss_function"`.

23.10.1 Metric Function

There are two different types of metrics in `spotPython`:

1. `"metric_river"` is used for the river based evaluation via `eval_oml_iter_progressive`.
2. `"metric_sklearn"` is used for the sklearn based evaluation.

We will consider multi-class classification metrics, e.g., `mapk_score` and `top_k_accuracy_score`.

> **Predict Probabilities**
>
> In this multi-class classification example the machine learning algorithm should return the probabilities of the specific classes (`"predict_proba"`) instead of the predicted values.

We set `"predict_proba"` to `True` in the `fun_control` dictionary.

23.10.1.1 The MAPK Metric

To select the MAPK metric, the following two entries can be added to the `fun_control` dictionary:

`"metric_sklearn": mapk_score"`

`"metric_params": {"k": 3}`.

23.10.1.2 Other Metrics

Alternatively, other metrics for multi-class classification can be used, e.g.,: * top_k_accuracy_score or * roc_auc_score

The metric `roc_auc_score` requires the parameter `"multi_class"`, e.g.,

`"multi_class": "ovr"`.

This is set in the `fun_control` dictionary.

> **Weights**
>
> `spotPython` performs a minimization, therefore, metrics that should be maximized have to be multiplied by -1. This is done by setting `"weights"` to `-1`.

- The complete setup for the metric in our example is:

```
from spotPython.utils.metrics import mapk_score
fun_control.update({
               "weights": -1,
               "metric_sklearn": mapk_score,
               "predict_proba": True,
               "metric_params": {"k": 3},
               })
```

23.11 Evaluation on Hold-out Data

- The default method for computing the performance is `"eval_holdout"`.
- Alternatively, cross-validation can be used for every machine learning model.
- Specifically for RandomForests, the OOB-score can be used.

```
fun_control.update({
    "eval": "train_hold_out",
})
```

23.11.1 OOB Score

Using the OOB-Score is a very efficient way to estimate the performance of a random forest classifier. The OOB-Score is calculated on the training data and does not require a hold-out

test set. If the OOB-Score is used, the key "eval" in the `fun_control` dictionary should be set to `"oob_score"` as shown below.

23.11.1.1 Cross Validation

Instead of using the OOB-score, the classical cross validation can be used. The number of folds is set by the key `"k_folds"`. For example, to use 5-fold cross validation, the key `"k_folds"` is set to `5`. Uncomment the following line to use cross validation:

```
# fun_control.update({
#      "eval": "train_cv",
#      "k_folds": 10,
# })
```

23.12 6. Calling the SPOT Function

23.13 Preparing the SPOT Call

- Get types and variable names as well as lower and upper bounds for the hyperparameters.

```
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name         | type   | default    |    lower |    upper | transform    |
|--------------|--------|------------|----------|----------|--------------|
| C            | float  | 1.0        |   0.1    |   10     | None         |
| kernel       | factor | rbf        |   0      |    0     | None         |
```

```
| degree        | int    | 3          |    3      |     3     | None          |
| gamma         | factor | scale      |    0      |     1     | None          |
| coef0         | float  | 0.0        |    0      |     0     | None          |
| shrinking     | factor | 0          |    0      |     1     | None          |
| probability   | factor | 0          |    1      |     1     | None          |
| tol           | float  | 0.001      |    0.0001 |     0.01  | None          |
| cache_size    | float  | 200.0      |  100      |   400     | None          |
| break_ties    | factor | 0          |    0      |     1     | None          |
```

23.14 The Objective Function

The objective function is selected next. It implements an interface from `sklearn`'s training, validation, and testing methods to `spotPython`.

```
from spotPython.fun.hypersklearn import HyperSklearn
fun = HyperSklearn().fun_sklearn
```

23.14.1 Run the `Spot` Optimizer

- Run SPOT for approx. x mins (`max_time`).
- Note: the run takes longer, because the evaluation time of initial design (here: `initi_size`, 20 points) is not considered.

```
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=SklearnHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
X_start
```

```
array([[1.e+00, 2.e+00, 3.e+00, 0.e+00, 0.e+00, 0.e+00, 0.e+00, 1.e-03,
        2.e+02, 0.e+00]])
```

```
import numpy as np
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
```

```
                    max_time = MAX_TIME,
                    noise = False,
                    tolerance_x = np.sqrt(np.spacing(1)),
                    var_type = var_type,
                    var_name = var_name,
                    infill_criterion = "y",
                    n_points = 1,
                    seed=123,
                    log_level = 50,
                    show_models= False,
                    show_progress= True,
                    fun_control = fun_control,
                    design_control={"init_size": INIT_SIZE,
                                    "repeats": 1},
                    surrogate_control={"noise": True,
                                       "cod_type": "norm",
                                       "min_theta": -4,
                                       "max_theta": 3,
                                       "n_theta": len(var_name),
                                       "model_fun_evals": 10_000,
                                       "log_level": 50
                                       })
spot_tuner.run(X_start=X_start)
```

```
spotPython tuning: -0.36466165413533835 [----------] 0.29%

spotPython tuning: -0.36466165413533835 [----------] 0.58%

spotPython tuning: -0.36466165413533835 [----------] 1.15%

spotPython tuning: -0.36466165413533835 [----------] 1.70%

spotPython tuning: -0.36466165413533835 [----------] 2.25%

spotPython tuning: -0.36466165413533835 [----------] 2.57%

spotPython tuning: -0.36466165413533835 [----------] 2.89%

spotPython tuning: -0.3746867167919799 [----------] 3.15%
```

```
spotPython tuning: -0.3746867167919799 [----------] 3.45%

spotPython tuning: -0.3746867167919799 [----------] 3.78%

spotPython tuning: -0.3746867167919799 [----------] 4.17%

spotPython tuning: -0.3746867167919799 [----------] 4.57%

spotPython tuning: -0.3746867167919799 [#---------] 5.50%

spotPython tuning: -0.37844611528822053 [#---------] 7.02%

spotPython tuning: -0.37844611528822053 [#---------] 8.53%

spotPython tuning: -0.37844611528822053 [#---------] 9.69%

spotPython tuning: -0.38847117794486213 [#---------] 10.65%

spotPython tuning: -0.38847117794486213 [#---------] 11.97%

spotPython tuning: -0.38847117794486213 [#---------] 13.11%

spotPython tuning: -0.38847117794486213 [#---------] 14.60%

spotPython tuning: -0.38847117794486213 [##--------] 16.35%

spotPython tuning: -0.38847117794486213 [##--------] 17.58%

spotPython tuning: -0.38847117794486213 [##--------] 18.62%

spotPython tuning: -0.38847117794486213 [##--------] 19.93%

spotPython tuning: -0.38847117794486213 [##--------] 21.09%

spotPython tuning: -0.38847117794486213 [##--------] 22.11%

spotPython tuning: -0.38847117794486213 [##--------] 23.25%
```

```
spotPython tuning: -0.38847117794486213 [##--------] 24.53%

spotPython tuning: -0.38847117794486213 [###-------] 26.15%

spotPython tuning: -0.38847117794486213 [###-------] 27.75%

spotPython tuning: -0.38847117794486213 [###-------] 29.41%

spotPython tuning: -0.38847117794486213 [###-------] 31.00%

spotPython tuning: -0.38847117794486213 [###-------] 33.34%

spotPython tuning: -0.38847117794486213 [####------] 35.35%

spotPython tuning: -0.38847117794486213 [####------] 37.49%

spotPython tuning: -0.38847117794486213 [####------] 39.82%

spotPython tuning: -0.38847117794486213 [####------] 42.43%

spotPython tuning: -0.38847117794486213 [####------] 44.38%

spotPython tuning: -0.38847117794486213 [#####-----] 46.14%

spotPython tuning: -0.38847117794486213 [#####-----] 48.11%

spotPython tuning: -0.38847117794486213 [#####-----] 49.52%

spotPython tuning: -0.38847117794486213 [#####-----] 51.43%

spotPython tuning: -0.38847117794486213 [#####-----] 53.47%

spotPython tuning: -0.38847117794486213 [######----] 55.59%

spotPython tuning: -0.38847117794486213 [######----] 57.73%

spotPython tuning: -0.38847117794486213 [######----] 59.92%
```

```
spotPython tuning: -0.38847117794486213 [######----] 61.75%

spotPython tuning: -0.38847117794486213 [######----] 63.95%

spotPython tuning: -0.38847117794486213 [#######---] 65.98%

spotPython tuning: -0.38847117794486213 [#######---] 67.76%

spotPython tuning: -0.38847117794486213 [#######---] 70.02%

spotPython tuning: -0.38847117794486213 [#######---] 72.65%

spotPython tuning: -0.38847117794486213 [#######---] 74.94%

spotPython tuning: -0.38847117794486213 [########--] 77.02%

spotPython tuning: -0.38847117794486213 [########--] 79.16%

spotPython tuning: -0.38847117794486213 [########--] 81.55%

spotPython tuning: -0.38847117794486213 [########--] 84.01%

spotPython tuning: -0.38847117794486213 [#########-] 86.73%

spotPython tuning: -0.38847117794486213 [#########-] 90.49%

spotPython tuning: -0.38847117794486213 [##########] 95.17%

spotPython tuning: -0.38847117794486213 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x2a1819f30>
```

23.14.2 Results

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```python
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

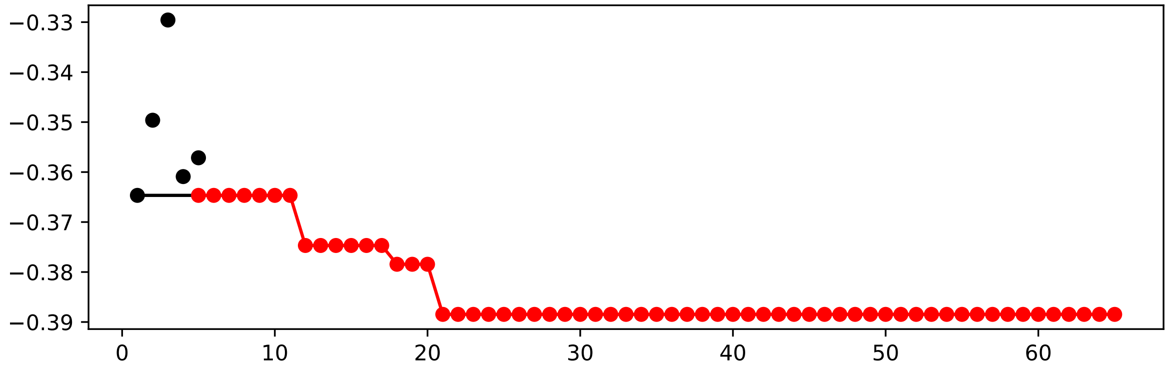


Figure 23.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

- Print the results

```python
print(gen_design_table(fun_control=fun_control,
    spot=spot_tuner))
```

```
| name        | type   | default   |    lower |    upper |                 tuned | transform
|-------------|--------|-----------|----------|----------|-----------------------|------------
| C           | float  | 1.0       |      0.1 |     10.0 |    2.9910408553979817 | None
| kernel      | factor | rbf       |      0.0 |      0.0 |                   0.0 | None
| degree      | int    | 3         |      3.0 |      3.0 |                   3.0 | None
| gamma       | factor | scale     |      0.0 |      1.0 |                   1.0 | None
| coef0       | float  | 0.0       |      0.0 |      0.0 |                   0.0 | None
| shrinking   | factor | 0         |      0.0 |      1.0 |                   1.0 | None
| probability | factor | 0         |      1.0 |      1.0 |                   1.0 | None
| tol         | float  | 0.001     |   0.0001 |     0.01 | 0.0006375709465191348 | None
| cache_size  | float  | 200.0     |    100.0 |    400.0 |    124.48966019120645 | None
| break_ties  | factor | 0         |      0.0 |      1.0 |                   0.0 | None
```

23.15 Show variable importance

```
spot_tuner.plot_importance(threshold=0.025, filename="./figures/" + experiment_name+"_impo
```

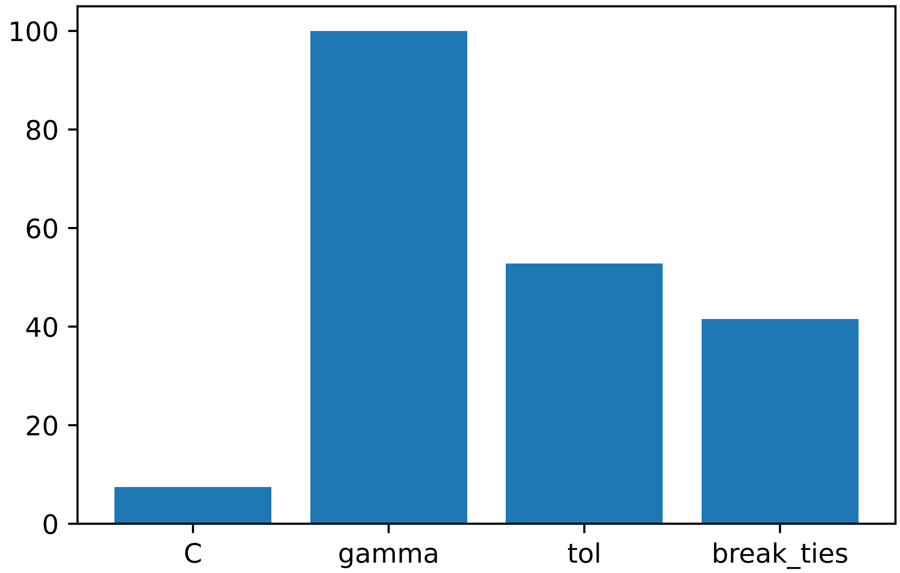


Figure 23.2: Variable importance plot, threshold 0.025.

23.16 Get Default Hyperparameters

```
from spotPython.hyperparameters.values import get_default_values, transform_hyper_paramete
values_default = get_default_values(fun_control)
values_default = transform_hyper_parameter_values(fun_control=fun_control, hyper_parameter
values_default
```

```
{'C': 1.0,
 'kernel': 'rbf',
 'degree': 3,
 'gamma': 'scale',
 'coef0': 0.0,
 'shrinking': 0,
 'probability': 0,
 'tol': 0.001,
```

```
 'cache_size': 200.0,
 'break_ties': 0}
```

```
from sklearn.pipeline import make_pipeline
model_default = make_pipeline(fun_control["prep_model"], fun_control["core_model"](**value
model_default
```

```
Pipeline(steps=[('nonetype', None),
                ('svc',
                 SVC(break_ties=0, cache_size=200.0, probability=0,
                     shrinking=0))])
```

Note

- Default value for "probability" is False, but we need it to be True for the metric "mapk_score".

```
values_default.update({"probability": 1})
```

23.17 Get SPOT Results

```
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
print(X)
```

```
[[2.99104086e+00 0.00000000e+00 3.00000000e+00 1.00000000e+00
  0.00000000e+00 1.00000000e+00 1.00000000e+00 6.37570947e-04
  1.24489660e+02 0.00000000e+00]]
```

```
from spotPython.hyperparameters.values import assign_values, return_conf_list_from_var_dic
v_dict = assign_values(X, fun_control["var_name"])
return_conf_list_from_var_dict(var_dict=v_dict, fun_control=fun_control)
```

```
[{'C': 2.9910408553979817,
  'kernel': 'rbf',
  'degree': 3,
  'gamma': 'auto',
```

```
 'coef0': 0.0,
 'shrinking': 1,
 'probability': 1,
 'tol': 0.0006375709465191348,
 'cache_size': 124.48966019120645,
 'break_ties': 0}]
```

```
from spotPython.hyperparameters.values import get_one_sklearn_model_from_X
model_spot = get_one_sklearn_model_from_X(X, fun_control)
model_spot
```

```
SVC(C=2.9910408553979817, break_ties=0, cache_size=124.48966019120645,
    gamma='auto', probability=1, shrinking=1, tol=0.0006375709465191348)
```

23.18 Evaluate SPOT Results

- Fetch the data.

```
from spotPython.utils.convert import get_Xy_from_df
X_train, y_train = get_Xy_from_df(fun_control["train"], fun_control["target_column"])
X_test, y_test = get_Xy_from_df(fun_control["test"], fun_control["target_column"])
X_test.shape, y_test.shape
```

```
((177, 64), (177,))
```

- Fit the model with the tuned hyperparameters. This gives one result:

```
model_spot.fit(X_train, y_train)
y_pred = model_spot.predict_proba(X_test)
res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
res
```

```
0.3775894538606403
```

```
def repeated_eval(n, model):
    res_values = []
    for i in range(n):
        model.fit(X_train, y_train)
```

```
        y_pred = model.predict_proba(X_test)
        res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
        res_values.append(res)
    mean_res = np.mean(res_values)
    print(f"mean_res: {mean_res}")
    std_res = np.std(res_values)
    print(f"std_res: {std_res}")
    min_res = np.min(res_values)
    print(f"min_res: {min_res}")
    max_res = np.max(res_values)
    print(f"max_res: {max_res}")
    median_res = np.median(res_values)
    print(f"median_res: {median_res}")
    return mean_res, std_res, min_res, max_res, median_res
```

23.18.1 Handling Non-deterministic Results

- Because the model is non-determinstic, we perform $n = 30$ runs and calculate the mean and standard deviation of the performance metric.

```
_ = repeated_eval(30, model_spot)
```

```
mean_res: 0.3770872567482737
std_res: 0.004957209547369661
min_res: 0.3691148775894538
max_res: 0.3898305084745763
median_res: 0.37664783427495285
```

23.18.2 Evalution of the Default Hyperparameters

```
model_default["svc"].probability = True
model_default.fit(X_train, y_train)["svc"]
```

```
SVC(break_ties=0, cache_size=200.0, probability=True, shrinking=0)
```

- One evaluation of the default hyperparameters is performed on the hold-out test set.

```
y_pred = model_default.predict_proba(X_test)
mapk_score(y_true=y_test, y_pred=y_pred, k=3)
```

```
0.3870056497175141
```

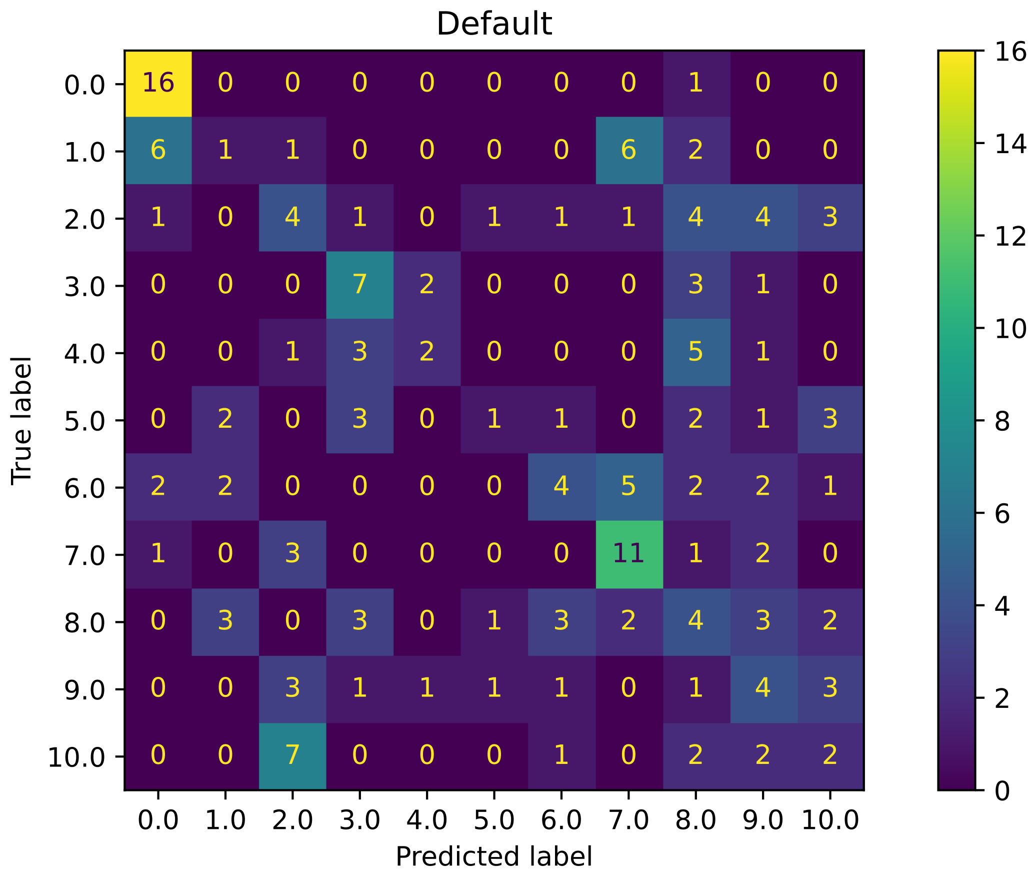
Since one single evaluation is not meaningful, we perform, similar to the evaluation of the SPOT results, $n = 30$ runs of the default setting and and calculate the mean and standard deviation of the performance metric.

```
_ = repeated_eval(30, model_default)
```

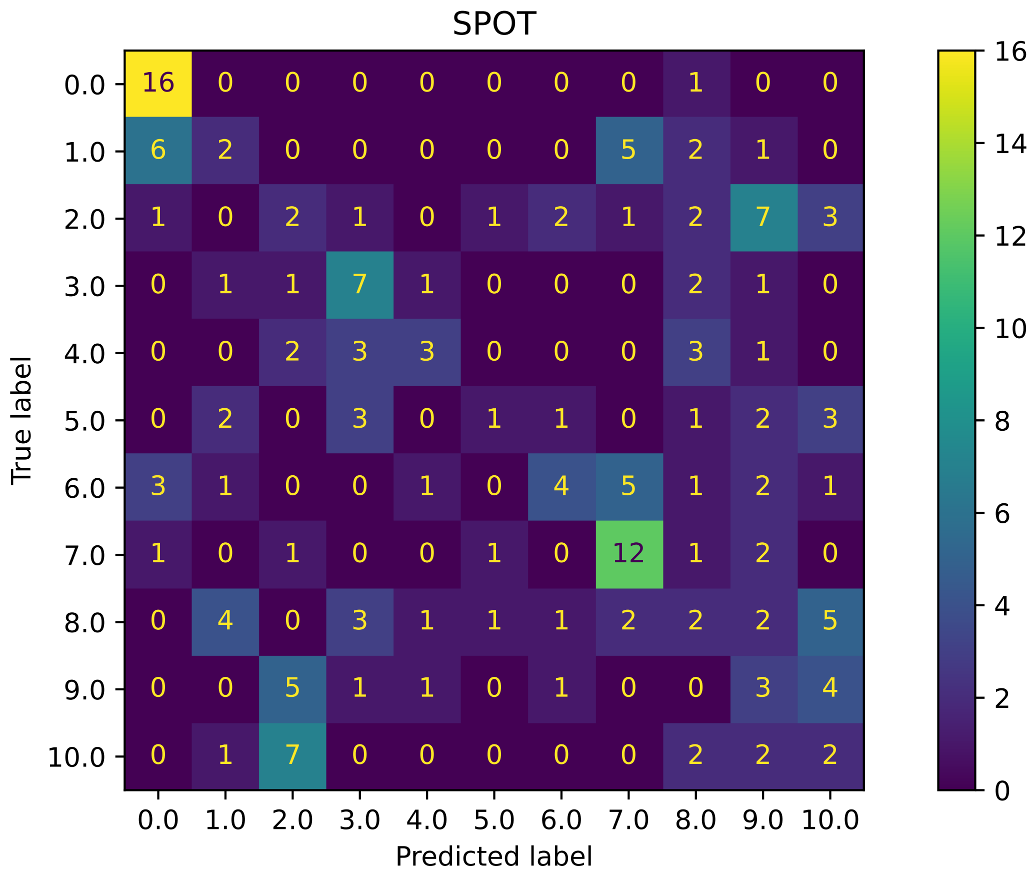
```
mean_res: 0.38386691776522286
std_res: 0.0037296800445732565
min_res: 0.3757062146892655
max_res: 0.3954802259887006
median_res: 0.38323917137476465
```

23.19 Plot: Compare Predictions

```
from spotPython.plot.validation import plot_confusion_matrix
plot_confusion_matrix(model_default, fun_control, title = "Default")
```




```
plot_confusion_matrix(model_spot, fun_control, title="SPOT")
```




```
min(spot_tuner.y), max(spot_tuner.y)
```

```
(-0.38847117794486213, -0.3295739348370927)
```

23.20 Cross-validated Evaluations

```
from spotPython.sklearn.traintest import evaluate_cv
fun_control.update({
     "eval": "train_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.36100628930817613, None)
```

```
fun_control.update({
     "eval": "test_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.33627450980392154, None)
```

- This is the evaluation that will be used in the comparison:

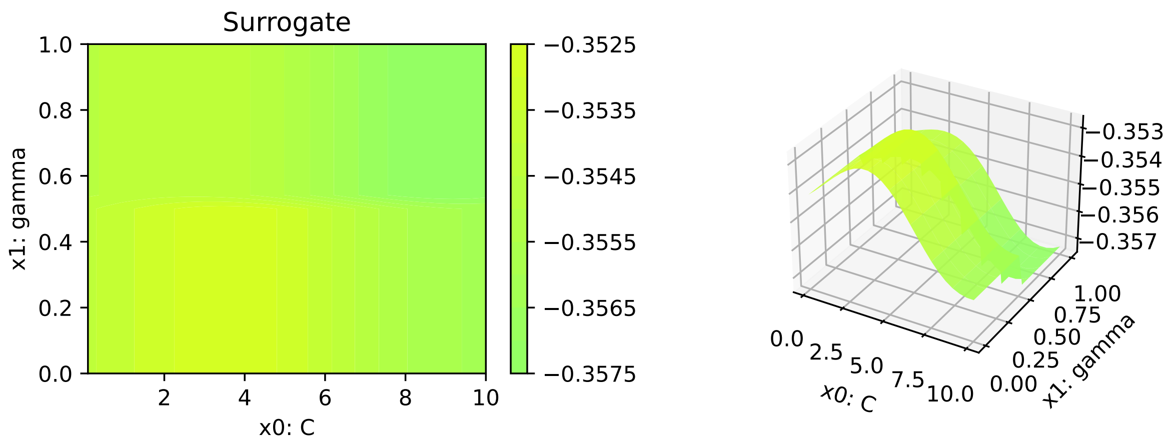
```
fun_control.update({
     "eval": "data_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

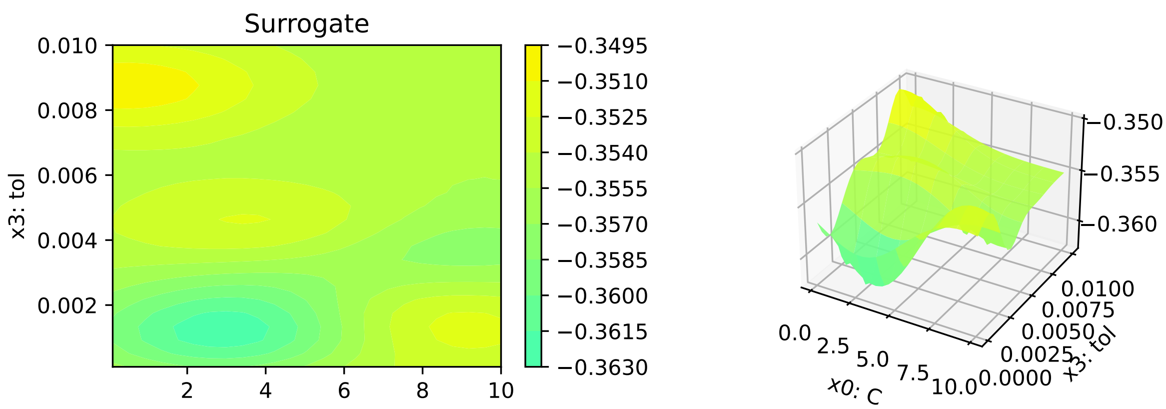
```
(0.36101945003353453, None)
```

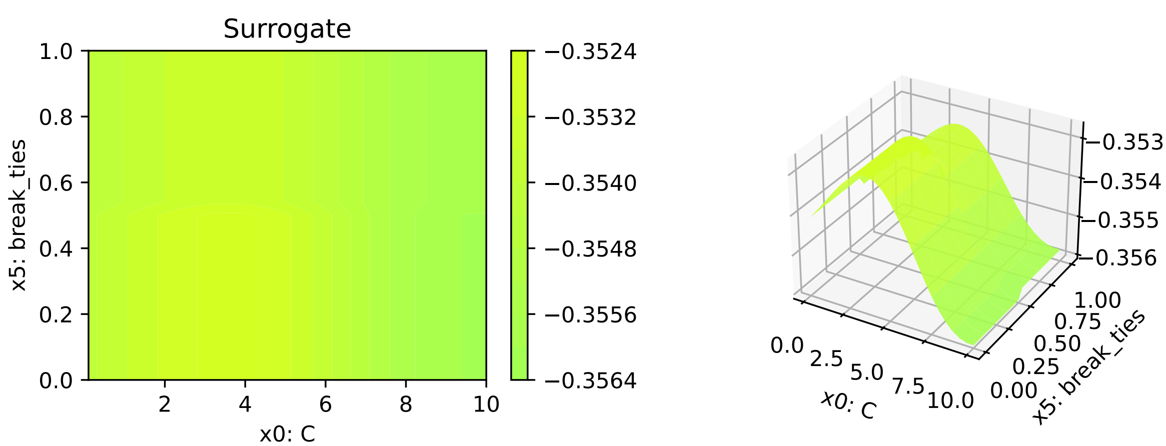
23.20.1 Detailed Hyperparameter Plots

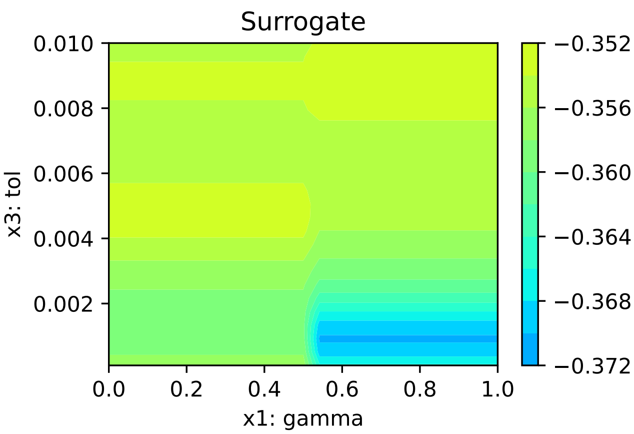
```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

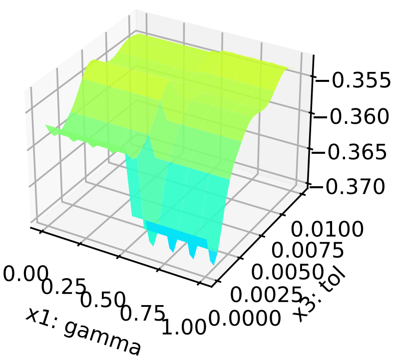
```
C:  7.497527475868464
gamma:  100.0
tol:  52.83705914727154
break_ties:  41.500097930570114
```

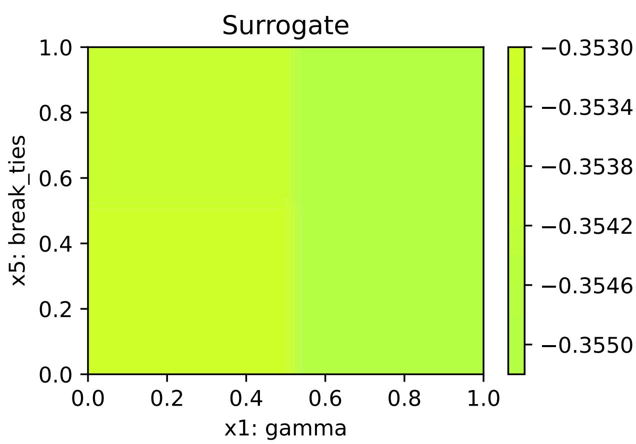

Surrogate
1.0
0.8
0.6
0.4
0.2
0.0
x1: gamma
2
4
6
8
10
x0: C
−0.3525
−0.3535
−0.3545
−0.3555
−0.3565
−0.3575
−0.353
−0.354
−0.355
−0.356
−0.357
0.0
2.5
5.0
7.5
10.0
x0: C
1.00
0.75
0.50
0.25
0.00
x1: gamma

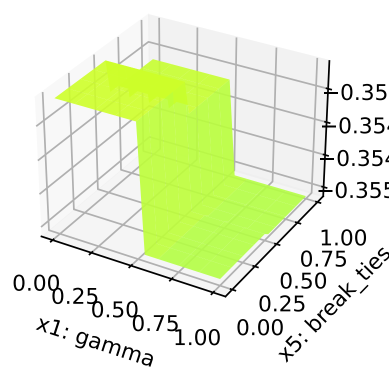

Surrogate
0.010
0.008
0.006
0.004
0.002
x3: tol
2
4
6
8
10
x0: C
−0.3495
−0.3510
−0.3525
−0.3540
−0.3555
−0.3570
−0.3585
−0.3600
−0.3615
−0.3630
−0.350
−0.355
−0.360
0.0
2.5
5.0
7.5
10.0
x0: C
0.0100
0.0075
0.0050
0.0025
0.0000
x3: tol

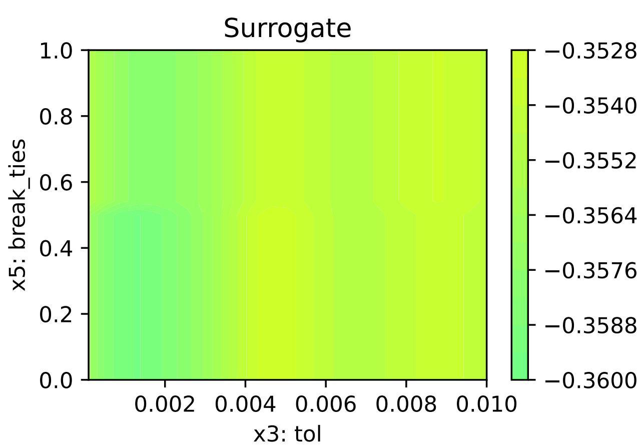

Surrogate
1.0
0.8
0.6
0.4
0.2
0.0
x5: break_ties
2
4
6
8
10
x0: C
−0.3524
−0.3532
−0.3540
−0.3548
−0.3556
−0.3564
−0.353
−0.354
−0.355
−0.356
0.0
2.5
5.0
7.5
10.0
x0: C
1.00
0.75
0.50
0.25
0.00
x5: break_ties

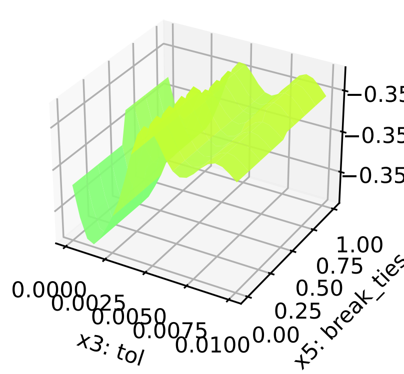

Surrogate
x3: tol
0.010
0.008
0.006
0.004
0.002
0.0
0.2
0.4
0.6
0.8
1.0
x1: gamma
−0.352
−0.356
−0.360
−0.364
−0.368
−0.372


−0.355
−0.360
−0.365
−0.370
0.00
0.25
0.50
0.75
1.00
x1: gamma
0.0000
0.0025
0.0050
0.0075
0.0100
x3: tol


Surrogate
x5: break_ties
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
x1: gamma
−0.3530
−0.3534
−0.3538
−0.3542
−0.3546
−0.3550


−0.3535
−0.3540
−0.3545
−0.3550
0.00
0.25
0.50
0.75
1.00
x1: gamma
0.00
0.25
0.50
0.75
1.00
x5: break_ties


Surrogate
x5: break_ties
1.0
0.8
0.6
0.4
0.2
0.0
0.002
0.004
0.006
0.008
0.010
x3: tol
−0.3528
−0.3540
−0.3552
−0.3564
−0.3576
−0.3588
−0.3600


−0.354
−0.356
−0.358
0.0000
0.0025
0.0050
0.0075
0.0100
x3: tol
0.00
0.25
0.50
0.75
1.00
x5: break_ties

23.21 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

```
Unable to display output for mime type(s): text/html
```

23.22 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

24 Hyperparameter Tuning: sklearn RandomForestClassifier VBDP Data

This document refers to the following software versions:

- `python`: 3.10.10

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                0.2.31
spotRiver                 0.0.93
```

```
Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

24.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time and the initial design size.

```
MAX_TIME = 1
INIT_SIZE = 5
ORIGINAL = False
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '19-sklearn' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
19-sklearn_p040025_1min_5init_2023-06-16_15-27-50
```

```
import warnings
warnings.filterwarnings("ignore")
```

24.2 Step 1: Initialization of the Empty `fun_control` Dictionary

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/16_spot_hpt_sklearn_classification")
```

24.3 1. Load Data: Classification

24.4 VBDP

```
import pandas as pd
if ORIGINAL == True:
    train_df = pd.read_csv('./data/VBDP/trainn.csv')
    test_df = pd.read_csv('./data/VBDP/testt.csv')
```

```python
else:
    train_df = pd.read_csv('./data/VBDP/train.csv')
    # remove the id column
    train_df = train_df.drop(columns=['id'])
```

```python
from sklearn.preprocessing import OrdinalEncoder
n_samples = train_df.shape[0]
n_features = train_df.shape[1] - 1
target_column = "prognosis"
# Encoder our prognosis labels as integers for easier decoding later
enc = OrdinalEncoder()
train_df[target_column] = enc.fit_transform(train_df[[target_column]])
train_df.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train_df.shape)
train_df.head()
```

```
(707, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	...	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0
3	0.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	...	0.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0

The full data set `train_df` 64 features. The target column is labeled as `prognosis`.

24.5 Holdout Train and Test Data

We split out a hold-out test set (25% of the data) so we can calculate an example MAP@K

```python
import numpy as np
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(train_df.drop(target_column, axis=1),
                                                    random_state=42,
                                                    test_size=0.25,
                                                    stratify=train_df[target_column])
train = pd.DataFrame(np.hstack((X_train, np.array(y_train).reshape(-1, 1))))
```

```
test = pd.DataFrame(np.hstack((X_test, np.array(y_test).reshape(-1, 1))))
train.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
test.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train.shape)
print(test.shape)
train.head()
```

```
(530, 65)
(177, 65)
```

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	...	x56	x57	x58	x59	x60	x61	x62	x63
0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0
3	1.0	1.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
# add the dataset to the fun_control
fun_control.update({"data": train_df, # full dataset,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": target_column})
```

24.6 Step 3: Specification of the Preprocessing Model

Data preprocesssing can be very simple, e.g., you can ignore it. Then you would choose the `prep_model` “None”:

```
prep_model = None
fun_control.update({"prep_model": prep_model})
```

A default approach for numerical data is the `StandardScaler` (mean 0, variance 1). This can be selected as follows:

```
# prep_model = StandardScaler()
# fun_control.update({"prep_model": prep_model})
```

Even more complicated pre-processing steps are possible, e.g., the follwing pipeline:

```
# categorical_columns = []
# one_hot_encoder = OneHotEncoder(handle_unknown="ignore", sparse_output=False)
# prep_model = ColumnTransformer(
#         transformers=[
#             ("categorical", one_hot_encoder, categorical_columns),
#         ],
#         remainder=StandardScaler(),
#     )
```

24.7 Step 4: Select `algorithm` and `core_model_hyper_dict`

The selection of the algorithm (ML model) that should be tuned is done by specifying the its name from the `sklearn` implementation. For example, the `SVC` support vector machine classifier is selected as follows:

`fun_control = add_core_model_to_fun_control(SVC, fun_control, SklearnHyperDict)`

Other core_models are, e.g.,:

- RidgeCV
- GradientBoostingRegressor
- ElasticNet
- RandomForestClassifier
- LogisticRegression
- KNeighborsClassifier
- RandomForestClassifier
- GradientBoostingClassifier
- HistGradientBoostingClassifier

We will use the `RandomForestClassifier` classifier in this example.

```
from sklearn.linear_model import RidgeCV
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.ensemble import HistGradientBoostingClassifier
from sklearn.linear_model import ElasticNet
```

```python
from spotPython.hyperparameters.values import add_core_model_to_fun_control
from spotPython.data.sklearn_hyper_dict import SklearnHyperDict
from spotPython.fun.hypersklearn import HyperSklearn
```

```python
# core_model  = RidgeCV
# core_model = GradientBoostingRegressor
# core_model = ElasticNet
# core_model = RandomForestClassifier
core_model = KNeighborsClassifier
# core_model = LogisticRegression
# core_model = KNeighborsClassifier
# core_model = GradientBoostingClassifier
# core_model = HistGradientBoostingClassifier
fun_control = add_core_model_to_fun_control(core_model=core_model,
                              fun_control=fun_control,
                              hyper_dict=SklearnHyperDict,
                              filename=None)
```

Now `fun_control` has the information from the JSON file. The available hyperparameters are:

```python
print(*fun_control["core_model_hyper_dict"].keys(), sep="\n")
```

```
n_neighbors
weights
algorithm
leaf_size
p
```

24.8 Step 5: Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

24.8.1 Modify hyperparameter of type numeric and integer (boolean)

Numeric and boolean values can be modified using the `modify_hyper_parameter_bounds` method. For example, to change the `tol` hyperparameter of the `SVC` model to the interval [1e-3, 1e-2], the following code can be used:

`fun_control = modify_hyper_parameter_bounds(fun_control, "tol", bounds=[1e-3, 1e-2])`

```
# from spotPython.hyperparameters.values import modify_hyper_parameter_bounds
# fun_control = modify_hyper_parameter_bounds(fun_control, "probability", bounds=[1, 1])
```

24.8.2 Modify hyperparameter of type factor

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

Factors can be modified with the `modify_hyper_parameter_levels` function. For example, to exclude the `sigmoid` kernel from the tuning, the `kernel` hyperparameter of the `SVC` model can be modified as follows:

`fun_control = modify_hyper_parameter_levels(fun_control, "kernel", ["linear", "rbf"])`

The new setting can be controlled via:

`fun_control["core_model_hyper_dict"]["kernel"]`

```
# from spotPython.hyperparameters.values import modify_hyper_parameter_levels
# fun_control = modify_hyper_parameter_levels(fun_control, "kernel", ["rbf"])
```

24.8.3 Optimizers

Optimizers are described in Section 20.6.

24.9 5. Selection of the Objective: Metric and Loss Functions

- Machine learning models are optimized with respect to a metric, for example, the `accuracy` function.
- Deep learning, e.g., neural networks are optimized with respect to a loss function, for example, the `cross_entropy` function and evaluated with respect to a metric, for example, the `accuracy` function.

24.10 Step 6: Selection of the Objective (Loss) Function

The loss function, that is usually used in deep learning for optimizing the weights of the net, is stored in the `fun_control` dictionary as `"loss_function"`.

24.10.1 Metric Function

There are two different types of metrics in `spotPython`:

1. `"metric_river"` is used for the river based evaluation via `eval_oml_iter_progressive`.
2. `"metric_sklearn"` is used for the sklearn based evaluation.

We will consider multi-class classification metrics, e.g., `mapk_score` and `top_k_accuracy_score`.

> **Predict Probabilities**
>
> In this multi-class classification example the machine learning algorithm should return the probabilities of the specific classes (`"predict_proba"`) instead of the predicted values.

We set `"predict_proba"` to `True` in the `fun_control` dictionary.

24.10.1.1 The MAPK Metric

To select the MAPK metric, the following two entries can be added to the `fun_control` dictionary:

`"metric_sklearn": mapk_score"`

`"metric_params": {"k": 3}`.

24.10.1.2 Other Metrics

Alternatively, other metrics for multi-class classification can be used, e.g.,: * top_k_accuracy_score or * roc_auc_score

The metric `roc_auc_score` requires the parameter `"multi_class"`, e.g.,

`"multi_class": "ovr"`.

This is set in the `fun_control` dictionary.

> **Weights**
>
> `spotPython` performs a minimization, therefore, metrics that should be maximized have to be multiplied by -1. This is done by setting `"weights"` to `-1`.

- The complete setup for the metric in our example is:

```
from spotPython.utils.metrics import mapk_score
fun_control.update({
               "weights": -1,
               "metric_sklearn": mapk_score,
               "predict_proba": True,
               "metric_params": {"k": 3},
               })
```

24.11 Evaluation on Hold-out Data

- The default method for computing the performance is `"eval_holdout"`.
- Alternatively, cross-validation can be used for every machine learning model.
- Specifically for RandomForests, the OOB-score can be used.

```
fun_control.update({
    "eval": "train_hold_out",
})
```

24.11.1 OOB Score

Using the OOB-Score is a very efficient way to estimate the performance of a random forest classifier. The OOB-Score is calculated on the training data and does not require a hold-out test set. If the OOB-Score is used, the key "eval" in the `fun_control` dictionary should be set to `"oob_score"` as shown below.

24.11.1.1 Cross Validation

Instead of using the OOB-score, the classical cross validation can be used. The number of folds is set by the key `"k_folds"`. For example, to use 5-fold cross validation, the key `"k_folds"` is set to `5`. Uncomment the following line to use cross validation:

```
# fun_control.update({
#      "eval": "train_cv",
#      "k_folds": 10,
# })
```

24.12 6. Calling the SPOT Function

24.13 Preparing the SPOT Call

- Get types and variable names as well as lower and upper bounds for the hyperparameters.

```
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name        | type   | default   |   lower |   upper | transform              |
|-------------|--------|-----------|---------|---------|------------------------|
| n_neighbors | int    | 2         |       1 |       7 | transform_power_2_int |
| weights     | factor | uniform   |       0 |       1 | None                   |
| algorithm   | factor | auto      |       0 |       3 | None                   |
| leaf_size   | int    | 5         |       2 |       7 | transform_power_2_int |
| p           | int    | 2         |       1 |       2 | None                   |
```

24.14 The Objective Function

The objective function is selected next. It implements an interface from `sklearn`'s training, validation, and testing methods to `spotPython`.

```
from spotPython.fun.hypersklearn import HyperSklearn
fun = HyperSklearn().fun_sklearn
```

24.14.1 Run the Spot Optimizer

- Run SPOT for approx. x mins (`max_time`).
- Note: the run takes longer, because the evaluation time of initial design (here: `initi_size`, 20 points) is not considered.

```
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=SklearnHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
X_start
```

```
array([[2, 0, 0, 5, 2]])
```

```
import numpy as np
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models= False,
                   show_progress= True,
                   fun_control = fun_control,
                   design_control={"init_size": INIT_SIZE,
                                   "repeats": 1},
                   surrogate_control={"noise": True,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": len(var_name),
                                      "model_fun_evals": 10_000,
```

```
                                              "log_level": 50
                                              })
spot_tuner.run(X_start=X_start)
```

```
spotPython tuning: -0.3107769423558897 [----------] 0.25%

spotPython tuning: -0.3107769423558897 [----------] 0.54%

spotPython tuning: -0.3107769423558897 [----------] 0.82%

spotPython tuning: -0.3107769423558897 [----------] 1.10%

spotPython tuning: -0.3107769423558897 [----------] 1.36%

spotPython tuning: -0.3107769423558897 [----------] 1.66%

spotPython tuning: -0.3107769423558897 [----------] 2.03%

spotPython tuning: -0.3107769423558897 [----------] 2.37%

spotPython tuning: -0.3107769423558897 [----------] 2.71%

spotPython tuning: -0.3107769423558897 [----------] 3.01%

spotPython tuning: -0.3107769423558897 [----------] 3.30%

spotPython tuning: -0.3107769423558897 [----------] 4.33%

spotPython tuning: -0.3107769423558897 [#---------] 5.36%

spotPython tuning: -0.3107769423558897 [#---------] 6.61%

spotPython tuning: -0.3107769423558897 [#---------] 7.84%

spotPython tuning: -0.3107769423558897 [#---------] 9.19%
```

```
spotPython tuning: -0.3107769423558897 [#---------] 10.77%

spotPython tuning: -0.3107769423558897 [#---------] 12.01%

spotPython tuning: -0.3107769423558897 [#---------] 14.29%

spotPython tuning: -0.3107769423558897 [##--------] 15.74%

spotPython tuning: -0.3107769423558897 [##--------] 16.95%

spotPython tuning: -0.3107769423558897 [##--------] 17.94%

spotPython tuning: -0.3107769423558897 [##--------] 18.99%

spotPython tuning: -0.3107769423558897 [##--------] 20.22%

spotPython tuning: -0.3107769423558897 [##--------] 21.18%

spotPython tuning: -0.3107769423558897 [##--------] 22.39%

spotPython tuning: -0.3107769423558897 [##--------] 23.74%

spotPython tuning: -0.3107769423558897 [###-------] 25.25%

spotPython tuning: -0.3107769423558897 [###-------] 26.97%

spotPython tuning: -0.3107769423558897 [###-------] 28.75%

spotPython tuning: -0.3107769423558897 [###-------] 30.42%

spotPython tuning: -0.3107769423558897 [###-------] 32.80%

spotPython tuning: -0.3107769423558897 [###-------] 34.88%

spotPython tuning: -0.3107769423558897 [####------] 37.45%

spotPython tuning: -0.3107769423558897 [####------] 41.32%
```

```
spotPython tuning: -0.3107769423558897 [####------] 44.27%

spotPython tuning: -0.3107769423558897 [#####-----] 47.09%

spotPython tuning: -0.3107769423558897 [#####-----] 50.24%

spotPython tuning: -0.3107769423558897 [#####-----] 53.08%

spotPython tuning: -0.3107769423558897 [######----] 55.87%

spotPython tuning: -0.3107769423558897 [######----] 58.90%

spotPython tuning: -0.3107769423558897 [######----] 61.90%

spotPython tuning: -0.3107769423558897 [#######---] 65.09%

spotPython tuning: -0.3107769423558897 [#######---] 68.24%

spotPython tuning: -0.3107769423558897 [#######---] 71.05%

spotPython tuning: -0.3107769423558897 [#######---] 74.07%

spotPython tuning: -0.3107769423558897 [########--] 78.37%

spotPython tuning: -0.3107769423558897 [########--] 81.79%

spotPython tuning: -0.3107769423558897 [#########-] 85.21%

spotPython tuning: -0.3107769423558897 [#########-] 88.90%

spotPython tuning: -0.3107769423558897 [#########-] 92.84%

spotPython tuning: -0.3107769423558897 [##########] 96.15%

spotPython tuning: -0.3107769423558897 [##########] 98.60%

spotPython tuning: -0.3107769423558897 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x1698c3940>
```

24.14.2 Results

After the hyperparameter tuning run is finished, the progress of the hyperparameter tuning can be visualized. The following code generates the progress plot from **?@fig-progress**.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

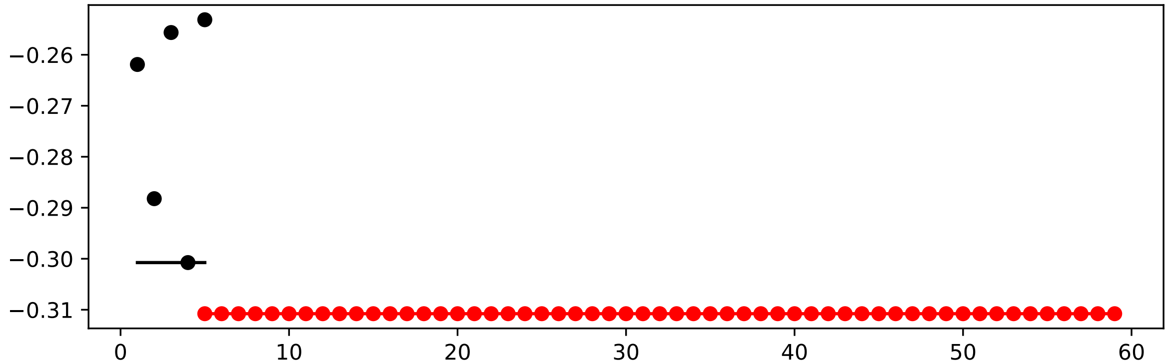


Figure 24.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

- Print the results

```
print(gen_design_table(fun_control=fun_control,
    spot=spot_tuner))
```

```
| name         | type   | default   |   lower |   upper |   tuned | transform              |
|--------------|--------|-----------|---------|---------|---------|------------------------|---
| n_neighbors  | int    | 2         |       1 |       7 |     4.0 | transform_power_2_int  |
| weights      | factor | uniform   |       0 |       1 |     1.0 | None                   |
| algorithm    | factor | auto      |       0 |       3 |     2.0 | None                   |
| leaf_size    | int    | 5         |       2 |       7 |     6.0 | transform_power_2_int  |
| p            | int    | 2         |       1 |       2 |     1.0 | None                   |
```

24.15 Show variable importance

```
spot_tuner.plot_importance(threshold=0.025, filename="./figures/" + experiment_name+"_impo
```

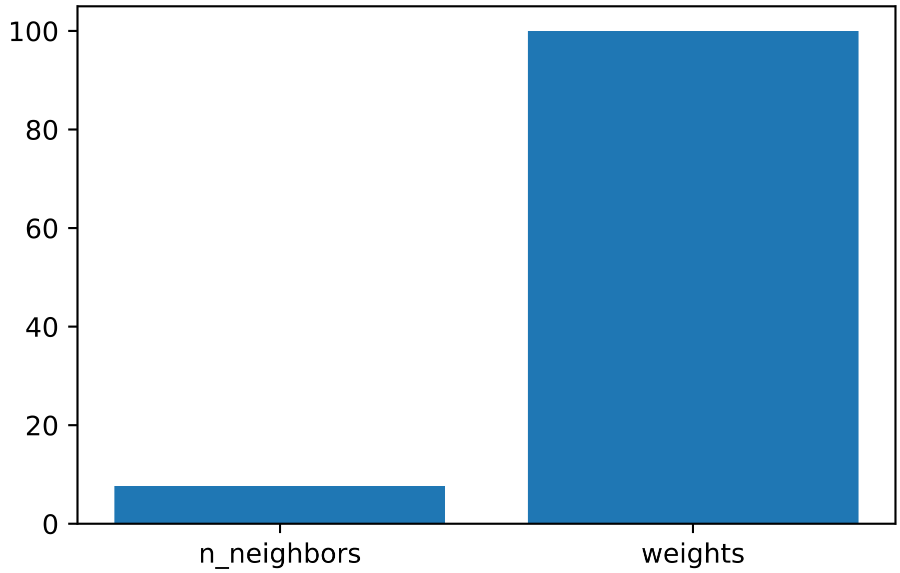


Figure 24.2: Variable importance plot, threshold 0.025.

24.16 Get Default Hyperparameters

```
from spotPython.hyperparameters.values import get_default_values, transform_hyper_paramete
values_default = get_default_values(fun_control)
values_default = transform_hyper_parameter_values(fun_control=fun_control, hyper_parameter
values_default
```

```
{'n_neighbors': 4,
 'weights': 'uniform',
 'algorithm': 'auto',
 'leaf_size': 32,
 'p': 2}
```

```
from sklearn.pipeline import make_pipeline
model_default = make_pipeline(fun_control["prep_model"], fun_control["core_model"](**value
model_default
```

```
Pipeline(steps=[('nonetype', None),
                ('kneighborsclassifier',
                 KNeighborsClassifier(leaf_size=32, n_neighbors=4))])
```

24.17 Get SPOT Results

```
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
print(X)
```

```
[[4. 1. 2. 6. 1.]]
```

```
from spotPython.hyperparameters.values import assign_values, return_conf_list_from_var_dic
v_dict = assign_values(X, fun_control["var_name"])
return_conf_list_from_var_dict(var_dict=v_dict, fun_control=fun_control)
```

```
[{'n_neighbors': 16,
  'weights': 'distance',
  'algorithm': 'kd_tree',
  'leaf_size': 64,
  'p': 1}]
```

```
from spotPython.hyperparameters.values import get_one_sklearn_model_from_X
model_spot = get_one_sklearn_model_from_X(X, fun_control)
model_spot
```

```
KNeighborsClassifier(algorithm='kd_tree', leaf_size=64, n_neighbors=16, p=1,
                     weights='distance')
```

24.18 Evaluate SPOT Results

- Fetch the data.

```
from spotPython.utils.convert import get_Xy_from_df
X_train, y_train = get_Xy_from_df(fun_control["train"], fun_control["target_column"])
X_test, y_test = get_Xy_from_df(fun_control["test"], fun_control["target_column"])
X_test.shape, y_test.shape
```

```
((177, 64), (177,))
```

- Fit the model with the tuned hyperparameters. This gives one result:

```
model_spot.fit(X_train, y_train)
y_pred = model_spot.predict_proba(X_test)
res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
res
```

```
0.3267419962335216
```

```
def repeated_eval(n, model):
    res_values = []
    for i in range(n):
        model.fit(X_train, y_train)
        y_pred = model.predict_proba(X_test)
        res = mapk_score(y_true=y_test, y_pred=y_pred, k=3)
        res_values.append(res)
    mean_res = np.mean(res_values)
    print(f"mean_res: {mean_res}")
    std_res = np.std(res_values)
    print(f"std_res: {std_res}")
    min_res = np.min(res_values)
    print(f"min_res: {min_res}")
    max_res = np.max(res_values)
    print(f"max_res: {max_res}")
    median_res = np.median(res_values)
    print(f"median_res: {median_res}")
    return mean_res, std_res, min_res, max_res, median_res
```

24.18.1 Handling Non-deterministic Results

- Because the model is non-determinstic, we perform $n = 30$ runs and calculate the mean and standard deviation of the performance metric.

```python
_ = repeated_eval(30, model_spot)
```

```
mean_res: 0.3267419962335218
std_res: 1.6653345369377348e-16
min_res: 0.3267419962335216
max_res: 0.3267419962335216
median_res: 0.3267419962335216
```

24.18.2 Evalution of the Default Hyperparameters

```python
model_default.fit(X_train, y_train)["kneighborsclassifier"]
```

```
KNeighborsClassifier(leaf_size=32, n_neighbors=4)
```

- One evaluation of the default hyperparameters is performed on the hold-out test set.

```python
y_pred = model_default.predict_proba(X_test)
mapk_score(y_true=y_test, y_pred=y_pred, k=3)
```

```
0.2768361581920904
```

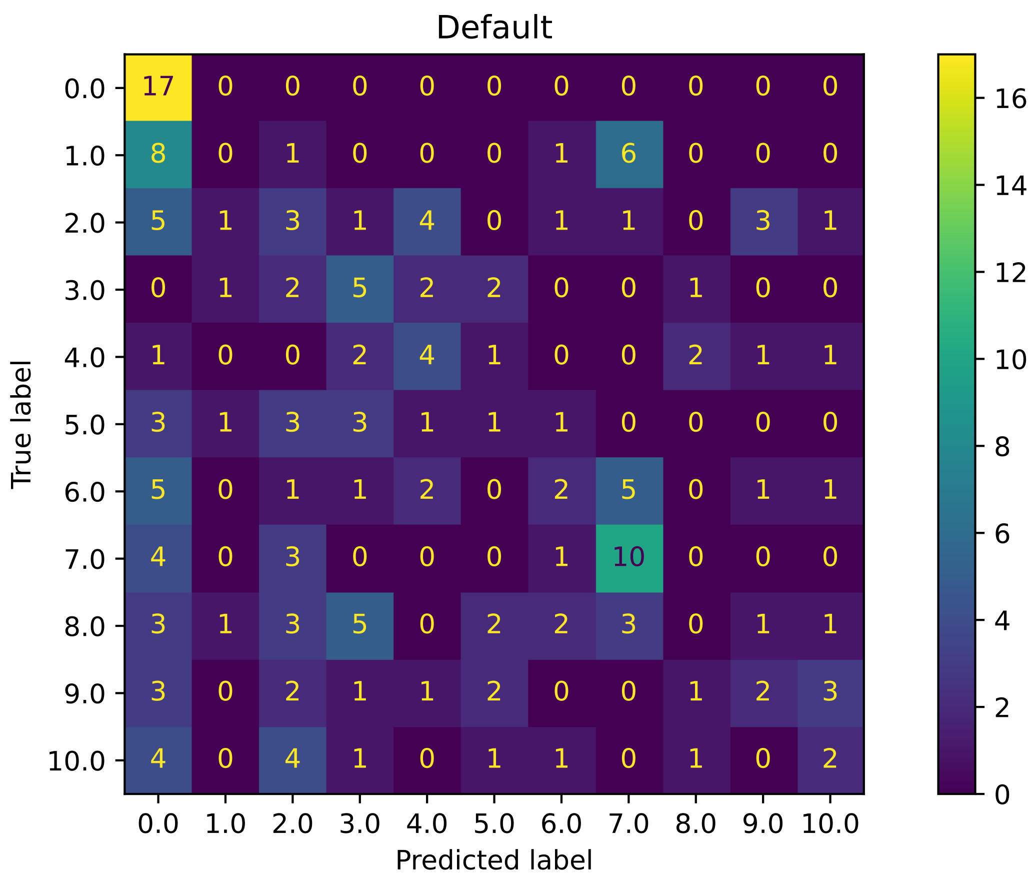
Since one single evaluation is not meaningful, we perform, similar to the evaluation of the SPOT results, $n = 30$ runs of the default setting and and calculate the mean and standard deviation of the performance metric.

```python
_ = repeated_eval(30, model_default)
```

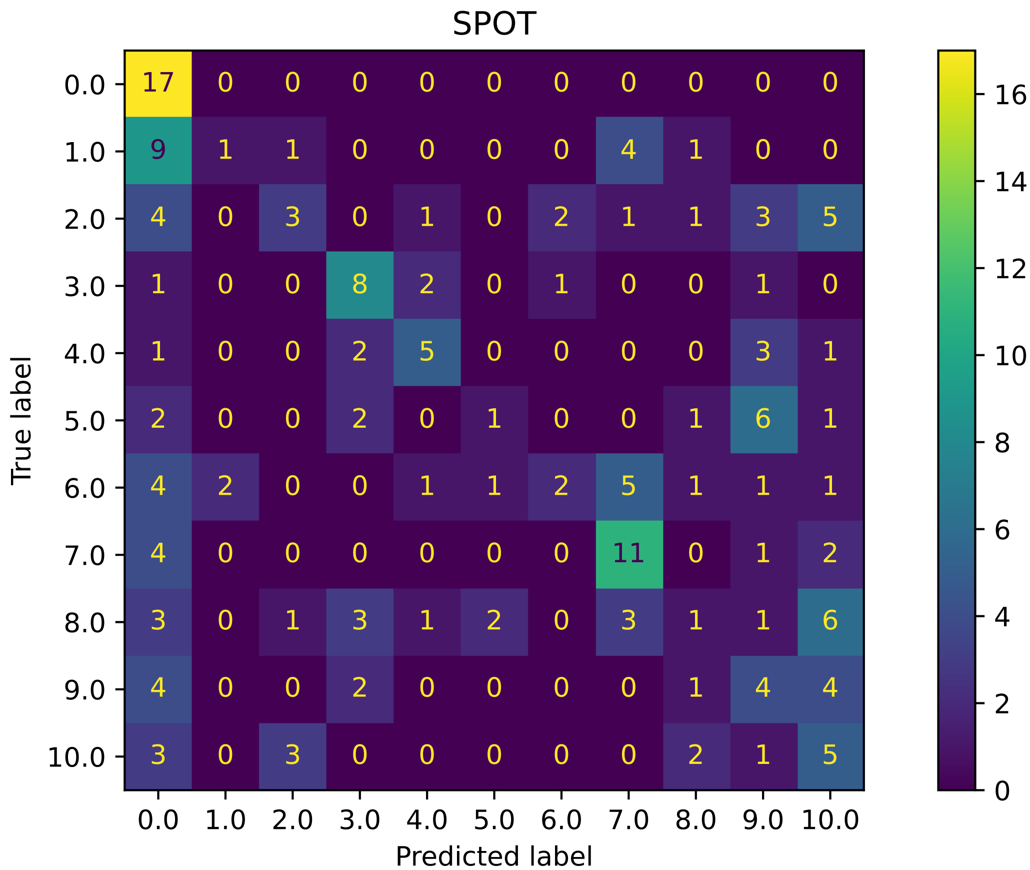
```
mean_res: 0.2768361581920903
std_res: 1.1102230246251565e-16
min_res: 0.2768361581920904
max_res: 0.2768361581920904
median_res: 0.2768361581920904
```

24.19 Plot: Compare Predictions

```
from spotPython.plot.validation import plot_confusion_matrix
plot_confusion_matrix(model_default, fun_control, title = "Default")
```




```
plot_confusion_matrix(model_spot, fun_control, title="SPOT")
```




```
min(spot_tuner.y), max(spot_tuner.y)
```

```
(-0.3107769423558897, -0.23558897243107768)
```

24.20 Cross-validated Evaluations

```
from spotPython.sklearn.traintest import evaluate_cv
fun_control.update({
     "eval": "train_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.3157232704402516, None)
```

```
fun_control.update({
     "eval": "test_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

```
(0.2832788671023965, None)
```

- This is the evaluation that will be used in the comparison:

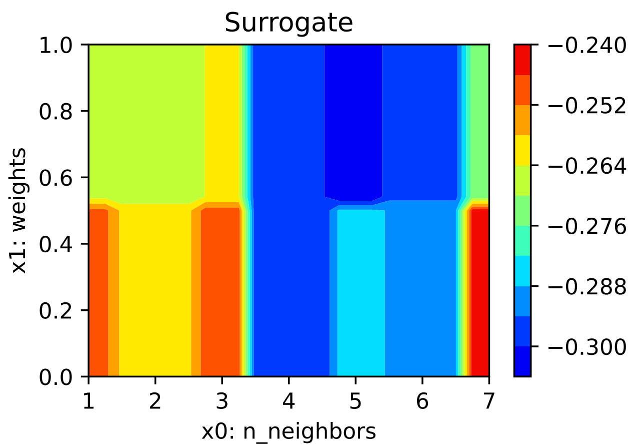
```
fun_control.update({
     "eval": "data_cv",
     "k_folds": 10,
})
evaluate_cv(model=model_spot, fun_control=fun_control, verbose=0)
```

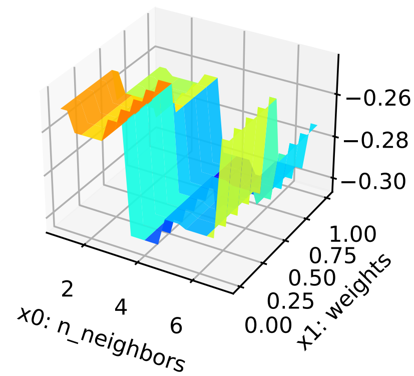
```
(0.3061904761904762, None)
```

24.20.1 Detailed Hyperparameter Plots

```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

```
n_neighbors:  7.659298853276286
weights:  100.0
```





24.21 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

```
Unable to display output for mime type(s): text/html
```

24.22 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

25 Hyperparameter Tuning for PyTorch With spotPython: Regression

In this tutorial, we will show how `spotPython` can be integrated into the `PyTorch` training workflow for regreession tasks.

This document refers to the following software versions:

- `python`: 3.10.10
- `torch`: 2.0.1
- `torchvision`: 0.15.0

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                    0.2.31
spotRiver                     0.0.93
```

```
Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

25.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time, initial design size and the device that is used.

```
MAX_TIME = 1
INIT_SIZE = 5
DEVICE = "cpu" # "cuda:0"
```

```
from spotPython.utils.device import getDevice
DEVICE = getDevice(DEVICE)
print(DEVICE)
```

```
cpu
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '24-torch' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_SI
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
24-torch_p040025_1min_5init_2023-06-16_15-34-13
```

25.2 Initialization of the `fun_control` Dictionary

`spotPython` uses a Python dictionary for storing the information required for the hyperparameter tuning process, which was described in Section 20.2.

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="regression",
 tensorboard_path="runs/24_spot_torch_regression",
```

```
device=DEVICE)
```

25.3 PyTorch Data Loading

```python
# Create dataset
import pandas as pd
import numpy as np
from sklearn import datasets as sklearn_datasets
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
X, y = sklearn_datasets.make_regression(
    n_samples=1000, n_features=10, noise=1, random_state=123)
y = y.reshape(-1, 1)

# Normalize the data
X_scaler = MinMaxScaler()
X_scaled = X_scaler.fit_transform(X)
y_scaler = MinMaxScaler()
y_scaled = y_scaler.fit_transform(y)

# combine the features and target into a single dataframe named train_df
train_df = pd.DataFrame(np.hstack((X_scaled, y_scaled)))

target_column = "y"
n_samples = train_df.shape[0]
n_features = train_df.shape[1] - 1
train_df.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
X_train, X_test, y_train, y_test = train_test_split(train_df.drop(target_column,
    axis=1),
    train_df[target_column],
    random_state=42,
    test_size=0.25)
trainset = pd.DataFrame(np.hstack((X_train, np.array(y_train).reshape(-1, 1))))
testset = pd.DataFrame(np.hstack((X_test, np.array(y_test).reshape(-1, 1))))
trainset.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
testset.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train_df.shape)
print(trainset.shape)
print(testset.shape)
```

```
(1000, 11)
(750, 11)
(250, 11)
```

```
import torch
from spotPython.torch.dataframedataset import DataFrameDataset
dtype_x = torch.float32
dtype_y = torch.float32
train_df = DataFrameDataset(train_df, target_column=target_column,
    dtype_x=dtype_x, dtype_y=dtype_y)
train = DataFrameDataset(trainset, target_column=target_column,
    dtype_x=dtype_x, dtype_y=dtype_y)
test = DataFrameDataset(testset, target_column=target_column,
    dtype_x=dtype_x, dtype_y=dtype_y)
n_samples = len(train)
```

- Now we can test the data loading:

```
from spotPython.torch.traintest import create_train_val_data_loaders
trainloader, testloader = create_train_val_data_loaders(train, 2, True, 0)
for i, data in enumerate(trainloader, 0):
    inputs, labels = data
    print(inputs.shape)
    print(labels.shape)
    print(inputs)
    print(labels)
    break
```

```
torch.Size([2, 10])
torch.Size([2])
tensor([[0.5267, 0.5861, 0.6044, 0.6215, 0.4695, 0.4065, 0.4873, 0.5056, 0.4605,
         0.5821],
        [0.4639, 0.5146, 0.5254, 0.8400, 0.3605, 0.6382, 0.3045, 0.4280, 0.5134,
         0.5654]])
tensor([0.5365, 0.5087])
```

- Since this works fine, we can add the data loading to the `fun_control` dictionary:

```
# add the dataset to the fun_control
fun_control.update({"data": train_df, # full dataset,
               "train": train,
```

```
                 "test": test,
                 "n_samples": n_samples,
                 "target_column": target_column,})
```

25.4 The Model (Algorithm) to be Tuned

25.5 Specification of the Preprocessing Model

After the training and test data are specified and added to the `fun_control` dictionary, `spotPython` allows the specification of a data preprocessing pipeline, e.g., for the scaling of the data or for the one-hot encoding of categorical variables, see Section 20.4.1. This feature is not used here, so we do not change the default value (which is `None`).

25.6 Select `algorithm` and `core_model_hyper_dict`

25.6.1 Implementing a Configurable Neural Network With spotPython

`spotPython` includes the `Net_lin_reg` class which is implemented in the file `netregression.py`.

This class inherits from the class `Net_Core` which is implemented in the file `netcore.py`, see **?@sec-the-net-core-class-24**.

```
from torch import nn
import spotPython.torch.netcore as netcore


class Net_lin_reg(netcore.Net_Core):
    def __init__(
        self, _L_in, _L_out, l1, dropout_prob, lr_mult,
        batch_size, epochs, k_folds, patience, optimizer,
        sgd_momentum
    ):
        super(Net_lin_reg, self).__init__(
            lr_mult=lr_mult,
            batch_size=batch_size,
            epochs=epochs,
            k_folds=k_folds,
            patience=patience,
```

```
            optimizer=optimizer,
            sgd_momentum=sgd_momentum,
        )
        l2 = max(l1 // 2, 4)
        self.fc1 = nn.Linear(_L_in, l1)
        self.fc2 = nn.Linear(l1, l2)
        self.fc3 = nn.Linear(l2, _L_out)
        self.relu = nn.ReLU()
        self.softmax = nn.Softmax(dim=1)
        self.dropout1 = nn.Dropout(p=dropout_prob)
        self.dropout2 = nn.Dropout(p=dropout_prob / 2)

    def forward(self, x):
        x = self.fc1(x)
        x = self.relu(x)
        x = self.dropout1(x)
        x = self.fc2(x)
        x = self.relu(x)
        x = self.dropout2(x)
        x = self.fc3(x)
        return x
```

25.6.1.1 The `Net_Core` class

`Net_lin_reg` inherits from the class `Net_Core` which is implemented in the file `netcore.py`. This class was described in Section 20.4.3.

```
from spotPython.torch.netregression import Net_lin_reg
from spotPython.data.torch_hyper_dict import TorchHyperDict
from spotPython.hyperparameters.values import add_core_model_to_fun_control
fun_control = add_core_model_to_fun_control(core_model=Net_lin_reg,
                              fun_control=fun_control,
                              hyper_dict=TorchHyperDict,
                              filename=None)
```

25.7 The Search Space

25.7.1 Configuring the Search Space With spotPython

25.7.1.1 The `hyper_dict` Hyperparameters for the Selected Algorithm

`spotPython` uses `JSON` files for the specification of the hyperparameters, which were described in Section 20.5.2.

The corresponding entries for the `Net_lin_reg` class are shown below.

```
    "Net_lin_reg":
    {
        "_L_in": {
            "type": "int",
            "default": 10,
            "transform": "None",
            "lower": 10,
            "upper": 10},
        "_L_out": {
            "type": "int",
            "default": 1,
            "transform": "None",
            "lower": 1,
            "upper": 1},
        "l1": {
            "type": "int",
            "default": 3,
            "transform": "transform_power_2_int",
            "lower": 3,
            "upper": 8},
        "dropout_prob": {
            "type": "float",
            "default": 0.01,
            "transform": "None",
            "lower": 0.0,
            "upper": 0.9},
        "lr_mult": {
            "type": "float",
            "default": 1.0,
            "transform": "None",
            "lower": 0.1,
```

```
        "upper": 10.0},
    "batch_size": {
        "type": "int",
        "default": 4,
        "transform": "transform_power_2_int",
        "lower": 1,
        "upper": 4},
    "epochs": {
        "type": "int",
        "default": 4,
        "transform": "transform_power_2_int",
        "lower": 4,
        "upper": 9},
    "k_folds": {
        "type": "int",
        "default": 1,
        "transform": "None",
        "lower": 1,
        "upper": 1},
    "patience": {
        "type": "int",
        "default": 2,
        "transform": "transform_power_2_int",
        "lower": 1,
        "upper": 5
    },
    "optimizer": {
        "levels": ["Adadelta",
                   "Adagrad",
                   "Adam",
                   "AdamW",
                   "SparseAdam",
                   "Adamax",
                   "ASGD",
                   "NAdam",
                   "RAdam",
                   "RMSprop",
                   "Rprop",
                   "SGD"],
        "type": "factor",
        "default": "SGD",
```

```
            "transform": "None",
            "class_name": "torch.optim",
            "core_model_parameter_type": "str",
            "lower": 0,
            "upper": 12},
        "sgd_momentum": {
            "type": "float",
            "default": 0.0,
            "transform": "None",
            "lower": 0.0,
            "upper": 1.0}
    },
```

25.8 Modifying the Hyperparameters

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

25.8.1 Modify `hyper_dict` Hyperparameters for the Selected Algorithm aka `core_model`

25.8.1.1 Modify Hyperparameters of Type numeric and integer (boolean)

```python
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds

fun_control = modify_hyper_parameter_bounds(fun_control, "epochs", bounds=[2, 16])
fun_control = modify_hyper_parameter_bounds(fun_control, "patience", bounds=[3, 7])
```

25.8.1.2 Modify Hyperparameter of Type factor

```python
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
fun_control = modify_hyper_parameter_levels(fun_control, "optimizer",
    ["Adadelta", "Adagrad", "Adam", "AdamW", "Adamax", "ASGD", "NAdam"])


fun_control.update({
```

```
                 "_L_in": n_features,
                 "_L_out": 1,})
```

25.8.2 Optimizers

Optimizers are described in Section 20.6.

25.9 Evaluation

The evaluation procedure requires the specification of two elements:

1. the way how the data is split into a train and a test set (see Section 20.7)
2. the loss function (and a metric).

25.9.1 Loss Functions and Metrics

The key `"loss_function"` specifies the loss function which is used during the optimization, see Section 20.8.

We will use MSE loss for the regression task.

```
from torch.nn import MSELoss
loss_torch = MSELoss()
fun_control.update({"loss_function": loss_torch})
```

25.9.2 Metric

```
from torchmetrics import MeanAbsoluteError
metric_torch = MeanAbsoluteError().to(fun_control["device"])
fun_control.update({"metric_torch": metric_torch})
```

25.10 Preparing the SPOT Call

The following code passes the information about the parameter ranges and bounds to `spot`.

```python
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

```python
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name         | type   | default   |   lower |   upper | transform             |
|--------------|--------|-----------|---------|---------|-----------------------|
| _L_in        | int    | 10        |    10   |    10   | None                  |
| _L_out       | int    | 1         |     1   |     1   | None                  |
| l1           | int    | 3         |     3   |     8   | transform_power_2_int |
| dropout_prob | float  | 0.01      |     0   |     0.9 | None                  |
| lr_mult      | float  | 1.0       |     0.1 |    10   | None                  |
| batch_size   | int    | 4         |     1   |     4   | transform_power_2_int |
| epochs       | int    | 4         |     2   |    16   | transform_power_2_int |
| k_folds      | int    | 1         |     1   |     1   | None                  |
| patience     | int    | 2         |     3   |     7   | transform_power_2_int |
| optimizer    | factor | SGD       |     0   |     6   | None                  |
| sgd_momentum | float  | 0.0       |     0   |     1   | None                  |
```

25.11 The Objective Function `fun_torch`

The objective function `fun_torch` is selected next. It implements an interface from `PyTorch`'s training, validation, and testing methods to `spotPython`.

```python
from spotPython.fun.hypertorch import HyperTorch
fun = HyperTorch().fun_torch
```

```python
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=TorchHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
```

25.12 Starting the Hyperparameter Tuning

The `spotPython` hyperparameter tuning is started by calling the `Spot` function as described in Section 20.12.

```
from spotPython.spot import spot
from math import inf
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models= False,
                   show_progress= True,
                   fun_control = fun_control,
                   design_control={"init_size": INIT_SIZE,
                                   "repeats": 1},
                   surrogate_control={"noise": True,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": len(var_name),
                                      "model_fun_evals": 10_000,
                                      "log_level": 50
                                      })
spot_tuner.run(X_start=X_start)
```

```
config: {'_L_in': 10, '_L_out': 1, 'l1': 64, 'dropout_prob': 0.7103122166156, 'lr_mult': 3.6
```

```
Epoch: 1
```

```
Loss on hold-out set: 0.04342649384450756
MeanAbsoluteError value on hold-out data: 0.1690325289964676
Epoch: 2
Loss on hold-out set: 0.03241857030968133
MeanAbsoluteError value on hold-out data: 0.1464509218931198
Epoch: 3
Loss on hold-out set: 0.03142147195084315
MeanAbsoluteError value on hold-out data: 0.14271624386310577
Epoch: 4
Loss on hold-out set: 0.029612648178284105
MeanAbsoluteError value on hold-out data: 0.1397300809621811
Epoch: 5
Loss on hold-out set: 0.027137785561774905
MeanAbsoluteError value on hold-out data: 0.13011577725410461
Epoch: 6
Loss on hold-out set: 0.02627408502035235
MeanAbsoluteError value on hold-out data: 0.1288663148880005
Epoch: 7
Loss on hold-out set: 0.025374893466696927
MeanAbsoluteError value on hold-out data: 0.12663322687149048
Epoch: 8
Loss on hold-out set: 0.024811667304388003
MeanAbsoluteError value on hold-out data: 0.12692083418369293
Epoch: 9

Loss on hold-out set: 0.023485446128209953
MeanAbsoluteError value on hold-out data: 0.12553144991397858
Epoch: 10

Loss on hold-out set: 0.021120951658016758
MeanAbsoluteError value on hold-out data: 0.11658996343612671
Epoch: 11
Loss on hold-out set: 0.02025409542808407
MeanAbsoluteError value on hold-out data: 0.11132477968931198
Epoch: 12

Loss on hold-out set: 0.020272977723691025
MeanAbsoluteError value on hold-out data: 0.11315356940031052
Epoch: 13
Loss on hold-out set: 0.02097146144430888
MeanAbsoluteError value on hold-out data: 0.11751607060432434
Epoch: 14
```

```
Loss on hold-out set: 0.017627828448128543
MeanAbsoluteError value on hold-out data: 0.10482937097549438
Epoch: 15
Loss on hold-out set: 0.019895642089020265
MeanAbsoluteError value on hold-out data: 0.11446276307106018
Epoch: 16
Loss on hold-out set: 0.01924844894337615
MeanAbsoluteError value on hold-out data: 0.11120268702507019
Epoch: 17
Loss on hold-out set: 0.02055856700692522
MeanAbsoluteError value on hold-out data: 0.11512668430805206
Epoch: 18
Loss on hold-out set: 0.01794628116400226
MeanAbsoluteError value on hold-out data: 0.1053675040602684
Epoch: 19
Loss on hold-out set: 0.016827998560314115
MeanAbsoluteError value on hold-out data: 0.10124519467353821
Epoch: 20

Loss on hold-out set: 0.017837993408504286
MeanAbsoluteError value on hold-out data: 0.10552717745304108
Epoch: 21

Loss on hold-out set: 0.0177507917886894
MeanAbsoluteError value on hold-out data: 0.10484973341226578
Epoch: 22
Loss on hold-out set: 0.015997260453571614
MeanAbsoluteError value on hold-out data: 0.09990706294775009
Epoch: 23

Loss on hold-out set: 0.01530171798444108
MeanAbsoluteError value on hold-out data: 0.09718606621026993
Epoch: 24
Loss on hold-out set: 0.014569115249047937
MeanAbsoluteError value on hold-out data: 0.09564418345689774
Epoch: 25
Loss on hold-out set: 0.012785022330813502
MeanAbsoluteError value on hold-out data: 0.08658638596534729
Epoch: 26
Loss on hold-out set: 0.012591445273229558
MeanAbsoluteError value on hold-out data: 0.08529463410377502
Epoch: 27
```

```
Loss on hold-out set: 0.013009714416081184
MeanAbsoluteError value on hold-out data: 0.09070044010877609
Epoch: 28
Loss on hold-out set: 0.014792813184229951
MeanAbsoluteError value on hold-out data: 0.09406431764364243
Epoch: 29
Loss on hold-out set: 0.012297555497896514
MeanAbsoluteError value on hold-out data: 0.08505751192569733
Epoch: 30
Loss on hold-out set: 0.012164602019382935
MeanAbsoluteError value on hold-out data: 0.08430840075016022
Epoch: 31

Loss on hold-out set: 0.013192675787171251
MeanAbsoluteError value on hold-out data: 0.08940473198890686
Epoch: 32

Loss on hold-out set: 0.015084788166476707
MeanAbsoluteError value on hold-out data: 0.0945659726858139
Epoch: 33
Loss on hold-out set: 0.011790269777472866
MeanAbsoluteError value on hold-out data: 0.08152515441179276
Epoch: 34

Loss on hold-out set: 0.010406835611272407
MeanAbsoluteError value on hold-out data: 0.07955285906791687
Epoch: 35
Loss on hold-out set: 0.010455311735552785
MeanAbsoluteError value on hold-out data: 0.07689002901315689
Epoch: 36
Loss on hold-out set: 0.010548529202902788
MeanAbsoluteError value on hold-out data: 0.0789913758635521
Epoch: 37
Loss on hold-out set: 0.011367817231650023
MeanAbsoluteError value on hold-out data: 0.08066083490848541
Epoch: 38
Loss on hold-out set: 0.011206679113552366
MeanAbsoluteError value on hold-out data: 0.07986011356115341
Epoch: 39
Loss on hold-out set: 0.0089823484702624
MeanAbsoluteError value on hold-out data: 0.06826275587081909
Epoch: 40
```

```
Loss on hold-out set: 0.010307353942679535
MeanAbsoluteError value on hold-out data: 0.07536228001117706
Epoch: 41
Loss on hold-out set: 0.01228431959661018
MeanAbsoluteError value on hold-out data: 0.07932780683040619
Epoch: 42

Loss on hold-out set: 0.012842802336978676
MeanAbsoluteError value on hold-out data: 0.08730970323085785
Epoch: 43

Loss on hold-out set: 0.012342592051840927
MeanAbsoluteError value on hold-out data: 0.08298889547586441
Epoch: 44
Loss on hold-out set: 0.009975214249846575
MeanAbsoluteError value on hold-out data: 0.07663258165121078
Epoch: 45

Loss on hold-out set: 0.01298027244813152
MeanAbsoluteError value on hold-out data: 0.08193835616111755
Epoch: 46
Loss on hold-out set: 0.011355159050588938
MeanAbsoluteError value on hold-out data: 0.07949873805046082
Epoch: 47
Loss on hold-out set: 0.010770619632431158
MeanAbsoluteError value on hold-out data: 0.07753996551036835
Epoch: 48
Loss on hold-out set: 0.008371803786997733
MeanAbsoluteError value on hold-out data: 0.06406306475400925
Epoch: 49
Loss on hold-out set: 0.010570468534225304
MeanAbsoluteError value on hold-out data: 0.07343066483736038
Epoch: 50
Loss on hold-out set: 0.010568406065239719
MeanAbsoluteError value on hold-out data: 0.07795646041631699
Epoch: 51
Loss on hold-out set: 0.010555209254993028
MeanAbsoluteError value on hold-out data: 0.07829353213310242
Epoch: 52
Loss on hold-out set: 0.01110869482478225
MeanAbsoluteError value on hold-out data: 0.07536850869655609
Epoch: 53
```

```
Loss on hold-out set: 0.009831840564545832
MeanAbsoluteError value on hold-out data: 0.07281412929296494
Epoch: 54

Loss on hold-out set: 0.008646576873664009
MeanAbsoluteError value on hold-out data: 0.0712658166885376
Epoch: 55
Loss on hold-out set: 0.008830688948939113
MeanAbsoluteError value on hold-out data: 0.06851371377706528
Epoch: 56

Loss on hold-out set: 0.010992878496548847
MeanAbsoluteError value on hold-out data: 0.08240298926830292
Epoch: 57
Loss on hold-out set: 0.011237576187245156
MeanAbsoluteError value on hold-out data: 0.07692135125398636
Epoch: 58
Loss on hold-out set: 0.0074055922052234805
MeanAbsoluteError value on hold-out data: 0.061905790120363235
Epoch: 59
Loss on hold-out set: 0.009352420894796714
MeanAbsoluteError value on hold-out data: 0.06877332925796509
Epoch: 60
Loss on hold-out set: 0.00992881548039517
MeanAbsoluteError value on hold-out data: 0.07386995106935501
Epoch: 61
Loss on hold-out set: 0.007967144042547596
MeanAbsoluteError value on hold-out data: 0.06197063997387886
Epoch: 62
Loss on hold-out set: 0.009809430164750665
MeanAbsoluteError value on hold-out data: 0.07528328895568848
Epoch: 63
Loss on hold-out set: 0.007482443688020699
MeanAbsoluteError value on hold-out data: 0.06220376864075661
Epoch: 64

Loss on hold-out set: 0.007650537952462113
MeanAbsoluteError value on hold-out data: 0.0616462379693985
Epoch: 65

Loss on hold-out set: 0.00944963309877111
```

```
MeanAbsoluteError value on hold-out data: 0.07380886375904083
Epoch: 66
Loss on hold-out set: 0.00963375142983798
MeanAbsoluteError value on hold-out data: 0.06991744041442871
Epoch: 67

Loss on hold-out set: 0.009848175337538123
MeanAbsoluteError value on hold-out data: 0.07214908301830292
Epoch: 68
Loss on hold-out set: 0.009530002398318365
MeanAbsoluteError value on hold-out data: 0.06897176802158356
Epoch: 69
Loss on hold-out set: 0.011544906687432606
MeanAbsoluteError value on hold-out data: 0.0789884403347969
Epoch: 70
Loss on hold-out set: 0.008642538441467638
MeanAbsoluteError value on hold-out data: 0.06711370497941971
Epoch: 71
Loss on hold-out set: 0.007308318046852946
MeanAbsoluteError value on hold-out data: 0.06251095235347748
Epoch: 72
Loss on hold-out set: 0.0070396171940956265
MeanAbsoluteError value on hold-out data: 0.061995722353458405
Epoch: 73
Loss on hold-out set: 0.007576594588738915
MeanAbsoluteError value on hold-out data: 0.0622473768889904
Epoch: 74
Loss on hold-out set: 0.01147145137809658
MeanAbsoluteError value on hold-out data: 0.07444890588521957
Epoch: 75

Loss on hold-out set: 0.008794140164115416
MeanAbsoluteError value on hold-out data: 0.06765597313642502
Epoch: 76

Loss on hold-out set: 0.008517488993483743
MeanAbsoluteError value on hold-out data: 0.06625761091709137
Epoch: 77
Loss on hold-out set: 0.010770707299295617
MeanAbsoluteError value on hold-out data: 0.07232186943292618
Epoch: 78
```

```
Loss on hold-out set: 0.008584555880301386
MeanAbsoluteError value on hold-out data: 0.06264881044626236
Epoch: 79
Loss on hold-out set: 0.009412785413013281
MeanAbsoluteError value on hold-out data: 0.07132186740636826
Epoch: 80
Loss on hold-out set: 0.011304464810037692
MeanAbsoluteError value on hold-out data: 0.08018455654382706
Epoch: 81
Loss on hold-out set: 0.009182361625502572
MeanAbsoluteError value on hold-out data: 0.06835348904132843
Epoch: 82
Loss on hold-out set: 0.008580369539375073
MeanAbsoluteError value on hold-out data: 0.06723114848136902
Epoch: 83
Loss on hold-out set: 0.007308827703941222
MeanAbsoluteError value on hold-out data: 0.06051626801490784
Epoch: 84
Loss on hold-out set: 0.010474350864043165
MeanAbsoluteError value on hold-out data: 0.07046880573034286
Epoch: 85
Loss on hold-out set: 0.008946626004456592
MeanAbsoluteError value on hold-out data: 0.06917101889848709
Epoch: 86

Loss on hold-out set: 0.009719592476214626
MeanAbsoluteError value on hold-out data: 0.06848680973052979
Epoch: 87

Loss on hold-out set: 0.010324598222627844
MeanAbsoluteError value on hold-out data: 0.07579311728477478
Epoch: 88
Loss on hold-out set: 0.007976084166377979
MeanAbsoluteError value on hold-out data: 0.0620650053024292
Early stopping at epoch 87
Returned to Spot: Validation loss: 0.007976084166377979
----------------------------------------------

config: {'_L_in': 10, '_L_out': 1, 'l1': 32, 'dropout_prob': 0.19981931523998656, 'lr_mult':
Epoch: 1

Loss on hold-out set: 0.05135071444276132
```

```
MeanAbsoluteError value on hold-out data: 0.19004403054714203
Epoch: 2
Loss on hold-out set: 0.055240126816849956
MeanAbsoluteError value on hold-out data: 0.1958133578300476
Epoch: 3
Loss on hold-out set: 0.02745025619668396
MeanAbsoluteError value on hold-out data: 0.13386915624141693
Epoch: 4
Loss on hold-out set: 0.020699185515312774
MeanAbsoluteError value on hold-out data: 0.11790911108255386
Epoch: 5
Loss on hold-out set: 0.031775632922194506
MeanAbsoluteError value on hold-out data: 0.14528360962867737
Epoch: 6
Loss on hold-out set: 0.027572152498913437
MeanAbsoluteError value on hold-out data: 0.13623668253421783
Epoch: 7
Loss on hold-out set: 0.017487476849438327
MeanAbsoluteError value on hold-out data: 0.10808835178613663
Epoch: 8
Loss on hold-out set: 0.017233370264109812
MeanAbsoluteError value on hold-out data: 0.10743360966444016
Epoch: 9
Loss on hold-out set: 0.0330867479114156
MeanAbsoluteError value on hold-out data: 0.14933191239833832
Epoch: 10
Loss on hold-out set: 0.024903247402490752
MeanAbsoluteError value on hold-out data: 0.12756335735321045
Epoch: 11
Loss on hold-out set: 0.019766980340998424
MeanAbsoluteError value on hold-out data: 0.11341910064220428
Epoch: 12
Loss on hold-out set: 0.009214457430827775
MeanAbsoluteError value on hold-out data: 0.07792237401008606
Epoch: 13
Loss on hold-out set: 0.022613961372132365
MeanAbsoluteError value on hold-out data: 0.12318940460681915
Epoch: 14
Loss on hold-out set: 0.0370562147643221
MeanAbsoluteError value on hold-out data: 0.16880851984024048
Epoch: 15
Loss on hold-out set: 0.023780052697187977
MeanAbsoluteError value on hold-out data: 0.12628984451293945
```

```
Epoch: 16

Loss on hold-out set: 0.01796544512341681
MeanAbsoluteError value on hold-out data: 0.10765523463487625
Epoch: 17

Loss on hold-out set: 0.04098964923698651
MeanAbsoluteError value on hold-out data: 0.17676641047000885
Epoch: 18
Loss on hold-out set: 0.01634146785363555
MeanAbsoluteError value on hold-out data: 0.10269782692193985
Epoch: 19
Loss on hold-out set: 0.008755892711250405
MeanAbsoluteError value on hold-out data: 0.07393845170736313
Epoch: 20
Loss on hold-out set: 0.017929543079318183
MeanAbsoluteError value on hold-out data: 0.10875210911035538

Epoch: 21
Loss on hold-out set: 0.008247580710112265
MeanAbsoluteError value on hold-out data: 0.07448623329401016
Epoch: 22
Loss on hold-out set: 0.03970267241330523
MeanAbsoluteError value on hold-out data: 0.17758998274803162
Epoch: 23
Loss on hold-out set: 0.013583216767169927
MeanAbsoluteError value on hold-out data: 0.09945183992385864
Epoch: 24
Loss on hold-out set: 0.011938848232507314
MeanAbsoluteError value on hold-out data: 0.08732447028160095
Epoch: 25
Loss on hold-out set: 0.015594311548691047
MeanAbsoluteError value on hold-out data: 0.11189018189907074
Epoch: 26
Loss on hold-out set: 0.010718557517975569
MeanAbsoluteError value on hold-out data: 0.07481750100851059
Epoch: 27
Loss on hold-out set: 0.009723904689675883
MeanAbsoluteError value on hold-out data: 0.08139874786138535
Epoch: 28
Loss on hold-out set: 0.022652930236960713
MeanAbsoluteError value on hold-out data: 0.13816455006599426
```

```
Epoch: 29
Loss on hold-out set: 0.004431951012903531
MeanAbsoluteError value on hold-out data: 0.04923048987984657
Epoch: 30
Loss on hold-out set: 0.022757708560675383
MeanAbsoluteError value on hold-out data: 0.12988287210464478
Epoch: 31
Loss on hold-out set: 0.0352410846634915
MeanAbsoluteError value on hold-out data: 0.1735907793045044
Epoch: 32
Loss on hold-out set: 0.004296917235478759
MeanAbsoluteError value on hold-out data: 0.051435746252536774
Epoch: 33
Loss on hold-out set: 0.010356589967973139
MeanAbsoluteError value on hold-out data: 0.08503927290439606
Epoch: 34
Loss on hold-out set: 0.0074915215618124135
MeanAbsoluteError value on hold-out data: 0.07409340888261795
Epoch: 35
Loss on hold-out set: 0.006911330807365869
MeanAbsoluteError value on hold-out data: 0.06867239624261856
Epoch: 36

Loss on hold-out set: 0.004447998699585074

MeanAbsoluteError value on hold-out data: 0.05195080488920212
Epoch: 37
Loss on hold-out set: 0.015268121576426845
MeanAbsoluteError value on hold-out data: 0.09777378290891647
Epoch: 38
Loss on hold-out set: 0.026381922983809522
MeanAbsoluteError value on hold-out data: 0.1401498019695282
Epoch: 39
Loss on hold-out set: 0.018137671739647265
MeanAbsoluteError value on hold-out data: 0.11488428711891174
Epoch: 40

Loss on hold-out set: 0.007639952065227063
MeanAbsoluteError value on hold-out data: 0.07074364274740219
Epoch: 41
Loss on hold-out set: 0.004912305537513212
MeanAbsoluteError value on hold-out data: 0.05826827883720398
```

```
Epoch: 42
Loss on hold-out set: 0.0029472614834575275
MeanAbsoluteError value on hold-out data: 0.043760064989328384
Epoch: 43
Loss on hold-out set: 0.03471151798179275
MeanAbsoluteError value on hold-out data: 0.17526774108409882
Epoch: 44
Loss on hold-out set: 0.029282672526805026
MeanAbsoluteError value on hold-out data: 0.1575097143650055
Epoch: 45
Loss on hold-out set: 0.003958759504664493
MeanAbsoluteError value on hold-out data: 0.045972779393196106
Epoch: 46
Loss on hold-out set: 0.0028996670030449565
MeanAbsoluteError value on hold-out data: 0.041366804391145706
Epoch: 47
Loss on hold-out set: 0.013869295607468015
MeanAbsoluteError value on hold-out data: 0.09255686402320862
Epoch: 48
Loss on hold-out set: 0.0028495015086312044
MeanAbsoluteError value on hold-out data: 0.04208499565720558
Epoch: 49
Loss on hold-out set: 0.003691297925175413
MeanAbsoluteError value on hold-out data: 0.04733885079622269
Epoch: 50
Loss on hold-out set: 0.006952826191033972
MeanAbsoluteError value on hold-out data: 0.06751010566949844
Epoch: 51
Loss on hold-out set: 0.014430852214756765
MeanAbsoluteError value on hold-out data: 0.1047201082110405
Epoch: 52
Loss on hold-out set: 0.02416261501218143
MeanAbsoluteError value on hold-out data: 0.1439865678548813
Epoch: 53
Loss on hold-out set: 0.008579979699693228
MeanAbsoluteError value on hold-out data: 0.07702311128377914
Epoch: 54
Loss on hold-out set: 0.003618252727105037
MeanAbsoluteError value on hold-out data: 0.04478016123175621
Epoch: 55
Loss on hold-out set: 0.006808479475837789
MeanAbsoluteError value on hold-out data: 0.06640102714300156
Epoch: 56
```

```
Loss on hold-out set: 0.004685204267795933
MeanAbsoluteError value on hold-out data: 0.05405489727854729
Epoch: 57
Loss on hold-out set: 0.0031419855383175766
MeanAbsoluteError value on hold-out data: 0.04262762889266014
Epoch: 58
Loss on hold-out set: 0.011460485365731935
MeanAbsoluteError value on hold-out data: 0.08320516347885132
Epoch: 59
Loss on hold-out set: 0.005147076175106983
MeanAbsoluteError value on hold-out data: 0.0562574528157711
Epoch: 60


Loss on hold-out set: 0.01011209765841302
MeanAbsoluteError value on hold-out data: 0.08943165838718414
Epoch: 61
Loss on hold-out set: 0.009513660603644033
MeanAbsoluteError value on hold-out data: 0.08356339484453201
Epoch: 62
Loss on hold-out set: 0.0077713305424702795
MeanAbsoluteError value on hold-out data: 0.07124308496713638
Epoch: 63
Loss on hold-out set: 0.021709555220839224
MeanAbsoluteError value on hold-out data: 0.12858958542346954
Epoch: 64
Loss on hold-out set: 0.00397904326918682
MeanAbsoluteError value on hold-out data: 0.05058349668979645
Epoch: 65
Loss on hold-out set: 0.02182657359854171
MeanAbsoluteError value on hold-out data: 0.12744154036045074
Epoch: 66
Loss on hold-out set: 0.004548802610339695
MeanAbsoluteError value on hold-out data: 0.05578804016113281
Epoch: 67
Loss on hold-out set: 0.009859057094313596
MeanAbsoluteError value on hold-out data: 0.08818627148866653
Epoch: 68
Loss on hold-out set: 0.00419747835564378
MeanAbsoluteError value on hold-out data: 0.052643198519945145
Epoch: 69
Loss on hold-out set: 0.004710303748173541
MeanAbsoluteError value on hold-out data: 0.05524705722928047
```

```
Epoch: 70
Loss on hold-out set: 0.0022917340056186446
MeanAbsoluteError value on hold-out data: 0.033571962267160416
Epoch: 71
Loss on hold-out set: 0.0038856341944713342
MeanAbsoluteError value on hold-out data: 0.05053972452878952
Epoch: 72
Loss on hold-out set: 0.004674154241863442
MeanAbsoluteError value on hold-out data: 0.04950087517499924
Epoch: 73
Loss on hold-out set: 0.005709235985322218
MeanAbsoluteError value on hold-out data: 0.058075159788131714
Epoch: 74
Loss on hold-out set: 0.003462756377350735
MeanAbsoluteError value on hold-out data: 0.04339740052819252
Epoch: 75
Loss on hold-out set: 0.0049035135215442435
MeanAbsoluteError value on hold-out data: 0.056410904973745346
Epoch: 76

Loss on hold-out set: 0.003306437626873192
MeanAbsoluteError value on hold-out data: 0.04928787425160408
Epoch: 77
Loss on hold-out set: 0.0031636320667243318
MeanAbsoluteError value on hold-out data: 0.046449027955532074
Epoch: 78
Loss on hold-out set: 0.0019069448309509379
MeanAbsoluteError value on hold-out data: 0.03196501359343529
Epoch: 79
Loss on hold-out set: 0.013935243159434512
MeanAbsoluteError value on hold-out data: 0.09540081769227982
Epoch: 80

Loss on hold-out set: 0.00370885504066552
MeanAbsoluteError value on hold-out data: 0.04854331538081169
Epoch: 81
Loss on hold-out set: 0.011659031954446905
MeanAbsoluteError value on hold-out data: 0.08890523761510849
Epoch: 82
Loss on hold-out set: 0.030991349565355403
MeanAbsoluteError value on hold-out data: 0.16622798144817352
Epoch: 83
```

```
Loss on hold-out set: 0.010133211402908751
MeanAbsoluteError value on hold-out data: 0.08760659396648407
Epoch: 84
Loss on hold-out set: 0.005938002643616576
MeanAbsoluteError value on hold-out data: 0.06439828872680664
Epoch: 85
Loss on hold-out set: 0.0029487344191262595
MeanAbsoluteError value on hold-out data: 0.040727049112319946
Epoch: 86
Loss on hold-out set: 0.008142576038249229
MeanAbsoluteError value on hold-out data: 0.08041436225175858
Epoch: 87
Loss on hold-out set: 0.0025678682141005993
MeanAbsoluteError value on hold-out data: 0.041586946696043015
Epoch: 88
Loss on hold-out set: 0.00433859876111934
MeanAbsoluteError value on hold-out data: 0.05091864615678787
Epoch: 89
Loss on hold-out set: 0.008928913868179447
MeanAbsoluteError value on hold-out data: 0.07950742542743683
Epoch: 90
Loss on hold-out set: 0.0015820453378469928
MeanAbsoluteError value on hold-out data: 0.02949104644358158
Epoch: 91
Loss on hold-out set: 0.002144518001985393
MeanAbsoluteError value on hold-out data: 0.03492527827620506
Epoch: 92
Loss on hold-out set: 0.00226811731944939
MeanAbsoluteError value on hold-out data: 0.038898710161447525
Epoch: 93
Loss on hold-out set: 0.005189051839375966
MeanAbsoluteError value on hold-out data: 0.05798594281077385
Epoch: 94
Loss on hold-out set: 0.011584308341537652
MeanAbsoluteError value on hold-out data: 0.09497111290693283
Epoch: 95
Loss on hold-out set: 0.004401186646550502
MeanAbsoluteError value on hold-out data: 0.05235263705253601
Epoch: 96

Loss on hold-out set: 0.003309228874154781
MeanAbsoluteError value on hold-out data: 0.04640469700098038
```

```
Epoch: 97
Loss on hold-out set: 0.007977573176551806
MeanAbsoluteError value on hold-out data: 0.07115387916564941
Epoch: 98
Loss on hold-out set: 0.006547284618902363
MeanAbsoluteError value on hold-out data: 0.06318923830986023
Epoch: 99
Loss on hold-out set: 0.0016340587447446428
MeanAbsoluteError value on hold-out data: 0.030537083745002747


Epoch: 100
Loss on hold-out set: 0.012002234543232541
MeanAbsoluteError value on hold-out data: 0.09814104437828064
Epoch: 101
Loss on hold-out set: 0.0069484128984377575
MeanAbsoluteError value on hold-out data: 0.06679879873991013
Epoch: 102
Loss on hold-out set: 0.00991517724469304
MeanAbsoluteError value on hold-out data: 0.0894632339477539
Epoch: 103
Loss on hold-out set: 0.002652899012900889
MeanAbsoluteError value on hold-out data: 0.03743859753012657
Epoch: 104
Loss on hold-out set: 0.0020498479287581225
MeanAbsoluteError value on hold-out data: 0.03549409657716751
Epoch: 105
Loss on hold-out set: 0.0026040123101617944
MeanAbsoluteError value on hold-out data: 0.04048633202910423
Epoch: 106
Loss on hold-out set: 0.0058661894872784615
MeanAbsoluteError value on hold-out data: 0.059979815036058426
Epoch: 107
Loss on hold-out set: 0.008054046977409407
MeanAbsoluteError value on hold-out data: 0.07780051231384277
Epoch: 108
Loss on hold-out set: 0.002538122867822255
MeanAbsoluteError value on hold-out data: 0.03873392567038536
Epoch: 109
Loss on hold-out set: 0.002203047551263712
MeanAbsoluteError value on hold-out data: 0.03629101812839508
Epoch: 110
Loss on hold-out set: 0.002389626304839591
```

```
MeanAbsoluteError value on hold-out data: 0.03579605743288994
Epoch: 111
Loss on hold-out set: 0.002393719084609888
MeanAbsoluteError value on hold-out data: 0.035603173077106476
Epoch: 112
Loss on hold-out set: 0.01307657929627519
MeanAbsoluteError value on hold-out data: 0.10103283822536469
Epoch: 113
Loss on hold-out set: 0.0018094849748242843
MeanAbsoluteError value on hold-out data: 0.03223435953259468
Epoch: 114
Loss on hold-out set: 0.007078360937731831
MeanAbsoluteError value on hold-out data: 0.06996901333332062
Epoch: 115
Loss on hold-out set: 0.005278048767267089
MeanAbsoluteError value on hold-out data: 0.06167752668261528

Epoch: 116
Loss on hold-out set: 0.01230739765359383
MeanAbsoluteError value on hold-out data: 0.0925789400935173
Epoch: 117
Loss on hold-out set: 0.002413757457888048
MeanAbsoluteError value on hold-out data: 0.03651439771056175
Epoch: 118
Loss on hold-out set: 0.0017231844034732173
MeanAbsoluteError value on hold-out data: 0.03174060955643654
Epoch: 119

Loss on hold-out set: 0.0031601964636999917
MeanAbsoluteError value on hold-out data: 0.043266430497169495
Epoch: 120
Loss on hold-out set: 0.01252774923647705
MeanAbsoluteError value on hold-out data: 0.089612677693367
Epoch: 121
Loss on hold-out set: 0.007574478066281269
MeanAbsoluteError value on hold-out data: 0.07228736579418182
Epoch: 122
Loss on hold-out set: 0.004768450922136636
MeanAbsoluteError value on hold-out data: 0.0543421171605587
Early stopping at epoch 121
Returned to Spot: Validation loss: 0.004768450922136636
----------------------------------------------
```

```
config: {'_L_in': 10, '_L_out': 1, 'l1': 128, 'dropout_prob': 0.8582565260508446, 'lr_mult':
Epoch: 1
Loss on hold-out set: 0.07254146638326348
MeanAbsoluteError value on hold-out data: 0.20898617804050446
Epoch: 2

Loss on hold-out set: 0.053092189210777484
MeanAbsoluteError value on hold-out data: 0.1873641312122345
Epoch: 3

Loss on hold-out set: 0.04803520301182289
MeanAbsoluteError value on hold-out data: 0.1750883162021637
Epoch: 4
Loss on hold-out set: 0.05156607197415724
MeanAbsoluteError value on hold-out data: 0.17691531777381897
Epoch: 5

Loss on hold-out set: 0.04115371631628174
MeanAbsoluteError value on hold-out data: 0.15788030624389648
Epoch: 6

Loss on hold-out set: 0.03606002425774932
MeanAbsoluteError value on hold-out data: 0.14919915795326233
Epoch: 7
Loss on hold-out set: 0.03590415418128638
MeanAbsoluteError value on hold-out data: 0.14963439106941223
Epoch: 8

Loss on hold-out set: 0.03555632439335265
MeanAbsoluteError value on hold-out data: 0.14579787850379944
Epoch: 9

Loss on hold-out set: 0.03547952006338164
MeanAbsoluteError value on hold-out data: 0.14873626828193665
Epoch: 10
Loss on hold-out set: 0.033331570779628235
MeanAbsoluteError value on hold-out data: 0.14300137758255005
Epoch: 11
```

```
Loss on hold-out set: 0.031640037583238155
MeanAbsoluteError value on hold-out data: 0.13734501600265503
Epoch: 12

Loss on hold-out set: 0.03291875772769951
MeanAbsoluteError value on hold-out data: 0.1433763951063156
Epoch: 13
Loss on hold-out set: 0.03394830564956161
MeanAbsoluteError value on hold-out data: 0.1421106904745102
Epoch: 14

Loss on hold-out set: 0.028671900653425838
MeanAbsoluteError value on hold-out data: 0.13082827627658844
Epoch: 15

Loss on hold-out set: 0.030691796665002283
MeanAbsoluteError value on hold-out data: 0.1385505199432373
Epoch: 16
Loss on hold-out set: 0.031132808530237525
MeanAbsoluteError value on hold-out data: 0.1380830556154251
Epoch: 17

Loss on hold-out set: 0.03347729917169393
MeanAbsoluteError value on hold-out data: 0.14217700064182281
Epoch: 18

Loss on hold-out set: 0.030257737145390515
MeanAbsoluteError value on hold-out data: 0.13592997193336487
Epoch: 19
Loss on hold-out set: 0.030656433998568294
MeanAbsoluteError value on hold-out data: 0.13851392269134521
Epoch: 20

Loss on hold-out set: 0.02967183413954141
MeanAbsoluteError value on hold-out data: 0.13411521911621094
Epoch: 21

Loss on hold-out set: 0.029768940589468305
MeanAbsoluteError value on hold-out data: 0.13381679356098175
Epoch: 22
```

```
Loss on hold-out set: 0.030358676360143968
MeanAbsoluteError value on hold-out data: 0.13582490384578705
Epoch: 23

Loss on hold-out set: 0.031214526427599292
MeanAbsoluteError value on hold-out data: 0.13686519861221313
Epoch: 24

Loss on hold-out set: 0.02982275192760426
MeanAbsoluteError value on hold-out data: 0.13306090235710144
Epoch: 25
Loss on hold-out set: 0.03065927680478732
MeanAbsoluteError value on hold-out data: 0.13472899794578552
Epoch: 26

Loss on hold-out set: 0.029670917031617138
MeanAbsoluteError value on hold-out data: 0.13419970870018005
Epoch: 27

Loss on hold-out set: 0.030008378783920004
MeanAbsoluteError value on hold-out data: 0.1361413598060608
Epoch: 28
Loss on hold-out set: 0.02985172090760898
MeanAbsoluteError value on hold-out data: 0.13546474277973175
Epoch: 29

Loss on hold-out set: 0.028834105015848762
MeanAbsoluteError value on hold-out data: 0.13087502121925354
Epoch: 30

Loss on hold-out set: 0.02907171796056597
MeanAbsoluteError value on hold-out data: 0.13118548691272736
Epoch: 31
Loss on hold-out set: 0.030422809375255988
MeanAbsoluteError value on hold-out data: 0.13667474687099457
Epoch: 32

Loss on hold-out set: 0.029014316821315635
MeanAbsoluteError value on hold-out data: 0.13137665390968323
Epoch: 33
```

```
Loss on hold-out set: 0.0297758045194981
MeanAbsoluteError value on hold-out data: 0.1351303607225418
Epoch: 34
Loss on hold-out set: 0.030217076740712702
MeanAbsoluteError value on hold-out data: 0.13374635577201843
Epoch: 35

Loss on hold-out set: 0.02910573782341089
MeanAbsoluteError value on hold-out data: 0.13176259398460388
Epoch: 36

Loss on hold-out set: 0.028955321798081666
MeanAbsoluteError value on hold-out data: 0.1326514035463333
Epoch: 37
Loss on hold-out set: 0.029037650207950114
MeanAbsoluteError value on hold-out data: 0.13124461472034454
Epoch: 38

Loss on hold-out set: 0.029595164384809323
MeanAbsoluteError value on hold-out data: 0.1335415244102478
Epoch: 39

Loss on hold-out set: 0.02943633574002888
MeanAbsoluteError value on hold-out data: 0.13221397995948792
Epoch: 40
Loss on hold-out set: 0.029789877650716032
MeanAbsoluteError value on hold-out data: 0.13164515793323517
Epoch: 41

Loss on hold-out set: 0.030176376545180877
MeanAbsoluteError value on hold-out data: 0.135281503200531
Epoch: 42

Loss on hold-out set: 0.02936532525520306
MeanAbsoluteError value on hold-out data: 0.13294662535190582
Epoch: 43
Loss on hold-out set: 0.029408940240876594
MeanAbsoluteError value on hold-out data: 0.1316380500793457
Epoch: 44
```

```
Loss on hold-out set: 0.02918187635145538
MeanAbsoluteError value on hold-out data: 0.1327092945575714
Epoch: 45

Loss on hold-out set: 0.029656542280996897
MeanAbsoluteError value on hold-out data: 0.1334073692560196
Epoch: 46
Loss on hold-out set: 0.02898557101560679
MeanAbsoluteError value on hold-out data: 0.13126839697360992
Epoch: 47

Loss on hold-out set: 0.02896188930812059
MeanAbsoluteError value on hold-out data: 0.1322120726108551
Epoch: 48

Loss on hold-out set: 0.02860523960184461
MeanAbsoluteError value on hold-out data: 0.13007642328739166
Epoch: 49
Loss on hold-out set: 0.030014456338285526
MeanAbsoluteError value on hold-out data: 0.13362281024456024
Epoch: 50

Loss on hold-out set: 0.029618658552838798
MeanAbsoluteError value on hold-out data: 0.1316697895526886
Epoch: 51

Loss on hold-out set: 0.029422852620870497
MeanAbsoluteError value on hold-out data: 0.13335685431957245
Epoch: 52
Loss on hold-out set: 0.030380328018315292
MeanAbsoluteError value on hold-out data: 0.13543392717838287
Epoch: 53

Loss on hold-out set: 0.029334762276363714
MeanAbsoluteError value on hold-out data: 0.1325831115245819
Epoch: 54

Loss on hold-out set: 0.02949479781013603
MeanAbsoluteError value on hold-out data: 0.1335434466600418
Epoch: 55
```

```
Loss on hold-out set: 0.029524499676141812
MeanAbsoluteError value on hold-out data: 0.13495998084545135
Epoch: 56

Loss on hold-out set: 0.02999647655023788
MeanAbsoluteError value on hold-out data: 0.13483074307441711
Epoch: 57

Loss on hold-out set: 0.028620425527527308
MeanAbsoluteError value on hold-out data: 0.1313958615064621
Epoch: 58
Loss on hold-out set: 0.027840658704711436
MeanAbsoluteError value on hold-out data: 0.13014157116413116
Epoch: 59

Loss on hold-out set: 0.028052637913206127
MeanAbsoluteError value on hold-out data: 0.1290893256664276
Epoch: 60

Loss on hold-out set: 0.02989886560938127
MeanAbsoluteError value on hold-out data: 0.13603851199150085
Epoch: 61
Loss on hold-out set: 0.02887716010804676
MeanAbsoluteError value on hold-out data: 0.13167275488376617
Epoch: 62

Loss on hold-out set: 0.029481228293540575
MeanAbsoluteError value on hold-out data: 0.13454119861125946
Epoch: 63

Loss on hold-out set: 0.02967791882013747
MeanAbsoluteError value on hold-out data: 0.13444609940052032
Epoch: 64
Loss on hold-out set: 0.02916821517318264
MeanAbsoluteError value on hold-out data: 0.13079901039600372
Epoch: 65

Loss on hold-out set: 0.029055664046124245
MeanAbsoluteError value on hold-out data: 0.13153484463691711
Epoch: 66
```

```
Loss on hold-out set: 0.029236603121389634
MeanAbsoluteError value on hold-out data: 0.13048037886619568
Epoch: 67
Loss on hold-out set: 0.029305746984628057
MeanAbsoluteError value on hold-out data: 0.13273386657238007
Epoch: 68

Loss on hold-out set: 0.02909036844105382
MeanAbsoluteError value on hold-out data: 0.13042683899402618
Epoch: 69

Loss on hold-out set: 0.030221306720923168
MeanAbsoluteError value on hold-out data: 0.13465481996536255
Epoch: 70
Loss on hold-out set: 0.0285715713026093
MeanAbsoluteError value on hold-out data: 0.13060669600963593
Epoch: 71

Loss on hold-out set: 0.028804899164000138
MeanAbsoluteError value on hold-out data: 0.1316671222448349
Epoch: 72

Loss on hold-out set: 0.029904268090225134
MeanAbsoluteError value on hold-out data: 0.13472215831279755
Epoch: 73
Loss on hold-out set: 0.029582908851249763
MeanAbsoluteError value on hold-out data: 0.13338841497898102
Epoch: 74

Loss on hold-out set: 0.030558942700978756
MeanAbsoluteError value on hold-out data: 0.1355697214603424
Epoch: 75

Loss on hold-out set: 0.02957815845186512
MeanAbsoluteError value on hold-out data: 0.1324586272239685
Epoch: 76
Loss on hold-out set: 0.029292128405359108
MeanAbsoluteError value on hold-out data: 0.13366995751857758
Epoch: 77
```

```
Loss on hold-out set: 0.029497522037515107
MeanAbsoluteError value on hold-out data: 0.13269035518169403
Epoch: 78

Loss on hold-out set: 0.028021050892809096
MeanAbsoluteError value on hold-out data: 0.13070359826087952
Epoch: 79
Loss on hold-out set: 0.02836115565475969
MeanAbsoluteError value on hold-out data: 0.12949137389659882
Epoch: 80

Loss on hold-out set: 0.029093020993702035
MeanAbsoluteError value on hold-out data: 0.13226114213466644
Epoch: 81

Loss on hold-out set: 0.02996004028607179
MeanAbsoluteError value on hold-out data: 0.13400769233703613
Epoch: 82
Loss on hold-out set: 0.029127469799932443
MeanAbsoluteError value on hold-out data: 0.13135239481925964
Epoch: 83

Loss on hold-out set: 0.030178326056484364
MeanAbsoluteError value on hold-out data: 0.1358153373003006
Epoch: 84

Loss on hold-out set: 0.029607370060560547
MeanAbsoluteError value on hold-out data: 0.13424253463745117
Epoch: 85
Loss on hold-out set: 0.02815947702464958
MeanAbsoluteError value on hold-out data: 0.13103052973747253
Epoch: 86

Loss on hold-out set: 0.029398340228920763
MeanAbsoluteError value on hold-out data: 0.1317664533853531
Epoch: 87

Loss on hold-out set: 0.030651742197854524
MeanAbsoluteError value on hold-out data: 0.136916384100914
Epoch: 88
```

```
Loss on hold-out set: 0.027694043902592967
MeanAbsoluteError value on hold-out data: 0.1276298463344574
Epoch: 89

Loss on hold-out set: 0.03000807094348905
MeanAbsoluteError value on hold-out data: 0.13264864683151245
Epoch: 90

Loss on hold-out set: 0.02961131964965413
MeanAbsoluteError value on hold-out data: 0.13266967236995697
Epoch: 91
Loss on hold-out set: 0.028191184605432986
MeanAbsoluteError value on hold-out data: 0.13030287623405457
Epoch: 92

Loss on hold-out set: 0.029193747860748166
MeanAbsoluteError value on hold-out data: 0.13082534074783325
Epoch: 93

Loss on hold-out set: 0.02892140015285501
MeanAbsoluteError value on hold-out data: 0.13002459704875946
Epoch: 94
Loss on hold-out set: 0.02903399979441019
MeanAbsoluteError value on hold-out data: 0.13130606710910797
Epoch: 95

Loss on hold-out set: 0.0297124751592249
MeanAbsoluteError value on hold-out data: 0.1318719983100891
Epoch: 96

Loss on hold-out set: 0.028373887229827234
MeanAbsoluteError value on hold-out data: 0.1308644413948059
Epoch: 97
Loss on hold-out set: 0.029508575943667285
MeanAbsoluteError value on hold-out data: 0.1325177550315857
Epoch: 98

Loss on hold-out set: 0.029738006535480963
MeanAbsoluteError value on hold-out data: 0.13334646821022034
Epoch: 99
```

```
Loss on hold-out set: 0.029365271623222118
MeanAbsoluteError value on hold-out data: 0.13416610658168793
Epoch: 100
Loss on hold-out set: 0.028200420256665287
MeanAbsoluteError value on hold-out data: 0.13049672544002533
Epoch: 101

Loss on hold-out set: 0.02874608458933229
MeanAbsoluteError value on hold-out data: 0.1297750174999237
Epoch: 102

Loss on hold-out set: 0.028173538109391907
MeanAbsoluteError value on hold-out data: 0.1306438446044922
Epoch: 103
Loss on hold-out set: 0.02874183514606557
MeanAbsoluteError value on hold-out data: 0.13152283430099487
Epoch: 104

Loss on hold-out set: 0.027237302417051978
MeanAbsoluteError value on hold-out data: 0.1291130632162094
Epoch: 105

Loss on hold-out set: 0.028495534294391594
MeanAbsoluteError value on hold-out data: 0.13100796937942505
Epoch: 106
Loss on hold-out set: 0.029073467934892204
MeanAbsoluteError value on hold-out data: 0.13183395564556122
Epoch: 107

Loss on hold-out set: 0.028063103684980887
MeanAbsoluteError value on hold-out data: 0.13196702301502228
Epoch: 108

Loss on hold-out set: 0.028863373054385497
MeanAbsoluteError value on hold-out data: 0.13324499130249023
Epoch: 109
Loss on hold-out set: 0.02832138867916304
MeanAbsoluteError value on hold-out data: 0.13103576004505157
Epoch: 110
```

```
Loss on hold-out set: 0.028414613421385487
MeanAbsoluteError value on hold-out data: 0.1304590255022049
Epoch: 111

Loss on hold-out set: 0.029456880761717912
MeanAbsoluteError value on hold-out data: 0.1326521635055542
Epoch: 112
Loss on hold-out set: 0.028487276870873757
MeanAbsoluteError value on hold-out data: 0.13238443434238434
Epoch: 113

Loss on hold-out set: 0.030044447511512164
MeanAbsoluteError value on hold-out data: 0.1319940984249115
Epoch: 114

Loss on hold-out set: 0.028359265933395363
MeanAbsoluteError value on hold-out data: 0.1305551379919052
Epoch: 115
Loss on hold-out set: 0.028815771574542546
MeanAbsoluteError value on hold-out data: 0.1323125809431076
Epoch: 116

Loss on hold-out set: 0.028501835580051798
MeanAbsoluteError value on hold-out data: 0.13262839615345
Epoch: 117

Loss on hold-out set: 0.02981605087882296
MeanAbsoluteError value on hold-out data: 0.13396306335926056
Epoch: 118
Loss on hold-out set: 0.028055942522381278
MeanAbsoluteError value on hold-out data: 0.1304110586643219
Epoch: 119

Loss on hold-out set: 0.029459569793737803
MeanAbsoluteError value on hold-out data: 0.1331765204668045
Epoch: 120

Loss on hold-out set: 0.029140402828731263
MeanAbsoluteError value on hold-out data: 0.13358788192272186
Epoch: 121
```

```
Loss on hold-out set: 0.028755569789815732
MeanAbsoluteError value on hold-out data: 0.13019143044948578
Epoch: 122

Loss on hold-out set: 0.028835936702477437
MeanAbsoluteError value on hold-out data: 0.13024787604808807
Epoch: 123

Loss on hold-out set: 0.029362137050641952
MeanAbsoluteError value on hold-out data: 0.13454528152942657
Epoch: 124
Loss on hold-out set: 0.029255866736445264
MeanAbsoluteError value on hold-out data: 0.1330205798149109
Epoch: 125

Loss on hold-out set: 0.029956713100449027
MeanAbsoluteError value on hold-out data: 0.13573656976222992
Epoch: 126

Loss on hold-out set: 0.028926381790564244
MeanAbsoluteError value on hold-out data: 0.12987443804740906
Epoch: 127
Loss on hold-out set: 0.029113949414895614
MeanAbsoluteError value on hold-out data: 0.13262134790420532
Epoch: 128

Loss on hold-out set: 0.030070728837842276
MeanAbsoluteError value on hold-out data: 0.1324104517698288
Epoch: 129

Loss on hold-out set: 0.028975142417863663
MeanAbsoluteError value on hold-out data: 0.1328933984041214
Epoch: 130
Loss on hold-out set: 0.028537240756753211
MeanAbsoluteError value on hold-out data: 0.13269296288490295
Epoch: 131

Loss on hold-out set: 0.028718328765438825
MeanAbsoluteError value on hold-out data: 0.13044683635234833
Epoch: 132
```

```
Loss on hold-out set: 0.0271229103517544
MeanAbsoluteError value on hold-out data: 0.12875136733055115
Epoch: 133
Loss on hold-out set: 0.028366501149527417
MeanAbsoluteError value on hold-out data: 0.13128480315208435
Epoch: 134

Loss on hold-out set: 0.028439375613379524
MeanAbsoluteError value on hold-out data: 0.13150343298912048
Epoch: 135

Loss on hold-out set: 0.02884527535449403
MeanAbsoluteError value on hold-out data: 0.13157595694065094
Epoch: 136
Loss on hold-out set: 0.02798505837408205
MeanAbsoluteError value on hold-out data: 0.13125166296958923
Epoch: 137

Loss on hold-out set: 0.027455759002283836
MeanAbsoluteError value on hold-out data: 0.12814807891845703
Epoch: 138

Loss on hold-out set: 0.02952496917724299
MeanAbsoluteError value on hold-out data: 0.13297633826732635
Epoch: 139
Loss on hold-out set: 0.02922385332475339
MeanAbsoluteError value on hold-out data: 0.13236331939697266
Epoch: 140

Loss on hold-out set: 0.02877841235900026
MeanAbsoluteError value on hold-out data: 0.13196636736392975
Epoch: 141

Loss on hold-out set: 0.027603455267186897
MeanAbsoluteError value on hold-out data: 0.12918145954608917
Epoch: 142
Loss on hold-out set: 0.028695996011811074
MeanAbsoluteError value on hold-out data: 0.13138805329799652
Epoch: 143
```

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Loss on hold-out set: 0.029575871145995 43
MeanAbsoluteError value on hold-out data: 0.13571493327617645
Epoch: 144

Loss on hold-out set: 0.027535034141813717
MeanAbsoluteError value on hold-out data: 0.12820635735988617
Epoch: 145
Loss on hold-out set: 0.029016801418038085
MeanAbsoluteError value on hold-out data: 0.13330577313899994
Epoch: 146

Loss on hold-out set: 0.02837844135821797
MeanAbsoluteError value on hold-out data: 0.13293617963790894
Epoch: 147

Loss on hold-out set: 0.027943121498586455
MeanAbsoluteError value on hold-out data: 0.1304130107164383
Epoch: 148
Loss on hold-out set: 0.029224215380381793
MeanAbsoluteError value on hold-out data: 0.13365034759044647
Epoch: 149

Loss on hold-out set: 0.028587126176571474
MeanAbsoluteError value on hold-out data: 0.13089869916439056
Epoch: 150

Loss on hold-out set: 0.027441209386646126
MeanAbsoluteError value on hold-out data: 0.12889283895492554
Epoch: 151
Loss on hold-out set: 0.02828269332756463
MeanAbsoluteError value on hold-out data: 0.13319998979568481
Epoch: 152

Loss on hold-out set: 0.028001307222099665
MeanAbsoluteError value on hold-out data: 0.1287468820810318
Epoch: 153

Loss on hold-out set: 0.02951476331645002
MeanAbsoluteError value on hold-out data: 0.13270702958106995
Epoch: 154
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Loss on hold-out set: 0.028292446138511878
MeanAbsoluteError value on hold-out data: 0.13135042786598206
Epoch: 155

Loss on hold-out set: 0.02831529515654741
MeanAbsoluteError value on hold-out data: 0.12949705123901367
Epoch: 156

Loss on hold-out set: 0.028177858111060536
MeanAbsoluteError value on hold-out data: 0.1308070570230484
Epoch: 157
Loss on hold-out set: 0.027697446993940198
MeanAbsoluteError value on hold-out data: 0.12906582653522491
Epoch: 158

Loss on hold-out set: 0.02792101434253103
MeanAbsoluteError value on hold-out data: 0.12852217257022858
Epoch: 159

Loss on hold-out set: 0.028474989293608814
MeanAbsoluteError value on hold-out data: 0.13001704216003418
Epoch: 160
Loss on hold-out set: 0.02829595092354187
MeanAbsoluteError value on hold-out data: 0.13045553863048553
Epoch: 161

Loss on hold-out set: 0.02904778920589403
MeanAbsoluteError value on hold-out data: 0.13189978897571564
Epoch: 162

Loss on hold-out set: 0.029027691297233104
MeanAbsoluteError value on hold-out data: 0.12985633313655853
Epoch: 163
Loss on hold-out set: 0.028638782826019452
MeanAbsoluteError value on hold-out data: 0.13140612840652466
Epoch: 164

Loss on hold-out set: 0.02871096167538781
MeanAbsoluteError value on hold-out data: 0.13077488541603088
Epoch: 165
```

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Loss on hold-out set: 0.028512644834894067
MeanAbsoluteError value on hold-out data: 0.13201256096363068
Epoch: 166
Loss on hold-out set: 0.026877934994311847
MeanAbsoluteError value on hold-out data: 0.12839306890964508
Epoch: 167

Loss on hold-out set: 0.029051508617412763
MeanAbsoluteError value on hold-out data: 0.13083487749099731
Epoch: 168

Loss on hold-out set: 0.02806242697794611
MeanAbsoluteError value on hold-out data: 0.1297825127840042
Epoch: 169
Loss on hold-out set: 0.02847060144889838
MeanAbsoluteError value on hold-out data: 0.13114994764328003
Epoch: 170

Loss on hold-out set: 0.029244984068209304
MeanAbsoluteError value on hold-out data: 0.13503298163414001
Epoch: 171

Loss on hold-out set: 0.028946454158382647
MeanAbsoluteError value on hold-out data: 0.13156749308109283
Epoch: 172
Loss on hold-out set: 0.027637472778248292
MeanAbsoluteError value on hold-out data: 0.13020849227905273
Epoch: 173

Loss on hold-out set: 0.02896394455388266
MeanAbsoluteError value on hold-out data: 0.1333213448524475
Epoch: 174

Loss on hold-out set: 0.02694800418219529
MeanAbsoluteError value on hold-out data: 0.12605020403862
Epoch: 175
Loss on hold-out set: 0.02870854464311075
MeanAbsoluteError value on hold-out data: 0.12940339744091034
Epoch: 176
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Loss on hold-out set: 0.028340637553628766
MeanAbsoluteError value on hold-out data: 0.13258907198905945
Epoch: 177

Loss on hold-out set: 0.027856544854633587
MeanAbsoluteError value on hold-out data: 0.13119633495807648
Epoch: 178
Loss on hold-out set: 0.027097395213786513
MeanAbsoluteError value on hold-out data: 0.12763528525829315
Epoch: 179

Loss on hold-out set: 0.028938790030507467
MeanAbsoluteError value on hold-out data: 0.13292831182479858
Epoch: 180

Loss on hold-out set: 0.027731849220387326
MeanAbsoluteError value on hold-out data: 0.13018898665905
Epoch: 181
Loss on hold-out set: 0.026161461244725313
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Epoch: 182

Loss on hold-out set: 0.027430815539773903
MeanAbsoluteError value on hold-out data: 0.12878519296646118
Epoch: 183

Loss on hold-out set: 0.028112614950514397
MeanAbsoluteError value on hold-out data: 0.13073569536209106
Epoch: 184
Loss on hold-out set: 0.028150235611683457
MeanAbsoluteError value on hold-out data: 0.13178473711013794
Epoch: 185

Loss on hold-out set: 0.028829217859776386
MeanAbsoluteError value on hold-out data: 0.13396260142326355
Epoch: 186

Loss on hold-out set: 0.02781955096599025
MeanAbsoluteError value on hold-out data: 0.12865537405014038
Epoch: 187
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Loss on hold-out set: 0.027895204994213902
MeanAbsoluteError value on hold-out data: 0.13086050748825073
Epoch: 188

Loss on hold-out set: 0.027633215912792365
MeanAbsoluteError value on hold-out data: 0.12834033370018005
Epoch: 189

Loss on hold-out set: 0.028296495988033712
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Epoch: 190
Loss on hold-out set: 0.02689513088153035
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Epoch: 191

Loss on hold-out set: 0.026623044920997926
MeanAbsoluteError value on hold-out data: 0.12687860429286957
Epoch: 192

Loss on hold-out set: 0.028138049425712477
MeanAbsoluteError value on hold-out data: 0.12969177961349487
Epoch: 193
Loss on hold-out set: 0.02721463965574609
MeanAbsoluteError value on hold-out data: 0.127584770321846
Epoch: 194

Loss on hold-out set: 0.02862747177753287
MeanAbsoluteError value on hold-out data: 0.13094456493854523
Epoch: 195

Loss on hold-out set: 0.027052440456852008
MeanAbsoluteError value on hold-out data: 0.12670226395130157
Epoch: 196
Loss on hold-out set: 0.02766296563226509
MeanAbsoluteError value on hold-out data: 0.1315525621175766
Epoch: 197

Loss on hold-out set: 0.028186309713576822
MeanAbsoluteError value on hold-out data: 0.13022635877132416
Epoch: 198
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Loss on hold-out set: 0.02878950985754879
MeanAbsoluteError value on hold-out data: 0.12988649308681488
Epoch: 199
Loss on hold-out set: 0.02953365420330859
MeanAbsoluteError value on hold-out data: 0.13364163041114807
Epoch: 200

Loss on hold-out set: 0.028508369949558982
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Epoch: 201

Loss on hold-out set: 0.027644072342664004
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Epoch: 202
Loss on hold-out set: 0.02797256991267204
MeanAbsoluteError value on hold-out data: 0.1297900378704071
Epoch: 203

Loss on hold-out set: 0.027761603284743613
MeanAbsoluteError value on hold-out data: 0.12835419178009033
Epoch: 204

Loss on hold-out set: 0.028261091962631327
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Epoch: 205
Loss on hold-out set: 0.026081277107077767
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Epoch: 206

Loss on hold-out set: 0.027999962574091722
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Epoch: 207

Loss on hold-out set: 0.028235253288894455
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Epoch: 208
Loss on hold-out set: 0.02853632698165408
MeanAbsoluteError value on hold-out data: 0.13075189292430878
Epoch: 209
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Loss on hold-out set: 0.026962533585901838
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Epoch: 210

Loss on hold-out set: 0.02839762322565851
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Epoch: 211
Loss on hold-out set: 0.027514984452476104
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Epoch: 212

Loss on hold-out set: 0.027692208519826334
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Epoch: 213

Loss on hold-out set: 0.027418828979231574
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Epoch: 214
Loss on hold-out set: 0.026249933602909246
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Epoch: 215

Loss on hold-out set: 0.028565777392728555
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Epoch: 216

Loss on hold-out set: 0.02744739306702589
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Epoch: 217
Loss on hold-out set: 0.026315080594516378
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Epoch: 218

Loss on hold-out set: 0.02721230997587554
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Epoch: 219

Loss on hold-out set: 0.028642571555877416
MeanAbsoluteError value on hold-out data: 0.12907032668590546
Epoch: 220
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Loss on hold-out set: 0.028624412614735775
MeanAbsoluteError value on hold-out data: 0.1305045485496521
Epoch: 221

Loss on hold-out set: 0.027446180583586586
MeanAbsoluteError value on hold-out data: 0.12947270274162292
Epoch: 222

Loss on hold-out set: 0.02763125361292623
MeanAbsoluteError value on hold-out data: 0.12979476153850555
Epoch: 223
Loss on hold-out set: 0.027783117604679622
MeanAbsoluteError value on hold-out data: 0.12920133769512177
Epoch: 224

Loss on hold-out set: 0.028542880118475295
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Epoch: 225

Loss on hold-out set: 0.02757999652007129
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Epoch: 226
Loss on hold-out set: 0.02812229620545016
MeanAbsoluteError value on hold-out data: 0.12982746958732605
Epoch: 227

Loss on hold-out set: 0.02745727066474501
MeanAbsoluteError value on hold-out data: 0.12730436027050018
Epoch: 228

Loss on hold-out set: 0.025726869060987763
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Epoch: 229
Loss on hold-out set: 0.02821230973645773
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Loss on hold-out set: 0.028471907928954654
MeanAbsoluteError value on hold-out data: 0.13254037499427795
Epoch: 231
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Loss on hold-out set: 0.02820938772771721
MeanAbsoluteError value on hold-out data: 0.12920419871807098
Epoch: 232
Loss on hold-out set: 0.028301171598189588
MeanAbsoluteError value on hold-out data: 0.12907929718494415
Epoch: 233

Loss on hold-out set: 0.02696681039475758
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Epoch: 234

Loss on hold-out set: 0.027239063490609016
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Epoch: 235
Loss on hold-out set: 0.028290664939413547
MeanAbsoluteError value on hold-out data: 0.1305394470691681
Epoch: 236

Loss on hold-out set: 0.026659048299188727
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Epoch: 237

Loss on hold-out set: 0.02721913414740508
MeanAbsoluteError value on hold-out data: 0.1256709098815918
Epoch: 238
Loss on hold-out set: 0.027530107266502454
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Epoch: 239

Loss on hold-out set: 0.026725337572182373
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Epoch: 240

Loss on hold-out set: 0.02670480876142392
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Loss on hold-out set: 0.028005830846959723
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Loss on hold-out set: 0.026941842956172576
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Epoch: 243

Loss on hold-out set: 0.027611143169439554
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Epoch: 244
Loss on hold-out set: 0.026410636170088157
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Epoch: 245

Loss on hold-out set: 0.02680109117180109
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Epoch: 246

Loss on hold-out set: 0.027779690382497696
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Epoch: 247
Loss on hold-out set: 0.02704863711997556
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Epoch: 248

Loss on hold-out set: 0.026959657119975115
MeanAbsoluteError value on hold-out data: 0.12756145000457764
Epoch: 249

Loss on hold-out set: 0.02733480204238731
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Loss on hold-out set: 0.02675269713780532
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Epoch: 251

Loss on hold-out set: 0.025874450573076805
MeanAbsoluteError value on hold-out data: 0.12700961530208588
Epoch: 252

Loss on hold-out set: 0.027277357770459882
MeanAbsoluteError value on hold-out data: 0.1269136667251587
Epoch: 253
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Loss on hold-out set: 0.027030044699992383
MeanAbsoluteError value on hold-out data: 0.12671001255512238
Epoch: 254

Loss on hold-out set: 0.02601267520794257
MeanAbsoluteError value on hold-out data: 0.12322929501533508
Epoch: 255

Loss on hold-out set: 0.026839217930197872
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Loss on hold-out set: 0.026852469197037862
MeanAbsoluteError value on hold-out data: 0.12570619583129883
Epoch: 257

Loss on hold-out set: 0.027697633360900607
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Epoch: 258

Loss on hold-out set: 0.027125289218189817
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Loss on hold-out set: 0.026637883307057564
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Epoch: 260

Loss on hold-out set: 0.027148144301221085
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Epoch: 261

Loss on hold-out set: 0.027788992730202154
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Epoch: 262
Loss on hold-out set: 0.026527148978978708
MeanAbsoluteError value on hold-out data: 0.12794478237628937
Epoch: 263

Loss on hold-out set: 0.027369012348547887
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Epoch: 264
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Loss on hold-out set: 0.025121883066312876
MeanAbsoluteError value on hold-out data: 0.12435020506381989
Epoch: 265
Loss on hold-out set: 0.029863029545134243
MeanAbsoluteError value on hold-out data: 0.1355566680431366
Epoch: 266

Loss on hold-out set: 0.026459153062314725
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Epoch: 267

Loss on hold-out set: 0.02720981161124655
MeanAbsoluteError value on hold-out data: 0.12825468182563782
Epoch: 268
Loss on hold-out set: 0.0275987744469118
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Epoch: 269

Loss on hold-out set: 0.027045976413452688
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Epoch: 270

Loss on hold-out set: 0.027528094538720325
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Loss on hold-out set: 0.026888260497362353
MeanAbsoluteError value on hold-out data: 0.1270419806241989
Epoch: 272

Loss on hold-out set: 0.026771011829938896
MeanAbsoluteError value on hold-out data: 0.12604402005672455
Epoch: 273

Loss on hold-out set: 0.027794709856583114
MeanAbsoluteError value on hold-out data: 0.13067598640918732
Epoch: 274
Loss on hold-out set: 0.02578141598729417
MeanAbsoluteError value on hold-out data: 0.12543421983718872
Epoch: 275
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Loss on hold-out set: 0.02700935435842742
MeanAbsoluteError value on hold-out data: 0.129507914185524
Epoch: 276

Loss on hold-out set: 0.02763067533650125
MeanAbsoluteError value on hold-out data: 0.1312444508075714
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Loss on hold-out set: 0.02645186053327052
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Epoch: 278

Loss on hold-out set: 0.02550423108281393
MeanAbsoluteError value on hold-out data: 0.12398237735033035
Epoch: 279

Loss on hold-out set: 0.026685179801910028
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Loss on hold-out set: 0.02597482025681529
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Loss on hold-out set: 0.02680512704673068
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Epoch: 282

Loss on hold-out set: 0.026779964325930147
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Loss on hold-out set: 0.02702647586702369
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Epoch: 284

Loss on hold-out set: 0.027439227462152
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Loss on hold-out set: 0.027554297367072045
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Epoch: 286
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Loss on hold-out set: 0.02779204960524415
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Epoch: 287

Loss on hold-out set: 0.02837523581828767
MeanAbsoluteError value on hold-out data: 0.1314147412776947
Epoch: 288

Loss on hold-out set: 0.027047837130327632
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Loss on hold-out set: 0.02792745801600783
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Loss on hold-out set: 0.02523493935230363
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Epoch: 291

Loss on hold-out set: 0.027657891729225715
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Loss on hold-out set: 0.02788596891410028
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Epoch: 293

Loss on hold-out set: 0.026343191545747685
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Epoch: 294

Loss on hold-out set: 0.02726250203538863
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Loss on hold-out set: 0.02561939001296802
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Epoch: 296

Loss on hold-out set: 0.027809359586584228
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Loss on hold-out set: 0.024864889717791813
MeanAbsoluteError value on hold-out data: 0.12254702299833298
Epoch: 298
Loss on hold-out set: 0.02524698917670624
MeanAbsoluteError value on hold-out data: 0.1220702975988388
Epoch: 299

Loss on hold-out set: 0.026326195250633948
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Epoch: 300

Loss on hold-out set: 0.026971960791270247
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Epoch: 301
Loss on hold-out set: 0.026697182120212045
MeanAbsoluteError value on hold-out data: 0.12383979558944702
Epoch: 302

Loss on hold-out set: 0.02450923392150192
MeanAbsoluteError value on hold-out data: 0.12120097130537033
Epoch: 303

Loss on hold-out set: 0.026876088449159095
MeanAbsoluteError value on hold-out data: 0.12732172012329102
Epoch: 304
Loss on hold-out set: 0.02616035890086399
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Loss on hold-out set: 0.025794017511458756
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Epoch: 306

Loss on hold-out set: 0.027676535997889006
MeanAbsoluteError value on hold-out data: 0.12901541590690613
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Loss on hold-out set: 0.026158357896395805
MeanAbsoluteError value on hold-out data: 0.12463873624801636
Epoch: 308
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Loss on hold-out set: 0.025996257851948O3
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Epoch: 309

Loss on hold-out set: 0.027695524981293906
MeanAbsoluteError value on hold-out data: 0.13162212073802948
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Loss on hold-out set: 0.026415937011964465
MeanAbsoluteError value on hold-out data: 0.12684574723243713
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Loss on hold-out set: 0.026584763623274436
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Loss on hold-out set: 0.025857225087238474
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Epoch: 314

Loss on hold-out set: 0.02645426910482153
MeanAbsoluteError value on hold-out data: 0.12510965764522552
Epoch: 315

Loss on hold-out set: 0.025815024210993822
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Epoch: 316
Loss on hold-out set: 0.026622546070235936
MeanAbsoluteError value on hold-out data: 0.13137270510196686
Epoch: 317

Loss on hold-out set: 0.02484237297413832
MeanAbsoluteError value on hold-out data: 0.1231384128332138
Epoch: 318

Loss on hold-out set: 0.02487610233326753
MeanAbsoluteError value on hold-out data: 0.12380921840667725
Epoch: 319
```

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Loss on hold-out set: 0.026125604866926246
MeanAbsoluteError value on hold-out data: 0.12637026607990265
Epoch: 320

Loss on hold-out set: 0.025713716354318118
MeanAbsoluteError value on hold-out data: 0.12523196637630463
Epoch: 321

Loss on hold-out set: 0.0262765504065707
MeanAbsoluteError value on hold-out data: 0.12584474682807922
Epoch: 322
Loss on hold-out set: 0.02711731883891237
MeanAbsoluteError value on hold-out data: 0.12775056064128876
Epoch: 323

Loss on hold-out set: 0.02441487085792081
MeanAbsoluteError value on hold-out data: 0.12148534506559372
Epoch: 324

Loss on hold-out set: 0.02338688395403248
MeanAbsoluteError value on hold-out data: 0.11791475862264633
Epoch: 325
Loss on hold-out set: 0.025713362853663664
MeanAbsoluteError value on hold-out data: 0.12568299472332
Epoch: 326

Loss on hold-out set: 0.02482589345629094
MeanAbsoluteError value on hold-out data: 0.12231981009244919
Epoch: 327

Loss on hold-out set: 0.025956581930901546
MeanAbsoluteError value on hold-out data: 0.12665575742721558
Epoch: 328
Loss on hold-out set: 0.02595232162217144
MeanAbsoluteError value on hold-out data: 0.1260087639093399
Epoch: 329

Loss on hold-out set: 0.024443602569905732
MeanAbsoluteError value on hold-out data: 0.12121763825416565
Epoch: 330
```

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Loss on hold-out set: 0.026783481339662102
MeanAbsoluteError value on hold-out data: 0.12893499433994293
Epoch: 331
Loss on hold-out set: 0.02741360910673393
MeanAbsoluteError value on hold-out data: 0.12640845775604248
Epoch: 332

Loss on hold-out set: 0.02503748657880351
MeanAbsoluteError value on hold-out data: 0.12087416648864746
Epoch: 333

Loss on hold-out set: 0.026246475782536437
MeanAbsoluteError value on hold-out data: 0.12912745773792267
Epoch: 334
Loss on hold-out set: 0.024572286730108316
MeanAbsoluteError value on hold-out data: 0.12187588959932327
Epoch: 335

Loss on hold-out set: 0.02451655488179919
MeanAbsoluteError value on hold-out data: 0.12437868863344193
Epoch: 336

Loss on hold-out set: 0.02556200964056188
MeanAbsoluteError value on hold-out data: 0.1248091608285904
Epoch: 337
Loss on hold-out set: 0.025689009319612523
MeanAbsoluteError value on hold-out data: 0.12403659522533417
Epoch: 338

Loss on hold-out set: 0.025899645342724396
MeanAbsoluteError value on hold-out data: 0.12677277624607086
Epoch: 339

Loss on hold-out set: 0.02429179406586627
MeanAbsoluteError value on hold-out data: 0.12437019497156143
Epoch: 340
Loss on hold-out set: 0.02482465865362125
MeanAbsoluteError value on hold-out data: 0.1233014315366745
Epoch: 341
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Loss on hold-out set: 0.027733054391516514
MeanAbsoluteError value on hold-out data: 0.1316295862197876
Epoch: 342

Loss on hold-out set: 0.024491072409728077
MeanAbsoluteError value on hold-out data: 0.12431661039590836
Epoch: 343
Loss on hold-out set: 0.025286253533461908
MeanAbsoluteError value on hold-out data: 0.12523898482322693
Epoch: 344

Loss on hold-out set: 0.025114721842407258
MeanAbsoluteError value on hold-out data: 0.1242324709892273
Epoch: 345

Loss on hold-out set: 0.02531048729584048
MeanAbsoluteError value on hold-out data: 0.12480854988098145
Epoch: 346
Loss on hold-out set: 0.024771701612577697
MeanAbsoluteError value on hold-out data: 0.1220175176858902
Epoch: 347

Loss on hold-out set: 0.024734271756315138
MeanAbsoluteError value on hold-out data: 0.12092068791389465
Epoch: 348

Loss on hold-out set: 0.026009701632816965
MeanAbsoluteError value on hold-out data: 0.12520907819271088
Epoch: 349
Loss on hold-out set: 0.02591563888551415
MeanAbsoluteError value on hold-out data: 0.12320083379745483
Epoch: 350

Loss on hold-out set: 0.024167318024319685
MeanAbsoluteError value on hold-out data: 0.12165489047765732
Epoch: 351

Loss on hold-out set: 0.02707966173669168
MeanAbsoluteError value on hold-out data: 0.12713757157325745
Epoch: 352
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Loss on hold-out set: 0.026471998290968864
MeanAbsoluteError value on hold-out data: 0.1268080621957779
Epoch: 353

Loss on hold-out set: 0.02456701614544727
MeanAbsoluteError value on hold-out data: 0.1220216378569603
Epoch: 354

Loss on hold-out set: 0.02460294273381199
MeanAbsoluteError value on hold-out data: 0.1213575229048729
Epoch: 355
Loss on hold-out set: 0.024502414249509455
MeanAbsoluteError value on hold-out data: 0.12381800264120102
Epoch: 356

Loss on hold-out set: 0.02385974898134009
MeanAbsoluteError value on hold-out data: 0.11925184726715088
Epoch: 357

Loss on hold-out set: 0.02384178676424199
MeanAbsoluteError value on hold-out data: 0.1188904345035553
Epoch: 358
Loss on hold-out set: 0.02404514323939414
MeanAbsoluteError value on hold-out data: 0.11867617070674896
Epoch: 359

Loss on hold-out set: 0.024936434558864372
MeanAbsoluteError value on hold-out data: 0.12372123450040817
Epoch: 360

Loss on hold-out set: 0.024979556853795656
MeanAbsoluteError value on hold-out data: 0.1220247745513916
Epoch: 361
Loss on hold-out set: 0.023633394354061844
MeanAbsoluteError value on hold-out data: 0.11948234587907791
Epoch: 362

Loss on hold-out set: 0.02437863253930118
MeanAbsoluteError value on hold-out data: 0.12435287237167358
Epoch: 363
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Loss on hold-out set: 0.024092913354494764
MeanAbsoluteError value on hold-out data: 0.12221052497625351
Epoch: 364
Loss on hold-out set: 0.024255970460556758
MeanAbsoluteError value on hold-out data: 0.1192091777920723
Epoch: 365

Loss on hold-out set: 0.026355153381009588
MeanAbsoluteError value on hold-out data: 0.12429562956094742
Epoch: 366

Loss on hold-out set: 0.02561247789514406
MeanAbsoluteError value on hold-out data: 0.12265223264694214
Epoch: 367
Loss on hold-out set: 0.024739362863571538
MeanAbsoluteError value on hold-out data: 0.11884764581918716
Epoch: 368

Loss on hold-out set: 0.026209457965451294
MeanAbsoluteError value on hold-out data: 0.12484348565340042
Epoch: 369

Loss on hold-out set: 0.02462227351575469
MeanAbsoluteError value on hold-out data: 0.12514230608940125
Epoch: 370
Loss on hold-out set: 0.026154713170835748
MeanAbsoluteError value on hold-out data: 0.12702664732933044
Epoch: 371

Loss on hold-out set: 0.024564881689075266
MeanAbsoluteError value on hold-out data: 0.12045172601938248
Epoch: 372

Loss on hold-out set: 0.0256031017734252
MeanAbsoluteError value on hold-out data: 0.12497209012508392
Epoch: 373
Loss on hold-out set: 0.025989725208395004
MeanAbsoluteError value on hold-out data: 0.12679165601730347
Epoch: 374
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Loss on hold-out set: 0.023697663388835888
MeanAbsoluteError value on hold-out data: 0.11963868141174316
Epoch: 375

Loss on hold-out set: 0.02508612424940414
MeanAbsoluteError value on hold-out data: 0.12484279274940491
Epoch: 376
Loss on hold-out set: 0.023595768254284243
MeanAbsoluteError value on hold-out data: 0.1191071942448616
Epoch: 377

Loss on hold-out set: 0.023335219246703977
MeanAbsoluteError value on hold-out data: 0.11806293576955795
Epoch: 378

Loss on hold-out set: 0.025666959637310357
MeanAbsoluteError value on hold-out data: 0.12698377668857574
Epoch: 379
Loss on hold-out set: 0.0244600710800781
MeanAbsoluteError value on hold-out data: 0.12077930569648743
Epoch: 380

Loss on hold-out set: 0.025619097734743263
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Epoch: 381

Loss on hold-out set: 0.02640969351681027
MeanAbsoluteError value on hold-out data: 0.1253969967365265
Epoch: 382
Loss on hold-out set: 0.023940504972730803
MeanAbsoluteError value on hold-out data: 0.11948590725660324
Epoch: 383

Loss on hold-out set: 0.02332960844267897
MeanAbsoluteError value on hold-out data: 0.11824877560138702
Epoch: 384

Loss on hold-out set: 0.024010680199911198
MeanAbsoluteError value on hold-out data: 0.12016543000936508
Epoch: 385
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Loss on hold-out set: 0.023136077083569642
MeanAbsoluteError value on hold-out data: 0.12008637934923172
Epoch: 386

Loss on hold-out set: 0.02523064350609881
MeanAbsoluteError value on hold-out data: 0.12171651422977448
Epoch: 387

Loss on hold-out set: 0.025242925992740008
MeanAbsoluteError value on hold-out data: 0.12567567825317383
Epoch: 388
Loss on hold-out set: 0.024514560459695835
MeanAbsoluteError value on hold-out data: 0.12134245783090591
Epoch: 389

Loss on hold-out set: 0.02513233423543473
MeanAbsoluteError value on hold-out data: 0.12346866726875305
Epoch: 390

Loss on hold-out set: 0.0244039308654222
MeanAbsoluteError value on hold-out data: 0.12244652956724167
Epoch: 391
Loss on hold-out set: 0.025456932905265905
MeanAbsoluteError value on hold-out data: 0.12387751042842865
Epoch: 392

Loss on hold-out set: 0.023264465754849275
MeanAbsoluteError value on hold-out data: 0.12106789648532867
Epoch: 393

Loss on hold-out set: 0.02262009511740568
MeanAbsoluteError value on hold-out data: 0.11603621393442154
Epoch: 394
Loss on hold-out set: 0.023743288848345402
MeanAbsoluteError value on hold-out data: 0.11786063015460968
Epoch: 395

Loss on hold-out set: 0.024990316808374095
MeanAbsoluteError value on hold-out data: 0.12242479622364044
Epoch: 396
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Loss on hold-out set: 0.02615112490738587
MeanAbsoluteError value on hold-out data: 0.1253129541873932
Epoch: 397
Loss on hold-out set: 0.024768358625733525
MeanAbsoluteError value on hold-out data: 0.12373123317956924
Epoch: 398

Loss on hold-out set: 0.02464979973291823
MeanAbsoluteError value on hold-out data: 0.12107350677251816
Epoch: 399

Loss on hold-out set: 0.02307363373518456
MeanAbsoluteError value on hold-out data: 0.11793996393680573
Epoch: 400
Loss on hold-out set: 0.024397918617857308
MeanAbsoluteError value on hold-out data: 0.12191412597894669
Epoch: 401

Loss on hold-out set: 0.02273047960796248
MeanAbsoluteError value on hold-out data: 0.11619771271944046
Epoch: 402

Loss on hold-out set: 0.02457451539344523
MeanAbsoluteError value on hold-out data: 0.12116055935621262
Epoch: 403
Loss on hold-out set: 0.023305102086111827
MeanAbsoluteError value on hold-out data: 0.11839911341667175
Epoch: 404

Loss on hold-out set: 0.025369491949750227
MeanAbsoluteError value on hold-out data: 0.12356437742710114
Epoch: 405

Loss on hold-out set: 0.02314879228424009
MeanAbsoluteError value on hold-out data: 0.11637574434280396
Epoch: 406
Loss on hold-out set: 0.022794979210642243
MeanAbsoluteError value on hold-out data: 0.11635645478963852
Epoch: 407
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Loss on hold-out set: 0.023915983432477028
MeanAbsoluteError value on hold-out data: 0.11740954220294952
Epoch: 408

Loss on hold-out set: 0.023838393196250158
MeanAbsoluteError value on hold-out data: 0.12050756067037582
Epoch: 409
Loss on hold-out set: 0.024727188305532763
MeanAbsoluteError value on hold-out data: 0.12264896184206009
Epoch: 410

Loss on hold-out set: 0.023633642201893963
MeanAbsoluteError value on hold-out data: 0.11818455904722214
Epoch: 411

Loss on hold-out set: 0.023292781874861248
MeanAbsoluteError value on hold-out data: 0.11816393584012985
Epoch: 412
Loss on hold-out set: 0.024017410881933755
MeanAbsoluteError value on hold-out data: 0.12088648229837418
Epoch: 413

Loss on hold-out set: 0.021481135888025166
MeanAbsoluteError value on hold-out data: 0.11354613304138184
Epoch: 414

Loss on hold-out set: 0.02332845918140568
MeanAbsoluteError value on hold-out data: 0.11847320199012756
Epoch: 415
Loss on hold-out set: 0.025513447258660258
MeanAbsoluteError value on hold-out data: 0.1219680905342102
Epoch: 416

Loss on hold-out set: 0.023982474229190604
MeanAbsoluteError value on hold-out data: 0.12139634788036346
Epoch: 417

Loss on hold-out set: 0.023879851051412212
MeanAbsoluteError value on hold-out data: 0.11828441917896271
Epoch: 418
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Loss on hold-out set: 0.022862631166159796
MeanAbsoluteError value on hold-out data: 0.11912048608064651
Epoch: 419

Loss on hold-out set: 0.023457917325625507
MeanAbsoluteError value on hold-out data: 0.12254786491394043
Epoch: 420

Loss on hold-out set: 0.022758046347000762
MeanAbsoluteError value on hold-out data: 0.12110935151576996
Epoch: 421
Loss on hold-out set: 0.02428473359264899
MeanAbsoluteError value on hold-out data: 0.12161623686552048
Epoch: 422

Loss on hold-out set: 0.023955635768943467
MeanAbsoluteError value on hold-out data: 0.1215689480304718
Epoch: 423

Loss on hold-out set: 0.022561546586221084
MeanAbsoluteError value on hold-out data: 0.11766660958528519
Epoch: 424
Loss on hold-out set: 0.022979534134065033
MeanAbsoluteError value on hold-out data: 0.11808428168296814
Epoch: 425

Loss on hold-out set: 0.024894651469852154
MeanAbsoluteError value on hold-out data: 0.12371217459440231
Epoch: 426

Loss on hold-out set: 0.02292143419540177
MeanAbsoluteError value on hold-out data: 0.11814817041158676
Epoch: 427
Loss on hold-out set: 0.02423999689029491
MeanAbsoluteError value on hold-out data: 0.12143082916736603
Epoch: 428

Loss on hold-out set: 0.022900963862678814
MeanAbsoluteError value on hold-out data: 0.11977987736463547
Epoch: 429
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Loss on hold-out set: 0.020933232910392688
MeanAbsoluteError value on hold-out data: 0.1111072525382042
Epoch: 430
Loss on hold-out set: 0.023668083593365738
MeanAbsoluteError value on hold-out data: 0.11710336059331894
Epoch: 431

Loss on hold-out set: 0.023717873287726735
MeanAbsoluteError value on hold-out data: 0.11839477717876434
Epoch: 432

Loss on hold-out set: 0.023824891336650278
MeanAbsoluteError value on hold-out data: 0.1224382147192955
Epoch: 433
Loss on hold-out set: 0.022023628922664407
MeanAbsoluteError value on hold-out data: 0.11341521143913269
Epoch: 434

Loss on hold-out set: 0.023718715806996138
MeanAbsoluteError value on hold-out data: 0.12034544348716736
Epoch: 435

Loss on hold-out set: 0.024917843870449968
MeanAbsoluteError value on hold-out data: 0.12214905768632889
Epoch: 436
Loss on hold-out set: 0.02346679347307751
MeanAbsoluteError value on hold-out data: 0.12324007600545883
Epoch: 437

Loss on hold-out set: 0.022449589597914987
MeanAbsoluteError value on hold-out data: 0.11521109193563461
Epoch: 438

Loss on hold-out set: 0.022633789942847215
MeanAbsoluteError value on hold-out data: 0.11520423740148544
Epoch: 439
Loss on hold-out set: 0.02401526058599605
MeanAbsoluteError value on hold-out data: 0.12129604071378708
Epoch: 440
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Loss on hold-out set: 0.021576283355583047
MeanAbsoluteError value on hold-out data: 0.11432266235351562
Epoch: 441

Loss on hold-out set: 0.02440703965490684
MeanAbsoluteError value on hold-out data: 0.12103714048862457
Epoch: 442
Loss on hold-out set: 0.02282978451132294
MeanAbsoluteError value on hold-out data: 0.1187901422381401
Epoch: 443

Loss on hold-out set: 0.020722501475441158
MeanAbsoluteError value on hold-out data: 0.11360959708690643
Epoch: 444

Loss on hold-out set: 0.023299706251515697
MeanAbsoluteError value on hold-out data: 0.11958733946084976
Epoch: 445
Loss on hold-out set: 0.02224660239230919
MeanAbsoluteError value on hold-out data: 0.11491816490888596
Epoch: 446

Loss on hold-out set: 0.024083950700005515
MeanAbsoluteError value on hold-out data: 0.11897750943899155
Epoch: 447

Loss on hold-out set: 0.02529386483860435
MeanAbsoluteError value on hold-out data: 0.11973710358142853
Epoch: 448
Loss on hold-out set: 0.022615699211504154
MeanAbsoluteError value on hold-out data: 0.11611416190862656
Epoch: 449

Loss on hold-out set: 0.023657858268901086
MeanAbsoluteError value on hold-out data: 0.12035120278596878
Epoch: 450

Loss on hold-out set: 0.02289564286125824
MeanAbsoluteError value on hold-out data: 0.11725740879774094
Epoch: 451
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Loss on hold-out set: 0.023539657649816945
MeanAbsoluteError value on hold-out data: 0.1184544488787651
Epoch: 452

Loss on hold-out set: 0.022683850403506463
MeanAbsoluteError value on hold-out data: 0.11755336821079254
Epoch: 453

Loss on hold-out set: 0.02293117636577032
MeanAbsoluteError value on hold-out data: 0.11696498841047287
Epoch: 454
Loss on hold-out set: 0.02141457090337705
MeanAbsoluteError value on hold-out data: 0.11332986503839493
Epoch: 455

Loss on hold-out set: 0.022960202136637235
MeanAbsoluteError value on hold-out data: 0.11613258719444275
Epoch: 456

Loss on hold-out set: 0.022951557529940297
MeanAbsoluteError value on hold-out data: 0.11752371490001678
Epoch: 457
Loss on hold-out set: 0.02136953924607951
MeanAbsoluteError value on hold-out data: 0.11293049156665802
Epoch: 458

Loss on hold-out set: 0.024870543831493706
MeanAbsoluteError value on hold-out data: 0.12352655827999115
Epoch: 459

Loss on hold-out set: 0.024200132913926305
MeanAbsoluteError value on hold-out data: 0.12228911370038986
Epoch: 460
Loss on hold-out set: 0.02199695974951131
MeanAbsoluteError value on hold-out data: 0.11509105563163757
Epoch: 461

Loss on hold-out set: 0.02192405377320635
MeanAbsoluteError value on hold-out data: 0.11769696325063705
Epoch: 462
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Loss on hold-out set: 0.020176844069695412
MeanAbsoluteError value on hold-out data: 0.11175347864627838
Epoch: 463
Loss on hold-out set: 0.023109121449621548
MeanAbsoluteError value on hold-out data: 0.11681101471185684
Epoch: 464

Loss on hold-out set: 0.022570218481935928
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Epoch: 465

Loss on hold-out set: 0.024449728484163036
MeanAbsoluteError value on hold-out data: 0.12124904990196228
Epoch: 466
Loss on hold-out set: 0.02326436463064359
MeanAbsoluteError value on hold-out data: 0.11764652281999588
Epoch: 467

Loss on hold-out set: 0.02305878413821726
MeanAbsoluteError value on hold-out data: 0.11776728183031082
Epoch: 468

Loss on hold-out set: 0.020210723213094754
MeanAbsoluteError value on hold-out data: 0.11202162504196167
Epoch: 469
Loss on hold-out set: 0.023146857135967973
MeanAbsoluteError value on hold-out data: 0.11534075438976288
Epoch: 470

Loss on hold-out set: 0.02322516438415429
MeanAbsoluteError value on hold-out data: 0.11835170537233353
Epoch: 471

Loss on hold-out set: 0.02286029658023229
MeanAbsoluteError value on hold-out data: 0.11850762367248535
Epoch: 472
Loss on hold-out set: 0.02312932037631981
MeanAbsoluteError value on hold-out data: 0.11786612123250961
Epoch: 473
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Loss on hold-out set: 0.021603435420353586
MeanAbsoluteError value on hold-out data: 0.11538133025169373
Epoch: 474

Loss on hold-out set: 0.02425973496242174
MeanAbsoluteError value on hold-out data: 0.12126123160123825
Epoch: 475
Loss on hold-out set: 0.02442942861157159
MeanAbsoluteError value on hold-out data: 0.12018684297800064
Epoch: 476

Loss on hold-out set: 0.02218317115267079
MeanAbsoluteError value on hold-out data: 0.11573611944913864
Epoch: 477

Loss on hold-out set: 0.0220433790610817
MeanAbsoluteError value on hold-out data: 0.11704763025045395
Epoch: 478
Loss on hold-out set: 0.021440188815273965
MeanAbsoluteError value on hold-out data: 0.11475631594657898
Epoch: 479

Loss on hold-out set: 0.022929736696823966
MeanAbsoluteError value on hold-out data: 0.11672338098287582
Epoch: 480

Loss on hold-out set: 0.022462368594836638
MeanAbsoluteError value on hold-out data: 0.11701062321662903
Epoch: 481
Loss on hold-out set: 0.02349965621169152
MeanAbsoluteError value on hold-out data: 0.11973823606967926
Epoch: 482

Loss on hold-out set: 0.02211975471242719
MeanAbsoluteError value on hold-out data: 0.11167091131210327
Epoch: 483

Loss on hold-out set: 0.023776901240441174
MeanAbsoluteError value on hold-out data: 0.11684451997280121
Epoch: 484
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Loss on hold-out set: 0.023157633946975693
MeanAbsoluteError value on hold-out data: 0.11861929297447205
Epoch: 485

Loss on hold-out set: 0.021693608365773494
MeanAbsoluteError value on hold-out data: 0.11100582033395767
Epoch: 486

Loss on hold-out set: 0.021923549949084797
MeanAbsoluteError value on hold-out data: 0.11301038414239883
Epoch: 487
Loss on hold-out set: 0.022503196874652832
MeanAbsoluteError value on hold-out data: 0.11801493167877197
Epoch: 488

Loss on hold-out set: 0.023735311348961355
MeanAbsoluteError value on hold-out data: 0.12164707481861115
Epoch: 489

Loss on hold-out set: 0.022037969028169756
MeanAbsoluteError value on hold-out data: 0.116172194480896
Epoch: 490
Loss on hold-out set: 0.02215405118467364
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Epoch: 491

Loss on hold-out set: 0.021439701649796916
MeanAbsoluteError value on hold-out data: 0.1142086312174797
Epoch: 492

Loss on hold-out set: 0.0219189559368048
MeanAbsoluteError value on hold-out data: 0.11595108360052109
Epoch: 493
Loss on hold-out set: 0.02391452643481898
MeanAbsoluteError value on hold-out data: 0.11856202781200409
Epoch: 494

Loss on hold-out set: 0.021708780911382442
MeanAbsoluteError value on hold-out data: 0.11286487430334091
Epoch: 495
```

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Loss on hold-out set: 0.02144376373369596
MeanAbsoluteError value on hold-out data: 0.11552345007658005
Epoch: 496
Loss on hold-out set: 0.024537016336219797
MeanAbsoluteError value on hold-out data: 0.12165994197130203
Epoch: 497

Loss on hold-out set: 0.022455062524192423
MeanAbsoluteError value on hold-out data: 0.11685484647750854
Epoch: 498

Loss on hold-out set: 0.019864095302449036
MeanAbsoluteError value on hold-out data: 0.10939931124448776
Epoch: 499
Loss on hold-out set: 0.02217290081855026
MeanAbsoluteError value on hold-out data: 0.11529228091239929
Epoch: 500

Loss on hold-out set: 0.0237322467424868
MeanAbsoluteError value on hold-out data: 0.12204740196466446
Epoch: 501

Loss on hold-out set: 0.024611871903762222
MeanAbsoluteError value on hold-out data: 0.11984031647443771
Epoch: 502
Loss on hold-out set: 0.020924927435892946
MeanAbsoluteError value on hold-out data: 0.11178842931985855
Epoch: 503

Loss on hold-out set: 0.02277671128094274
MeanAbsoluteError value on hold-out data: 0.11665941774845123
Epoch: 504

Loss on hold-out set: 0.020415547395289953
MeanAbsoluteError value on hold-out data: 0.11074292659759521
Epoch: 505
Loss on hold-out set: 0.02102798521402292
MeanAbsoluteError value on hold-out data: 0.11332561820745468
Epoch: 506
```

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Loss on hold-out set: 0.02302290615485011
MeanAbsoluteError value on hold-out data: 0.11878784000873566
Epoch: 507

Loss on hold-out set: 0.023182960726868866
MeanAbsoluteError value on hold-out data: 0.11779478937387466
Epoch: 508
Loss on hold-out set: 0.02190454817880853
MeanAbsoluteError value on hold-out data: 0.11658349633216858
Epoch: 509

Loss on hold-out set: 0.020845877493314523
MeanAbsoluteError value on hold-out data: 0.11147477477788925
Epoch: 510

Loss on hold-out set: 0.023738226272968555
MeanAbsoluteError value on hold-out data: 0.1173601895570755
Epoch: 511
Loss on hold-out set: 0.021492921387369582
MeanAbsoluteError value on hold-out data: 0.11267439275979996
Epoch: 512

Loss on hold-out set: 0.021578436594524342
MeanAbsoluteError value on hold-out data: 0.11500284820795059
Epoch: 513

Loss on hold-out set: 0.021039207737242882
MeanAbsoluteError value on hold-out data: 0.11026720702648163
Epoch: 514
Loss on hold-out set: 0.022410094139534823
MeanAbsoluteError value on hold-out data: 0.11265458166599274
Epoch: 515

Loss on hold-out set: 0.024710591226563945
MeanAbsoluteError value on hold-out data: 0.12165377289056778
Epoch: 516

Loss on hold-out set: 0.023171624012951118
MeanAbsoluteError value on hold-out data: 0.11671715974807739
Epoch: 517
```

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Loss on hold-out set: 0.021646354483285297
MeanAbsoluteError value on hold-out data: 0.11638765037059784
Epoch: 518

Loss on hold-out set: 0.02108114870240873
MeanAbsoluteError value on hold-out data: 0.1135602816939354
Epoch: 519

Loss on hold-out set: 0.02121865130975493
MeanAbsoluteError value on hold-out data: 0.11219403892755508
Epoch: 520
Loss on hold-out set: 0.02094147380499635
MeanAbsoluteError value on hold-out data: 0.11254709959030151
Epoch: 521

Loss on hold-out set: 0.021669104081520344
MeanAbsoluteError value on hold-out data: 0.11478706449270248
Epoch: 522

Loss on hold-out set: 0.020766701062287514
MeanAbsoluteError value on hold-out data: 0.11280742287635803
Epoch: 523
Loss on hold-out set: 0.02084682644107185
MeanAbsoluteError value on hold-out data: 0.11082013696432114
Epoch: 524

Loss on hold-out set: 0.02175479009669895
MeanAbsoluteError value on hold-out data: 0.1159108504652977
Epoch: 525

Loss on hold-out set: 0.021177889410755598
MeanAbsoluteError value on hold-out data: 0.11399303376674652
Epoch: 526
Loss on hold-out set: 0.022327358522937477
MeanAbsoluteError value on hold-out data: 0.12083404511213303
Epoch: 527

Loss on hold-out set: 0.02101068141940535
MeanAbsoluteError value on hold-out data: 0.10910546779632568
Epoch: 528
```

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Loss on hold-out set: 0.01851212380027088
MeanAbsoluteError value on hold-out data: 0.10844247043132782
Epoch: 529
Loss on hold-out set: 0.020614500320710553
MeanAbsoluteError value on hold-out data: 0.11239267885684967
Epoch: 530

Loss on hold-out set: 0.021549897017078667
MeanAbsoluteError value on hold-out data: 0.11290600895881653
Epoch: 531

Loss on hold-out set: 0.02005726348841563
MeanAbsoluteError value on hold-out data: 0.10885307192802429
Epoch: 532
Loss on hold-out set: 0.021044700809115965
MeanAbsoluteError value on hold-out data: 0.11153189092874527
Epoch: 533

Loss on hold-out set: 0.02187827360855105
MeanAbsoluteError value on hold-out data: 0.1177166998386383
Epoch: 534

Loss on hold-out set: 0.021078451697151952
MeanAbsoluteError value on hold-out data: 0.11589737981557846
Epoch: 535
Loss on hold-out set: 0.021959854142720968
MeanAbsoluteError value on hold-out data: 0.11721955984830856
Epoch: 536

Loss on hold-out set: 0.021360205965320348
MeanAbsoluteError value on hold-out data: 0.11404252052307129
Epoch: 537

Loss on hold-out set: 0.020774018984181263
MeanAbsoluteError value on hold-out data: 0.1099095419049263
Epoch: 538
Loss on hold-out set: 0.02318008676248913
MeanAbsoluteError value on hold-out data: 0.11662647128105164
Epoch: 539
```

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Loss on hold-out set: 0.02207942665328422
MeanAbsoluteError value on hold-out data: 0.11532655358314514
Epoch: 540

Loss on hold-out set: 0.019276999758246045
MeanAbsoluteError value on hold-out data: 0.10951776802539825
Epoch: 541
Loss on hold-out set: 0.022426072078863702
MeanAbsoluteError value on hold-out data: 0.1182977557182312
Epoch: 542

Loss on hold-out set: 0.022108451544978987
MeanAbsoluteError value on hold-out data: 0.11493810266256332
Epoch: 543

Loss on hold-out set: 0.021866963458014654
MeanAbsoluteError value on hold-out data: 0.11366204917430878
Epoch: 544
Loss on hold-out set: 0.021043625916354357
MeanAbsoluteError value on hold-out data: 0.11472773551940918
Epoch: 545

Loss on hold-out set: 0.021043917306766767
MeanAbsoluteError value on hold-out data: 0.11395954340696335
Epoch: 546

Loss on hold-out set: 0.02012517867871793
MeanAbsoluteError value on hold-out data: 0.11162088811397552
Epoch: 547
Loss on hold-out set: 0.02200843259051908
MeanAbsoluteError value on hold-out data: 0.11470415443181992
Epoch: 548

Loss on hold-out set: 0.021337434713398884
MeanAbsoluteError value on hold-out data: 0.11368593573570251
Epoch: 549

Loss on hold-out set: 0.021873941134011452
MeanAbsoluteError value on hold-out data: 0.11421263217926025
Epoch: 550
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Loss on hold-out set: 0.020344290077628103
MeanAbsoluteError value on hold-out data: 0.1134381890296936
Epoch: 551

Loss on hold-out set: 0.020410314074106282
MeanAbsoluteError value on hold-out data: 0.11102306097745895
Epoch: 552

Loss on hold-out set: 0.018620407720057606
MeanAbsoluteError value on hold-out data: 0.10885990411043167
Epoch: 553
Loss on hold-out set: 0.01849808544240659
MeanAbsoluteError value on hold-out data: 0.10443562269210815
Epoch: 554

Loss on hold-out set: 0.0223031770347734
MeanAbsoluteError value on hold-out data: 0.11068274080753326
Epoch: 555

Loss on hold-out set: 0.019833432240702678
MeanAbsoluteError value on hold-out data: 0.10846724361181259
Epoch: 556
Loss on hold-out set: 0.019792447884101422
MeanAbsoluteError value on hold-out data: 0.10751036554574966
Epoch: 557

Loss on hold-out set: 0.019698599439579995
MeanAbsoluteError value on hold-out data: 0.10935348272323608
Epoch: 558

Loss on hold-out set: 0.020615220732191422
MeanAbsoluteError value on hold-out data: 0.11320631951093674
Epoch: 559
Loss on hold-out set: 0.020081268042340526
MeanAbsoluteError value on hold-out data: 0.11007829010486603
Epoch: 560

Loss on hold-out set: 0.02135887416433737
MeanAbsoluteError value on hold-out data: 0.11501587182283401
Epoch: 561
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Loss on hold-out set: 0.020102756249640 76
MeanAbsoluteError value on hold-out data: 0.11070985347032547
Epoch: 562
Loss on hold-out set: 0.018456721711020994
MeanAbsoluteError value on hold-out data: 0.10680166631937027
Epoch: 563

Loss on hold-out set: 0.018271808327262988
MeanAbsoluteError value on hold-out data: 0.10192326456308365
Epoch: 564

Loss on hold-out set: 0.01934329594989928
MeanAbsoluteError value on hold-out data: 0.10828995704650879
Epoch: 565
Loss on hold-out set: 0.020653208386065672
MeanAbsoluteError value on hold-out data: 0.11150039732456207
Epoch: 566

Loss on hold-out set: 0.019098573223309358
MeanAbsoluteError value on hold-out data: 0.1052529588341713
Epoch: 567

Loss on hold-out set: 0.018669051183387637
MeanAbsoluteError value on hold-out data: 0.10807386785745621
Epoch: 568
Loss on hold-out set: 0.021354134036312946
MeanAbsoluteError value on hold-out data: 0.11300778388977051
Epoch: 569

Loss on hold-out set: 0.021667064329376443
MeanAbsoluteError value on hold-out data: 0.11379478126764297
Epoch: 570

Loss on hold-out set: 0.022182504691906312
MeanAbsoluteError value on hold-out data: 0.11919287592172623
Epoch: 571
Loss on hold-out set: 0.018892602046835235
MeanAbsoluteError value on hold-out data: 0.10864958167076111
Epoch: 572
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Loss on hold-out set: 0.01865028621138966
MeanAbsoluteError value on hold-out data: 0.10810087621212006
Epoch: 573

Loss on hold-out set: 0.021292830570891964
MeanAbsoluteError value on hold-out data: 0.11485359072685242
Epoch: 574
Loss on hold-out set: 0.01976854414478415
MeanAbsoluteError value on hold-out data: 0.1085931658744812
Epoch: 575

Loss on hold-out set: 0.02105625370160851
MeanAbsoluteError value on hold-out data: 0.11314203590154648
Epoch: 576

Loss on hold-out set: 0.019837185412858768
MeanAbsoluteError value on hold-out data: 0.11154814064502716
Epoch: 577
Loss on hold-out set: 0.019896692181306814
MeanAbsoluteError value on hold-out data: 0.10709696263074875
Epoch: 578

Loss on hold-out set: 0.02146082932401138
MeanAbsoluteError value on hold-out data: 0.11588228493928909
Epoch: 579

Loss on hold-out set: 0.019487444555658536
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Epoch: 580
Loss on hold-out set: 0.021139051051723073
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Epoch: 581

Loss on hold-out set: 0.020679103746879264
MeanAbsoluteError value on hold-out data: 0.10763908177614212
Epoch: 582

Loss on hold-out set: 0.020124656294049904
MeanAbsoluteError value on hold-out data: 0.10896617919206619
Epoch: 583
```

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Loss on hold-out set: 0.017316887185249166
MeanAbsoluteError value on hold-out data: 0.10162966698408127
Epoch: 584

Loss on hold-out set: 0.02112637125508627
MeanAbsoluteError value on hold-out data: 0.11312571167945862
Epoch: 585

Loss on hold-out set: 0.021694292105263836
MeanAbsoluteError value on hold-out data: 0.11405783146619797
Epoch: 586
Loss on hold-out set: 0.02130799798326431
MeanAbsoluteError value on hold-out data: 0.1113554909825325
Epoch: 587

Loss on hold-out set: 0.020001324582420543
MeanAbsoluteError value on hold-out data: 0.10729779303073883
Epoch: 588

Loss on hold-out set: 0.018259872842148372
MeanAbsoluteError value on hold-out data: 0.1043153628706932
Epoch: 589
Loss on hold-out set: 0.019555863206866586
MeanAbsoluteError value on hold-out data: 0.1101229190826416
Epoch: 590

Loss on hold-out set: 0.019993622236991845
MeanAbsoluteError value on hold-out data: 0.10775936394929886
Epoch: 591

Loss on hold-out set: 0.021095614023991707
MeanAbsoluteError value on hold-out data: 0.1125088483095169
Epoch: 592
Loss on hold-out set: 0.019161930774571373
MeanAbsoluteError value on hold-out data: 0.10618714243173599
Epoch: 593

Loss on hold-out set: 0.020865032917548283
MeanAbsoluteError value on hold-out data: 0.11225216090679169
Epoch: 594
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Loss on hold-out set: 0.021050679005857092
MeanAbsoluteError value on hold-out data: 0.11421924829483032
Epoch: 595
Loss on hold-out set: 0.018760334007965868
MeanAbsoluteError value on hold-out data: 0.10454518347978592
Epoch: 596

Loss on hold-out set: 0.01795732031944984
MeanAbsoluteError value on hold-out data: 0.10745053738355637
Epoch: 597

Loss on hold-out set: 0.019025897895529244
MeanAbsoluteError value on hold-out data: 0.1062474250793457
Epoch: 598
Loss on hold-out set: 0.020082725936517817
MeanAbsoluteError value on hold-out data: 0.10836248844861984
Epoch: 599

Loss on hold-out set: 0.01904959806299303
MeanAbsoluteError value on hold-out data: 0.10861247777938843
Epoch: 600

Loss on hold-out set: 0.01945469636770819
MeanAbsoluteError value on hold-out data: 0.10773701965808868
Epoch: 601
Loss on hold-out set: 0.02098833644175708
MeanAbsoluteError value on hold-out data: 0.1128249242901802
Epoch: 602

Loss on hold-out set: 0.019686566421878524
MeanAbsoluteError value on hold-out data: 0.1075601577758789
Epoch: 603

Loss on hold-out set: 0.019640216164698358
MeanAbsoluteError value on hold-out data: 0.10698533058166504
Epoch: 604
Loss on hold-out set: 0.019336504151142436
MeanAbsoluteError value on hold-out data: 0.10773066431283951
Epoch: 605
```

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Loss on hold-out set: 0.017480402773168856
MeanAbsoluteError value on hold-out data: 0.10086261481046677
Epoch: 606

Loss on hold-out set: 0.019338614589554104
MeanAbsoluteError value on hold-out data: 0.10514523833990097
Epoch: 607
Loss on hold-out set: 0.01735598045255756
MeanAbsoluteError value on hold-out data: 0.09858990460634232
Epoch: 608

Loss on hold-out set: 0.018519322291977006
MeanAbsoluteError value on hold-out data: 0.10427018254995346
Epoch: 609

Loss on hold-out set: 0.018746971916261828
MeanAbsoluteError value on hold-out data: 0.11255555599927902
Epoch: 610
Loss on hold-out set: 0.019304412121273345
MeanAbsoluteError value on hold-out data: 0.1076584979891777
Epoch: 611

Loss on hold-out set: 0.02012894622074479
MeanAbsoluteError value on hold-out data: 0.11108811944723129
Epoch: 612

Loss on hold-out set: 0.01756579169780404
MeanAbsoluteError value on hold-out data: 0.10419226437807083
Epoch: 613
Loss on hold-out set: 0.018140679546049795
MeanAbsoluteError value on hold-out data: 0.10393586754798889
Epoch: 614

Loss on hold-out set: 0.01821712639333176
MeanAbsoluteError value on hold-out data: 0.10343380272388458
Epoch: 615

Loss on hold-out set: 0.018243885946430963
MeanAbsoluteError value on hold-out data: 0.103538878262043
Epoch: 616
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Loss on hold-out set: 0.01655361628518828
MeanAbsoluteError value on hold-out data: 0.10157578438520432
Epoch: 617

Loss on hold-out set: 0.019015356400438273
MeanAbsoluteError value on hold-out data: 0.10701742768287659
Epoch: 618

Loss on hold-out set: 0.018491461264541917
MeanAbsoluteError value on hold-out data: 0.10536760091781616
Epoch: 619
Loss on hold-out set: 0.018775142525167515
MeanAbsoluteError value on hold-out data: 0.10519521683454514
Epoch: 620

Loss on hold-out set: 0.01956888519130492
MeanAbsoluteError value on hold-out data: 0.1078231930732727
Epoch: 621

Loss on hold-out set: 0.019098132604946538
MeanAbsoluteError value on hold-out data: 0.10577452182769775
Epoch: 622
Loss on hold-out set: 0.01869967289841346
MeanAbsoluteError value on hold-out data: 0.10604407638311386
Epoch: 623

Loss on hold-out set: 0.020207976448873524
MeanAbsoluteError value on hold-out data: 0.1084987223148346
Epoch: 624

Loss on hold-out set: 0.01859689987862415
MeanAbsoluteError value on hold-out data: 0.10376312583684921
Epoch: 625
Loss on hold-out set: 0.018009887902153424
MeanAbsoluteError value on hold-out data: 0.10308995842933655
Epoch: 626

Loss on hold-out set: 0.018904189133997232
MeanAbsoluteError value on hold-out data: 0.10577023774385452
Epoch: 627
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Loss on hold-out set: 0.019237572275839436
MeanAbsoluteError value on hold-out data: 0.10899733006954193
Epoch: 628
Loss on hold-out set: 0.019454301151951466
MeanAbsoluteError value on hold-out data: 0.10939522087574005
Epoch: 629

Loss on hold-out set: 0.017542750957375876
MeanAbsoluteError value on hold-out data: 0.1037292405962944
Epoch: 630

Loss on hold-out set: 0.01898367247694599
MeanAbsoluteError value on hold-out data: 0.10877793282270432
Epoch: 631
Loss on hold-out set: 0.018977154664074382
MeanAbsoluteError value on hold-out data: 0.10928075015544891
Epoch: 632

Loss on hold-out set: 0.01888611894585362
MeanAbsoluteError value on hold-out data: 0.10556654632091522
Epoch: 633

Loss on hold-out set: 0.01981390810193261
MeanAbsoluteError value on hold-out data: 0.11048473417758942
Epoch: 634
Loss on hold-out set: 0.01982973005736009
MeanAbsoluteError value on hold-out data: 0.10782770812511444
Epoch: 635

Loss on hold-out set: 0.01976306843663527
MeanAbsoluteError value on hold-out data: 0.1094881072640419
Epoch: 636

Loss on hold-out set: 0.020052206044080475
MeanAbsoluteError value on hold-out data: 0.10949826240539551
Epoch: 637
Loss on hold-out set: 0.018987396671436726
MeanAbsoluteError value on hold-out data: 0.10399693250656128
Epoch: 638
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Loss on hold-out set: 0.017459646335616622
MeanAbsoluteError value on hold-out data: 0.10210321098566055
Epoch: 639

Loss on hold-out set: 0.020344960130363308
MeanAbsoluteError value on hold-out data: 0.11011100560426712
Epoch: 640
Loss on hold-out set: 0.017781999925112663
MeanAbsoluteError value on hold-out data: 0.10322342067956924
Epoch: 641

Loss on hold-out set: 0.020828682977201727
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Epoch: 642

Loss on hold-out set: 0.018740417959343177
MeanAbsoluteError value on hold-out data: 0.10820236057043076
Epoch: 643
Loss on hold-out set: 0.01858302713175519
MeanAbsoluteError value on hold-out data: 0.10401251167058945
Epoch: 644

Loss on hold-out set: 0.018891166310349945
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Epoch: 645

Loss on hold-out set: 0.020541500185402885
MeanAbsoluteError value on hold-out data: 0.1106203943490982
Epoch: 646
Loss on hold-out set: 0.01647773934081973
MeanAbsoluteError value on hold-out data: 0.10025754570960999
Epoch: 647

Loss on hold-out set: 0.019247033660794843
MeanAbsoluteError value on hold-out data: 0.10675700008869171
Epoch: 648

Loss on hold-out set: 0.018887962545268238
MeanAbsoluteError value on hold-out data: 0.10645484924316406
Epoch: 649
```

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Loss on hold-out set: 0.018011406609536304
MeanAbsoluteError value on hold-out data: 0.10329703986644745
Epoch: 650

Loss on hold-out set: 0.01789210592519036
MeanAbsoluteError value on hold-out data: 0.10401032119989395
Epoch: 651

Loss on hold-out set: 0.01954711123854698
MeanAbsoluteError value on hold-out data: 0.10519330948591232
Epoch: 652
Loss on hold-out set: 0.018304539626697078
MeanAbsoluteError value on hold-out data: 0.10358963161706924
Epoch: 653

Loss on hold-out set: 0.019476282239726667
MeanAbsoluteError value on hold-out data: 0.10670971870422363
Epoch: 654

Loss on hold-out set: 0.019840936635397762
MeanAbsoluteError value on hold-out data: 0.10667989403009415
Epoch: 655
Loss on hold-out set: 0.020577441855275536
MeanAbsoluteError value on hold-out data: 0.10865594446659088
Epoch: 656

Loss on hold-out set: 0.017251827353805614
MeanAbsoluteError value on hold-out data: 0.10412002354860306
Epoch: 657

Loss on hold-out set: 0.017177921633265213
MeanAbsoluteError value on hold-out data: 0.10299061238765717
Epoch: 658
Loss on hold-out set: 0.018056181907013524
MeanAbsoluteError value on hold-out data: 0.10410809516906738
Epoch: 659

Loss on hold-out set: 0.01814161726356057
MeanAbsoluteError value on hold-out data: 0.10588422417640686
Epoch: 660
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Loss on hold-out set: 0.019873282289942
MeanAbsoluteError value on hold-out data: 0.10767674446105957
Epoch: 661
Loss on hold-out set: 0.01755247924986179
MeanAbsoluteError value on hold-out data: 0.09996090084314346
Epoch: 662

Loss on hold-out set: 0.01891415100248802
MeanAbsoluteError value on hold-out data: 0.106276735663414
Epoch: 663

Loss on hold-out set: 0.019295882897131376
MeanAbsoluteError value on hold-out data: 0.10630935430526733
Epoch: 664
Loss on hold-out set: 0.01763917535260892
MeanAbsoluteError value on hold-out data: 0.10051185637712479
Epoch: 665

Loss on hold-out set: 0.018616190037913233
MeanAbsoluteError value on hold-out data: 0.1057797521352768
Epoch: 666

Loss on hold-out set: 0.01927646206924692
MeanAbsoluteError value on hold-out data: 0.1071569174528122
Epoch: 667
Loss on hold-out set: 0.019441051553973618
MeanAbsoluteError value on hold-out data: 0.10611932724714279
Epoch: 668

Loss on hold-out set: 0.018578749751710952
MeanAbsoluteError value on hold-out data: 0.10355144739151001
Epoch: 669

Loss on hold-out set: 0.019766613067812765
MeanAbsoluteError value on hold-out data: 0.10602416098117828
Epoch: 670
Loss on hold-out set: 0.01748774948505646
MeanAbsoluteError value on hold-out data: 0.09784570336341858
Epoch: 671
```

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Loss on hold-out set: 0.01660864623360491
MeanAbsoluteError value on hold-out data: 0.09851561486721039
Epoch: 672

Loss on hold-out set: 0.017454622972533494
MeanAbsoluteError value on hold-out data: 0.09978745877742767
Epoch: 673
Loss on hold-out set: 0.021630273226613404
MeanAbsoluteError value on hold-out data: 0.11132030189037323
Epoch: 674

Loss on hold-out set: 0.017844862618367187
MeanAbsoluteError value on hold-out data: 0.10227601230144501
Epoch: 675

Loss on hold-out set: 0.01864410600986351
MeanAbsoluteError value on hold-out data: 0.10481910407543182
Epoch: 676
Loss on hold-out set: 0.018052352007944136
MeanAbsoluteError value on hold-out data: 0.10433438420295715
Epoch: 677

Loss on hold-out set: 0.017235297717076416
MeanAbsoluteError value on hold-out data: 0.10109560936689377
Epoch: 678

Loss on hold-out set: 0.017384516928286756
MeanAbsoluteError value on hold-out data: 0.10228274762630463
Epoch: 679
Loss on hold-out set: 0.01930847059430865
MeanAbsoluteError value on hold-out data: 0.10550364851951599
Epoch: 680

Loss on hold-out set: 0.018738552669334847
MeanAbsoluteError value on hold-out data: 0.1029488742351532
Epoch: 681

Loss on hold-out set: 0.018615052785441247
MeanAbsoluteError value on hold-out data: 0.10395708680152893
Epoch: 682
```

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Loss on hold-out set: 0.01980475352032954
MeanAbsoluteError value on hold-out data: 0.10875669121742249
Epoch: 683

Loss on hold-out set: 0.02047474571445491
MeanAbsoluteError value on hold-out data: 0.11153984069824219
Epoch: 684

Loss on hold-out set: 0.016963053460688875
MeanAbsoluteError value on hold-out data: 0.0986732542514801
Epoch: 685
Loss on hold-out set: 0.017295674102788327
MeanAbsoluteError value on hold-out data: 0.10057773441076279
Epoch: 686

Loss on hold-out set: 0.018202270255133043
MeanAbsoluteError value on hold-out data: 0.10660959780216217
Epoch: 687

Loss on hold-out set: 0.016765688913098226
MeanAbsoluteError value on hold-out data: 0.09949414432048798
Epoch: 688
Loss on hold-out set: 0.018038445175431357
MeanAbsoluteError value on hold-out data: 0.10306671261787415
Epoch: 689

Loss on hold-out set: 0.017290188863310806
MeanAbsoluteError value on hold-out data: 0.10182762891054153
Epoch: 690

Loss on hold-out set: 0.017960570929863025
MeanAbsoluteError value on hold-out data: 0.10250497609376907
Epoch: 691
Loss on hold-out set: 0.017611498346896043
MeanAbsoluteError value on hold-out data: 0.10088930279016495
Epoch: 692

Loss on hold-out set: 0.016542331502035557
MeanAbsoluteError value on hold-out data: 0.10009653866291046
Epoch: 693
```

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Loss on hold-out set: 0.017325325659767257
MeanAbsoluteError value on hold-out data: 0.10322022438049316
Epoch: 694
Loss on hold-out set: 0.01591412096400745
MeanAbsoluteError value on hold-out data: 0.09918152540922165
Epoch: 695

Loss on hold-out set: 0.017543487727742863
MeanAbsoluteError value on hold-out data: 0.09985522925853729
Epoch: 696

Loss on hold-out set: 0.0172171680949153
MeanAbsoluteError value on hold-out data: 0.10227479785680771
Epoch: 697
Loss on hold-out set: 0.017283391932287485
MeanAbsoluteError value on hold-out data: 0.10149630904197693
Epoch: 698

Loss on hold-out set: 0.017579404163528427
MeanAbsoluteError value on hold-out data: 0.1023906022310257
Epoch: 699

Loss on hold-out set: 0.016344146365202811
MeanAbsoluteError value on hold-out data: 0.09826597571372986
Epoch: 700
Loss on hold-out set: 0.017409856436764435
MeanAbsoluteError value on hold-out data: 0.10115405172109604
Epoch: 701

Loss on hold-out set: 0.0168397749793318
MeanAbsoluteError value on hold-out data: 0.09994864463806152
Epoch: 702

Loss on hold-out set: 0.015416040195462605
MeanAbsoluteError value on hold-out data: 0.09572401642799377
Epoch: 703
Loss on hold-out set: 0.017922625823301435
MeanAbsoluteError value on hold-out data: 0.10388849675655365
Epoch: 704
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Loss on hold-out set: 0.018035247638181318
MeanAbsoluteError value on hold-out data: 0.1062803789973259
Epoch: 705

Loss on hold-out set: 0.020093524331411268
MeanAbsoluteError value on hold-out data: 0.10830426216125488
Epoch: 706
Loss on hold-out set: 0.017781668507868744
MeanAbsoluteError value on hold-out data: 0.09976394474506378
Epoch: 707

Loss on hold-out set: 0.018889225666716813
MeanAbsoluteError value on hold-out data: 0.10424893349409103
Epoch: 708

Loss on hold-out set: 0.016349037405404186
MeanAbsoluteError value on hold-out data: 0.09798286110162735
Epoch: 709
Loss on hold-out set: 0.017813459418927476
MeanAbsoluteError value on hold-out data: 0.10154377669095993
Epoch: 710

Loss on hold-out set: 0.016896084598071563
MeanAbsoluteError value on hold-out data: 0.09824979305267334
Epoch: 711

Loss on hold-out set: 0.018116601957881357
MeanAbsoluteError value on hold-out data: 0.0983966812491417
Epoch: 712
Loss on hold-out set: 0.01645104233912813
MeanAbsoluteError value on hold-out data: 0.09765047580003738
Epoch: 713

Loss on hold-out set: 0.015275362962735623
MeanAbsoluteError value on hold-out data: 0.09650405496358871
Epoch: 714

Loss on hold-out set: 0.016415759348225645
MeanAbsoluteError value on hold-out data: 0.09797276556491852
Epoch: 715
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Loss on hold-out set: 0.017850276997390512
MeanAbsoluteError value on hold-out data: 0.1035984680056572
Epoch: 716

Loss on hold-out set: 0.01728659602102804
MeanAbsoluteError value on hold-out data: 0.0991983562707901
Epoch: 717

Loss on hold-out set: 0.01865281924319182
MeanAbsoluteError value on hold-out data: 0.1062263771891594
Epoch: 718
Loss on hold-out set: 0.015568749367521378
MeanAbsoluteError value on hold-out data: 0.09523359686136246
Epoch: 719

Loss on hold-out set: 0.01648549277529431
MeanAbsoluteError value on hold-out data: 0.10069307684898376
Epoch: 720

Loss on hold-out set: 0.01860758662764662
MeanAbsoluteError value on hold-out data: 0.10284405201673508
Epoch: 721
Loss on hold-out set: 0.016066606315880562
MeanAbsoluteError value on hold-out data: 0.09608094394207001
Epoch: 722

Loss on hold-out set: 0.014649723424906067
MeanAbsoluteError value on hold-out data: 0.09343506395816803
Epoch: 723

Loss on hold-out set: 0.01771977166948394
MeanAbsoluteError value on hold-out data: 0.10168081521987915
Epoch: 724
Loss on hold-out set: 0.016961859668773893
MeanAbsoluteError value on hold-out data: 0.10062620043754578
Epoch: 725

Loss on hold-out set: 0.01615382446233222
MeanAbsoluteError value on hold-out data: 0.09851934760808945
Epoch: 726
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Loss on hold-out set: 0.017318440368350518
MeanAbsoluteError value on hold-out data: 0.10177668929100037
Epoch: 727
Loss on hold-out set: 0.015518829409896474
MeanAbsoluteError value on hold-out data: 0.09606636315584183
Epoch: 728

Loss on hold-out set: 0.016879196186588768
MeanAbsoluteError value on hold-out data: 0.10157843679189682
Epoch: 729

Loss on hold-out set: 0.0184922357576094
MeanAbsoluteError value on hold-out data: 0.10278808325529099
Epoch: 730
Loss on hold-out set: 0.015613259675640923
MeanAbsoluteError value on hold-out data: 0.09813454747200012
Epoch: 731

Loss on hold-out set: 0.014793719585256137
MeanAbsoluteError value on hold-out data: 0.09532295167446136
Epoch: 732

Loss on hold-out set: 0.015789856381888966
MeanAbsoluteError value on hold-out data: 0.09671646356582642
Epoch: 733
Loss on hold-out set: 0.01661454499825292
MeanAbsoluteError value on hold-out data: 0.09852056950330734
Epoch: 734

Loss on hold-out set: 0.015504950774484313
MeanAbsoluteError value on hold-out data: 0.0950339138507843
Epoch: 735

Loss on hold-out set: 0.017998467501505123
MeanAbsoluteError value on hold-out data: 0.10155121237039566
Epoch: 736
Loss on hold-out set: 0.01713279315538178
MeanAbsoluteError value on hold-out data: 0.09962847083806992
Epoch: 737
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Loss on hold-out set: 0.015142237093453635
MeanAbsoluteError value on hold-out data: 0.09372108429670334
Epoch: 738

Loss on hold-out set: 0.014468175453466757
MeanAbsoluteError value on hold-out data: 0.09136510640382767
Epoch: 739
Loss on hold-out set: 0.015705199212631367
MeanAbsoluteError value on hold-out data: 0.0985097587108612
Epoch: 740

Loss on hold-out set: 0.014530190523667746
MeanAbsoluteError value on hold-out data: 0.09283675253391266
Epoch: 741

Loss on hold-out set: 0.015884845115166777
MeanAbsoluteError value on hold-out data: 0.09858941286802292
Epoch: 742
Loss on hold-out set: 0.014790638767590281
MeanAbsoluteError value on hold-out data: 0.09296726435422897
Epoch: 743

Loss on hold-out set: 0.0147385421100383
MeanAbsoluteError value on hold-out data: 0.0935436263680458
Epoch: 744

Loss on hold-out set: 0.014982226322996818
MeanAbsoluteError value on hold-out data: 0.0906415581703186
Epoch: 745
Loss on hold-out set: 0.015443419628863921
MeanAbsoluteError value on hold-out data: 0.09472049027681351
Epoch: 746

Loss on hold-out set: 0.017008698723327977
MeanAbsoluteError value on hold-out data: 0.10040917247533798
Epoch: 747

Loss on hold-out set: 0.016421729181626384
MeanAbsoluteError value on hold-out data: 0.10092727094888687
Epoch: 748
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Loss on hold-out set: 0.01666919616967789
MeanAbsoluteError value on hold-out data: 0.09925303608179092
Epoch: 749

Loss on hold-out set: 0.01677395410918204
MeanAbsoluteError value on hold-out data: 0.09918217360973358
Epoch: 750

Loss on hold-out set: 0.016633017460408156
MeanAbsoluteError value on hold-out data: 0.09910423308610916
Epoch: 751
Loss on hold-out set: 0.014822531560615365
MeanAbsoluteError value on hold-out data: 0.09323468059301376
Epoch: 752

Loss on hold-out set: 0.017883301638648846
MeanAbsoluteError value on hold-out data: 0.10147513449192047
Epoch: 753

Loss on hold-out set: 0.017023751587682153
MeanAbsoluteError value on hold-out data: 0.09942075610160828
Epoch: 754
Loss on hold-out set: 0.01757436468071925
MeanAbsoluteError value on hold-out data: 0.10113897174596786
Epoch: 755

Loss on hold-out set: 0.016658968542105867
MeanAbsoluteError value on hold-out data: 0.09821362793445587
Epoch: 756

Loss on hold-out set: 0.016258501603103166
MeanAbsoluteError value on hold-out data: 0.09796946495771408
Epoch: 757
Loss on hold-out set: 0.01596553130017128
MeanAbsoluteError value on hold-out data: 0.09825724363327026
Epoch: 758

Loss on hold-out set: 0.014207765285585386
MeanAbsoluteError value on hold-out data: 0.09256845712661743
Epoch: 759
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Loss on hold-out set: 0.01508919957348553
MeanAbsoluteError value on hold-out data: 0.09183809161186218
Epoch: 760
Loss on hold-out set: 0.017862649558859023
MeanAbsoluteError value on hold-out data: 0.10330671072006226
Epoch: 761

Loss on hold-out set: 0.015641774783337798
MeanAbsoluteError value on hold-out data: 0.09500480443239212
Epoch: 762

Loss on hold-out set: 0.017126066408964108
MeanAbsoluteError value on hold-out data: 0.09961653500795364
Epoch: 763
Loss on hold-out set: 0.015235706489514389
MeanAbsoluteError value on hold-out data: 0.09359266608953476
Epoch: 764

Loss on hold-out set: 0.01567489604349248
MeanAbsoluteError value on hold-out data: 0.0966809093952179
Epoch: 765

Loss on hold-out set: 0.016853197449818252
MeanAbsoluteError value on hold-out data: 0.10043400526046753
Epoch: 766
Loss on hold-out set: 0.013544393473633438
MeanAbsoluteError value on hold-out data: 0.08841677010059357
Epoch: 767

Loss on hold-out set: 0.016158970117539865
MeanAbsoluteError value on hold-out data: 0.09814944118261337
Epoch: 768

Loss on hold-out set: 0.0148608559317654
MeanAbsoluteError value on hold-out data: 0.09521396458148956
Epoch: 769
Loss on hold-out set: 0.01433317745104432
MeanAbsoluteError value on hold-out data: 0.09132339805364609
Epoch: 770
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Loss on hold-out set: 0.015744123577741191
MeanAbsoluteError value on hold-out data: 0.09507577121257782
Epoch: 771

Loss on hold-out set: 0.0158090458487762
MeanAbsoluteError value on hold-out data: 0.09432737529277802
Epoch: 772
Loss on hold-out set: 0.013316139901435235
MeanAbsoluteError value on hold-out data: 0.08808921277523041
Epoch: 773

Loss on hold-out set: 0.015427641596640266
MeanAbsoluteError value on hold-out data: 0.09331904351711273
Epoch: 774

Loss on hold-out set: 0.01674030014653302
MeanAbsoluteError value on hold-out data: 0.0941973403096199
Epoch: 775
Loss on hold-out set: 0.01461329965370472
MeanAbsoluteError value on hold-out data: 0.09345830976963043
Epoch: 776

Loss on hold-out set: 0.015207093085421852
MeanAbsoluteError value on hold-out data: 0.09533221274614334
Epoch: 777

Loss on hold-out set: 0.01483429439686006
MeanAbsoluteError value on hold-out data: 0.09305422753095627
Epoch: 778
Loss on hold-out set: 0.01583205207597833
MeanAbsoluteError value on hold-out data: 0.09613344818353653
Epoch: 779

Loss on hold-out set: 0.015403726776615561
MeanAbsoluteError value on hold-out data: 0.09381787478923798
Epoch: 780

Loss on hold-out set: 0.01629024679947179
MeanAbsoluteError value on hold-out data: 0.09851596504449844
Epoch: 781
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Loss on hold-out set: 0.014205226932632892
MeanAbsoluteError value on hold-out data: 0.09200969338417053
Epoch: 782

Loss on hold-out set: 0.016660101287998226
MeanAbsoluteError value on hold-out data: 0.09883374720811844
Epoch: 783

Loss on hold-out set: 0.014465254366126222
MeanAbsoluteError value on hold-out data: 0.09339061379432678
Epoch: 784
Loss on hold-out set: 0.015871435164590365
MeanAbsoluteError value on hold-out data: 0.0986173078417778
Epoch: 785

Loss on hold-out set: 0.014744809838436292
MeanAbsoluteError value on hold-out data: 0.09018722176551819
Epoch: 786

Loss on hold-out set: 0.016088341640982738
MeanAbsoluteError value on hold-out data: 0.09900602698326111
Epoch: 787
Loss on hold-out set: 0.014065675742555565
MeanAbsoluteError value on hold-out data: 0.0902169942855835
Epoch: 788

Loss on hold-out set: 0.015797387890052050
MeanAbsoluteError value on hold-out data: 0.09375767409801483
Epoch: 789

Loss on hold-out set: 0.015019675807755751
MeanAbsoluteError value on hold-out data: 0.09471265226602554
Epoch: 790
Loss on hold-out set: 0.015771777050589054
MeanAbsoluteError value on hold-out data: 0.09678127616643906
Epoch: 791

Loss on hold-out set: 0.015561442663747585
MeanAbsoluteError value on hold-out data: 0.09435360878705978
Epoch: 792
```

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Loss on hold-out set: 0.014820701123438388
MeanAbsoluteError value on hold-out data: 0.09536872059106827
Epoch: 793
Loss on hold-out set: 0.015888457017426846
MeanAbsoluteError value on hold-out data: 0.09735643118619919
Epoch: 794

Loss on hold-out set: 0.015479890631734937
MeanAbsoluteError value on hold-out data: 0.09646245092153549
Epoch: 795

Loss on hold-out set: 0.015795347991952438
MeanAbsoluteError value on hold-out data: 0.0942949429154396
Epoch: 796
Loss on hold-out set: 0.01653671105353472
MeanAbsoluteError value on hold-out data: 0.09863130003213882
Epoch: 797

Loss on hold-out set: 0.015588144303959174
MeanAbsoluteError value on hold-out data: 0.09389770776033401
Epoch: 798

Loss on hold-out set: 0.01459494087229056
MeanAbsoluteError value on hold-out data: 0.09208852797746658
Epoch: 799
Loss on hold-out set: 0.014111448874658284
MeanAbsoluteError value on hold-out data: 0.08977480977773666
Epoch: 800

Loss on hold-out set: 0.015648571488757927
MeanAbsoluteError value on hold-out data: 0.09522580355405807
Epoch: 801

Loss on hold-out set: 0.015433027949475217
MeanAbsoluteError value on hold-out data: 0.09409930557012558
Epoch: 802
Loss on hold-out set: 0.01456828123923818
MeanAbsoluteError value on hold-out data: 0.093818299472332
Epoch: 803
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Loss on hold-out set: 0.014361463066500922
MeanAbsoluteError value on hold-out data: 0.09232311695814133
Epoch: 804

Loss on hold-out set: 0.01540454290099054
MeanAbsoluteError value on hold-out data: 0.09542383998632431
Epoch: 805
Loss on hold-out set: 0.01412925478410519
MeanAbsoluteError value on hold-out data: 0.09214485436677933
Epoch: 806

Loss on hold-out set: 0.015302315247390652
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Epoch: 807

Loss on hold-out set: 0.014924824226169827
MeanAbsoluteError value on hold-out data: 0.09235479682683945
Epoch: 808
Loss on hold-out set: 0.01527423550342064
MeanAbsoluteError value on hold-out data: 0.09637948870658875
Epoch: 809

Loss on hold-out set: 0.016262077067173475
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Epoch: 810

Loss on hold-out set: 0.01567846018850105
MeanAbsoluteError value on hold-out data: 0.0933891013264656
Epoch: 811
Loss on hold-out set: 0.015213714748921726
MeanAbsoluteError value on hold-out data: 0.09116142988204956
Epoch: 812

Loss on hold-out set: 0.013756423833377388
MeanAbsoluteError value on hold-out data: 0.0900757908821106
Epoch: 813

Loss on hold-out set: 0.01839562880176042
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Epoch: 814
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Loss on hold-out set: 0.015182181795632157
MeanAbsoluteError value on hold-out data: 0.09218452125787735
Epoch: 815

Loss on hold-out set: 0.0139972553877548
MeanAbsoluteError value on hold-out data: 0.09058535099029541
Epoch: 816

Loss on hold-out set: 0.013242995338223408
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Epoch: 817
Loss on hold-out set: 0.01473445550140847
MeanAbsoluteError value on hold-out data: 0.09116136282682419
Epoch: 818

Loss on hold-out set: 0.013665831413224321
MeanAbsoluteError value on hold-out data: 0.08938939869403839
Epoch: 819

Loss on hold-out set: 0.015195753763521983
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Epoch: 820
Loss on hold-out set: 0.015082794714811219
MeanAbsoluteError value on hold-out data: 0.09222277253866196
Epoch: 821

Loss on hold-out set: 0.013607402794865872
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Epoch: 822

Loss on hold-out set: 0.016893337173581435
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Epoch: 823
Loss on hold-out set: 0.01506639994472304
MeanAbsoluteError value on hold-out data: 0.0923953726887703
Epoch: 824

Loss on hold-out set: 0.016219097280021137
MeanAbsoluteError value on hold-out data: 0.09742569923400879
Epoch: 825
```

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Loss on hold-out set: 0.015211888780468143
MeanAbsoluteError value on hold-out data: 0.09546727687120438
Epoch: 826
Loss on hold-out set: 0.014476074131574326
MeanAbsoluteError value on hold-out data: 0.09023857861757278
Epoch: 827

Loss on hold-out set: 0.014394108933390838
MeanAbsoluteError value on hold-out data: 0.09389157593250275
Epoch: 828

Loss on hold-out set: 0.016212400640458025
MeanAbsoluteError value on hold-out data: 0.09615512192249298
Epoch: 829
Loss on hold-out set: 0.015200932924951
MeanAbsoluteError value on hold-out data: 0.09148624539375305
Epoch: 830

Loss on hold-out set: 0.014011173274241931
MeanAbsoluteError value on hold-out data: 0.09051520377397537
Epoch: 831

Loss on hold-out set: 0.014750447095211712
MeanAbsoluteError value on hold-out data: 0.08922968059778214
Epoch: 832
Loss on hold-out set: 0.015959513172177444
MeanAbsoluteError value on hold-out data: 0.09590347856283188
Epoch: 833

Loss on hold-out set: 0.015782137073056597
MeanAbsoluteError value on hold-out data: 0.09489475935697556
Epoch: 834

Loss on hold-out set: 0.014918793788492622
MeanAbsoluteError value on hold-out data: 0.09152374416589737
Epoch: 835
Loss on hold-out set: 0.014300180088563744
MeanAbsoluteError value on hold-out data: 0.09243977069854736
Epoch: 836
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Loss on hold-out set: 0.014263867493330811
MeanAbsoluteError value on hold-out data: 0.0895862728357315
Epoch: 837

Loss on hold-out set: 0.013829186764584544
MeanAbsoluteError value on hold-out data: 0.09192048013210297
Epoch: 838
Loss on hold-out set: 0.015029940661527992
MeanAbsoluteError value on hold-out data: 0.09443771839141846
Epoch: 839

Loss on hold-out set: 0.013477135332359468
MeanAbsoluteError value on hold-out data: 0.08657905459403992
Epoch: 840

Loss on hold-out set: 0.012670232078817208
MeanAbsoluteError value on hold-out data: 0.08582752197980881
Epoch: 841
Loss on hold-out set: 0.01635308803214381
MeanAbsoluteError value on hold-out data: 0.09620221704244614
Epoch: 842

Loss on hold-out set: 0.015911041331807308
MeanAbsoluteError value on hold-out data: 0.09556442499160767
Epoch: 843

Loss on hold-out set: 0.014272002667251702
MeanAbsoluteError value on hold-out data: 0.08904522657394409
Epoch: 844
Loss on hold-out set: 0.014074393740738742
MeanAbsoluteError value on hold-out data: 0.09014708548784256
Epoch: 845

Loss on hold-out set: 0.013846195451042148
MeanAbsoluteError value on hold-out data: 0.0927455946803093
Epoch: 846

Loss on hold-out set: 0.014391424031055066
MeanAbsoluteError value on hold-out data: 0.09160859137773514
Epoch: 847
```

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Loss on hold-out set: 0.013553423114838854
MeanAbsoluteError value on hold-out data: 0.09019685536623001
Epoch: 848

Loss on hold-out set: 0.014290172002947656
MeanAbsoluteError value on hold-out data: 0.08803069591522217
Epoch: 849

Loss on hold-out set: 0.013453789342444603
MeanAbsoluteError value on hold-out data: 0.08822236210107803
Epoch: 850
Loss on hold-out set: 0.013782070837102462
MeanAbsoluteError value on hold-out data: 0.08846620470285416
Epoch: 851

Loss on hold-out set: 0.011955976953552938
MeanAbsoluteError value on hold-out data: 0.08339307457208633
Epoch: 852

Loss on hold-out set: 0.013678646880252927
MeanAbsoluteError value on hold-out data: 0.08796580880880356
Epoch: 853
Loss on hold-out set: 0.012309152616568704
MeanAbsoluteError value on hold-out data: 0.0863678902387619
Epoch: 854

Loss on hold-out set: 0.014462305930210277
MeanAbsoluteError value on hold-out data: 0.09181106835603714
Epoch: 855

Loss on hold-out set: 0.015117639161326224
MeanAbsoluteError value on hold-out data: 0.09170638769865036
Epoch: 856
Loss on hold-out set: 0.015351793849452709
MeanAbsoluteError value on hold-out data: 0.0922279953956604
Epoch: 857

Loss on hold-out set: 0.014803498281489738
MeanAbsoluteError value on hold-out data: 0.09176716953516006
Epoch: 858
```

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Loss on hold-out set: 0.013938605706304468
MeanAbsoluteError value on hold-out data: 0.09038164466619492
Epoch: 859
Loss on hold-out set: 0.01409570108776279
MeanAbsoluteError value on hold-out data: 0.08727669715881348
Epoch: 860

Loss on hold-out set: 0.013618918375771803
MeanAbsoluteError value on hold-out data: 0.08949270844459534
Epoch: 861

Loss on hold-out set: 0.0145311187566161
MeanAbsoluteError value on hold-out data: 0.09019173681735992
Epoch: 862
Loss on hold-out set: 0.013138053924564397
MeanAbsoluteError value on hold-out data: 0.08633878082036972
Epoch: 863

Loss on hold-out set: 0.014506889846282622
MeanAbsoluteError value on hold-out data: 0.09066832810640335
Epoch: 864

Loss on hold-out set: 0.014306843775181429
MeanAbsoluteError value on hold-out data: 0.08783464133739471
Epoch: 865
Loss on hold-out set: 0.01547553087764148
MeanAbsoluteError value on hold-out data: 0.094589464366436
Epoch: 866

Loss on hold-out set: 0.014391928578794856
MeanAbsoluteError value on hold-out data: 0.09209095686674118
Epoch: 867

Loss on hold-out set: 0.014229574606773288
MeanAbsoluteError value on hold-out data: 0.09135963767766953
Epoch: 868
Loss on hold-out set: 0.015954846519210454
MeanAbsoluteError value on hold-out data: 0.09466136246919632
Epoch: 869
```

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Loss on hold-out set: 0.015558582739079915
MeanAbsoluteError value on hold-out data: 0.09356588870286942
Epoch: 870

Loss on hold-out set: 0.011377371865758807
MeanAbsoluteError value on hold-out data: 0.07930696755647659
Epoch: 871
Loss on hold-out set: 0.014277580990553058
MeanAbsoluteError value on hold-out data: 0.09096979349851608
Epoch: 872

Loss on hold-out set: 0.013844664583011763
MeanAbsoluteError value on hold-out data: 0.08923368155956268
Epoch: 873

Loss on hold-out set: 0.013487235837674234
MeanAbsoluteError value on hold-out data: 0.08802458643913269
Epoch: 874
Loss on hold-out set: 0.013320942501037885
MeanAbsoluteError value on hold-out data: 0.08887360244989395
Epoch: 875

Loss on hold-out set: 0.014541483319480903
MeanAbsoluteError value on hold-out data: 0.08891406655311584
Epoch: 876

Loss on hold-out set: 0.013334820625411036
MeanAbsoluteError value on hold-out data: 0.08753126859664917
Epoch: 877
Loss on hold-out set: 0.013480205899101445
MeanAbsoluteError value on hold-out data: 0.08865536004304886
Epoch: 878

Loss on hold-out set: 0.013644019615424744
MeanAbsoluteError value on hold-out data: 0.08649273961782455
Epoch: 879

Loss on hold-out set: 0.015054734443498698
MeanAbsoluteError value on hold-out data: 0.09364774823188782
Epoch: 880
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Loss on hold-out set: 0.013196795752422238
MeanAbsoluteError value on hold-out data: 0.08854521065950394
Epoch: 881

Loss on hold-out set: 0.013922495092883765
MeanAbsoluteError value on hold-out data: 0.08884172141551971
Epoch: 882

Loss on hold-out set: 0.014864572632698886
MeanAbsoluteError value on hold-out data: 0.09289868175983429
Epoch: 883
Loss on hold-out set: 0.011403824412360942
MeanAbsoluteError value on hold-out data: 0.0802447572350502
Epoch: 884

Loss on hold-out set: 0.015980675610359565
MeanAbsoluteError value on hold-out data: 0.09286246448755264
Epoch: 885

Loss on hold-out set: 0.013794221634628533
MeanAbsoluteError value on hold-out data: 0.08631928265094757
Epoch: 886
Loss on hold-out set: 0.013736564248247304
MeanAbsoluteError value on hold-out data: 0.08781462907791138
Epoch: 887

Loss on hold-out set: 0.012909846542073259
MeanAbsoluteError value on hold-out data: 0.08839555829763412
Epoch: 888

Loss on hold-out set: 0.01349793472950599
MeanAbsoluteError value on hold-out data: 0.08869428932666779
Epoch: 889
Loss on hold-out set: 0.013612541357463972
MeanAbsoluteError value on hold-out data: 0.09002964198589325
Epoch: 890

Loss on hold-out set: 0.013304527140862775
MeanAbsoluteError value on hold-out data: 0.08806803822517395
Epoch: 891
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Loss on hold-out set: 0.012566578958406656
MeanAbsoluteError value on hold-out data: 0.08362329006195068
Epoch: 892
Loss on hold-out set: 0.01374915286481458
MeanAbsoluteError value on hold-out data: 0.08901563286781311
Epoch: 893

Loss on hold-out set: 0.014663677237937616
MeanAbsoluteError value on hold-out data: 0.09342865645885468
Epoch: 894

Loss on hold-out set: 0.013702444752852897
MeanAbsoluteError value on hold-out data: 0.08844010531902313
Epoch: 895
Loss on hold-out set: 0.013136316427553538
MeanAbsoluteError value on hold-out data: 0.08566442131996155
Epoch: 896

Loss on hold-out set: 0.015076807367828883
MeanAbsoluteError value on hold-out data: 0.09198251366615295
Epoch: 897

Loss on hold-out set: 0.012167483899144524
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Epoch: 898
Loss on hold-out set: 0.012761763082404893
MeanAbsoluteError value on hold-out data: 0.08507739007472992
Epoch: 899

Loss on hold-out set: 0.012822795969453486
MeanAbsoluteError value on hold-out data: 0.08722814917564392
Epoch: 900

Loss on hold-out set: 0.013532195255005111
MeanAbsoluteError value on hold-out data: 0.08585546165704727
Epoch: 901
Loss on hold-out set: 0.014708177911428115
MeanAbsoluteError value on hold-out data: 0.08834561705589294
Epoch: 902
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Loss on hold-out set: 0.012804404352452062
MeanAbsoluteError value on hold-out data: 0.08634952455759048
Epoch: 903

Loss on hold-out set: 0.014677136770139139
MeanAbsoluteError value on hold-out data: 0.09137943387031555
Epoch: 904
Loss on hold-out set: 0.013501465792675542
MeanAbsoluteError value on hold-out data: 0.08878414332866669
Epoch: 905

Loss on hold-out set: 0.012797826413395039
MeanAbsoluteError value on hold-out data: 0.08642449975013733
Epoch: 906

Loss on hold-out set: 0.013566809668506418
MeanAbsoluteError value on hold-out data: 0.09020061045885086
Epoch: 907
Loss on hold-out set: 0.013504237570232362
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Epoch: 908

Loss on hold-out set: 0.012863105444196965
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Epoch: 909

Loss on hold-out set: 0.013495934996984336
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Epoch: 910
Loss on hold-out set: 0.013456562560465197
MeanAbsoluteError value on hold-out data: 0.08538568764925003
Epoch: 911

Loss on hold-out set: 0.013091509888366394
MeanAbsoluteError value on hold-out data: 0.08560517430305481
Epoch: 912

Loss on hold-out set: 0.012825484782467053
MeanAbsoluteError value on hold-out data: 0.08429942280054092
Epoch: 913
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Loss on hold-out set: 0.016179933634897073
MeanAbsoluteError value on hold-out data: 0.09457338601350784
Epoch: 914

Loss on hold-out set: 0.013485974807990716
MeanAbsoluteError value on hold-out data: 0.0878821387887001
Epoch: 915

Loss on hold-out set: 0.014179736994313 62
MeanAbsoluteError value on hold-out data: 0.08675999194383621
Epoch: 916
Loss on hold-out set: 0.013191381610522513
MeanAbsoluteError value on hold-out data: 0.08405213803052902
Epoch: 917

Loss on hold-out set: 0.012749267001878858
MeanAbsoluteError value on hold-out data: 0.0861024260520935
Epoch: 918

Loss on hold-out set: 0.011617199963511666
MeanAbsoluteError value on hold-out data: 0.08268383145332336
Epoch: 919
Loss on hold-out set: 0.013157572739825506
MeanAbsoluteError value on hold-out data: 0.08612223714590073
Epoch: 920

Loss on hold-out set: 0.013736357822660163
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Epoch: 921

Loss on hold-out set: 0.012415992980483376
MeanAbsoluteError value on hold-out data: 0.08477887511253357
Epoch: 922
Loss on hold-out set: 0.014012207859777845
MeanAbsoluteError value on hold-out data: 0.08937518298625946
Epoch: 923

Loss on hold-out set: 0.013406200986452555
MeanAbsoluteError value on hold-out data: 0.08917295932769775
Epoch: 924
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Loss on hold-out set: 0.012882534357158875
MeanAbsoluteError value on hold-out data: 0.08562973141670227
Epoch: 925
Loss on hold-out set: 0.015466952804587587
MeanAbsoluteError value on hold-out data: 0.08939510583877563
Epoch: 926

Loss on hold-out set: 0.01441381170276145
MeanAbsoluteError value on hold-out data: 0.08947205543518066
Epoch: 927

Loss on hold-out set: 0.013102958142990246
MeanAbsoluteError value on hold-out data: 0.08725864440202713
Epoch: 928
Loss on hold-out set: 0.014731503432800915
MeanAbsoluteError value on hold-out data: 0.09005659073591232
Epoch: 929

Loss on hold-out set: 0.013432767093133104
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Epoch: 930

Loss on hold-out set: 0.014214614904873694
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Epoch: 931
Loss on hold-out set: 0.013372740295599215
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Epoch: 932

Loss on hold-out set: 0.013629214286435551
MeanAbsoluteError value on hold-out data: 0.0884675458073616
Epoch: 933

Loss on hold-out set: 0.013500536773378069
MeanAbsoluteError value on hold-out data: 0.08571277558803558
Epoch: 934
Loss on hold-out set: 0.015223228230352106
MeanAbsoluteError value on hold-out data: 0.09261801838874817
Epoch: 935
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Loss on hold-out set: 0.013729168941887717
MeanAbsoluteError value on hold-out data: 0.08643829077482224
Epoch: 936

Loss on hold-out set: 0.013435283796376703
MeanAbsoluteError value on hold-out data: 0.08732474595308304
Epoch: 937
Loss on hold-out set: 0.01400050502512992
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Epoch: 938

Loss on hold-out set: 0.01374788439785334
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Epoch: 939

Loss on hold-out set: 0.013975459979070971
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Loss on hold-out set: 0.014488159810231688
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Epoch: 941

Loss on hold-out set: 0.015521766135128321
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Epoch: 942

Loss on hold-out set: 0.011967141273974751
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Epoch: 943
Loss on hold-out set: 0.013285201382859668
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Epoch: 944

Loss on hold-out set: 0.012364755034116872
MeanAbsoluteError value on hold-out data: 0.0820225328207016
Epoch: 945

Loss on hold-out set: 0.013578104357584380
MeanAbsoluteError value on hold-out data: 0.08822458237409592
Epoch: 946
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Loss on hold-out set: 0.014130181498379291
MeanAbsoluteError value on hold-out data: 0.08861739933490753
Epoch: 947

Loss on hold-out set: 0.011899762733955868
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Epoch: 948

Loss on hold-out set: 0.013659824194182874
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Loss on hold-out set: 0.014188895814451389
MeanAbsoluteError value on hold-out data: 0.08660836517810822
Epoch: 950

Loss on hold-out set: 0.01489021736598564
MeanAbsoluteError value on hold-out data: 0.08750336617231369
Epoch: 951

Loss on hold-out set: 0.013640681347824283
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Epoch: 952
Loss on hold-out set: 0.012422415814774771
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Epoch: 953

Loss on hold-out set: 0.01429853327514138
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Epoch: 954

Loss on hold-out set: 0.014859502582500378
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Epoch: 955
Loss on hold-out set: 0.011403669340870693
MeanAbsoluteError value on hold-out data: 0.08137468248605728
Epoch: 956

Loss on hold-out set: 0.011774248238337653
MeanAbsoluteError value on hold-out data: 0.0791115015745163
Epoch: 957
```

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Loss on hold-out set: 0.013598434102884008
MeanAbsoluteError value on hold-out data: 0.0832817554473877
Epoch: 958
Loss on hold-out set: 0.012995897915097886
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Loss on hold-out set: 0.011789342234242212
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Epoch: 960

Loss on hold-out set: 0.014021191478823311
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Epoch: 961
Loss on hold-out set: 0.01262357908616347
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Epoch: 962

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Epoch: 963

Loss on hold-out set: 0.012855978842659776
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Epoch: 964
Loss on hold-out set: 0.012690824259188958
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Epoch: 965

Loss on hold-out set: 0.012142869478702778
MeanAbsoluteError value on hold-out data: 0.07837657630443573
Epoch: 966

Loss on hold-out set: 0.012993068474279425
MeanAbsoluteError value on hold-out data: 0.08412736654281616
Epoch: 967
Loss on hold-out set: 0.014928310716253085
MeanAbsoluteError value on hold-out data: 0.09430713206529617
Epoch: 968
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Loss on hold-out set: 0.012481326469981771
MeanAbsoluteError value on hold-out data: 0.08480068296194077
Epoch: 969

Loss on hold-out set: 0.013752144808337714
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Epoch: 970
Loss on hold-out set: 0.0122975459802304
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Epoch: 971

Loss on hold-out set: 0.012144197339900227
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Epoch: 972

Loss on hold-out set: 0.01300906093323647
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Epoch: 973
Loss on hold-out set: 0.012214521277528548
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Epoch: 974

Loss on hold-out set: 0.014519686006048384
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Loss on hold-out set: 0.013253374465978898
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Epoch: 976
Loss on hold-out set: 0.0131908582127168
MeanAbsoluteError value on hold-out data: 0.08841093629598618
Epoch: 977

Loss on hold-out set: 0.012661092667694902
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Epoch: 978

Loss on hold-out set: 0.013548102415225003
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Epoch: 979
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Loss on hold-out set: 0.012494938180025202
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Epoch: 980

Loss on hold-out set: 0.011902316657069605
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Epoch: 981

Loss on hold-out set: 0.012901223134540486
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Epoch: 982
Loss on hold-out set: 0.012699514931094502
MeanAbsoluteError value on hold-out data: 0.08436568826436996
Epoch: 983

Loss on hold-out set: 0.012696069155232787
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Epoch: 984

Loss on hold-out set: 0.012215069143276197
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Loss on hold-out set: 0.013164915702363942
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Epoch: 986

Loss on hold-out set: 0.011024543430927831
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Epoch: 987

Loss on hold-out set: 0.012811821837725196
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Epoch: 988
Loss on hold-out set: 0.012188014374454118
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Epoch: 989

Loss on hold-out set: 0.012952206379486597
MeanAbsoluteError value on hold-out data: 0.08346692472696304
Epoch: 990
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Loss on hold-out set: 0.012793291356859603
MeanAbsoluteError value on hold-out data: 0.0840337723493576
Epoch: 991
Loss on hold-out set: 0.01319227846058008
MeanAbsoluteError value on hold-out data: 0.08512308448553085
Epoch: 992

Loss on hold-out set: 0.01339466738012561
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Epoch: 993

Loss on hold-out set: 0.012229679555166512
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Epoch: 994
Loss on hold-out set: 0.012480821931530954
MeanAbsoluteError value on hold-out data: 0.08301268517971039
Epoch: 995

Loss on hold-out set: 0.01164932591750888
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Epoch: 996

Loss on hold-out set: 0.013570620946411508
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Epoch: 997
Loss on hold-out set: 0.01462828071981979
MeanAbsoluteError value on hold-out data: 0.08931872993707657
Epoch: 998

Loss on hold-out set: 0.01246898428745529
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Epoch: 999

Loss on hold-out set: 0.012891983263810592
MeanAbsoluteError value on hold-out data: 0.08486884087324142
Epoch: 1000
Loss on hold-out set: 0.01368076688949562
MeanAbsoluteError value on hold-out data: 0.0858372300863266
Epoch: 1001
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Loss on hold-out set: 0.011766439051216366
MeanAbsoluteError value on hold-out data: 0.07979072630405426
Epoch: 1002

Loss on hold-out set: 0.012437907624068127
MeanAbsoluteError value on hold-out data: 0.08604569733142853
Epoch: 1003
Loss on hold-out set: 0.013038808243824557
MeanAbsoluteError value on hold-out data: 0.08675100654363632
Epoch: 1004

Loss on hold-out set: 0.01329554062137504
MeanAbsoluteError value on hold-out data: 0.08813436329364777
Epoch: 1005

Loss on hold-out set: 0.011258259151751797
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Epoch: 1006
Loss on hold-out set: 0.011686939058708958
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Epoch: 1007

Loss on hold-out set: 0.012094435365834216
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Epoch: 1008

Loss on hold-out set: 0.011137072174860804
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Epoch: 1009
Loss on hold-out set: 0.011616186385266096
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Epoch: 1010

Loss on hold-out set: 0.010414760695542404
MeanAbsoluteError value on hold-out data: 0.07657293975353241
Epoch: 1011

Loss on hold-out set: 0.01093506706728173
MeanAbsoluteError value on hold-out data: 0.07842536270618439
Epoch: 1012
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Loss on hold-out set: 0.012111888704801572
MeanAbsoluteError value on hold-out data: 0.08217654377222061
Epoch: 1013

Loss on hold-out set: 0.010955178362601146
MeanAbsoluteError value on hold-out data: 0.07698597759008408
Epoch: 1014

Loss on hold-out set: 0.01207791909900455
MeanAbsoluteError value on hold-out data: 0.08560489863157272
Epoch: 1015
Loss on hold-out set: 0.012394624582666438
MeanAbsoluteError value on hold-out data: 0.08431355655193329
Epoch: 1016

Loss on hold-out set: 0.01415396821006046
MeanAbsoluteError value on hold-out data: 0.09020531177520752
Epoch: 1017

Loss on hold-out set: 0.011663329312917388
MeanAbsoluteError value on hold-out data: 0.0812966376543045
Epoch: 1018
Loss on hold-out set: 0.012405979675556107
MeanAbsoluteError value on hold-out data: 0.08423751592636108
Epoch: 1019

Loss on hold-out set: 0.011891877634334379
MeanAbsoluteError value on hold-out data: 0.08169087022542953
Epoch: 1020

Loss on hold-out set: 0.012825696522777435
MeanAbsoluteError value on hold-out data: 0.08561678230762482
Epoch: 1021
Loss on hold-out set: 0.013748006419749194
MeanAbsoluteError value on hold-out data: 0.08771415054798126
Epoch: 1022

Loss on hold-out set: 0.012579775929951515
MeanAbsoluteError value on hold-out data: 0.0824674442410469
Epoch: 1023
```

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Loss on hold-out set: 0.013423033380725731
MeanAbsoluteError value on hold-out data: 0.08629927039146423
Epoch: 1024
Loss on hold-out set: 0.01273685622162399
MeanAbsoluteError value on hold-out data: 0.0823749378323555
Epoch: 1025

Loss on hold-out set: 0.010957650625720513
MeanAbsoluteError value on hold-out data: 0.07855492830276489
Epoch: 1026

Loss on hold-out set: 0.012673159288121193
MeanAbsoluteError value on hold-out data: 0.08387372642755508
Epoch: 1027
Loss on hold-out set: 0.011929857644172443
MeanAbsoluteError value on hold-out data: 0.08385168761014938
Epoch: 1028

Loss on hold-out set: 0.0112747721720649
MeanAbsoluteError value on hold-out data: 0.07901829481124878
Epoch: 1029

Loss on hold-out set: 0.011451630586816464
MeanAbsoluteError value on hold-out data: 0.0809057354927063
Epoch: 1030
Loss on hold-out set: 0.012351773591464431
MeanAbsoluteError value on hold-out data: 0.08263092488050461
Epoch: 1031

Loss on hold-out set: 0.012158858852387008
MeanAbsoluteError value on hold-out data: 0.08239799737930298
Epoch: 1032

Loss on hold-out set: 0.011457097087096978
MeanAbsoluteError value on hold-out data: 0.08022628724575043
Epoch: 1033
Loss on hold-out set: 0.012223661463016622
MeanAbsoluteError value on hold-out data: 0.08243587613105774
Epoch: 1034
```

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Loss on hold-out set: 0.013027768788742834
MeanAbsoluteError value on hold-out data: 0.08268771320581436
Epoch: 1035

Loss on hold-out set: 0.011135144173094887
MeanAbsoluteError value on hold-out data: 0.07884838432073593
Epoch: 1036
Loss on hold-out set: 0.011696101562023008
MeanAbsoluteError value on hold-out data: 0.08096581697463989
Epoch: 1037

Loss on hold-out set: 0.012676177467898621
MeanAbsoluteError value on hold-out data: 0.08184055984020233
Epoch: 1038

Loss on hold-out set: 0.012555539040392128
MeanAbsoluteError value on hold-out data: 0.08199512958526611
Epoch: 1039
Loss on hold-out set: 0.012327014254721385
MeanAbsoluteError value on hold-out data: 0.07955587655305862
Epoch: 1040

Loss on hold-out set: 0.011220390993282005
MeanAbsoluteError value on hold-out data: 0.07918968051671982
Epoch: 1041

Loss on hold-out set: 0.011462483538410501
MeanAbsoluteError value on hold-out data: 0.08188340812921524
Epoch: 1042
Loss on hold-out set: 0.010649583909738188
MeanAbsoluteError value on hold-out data: 0.07578130811452866
Epoch: 1043

Loss on hold-out set: 0.012035919755301923
MeanAbsoluteError value on hold-out data: 0.07810864597558975
Epoch: 1044

Loss on hold-out set: 0.012948367150092963
MeanAbsoluteError value on hold-out data: 0.08269819617271423
Epoch: 1045
```

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Loss on hold-out set: 0.01250127091723698
MeanAbsoluteError value on hold-out data: 0.08176017552614212
Epoch: 1046

Loss on hold-out set: 0.010911215937558155
MeanAbsoluteError value on hold-out data: 0.07998279482126236
Epoch: 1047

Loss on hold-out set: 0.01263747545153213
MeanAbsoluteError value on hold-out data: 0.0827711671590805
Epoch: 1048
Loss on hold-out set: 0.009854043165323673
MeanAbsoluteError value on hold-out data: 0.07392461597919464
Epoch: 1049

Loss on hold-out set: 0.011402873870004744
MeanAbsoluteError value on hold-out data: 0.0782209187746048
Epoch: 1050

Loss on hold-out set: 0.013399352995996499
MeanAbsoluteError value on hold-out data: 0.08679027855396271
Epoch: 1051
Loss on hold-out set: 0.010188633408445943
MeanAbsoluteError value on hold-out data: 0.07582136988639832
Epoch: 1052

Loss on hold-out set: 0.009512449616401379
MeanAbsoluteError value on hold-out data: 0.07229123264551163
Epoch: 1053

Loss on hold-out set: 0.012731733833813147
MeanAbsoluteError value on hold-out data: 0.08434826135635376
Epoch: 1054
Loss on hold-out set: 0.012885824413824593
MeanAbsoluteError value on hold-out data: 0.08514755964279175
Epoch: 1055

Loss on hold-out set: 0.010035799694305752
MeanAbsoluteError value on hold-out data: 0.07459049671888351
Epoch: 1056
```

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Loss on hold-out set: 0.012388124172042202
MeanAbsoluteError value on hold-out data: 0.08555106818675995
Epoch: 1057
Loss on hold-out set: 0.011207679328993738
MeanAbsoluteError value on hold-out data: 0.07865828275680542
Epoch: 1058

Loss on hold-out set: 0.01002513197985536
MeanAbsoluteError value on hold-out data: 0.07601306587457657
Epoch: 1059

Loss on hold-out set: 0.011089150561529095
MeanAbsoluteError value on hold-out data: 0.07771428674459457
Epoch: 1060
Loss on hold-out set: 0.011621527528703457
MeanAbsoluteError value on hold-out data: 0.0793180763721466
Epoch: 1061

Loss on hold-out set: 0.010389654199486054
MeanAbsoluteError value on hold-out data: 0.07576394081115723
Epoch: 1062

Loss on hold-out set: 0.012451512377101608
MeanAbsoluteError value on hold-out data: 0.08372895419597626
Epoch: 1063
Loss on hold-out set: 0.011677552122958635
MeanAbsoluteError value on hold-out data: 0.08126447349786758
Epoch: 1064

Loss on hold-out set: 0.011478591618815698
MeanAbsoluteError value on hold-out data: 0.07807750999927521
Epoch: 1065

Loss on hold-out set: 0.009800507114753903
MeanAbsoluteError value on hold-out data: 0.07437776774168015
Epoch: 1066
Loss on hold-out set: 0.012226944004263107
MeanAbsoluteError value on hold-out data: 0.0815361812710762
Epoch: 1067
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Loss on hold-out set: 0.010502132781160375
MeanAbsoluteError value on hold-out data: 0.07625113427639008
Epoch: 1068

Loss on hold-out set: 0.010774849603767506
MeanAbsoluteError value on hold-out data: 0.07614226639270782
Epoch: 1069
Loss on hold-out set: 0.011490928737299934
MeanAbsoluteError value on hold-out data: 0.07725189626216888
Epoch: 1070

Loss on hold-out set: 0.012233366580342893
MeanAbsoluteError value on hold-out data: 0.08256185054779053
Epoch: 1071

Loss on hold-out set: 0.012263061729245238
MeanAbsoluteError value on hold-out data: 0.08002056181430817
Epoch: 1072
Loss on hold-out set: 0.012117689512773117
MeanAbsoluteError value on hold-out data: 0.0787145122885704
Epoch: 1073

Loss on hold-out set: 0.012144752912621092
MeanAbsoluteError value on hold-out data: 0.0800127312541008
Epoch: 1074

Loss on hold-out set: 0.012210509524975351
MeanAbsoluteError value on hold-out data: 0.08200754225254059
Epoch: 1075
Loss on hold-out set: 0.010416309441977016
MeanAbsoluteError value on hold-out data: 0.07679019123315811
Epoch: 1076

Loss on hold-out set: 0.013302755834438358
MeanAbsoluteError value on hold-out data: 0.08370843529701233
Epoch: 1077

Loss on hold-out set: 0.012833907805519023
MeanAbsoluteError value on hold-out data: 0.08330115675926208
Epoch: 1078
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Loss on hold-out set: 0.013248148478742222
MeanAbsoluteError value on hold-out data: 0.08606868982315063
Epoch: 1079

Loss on hold-out set: 0.010054815436039l6
MeanAbsoluteError value on hold-out data: 0.07542644441127777
Epoch: 1080

Loss on hold-out set: 0.010197770552355602
MeanAbsoluteError value on hold-out data: 0.07685703039169312
Epoch: 1081
Loss on hold-out set: 0.012750945016329448
MeanAbsoluteError value on hold-out data: 0.08062245696783066
Epoch: 1082

Loss on hold-out set: 0.011707370338020459
MeanAbsoluteError value on hold-out data: 0.07736724615097046
Epoch: 1083

Loss on hold-out set: 0.012777391511647996
MeanAbsoluteError value on hold-out data: 0.08214826881885529
Epoch: 1084
Loss on hold-out set: 0.010727998263682821
MeanAbsoluteError value on hold-out data: 0.0759759321808815
Epoch: 1085

Loss on hold-out set: 0.010741418776330345
MeanAbsoluteError value on hold-out data: 0.07711295038461685
Epoch: 1086

Loss on hold-out set: 0.01284451450661436
MeanAbsoluteError value on hold-out data: 0.0850835070014
Epoch: 1087
Loss on hold-out set: 0.01090202524336443
MeanAbsoluteError value on hold-out data: 0.0791894942522049
Epoch: 1088

Loss on hold-out set: 0.011117062644140484
MeanAbsoluteError value on hold-out data: 0.08064073324203491
Epoch: 1089
```

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Loss on hold-out set: 0.01118014280589705
MeanAbsoluteError value on hold-out data: 0.07811523228883743
Epoch: 1090
Loss on hold-out set: 0.011771700633923198
MeanAbsoluteError value on hold-out data: 0.08065576106309891
Epoch: 1091

Loss on hold-out set: 0.012448824220191454
MeanAbsoluteError value on hold-out data: 0.08088470250368118
Epoch: 1092

Loss on hold-out set: 0.010363373479394795
MeanAbsoluteError value on hold-out data: 0.07667979598045349
Epoch: 1093
Loss on hold-out set: 0.013579654672400162
MeanAbsoluteError value on hold-out data: 0.08686355501413345
Epoch: 1094

Loss on hold-out set: 0.0109594703256577
MeanAbsoluteError value on hold-out data: 0.07570501416921616
Epoch: 1095

Loss on hold-out set: 0.011599726295729246
MeanAbsoluteError value on hold-out data: 0.08170264214277267
Epoch: 1096
Loss on hold-out set: 0.011184756542012717
MeanAbsoluteError value on hold-out data: 0.0792393907904625
Epoch: 1097

Loss on hold-out set: 0.01008753426571881
MeanAbsoluteError value on hold-out data: 0.07495980709791183
Epoch: 1098

Loss on hold-out set: 0.010446139722456185
MeanAbsoluteError value on hold-out data: 0.07554925978183746
Epoch: 1099
Loss on hold-out set: 0.012408739429238267
MeanAbsoluteError value on hold-out data: 0.08059550076723099
Epoch: 1100
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Loss on hold-out set: 0.012620524705780553
MeanAbsoluteError value on hold-out data: 0.08325254917144775
Epoch: 1101

Loss on hold-out set: 0.012514443024216684
MeanAbsoluteError value on hold-out data: 0.0822749137878418
Epoch: 1102
Loss on hold-out set: 0.011102141157219497
MeanAbsoluteError value on hold-out data: 0.0791015699505806
Epoch: 1103

Loss on hold-out set: 0.01103044298608438
MeanAbsoluteError value on hold-out data: 0.07723567634820938
Epoch: 1104

Loss on hold-out set: 0.012546523709558338
MeanAbsoluteError value on hold-out data: 0.08035692572593689
Epoch: 1105
Loss on hold-out set: 0.01177444367397887
MeanAbsoluteError value on hold-out data: 0.08034929633140564
Epoch: 1106

Loss on hold-out set: 0.011273566614011845
MeanAbsoluteError value on hold-out data: 0.07944448292255402
Epoch: 1107

Loss on hold-out set: 0.011916963494598653
MeanAbsoluteError value on hold-out data: 0.0795363038778305
Epoch: 1108
Loss on hold-out set: 0.0108651167018373
MeanAbsoluteError value on hold-out data: 0.07627248764038086
Epoch: 1109

Loss on hold-out set: 0.010724245343735674
MeanAbsoluteError value on hold-out data: 0.077794149518013
Epoch: 1110

Loss on hold-out set: 0.011079654853286531
MeanAbsoluteError value on hold-out data: 0.0777832493185997
Epoch: 1111
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Loss on hold-out set: 0.012539995779613188
MeanAbsoluteError value on hold-out data: 0.08166177570819855
Epoch: 1112

Loss on hold-out set: 0.01220796442886543
MeanAbsoluteError value on hold-out data: 0.08286312967538834
Epoch: 1113

Loss on hold-out set: 0.010958727227261988
MeanAbsoluteError value on hold-out data: 0.0784730389714241
Epoch: 1114
Loss on hold-out set: 0.010762654750557583
MeanAbsoluteError value on hold-out data: 0.076114222407341
Epoch: 1115

Loss on hold-out set: 0.011720893977520366
MeanAbsoluteError value on hold-out data: 0.07890045642852783
Epoch: 1116

Loss on hold-out set: 0.009720561927751987
MeanAbsoluteError value on hold-out data: 0.07479685544967651
Epoch: 1117
Loss on hold-out set: 0.00977680951046447
MeanAbsoluteError value on hold-out data: 0.07467751950025558
Epoch: 1118

Loss on hold-out set: 0.01157897966216827
MeanAbsoluteError value on hold-out data: 0.07660027593374252
Epoch: 1119

Loss on hold-out set: 0.012535288721992402
MeanAbsoluteError value on hold-out data: 0.08100298792123795
Epoch: 1120
Loss on hold-out set: 0.011143402815196168
MeanAbsoluteError value on hold-out data: 0.07920339703559875
Epoch: 1121

Loss on hold-out set: 0.011204815503941366
MeanAbsoluteError value on hold-out data: 0.07582560926675797
Epoch: 1122
```

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Loss on hold-out set: 0.011061092115896827
MeanAbsoluteError value on hold-out data: 0.07476154714822769
Epoch: 1123
Loss on hold-out set: 0.009233967787280714
MeanAbsoluteError value on hold-out data: 0.0715944766998291
Epoch: 1124

Loss on hold-out set: 0.01150373257973115
MeanAbsoluteError value on hold-out data: 0.077443428337574
Epoch: 1125

Loss on hold-out set: 0.009980500097481127
MeanAbsoluteError value on hold-out data: 0.07342773675918579
Epoch: 1126
Loss on hold-out set: 0.009941558360068967
MeanAbsoluteError value on hold-out data: 0.07388486713171005
Epoch: 1127

Loss on hold-out set: 0.011211993714872127
MeanAbsoluteError value on hold-out data: 0.07862399518489838
Epoch: 1128

Loss on hold-out set: 0.012369329184900076
MeanAbsoluteError value on hold-out data: 0.08201830834150314
Epoch: 1129
Loss on hold-out set: 0.011377136771213069
MeanAbsoluteError value on hold-out data: 0.08046235144138336
Epoch: 1130

Loss on hold-out set: 0.011203567828270025
MeanAbsoluteError value on hold-out data: 0.07763533294200897
Epoch: 1131

Loss on hold-out set: 0.011692694725012795
MeanAbsoluteError value on hold-out data: 0.08006005734205246
Epoch: 1132
Loss on hold-out set: 0.00991421418043198
MeanAbsoluteError value on hold-out data: 0.07472846657037735
Epoch: 1133
```

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Loss on hold-out set: 0.010814911134075374
MeanAbsoluteError value on hold-out data: 0.0771009624004364
Epoch: 1134

Loss on hold-out set: 0.010693285518257956
MeanAbsoluteError value on hold-out data: 0.07694597542285919
Epoch: 1135
Loss on hold-out set: 0.00998767944337184
MeanAbsoluteError value on hold-out data: 0.07498180866241455
Epoch: 1136

Loss on hold-out set: 0.012150222316025368
MeanAbsoluteError value on hold-out data: 0.07995165139436722
Epoch: 1137

Loss on hold-out set: 0.011540297305594626
MeanAbsoluteError value on hold-out data: 0.07802315056324005
Epoch: 1138
Loss on hold-out set: 0.01141789869199177
MeanAbsoluteError value on hold-out data: 0.07698647677898407
Epoch: 1139

Loss on hold-out set: 0.010481555612156322
MeanAbsoluteError value on hold-out data: 0.07599309831857681
Epoch: 1140

Loss on hold-out set: 0.010650781994978995
MeanAbsoluteError value on hold-out data: 0.07715337723493576
Epoch: 1141
Loss on hold-out set: 0.012108441645251938
MeanAbsoluteError value on hold-out data: 0.07828451693058014
Epoch: 1142

Loss on hold-out set: 0.009802824827687195
MeanAbsoluteError value on hold-out data: 0.07277807593345642
Epoch: 1143

Loss on hold-out set: 0.012120266492226316
MeanAbsoluteError value on hold-out data: 0.07901759445667267
Epoch: 1144
```

```
Loss on hold-out set: 0.012059111736913717
MeanAbsoluteError value on hold-out data: 0.07889916747808456
Epoch: 1145

Loss on hold-out set: 0.009805920953773846
MeanAbsoluteError value on hold-out data: 0.07382979243993759
Epoch: 1146

Loss on hold-out set: 0.010978108909863902
MeanAbsoluteError value on hold-out data: 0.07644770294427872
Epoch: 1147
Loss on hold-out set: 0.010133882095118073
MeanAbsoluteError value on hold-out data: 0.07273734360933304
Epoch: 1148

Loss on hold-out set: 0.011195821483173253
MeanAbsoluteError value on hold-out data: 0.07947930693626404
Epoch: 1149

Loss on hold-out set: 0.013025282762882853
MeanAbsoluteError value on hold-out data: 0.080091193318367
Epoch: 1150
Loss on hold-out set: 0.009930520062844152
MeanAbsoluteError value on hold-out data: 0.07438819855451584
Epoch: 1151

Loss on hold-out set: 0.009295422696838331
MeanAbsoluteError value on hold-out data: 0.07031237334012985
Epoch: 1152

Loss on hold-out set: 0.010738751989823261
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Epoch: 1153
Loss on hold-out set: 0.011024827821747749
MeanAbsoluteError value on hold-out data: 0.07740747183561325
Epoch: 1154

Loss on hold-out set: 0.008930261308402502
MeanAbsoluteError value on hold-out data: 0.07085549086332321
Epoch: 1155
```

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Loss on hold-out set: 0.011539188668539282
MeanAbsoluteError value on hold-out data: 0.0772789716720581
Epoch: 1156
Loss on hold-out set: 0.010123053233849835
MeanAbsoluteError value on hold-out data: 0.07367049157619476
Epoch: 1157

Loss on hold-out set: 0.011610688355770738
MeanAbsoluteError value on hold-out data: 0.07927259802818298
Epoch: 1158

Loss on hold-out set: 0.010492602818776503
MeanAbsoluteError value on hold-out data: 0.07618236541748047
Epoch: 1159
Loss on hold-out set: 0.010631467768907896
MeanAbsoluteError value on hold-out data: 0.07528181374073029
Epoch: 1160

Loss on hold-out set: 0.011854245097965758
MeanAbsoluteError value on hold-out data: 0.0779556855559349
Epoch: 1161

Loss on hold-out set: 0.011503334450244438
MeanAbsoluteError value on hold-out data: 0.08080312609672546
Epoch: 1162
Loss on hold-out set: 0.009595511307634298
MeanAbsoluteError value on hold-out data: 0.07287956774234772
Epoch: 1163

Loss on hold-out set: 0.009614242665556959
MeanAbsoluteError value on hold-out data: 0.07159675657749176
Epoch: 1164

Loss on hold-out set: 0.011290574403119535
MeanAbsoluteError value on hold-out data: 0.07772775739431381
Epoch: 1165
Loss on hold-out set: 0.011026290433558945
MeanAbsoluteError value on hold-out data: 0.07726873457431793
Epoch: 1166
```

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Loss on hold-out set: 0.011125503278550847
MeanAbsoluteError value on hold-out data: 0.07301675528287888
Epoch: 1167

Loss on hold-out set: 0.00929979080084498
MeanAbsoluteError value on hold-out data: 0.07034894824028015
Epoch: 1168
Loss on hold-out set: 0.010355091206050323
MeanAbsoluteError value on hold-out data: 0.07559292018413544
Epoch: 1169

Loss on hold-out set: 0.01149604244264386
MeanAbsoluteError value on hold-out data: 0.07810287177562714
Epoch: 1170

Loss on hold-out set: 0.01065840980949967
MeanAbsoluteError value on hold-out data: 0.07406508177518845
Epoch: 1171
Loss on hold-out set: 0.00991711777697977
MeanAbsoluteError value on hold-out data: 0.07204615324735641
Epoch: 1172

Loss on hold-out set: 0.012141410577508699
MeanAbsoluteError value on hold-out data: 0.07865913957357407
Epoch: 1173

Loss on hold-out set: 0.011025327633930526
MeanAbsoluteError value on hold-out data: 0.07731195539236069
Epoch: 1174
Loss on hold-out set: 0.009963858544651885
MeanAbsoluteError value on hold-out data: 0.07467922568321228
Epoch: 1175

Loss on hold-out set: 0.009354982629405035
MeanAbsoluteError value on hold-out data: 0.07106582075357437
Epoch: 1176

Loss on hold-out set: 0.01011292414055788
MeanAbsoluteError value on hold-out data: 0.07326583564281464
Epoch: 1177
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Loss on hold-out set: 0.011098738242993325
MeanAbsoluteError value on hold-out data: 0.07852312177419662
Epoch: 1178

Loss on hold-out set: 0.011178461088760135
MeanAbsoluteError value on hold-out data: 0.07800602912902832
Epoch: 1179

Loss on hold-out set: 0.009317323507687736
MeanAbsoluteError value on hold-out data: 0.07274885475635529
Epoch: 1180
Loss on hold-out set: 0.010396402190153822
MeanAbsoluteError value on hold-out data: 0.07521259784698486
Epoch: 1181

Loss on hold-out set: 0.009941043013617066
MeanAbsoluteError value on hold-out data: 0.07139202207326889
Epoch: 1182

Loss on hold-out set: 0.01021952710985109
MeanAbsoluteError value on hold-out data: 0.07297026365995407
Epoch: 1183
Loss on hold-out set: 0.009756792395427661
MeanAbsoluteError value on hold-out data: 0.07456432282924652
Epoch: 1184

Loss on hold-out set: 0.011581307511999815
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Epoch: 1185

Loss on hold-out set: 0.010796532219113336
MeanAbsoluteError value on hold-out data: 0.0766730085015297
Epoch: 1186
Loss on hold-out set: 0.010933661777865684
MeanAbsoluteError value on hold-out data: 0.08026418834924698
Epoch: 1187

Loss on hold-out set: 0.010042317001407355
MeanAbsoluteError value on hold-out data: 0.07559816539287567
Epoch: 1188
```

```
Loss on hold-out set: 0.008712811935432304
MeanAbsoluteError value on hold-out data: 0.07087372988462448
Epoch: 1189
Loss on hold-out set: 0.010279681871907087
MeanAbsoluteError value on hold-out data: 0.07391613721847534
Epoch: 1190

Loss on hold-out set: 0.011137010384734936
MeanAbsoluteError value on hold-out data: 0.07631327956914902
Epoch: 1191

Loss on hold-out set: 0.011629650435885803
MeanAbsoluteError value on hold-out data: 0.077690489590168
Epoch: 1192
Loss on hold-out set: 0.011278155004620203
MeanAbsoluteError value on hold-out data: 0.0773138552904129
Epoch: 1193

Loss on hold-out set: 0.010587727128974317
MeanAbsoluteError value on hold-out data: 0.07349226623773575
Epoch: 1194

Loss on hold-out set: 0.010275874368429262
MeanAbsoluteError value on hold-out data: 0.0736473873257637
Epoch: 1195
Loss on hold-out set: 0.009032518398123556
MeanAbsoluteError value on hold-out data: 0.06782954931259155
Epoch: 1196

Loss on hold-out set: 0.010340849553758745
MeanAbsoluteError value on hold-out data: 0.07494699209928513
Epoch: 1197

Loss on hold-out set: 0.012176900029007811
MeanAbsoluteError value on hold-out data: 0.0804983377456665
Epoch: 1198
Loss on hold-out set: 0.010119872566422904
MeanAbsoluteError value on hold-out data: 0.07130838930606842
Epoch: 1199
```

```
Loss on hold-out set: 0.010017563611472723
MeanAbsoluteError value on hold-out data: 0.0737856850028038
Epoch: 1200

Loss on hold-out set: 0.01038823057540867
MeanAbsoluteError value on hold-out data: 0.07603166252374649
Epoch: 1201
Loss on hold-out set: 0.010723844049172537
MeanAbsoluteError value on hold-out data: 0.07624805718660355
Epoch: 1202

Loss on hold-out set: 0.010367987147716728
MeanAbsoluteError value on hold-out data: 0.07773031294345856
Epoch: 1203

Loss on hold-out set: 0.010669018831261685
MeanAbsoluteError value on hold-out data: 0.0729878842830658
Epoch: 1204
Loss on hold-out set: 0.010368841385719255
MeanAbsoluteError value on hold-out data: 0.07590088248252869
Epoch: 1205

Loss on hold-out set: 0.01119318354296297
MeanAbsoluteError value on hold-out data: 0.07752277702093124
Epoch: 1206

Loss on hold-out set: 0.011221161497135958
MeanAbsoluteError value on hold-out data: 0.07832232117652893
Epoch: 1207
Loss on hold-out set: 0.009876130845247341
MeanAbsoluteError value on hold-out data: 0.07472235709428787
Epoch: 1208

Loss on hold-out set: 0.009277496043328028
MeanAbsoluteError value on hold-out data: 0.07115327566862106
Epoch: 1209

Loss on hold-out set: 0.010269299304563901
MeanAbsoluteError value on hold-out data: 0.07683803886175156
Epoch: 1210
```

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Loss on hold-out set: 0.010664659622949936
MeanAbsoluteError value on hold-out data: 0.07450729608535767
Epoch: 1211

Loss on hold-out set: 0.009774355110701738
MeanAbsoluteError value on hold-out data: 0.07295385748147964
Epoch: 1212

Loss on hold-out set: 0.009331698639653042
MeanAbsoluteError value on hold-out data: 0.07267807424068451
Epoch: 1213
Loss on hold-out set: 0.01119974745068248
MeanAbsoluteError value on hold-out data: 0.07572437822818756
Epoch: 1214

Loss on hold-out set: 0.009298092349881699
MeanAbsoluteError value on hold-out data: 0.07006140053272247
Epoch: 1215

Loss on hold-out set: 0.010848118646244985
MeanAbsoluteError value on hold-out data: 0.07478907704353333
Epoch: 1216
Loss on hold-out set: 0.01054510875824538
MeanAbsoluteError value on hold-out data: 0.07458095252513885
Epoch: 1217

Loss on hold-out set: 0.010151466601164429
MeanAbsoluteError value on hold-out data: 0.0721917524933815
Epoch: 1218

Loss on hold-out set: 0.010910853493842297
MeanAbsoluteError value on hold-out data: 0.07552245259284973
Epoch: 1219
Loss on hold-out set: 0.00996457369831963
MeanAbsoluteError value on hold-out data: 0.07514721155166626
Epoch: 1220

Loss on hold-out set: 0.010755843303049914
MeanAbsoluteError value on hold-out data: 0.07166267186403275
Epoch: 1221
```

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Loss on hold-out set: 0.008803885544524l4
MeanAbsoluteError value on hold-out data: 0.06889581680297852
Epoch: 1222
Loss on hold-out set: 0.009941025859143337
MeanAbsoluteError value on hold-out data: 0.07202009111642838
Epoch: 1223

Loss on hold-out set: 0.010564479124805076
MeanAbsoluteError value on hold-out data: 0.07366663962602615
Epoch: 1224

Loss on hold-out set: 0.01017818272965087
MeanAbsoluteError value on hold-out data: 0.07209213078022003
Epoch: 1225
Loss on hold-out set: 0.01009860261088761
MeanAbsoluteError value on hold-out data: 0.07065153867006302
Epoch: 1226

Loss on hold-out set: 0.010940161125011703
MeanAbsoluteError value on hold-out data: 0.0744481310248375
Epoch: 1227

Loss on hold-out set: 0.010376254155877784
MeanAbsoluteError value on hold-out data: 0.07425481826066971
Epoch: 1228
Loss on hold-out set: 0.011720059195639199
MeanAbsoluteError value on hold-out data: 0.07923925668001175
Epoch: 1229

Loss on hold-out set: 0.011270488257590234
MeanAbsoluteError value on hold-out data: 0.07514500617980957
Epoch: 1230

Loss on hold-out set: 0.008389719506491625
MeanAbsoluteError value on hold-out data: 0.0659705102443695
Epoch: 1231
Loss on hold-out set: 0.010530719625397372
MeanAbsoluteError value on hold-out data: 0.07303471118211746
Epoch: 1232
```

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Loss on hold-out set: 0.010138800239856211
MeanAbsoluteError value on hold-out data: 0.0747898519039154
Epoch: 1233

Loss on hold-out set: 0.011900610733234012
MeanAbsoluteError value on hold-out data: 0.08047665655612946
Epoch: 1234
Loss on hold-out set: 0.010294533764948332
MeanAbsoluteError value on hold-out data: 0.07467756420373917
Epoch: 1235

Loss on hold-out set: 0.010570640662496468
MeanAbsoluteError value on hold-out data: 0.07315560430288315
Epoch: 1236

Loss on hold-out set: 0.010606103281206742
MeanAbsoluteError value on hold-out data: 0.07677319645881653
Epoch: 1237
Loss on hold-out set: 0.01129288674397685
MeanAbsoluteError value on hold-out data: 0.0778212696313858
Epoch: 1238

Loss on hold-out set: 0.010017689127610842
MeanAbsoluteError value on hold-out data: 0.0726381242275238
Epoch: 1239

Loss on hold-out set: 0.011391270786201252
MeanAbsoluteError value on hold-out data: 0.07796874642372131
Epoch: 1240
Loss on hold-out set: 0.009915170828414073
MeanAbsoluteError value on hold-out data: 0.07491980493068695
Epoch: 1241

Loss on hold-out set: 0.011587320421518447
MeanAbsoluteError value on hold-out data: 0.07778828591108322
Epoch: 1242

Loss on hold-out set: 0.012615779197391626
MeanAbsoluteError value on hold-out data: 0.07785859704017639
Epoch: 1243
```

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Loss on hold-out set: 0.009537054298756023
MeanAbsoluteError value on hold-out data: 0.07153238356113434
Epoch: 1244

Loss on hold-out set: 0.009535494003272712
MeanAbsoluteError value on hold-out data: 0.0728844478726387
Epoch: 1245

Loss on hold-out set: 0.00932454006925885
MeanAbsoluteError value on hold-out data: 0.07227599620819092
Epoch: 1246
Loss on hold-out set: 0.011829226132419232
MeanAbsoluteError value on hold-out data: 0.07634764909744263
Epoch: 1247

Loss on hold-out set: 0.011277739149785096
MeanAbsoluteError value on hold-out data: 0.07521828263998032
Epoch: 1248

Loss on hold-out set: 0.010307766257004308
MeanAbsoluteError value on hold-out data: 0.07626160234212875
Epoch: 1249
Loss on hold-out set: 0.010725829119195018
MeanAbsoluteError value on hold-out data: 0.07841074466705322
Epoch: 1250

Loss on hold-out set: 0.011186457549841483
MeanAbsoluteError value on hold-out data: 0.0749242752790451
Epoch: 1251

Loss on hold-out set: 0.009555056068954097
MeanAbsoluteError value on hold-out data: 0.07249300926923752
Epoch: 1252
Loss on hold-out set: 0.01084924627139723
MeanAbsoluteError value on hold-out data: 0.07528617233037949
Epoch: 1253

Loss on hold-out set: 0.00986426672898233
MeanAbsoluteError value on hold-out data: 0.07195989787578583
Epoch: 1254
```

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Loss on hold-out set: 0.00933077474932361
MeanAbsoluteError value on hold-out data: 0.07114585489034653
Epoch: 1255
Loss on hold-out set: 0.009954094097131853
MeanAbsoluteError value on hold-out data: 0.07250374555587769
Epoch: 1256

Loss on hold-out set: 0.009760017847220297
MeanAbsoluteError value on hold-out data: 0.0730866864323616
Epoch: 1257

Loss on hold-out set: 0.010292440854051772
MeanAbsoluteError value on hold-out data: 0.0761951431632042
Epoch: 1258
Loss on hold-out set: 0.00950987617012288
MeanAbsoluteError value on hold-out data: 0.0733284205198288
Epoch: 1259

Loss on hold-out set: 0.01002813345422813
MeanAbsoluteError value on hold-out data: 0.07193554937839508
Epoch: 1260

Loss on hold-out set: 0.010563814251666675
MeanAbsoluteError value on hold-out data: 0.07236352562904358
Epoch: 1261
Loss on hold-out set: 0.008765757402215968
MeanAbsoluteError value on hold-out data: 0.06662074476480484
Epoch: 1262

Loss on hold-out set: 0.011481335276160583
MeanAbsoluteError value on hold-out data: 0.08005326986312866
Epoch: 1263

Loss on hold-out set: 0.009553959993790565
MeanAbsoluteError value on hold-out data: 0.07221537828445435
Epoch: 1264
Loss on hold-out set: 0.011025739196829818
MeanAbsoluteError value on hold-out data: 0.07472291588783264
Epoch: 1265
```

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Loss on hold-out set: 0.010474584483340573
MeanAbsoluteError value on hold-out data: 0.07535623759031296
Epoch: 1266

Loss on hold-out set: 0.010767353910014208
MeanAbsoluteError value on hold-out data: 0.07415563613176346
Epoch: 1267
Loss on hold-out set: 0.010007213792826708
MeanAbsoluteError value on hold-out data: 0.07036259025335312
Epoch: 1268

Loss on hold-out set: 0.009164589219605355
MeanAbsoluteError value on hold-out data: 0.06827434152364731
Epoch: 1269

Loss on hold-out set: 0.009114181794478402
MeanAbsoluteError value on hold-out data: 0.0714464783668518
Epoch: 1270
Loss on hold-out set: 0.01015698351591709
MeanAbsoluteError value on hold-out data: 0.07135366648435593
Epoch: 1271

Loss on hold-out set: 0.01043314284691102
MeanAbsoluteError value on hold-out data: 0.07729355245828629
Epoch: 1272

Loss on hold-out set: 0.00939405448156928
MeanAbsoluteError value on hold-out data: 0.0705965980887413
Epoch: 1273
Loss on hold-out set: 0.010177939625694611
MeanAbsoluteError value on hold-out data: 0.0716860219836235
Epoch: 1274

Loss on hold-out set: 0.01110011576370501
MeanAbsoluteError value on hold-out data: 0.0746944472193718
Epoch: 1275

Loss on hold-out set: 0.010416124105710575
MeanAbsoluteError value on hold-out data: 0.07549581676721573
Epoch: 1276
```

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Loss on hold-out set: 0.011343188062407231
MeanAbsoluteError value on hold-out data: 0.07968277484178543
Epoch: 1277

Loss on hold-out set: 0.01018522257432475
MeanAbsoluteError value on hold-out data: 0.07111285626888275
Epoch: 1278

Loss on hold-out set: 0.010749799067865145
MeanAbsoluteError value on hold-out data: 0.07705681025981903
Epoch: 1279
Loss on hold-out set: 0.011083120065580564
MeanAbsoluteError value on hold-out data: 0.07705569267272949
Epoch: 1280

Loss on hold-out set: 0.010430563520106564
MeanAbsoluteError value on hold-out data: 0.07447028160095215
Epoch: 1281

Loss on hold-out set: 0.010179245674201714
MeanAbsoluteError value on hold-out data: 0.07275322079658508
Epoch: 1282
Loss on hold-out set: 0.009788323380295576
MeanAbsoluteError value on hold-out data: 0.07319777458906174
Epoch: 1283

Loss on hold-out set: 0.011247641765894514
MeanAbsoluteError value on hold-out data: 0.07766439020633698
Epoch: 1284

Loss on hold-out set: 0.008277598971556775
MeanAbsoluteError value on hold-out data: 0.06692937761545181
Epoch: 1285
Loss on hold-out set: 0.01033032116940376
MeanAbsoluteError value on hold-out data: 0.07192326337099075
Epoch: 1286

Loss on hold-out set: 0.009619622026354288
MeanAbsoluteError value on hold-out data: 0.07033232599496841
Epoch: 1287
```

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Loss on hold-out set: 0.009890433630159047
MeanAbsoluteError value on hold-out data: 0.07308977842330933
Epoch: 1288
Loss on hold-out set: 0.00984062159594032
MeanAbsoluteError value on hold-out data: 0.07265618443489075
Epoch: 1289

Loss on hold-out set: 0.011198850175763558
MeanAbsoluteError value on hold-out data: 0.07830321043729782
Epoch: 1290

Loss on hold-out set: 0.010502852200000537
MeanAbsoluteError value on hold-out data: 0.0696742981672287
Epoch: 1291
Loss on hold-out set: 0.010047438100482396
MeanAbsoluteError value on hold-out data: 0.07121291756629944
Epoch: 1292

Loss on hold-out set: 0.008771724218871289
MeanAbsoluteError value on hold-out data: 0.06735574454069138
Epoch: 1293

Loss on hold-out set: 0.010769624402522215
MeanAbsoluteError value on hold-out data: 0.07391374558210373
Epoch: 1294
Loss on hold-out set: 0.009964223970631186
MeanAbsoluteError value on hold-out data: 0.07089969515800476
Epoch: 1295

Loss on hold-out set: 0.010287941685916546
MeanAbsoluteError value on hold-out data: 0.0719759464263916
Epoch: 1296

Loss on hold-out set: 0.01160810739240939
MeanAbsoluteError value on hold-out data: 0.07702049612998962
Epoch: 1297
Loss on hold-out set: 0.00876294934125326
MeanAbsoluteError value on hold-out data: 0.06879313290119171
Epoch: 1298
```

```
Loss on hold-out set: 0.009852756865341993
MeanAbsoluteError value on hold-out data: 0.07310742884874344
Epoch: 1299

Loss on hold-out set: 0.010438686033473156
MeanAbsoluteError value on hold-out data: 0.07417568564414978
Epoch: 1300
Loss on hold-out set: 0.008953465084697807
MeanAbsoluteError value on hold-out data: 0.06595780700445175
Epoch: 1301

Loss on hold-out set: 0.009949711652989208
MeanAbsoluteError value on hold-out data: 0.0742390900850296
Epoch: 1302

Loss on hold-out set: 0.010041147725593357
MeanAbsoluteError value on hold-out data: 0.07501474022865295
Epoch: 1303
Loss on hold-out set: 0.010691503118626619
MeanAbsoluteError value on hold-out data: 0.07391992956399918
Epoch: 1304

Loss on hold-out set: 0.009742744731362715
MeanAbsoluteError value on hold-out data: 0.07227876782417297
Epoch: 1305

Loss on hold-out set: 0.009998823350930858
MeanAbsoluteError value on hold-out data: 0.07017512619495392
Epoch: 1306
Loss on hold-out set: 0.009533269048260991
MeanAbsoluteError value on hold-out data: 0.07168278843164444
Epoch: 1307

Loss on hold-out set: 0.008796118861512998
MeanAbsoluteError value on hold-out data: 0.06957945227622986
Epoch: 1308

Loss on hold-out set: 0.009290410942897627
MeanAbsoluteError value on hold-out data: 0.07000241428613663
Epoch: 1309
```

```
Loss on hold-out set: 0.008548558843855669
MeanAbsoluteError value on hold-out data: 0.06887238472700119
Epoch: 1310

Loss on hold-out set: 0.00946856957404331
MeanAbsoluteError value on hold-out data: 0.07003369182348251
Epoch: 1311

Loss on hold-out set: 0.009577093094634014
MeanAbsoluteError value on hold-out data: 0.07102447003126144
Epoch: 1312
Loss on hold-out set: 0.009106900880724425
MeanAbsoluteError value on hold-out data: 0.07120216637849808
Epoch: 1313

Loss on hold-out set: 0.010107322632563106
MeanAbsoluteError value on hold-out data: 0.07425420731306076
Epoch: 1314

Loss on hold-out set: 0.009753816191247704
MeanAbsoluteError value on hold-out data: 0.07342067360877991
Epoch: 1315
Loss on hold-out set: 0.011738936217062321
MeanAbsoluteError value on hold-out data: 0.07400793582201004
Epoch: 1316

Loss on hold-out set: 0.009224371515216868
MeanAbsoluteError value on hold-out data: 0.07016816735267639
Epoch: 1317

Loss on hold-out set: 0.008473544108531617
MeanAbsoluteError value on hold-out data: 0.06709073483943939
Epoch: 1318
Loss on hold-out set: 0.009193296491988197
MeanAbsoluteError value on hold-out data: 0.06622625142335892
Epoch: 1319

Loss on hold-out set: 0.008398387399295947
MeanAbsoluteError value on hold-out data: 0.0648035854101181
Epoch: 1320
```

```
Loss on hold-out set: 0.010327937521554607
MeanAbsoluteError value on hold-out data: 0.07500472664833069
Epoch: 1321
Loss on hold-out set: 0.011536060639858382
MeanAbsoluteError value on hold-out data: 0.07679342478513718
Epoch: 1322

Loss on hold-out set: 0.008689730893966043
MeanAbsoluteError value on hold-out data: 0.06749386340379715
Epoch: 1323

Loss on hold-out set: 0.010828679390445663
MeanAbsoluteError value on hold-out data: 0.07468447089195251
Epoch: 1324
Loss on hold-out set: 0.010308048491509302
MeanAbsoluteError value on hold-out data: 0.07060085982084274
Epoch: 1325

Loss on hold-out set: 0.008790233800609712
MeanAbsoluteError value on hold-out data: 0.06812584400177002
Epoch: 1326

Loss on hold-out set: 0.011361951423198964
MeanAbsoluteError value on hold-out data: 0.07751327008008957
Epoch: 1327
Loss on hold-out set: 0.008326106359406064
MeanAbsoluteError value on hold-out data: 0.06554631888866425
Epoch: 1328

Loss on hold-out set: 0.009981885382421752
MeanAbsoluteError value on hold-out data: 0.07357635349035263
Epoch: 1329

Loss on hold-out set: 0.009368756783648374
MeanAbsoluteError value on hold-out data: 0.0711943507194519
Epoch: 1330
Loss on hold-out set: 0.009189992161263944
MeanAbsoluteError value on hold-out data: 0.06892528384923935
Epoch: 1331
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```
Loss on hold-out set: 0.009847660361629096
MeanAbsoluteError value on hold-out data: 0.07461901009082794
Epoch: 1332

Loss on hold-out set: 0.009715415131916719
MeanAbsoluteError value on hold-out data: 0.07007092237472534
Epoch: 1333
Loss on hold-out set: 0.008806423506587937
MeanAbsoluteError value on hold-out data: 0.06820690631866455
Epoch: 1334

Loss on hold-out set: 0.010165360937962 76
MeanAbsoluteError value on hold-out data: 0.07224733382463455
Epoch: 1335

Loss on hold-out set: 0.009823508214928249
MeanAbsoluteError value on hold-out data: 0.07187225669622421
Epoch: 1336
Loss on hold-out set: 0.009055357748596483
MeanAbsoluteError value on hold-out data: 0.0698966532945633
Epoch: 1337

Loss on hold-out set: 0.010737765276474723
MeanAbsoluteError value on hold-out data: 0.07527804374694824
Epoch: 1338

Loss on hold-out set: 0.00996409402253145
MeanAbsoluteError value on hold-out data: 0.07188189774751663
Epoch: 1339
Loss on hold-out set: 0.011676839998590366
MeanAbsoluteError value on hold-out data: 0.07295245677232742
Epoch: 1340

Loss on hold-out set: 0.009921450079564237
MeanAbsoluteError value on hold-out data: 0.07304467260837555
Epoch: 1341

Loss on hold-out set: 0.009040064223830389
MeanAbsoluteError value on hold-out data: 0.06662158668041229
Epoch: 1342
```

```
Loss on hold-out set: 0.010686996568983887
MeanAbsoluteError value on hold-out data: 0.07201562821865082
Epoch: 1343

Loss on hold-out set: 0.009767752504728075
MeanAbsoluteError value on hold-out data: 0.0709836333990097
Epoch: 1344

Loss on hold-out set: 0.009980572662801326
MeanAbsoluteError value on hold-out data: 0.07360950112342834
Epoch: 1345
Loss on hold-out set: 0.010284369714451411
MeanAbsoluteError value on hold-out data: 0.0715278759598732
Epoch: 1346

Loss on hold-out set: 0.009197275354296531
MeanAbsoluteError value on hold-out data: 0.06962273269891739
Epoch: 1347

Loss on hold-out set: 0.008287607185923964
MeanAbsoluteError value on hold-out data: 0.06535878777503967
Epoch: 1348
Loss on hold-out set: 0.010116412025599857
MeanAbsoluteError value on hold-out data: 0.07217732071876526
Epoch: 1349

Loss on hold-out set: 0.009506785953699365
MeanAbsoluteError value on hold-out data: 0.07149269431829453
Epoch: 1350

Loss on hold-out set: 0.010106662613329528
MeanAbsoluteError value on hold-out data: 0.07518493384122849
Epoch: 1351
Loss on hold-out set: 0.009532257076116366
MeanAbsoluteError value on hold-out data: 0.0688733458518982
Epoch: 1352

Loss on hold-out set: 0.009952625056042356
MeanAbsoluteError value on hold-out data: 0.072722427546978
Epoch: 1353
```

```
Loss on hold-out set: 0.009994245077953868
MeanAbsoluteError value on hold-out data: 0.07061491906642914
Epoch: 1354
Loss on hold-out set: 0.009600658723841965
MeanAbsoluteError value on hold-out data: 0.07222927361726761
Epoch: 1355

Loss on hold-out set: 0.009085319968295776
MeanAbsoluteError value on hold-out data: 0.06775224953889847
Epoch: 1356

Loss on hold-out set: 0.010120596671176827
MeanAbsoluteError value on hold-out data: 0.06958942860364914
Epoch: 1357
Loss on hold-out set: 0.010489223300586067
MeanAbsoluteError value on hold-out data: 0.0730230063199997
Epoch: 1358

Loss on hold-out set: 0.011572345895522933
MeanAbsoluteError value on hold-out data: 0.07560613006353378
Epoch: 1359

Loss on hold-out set: 0.008898680077448566
MeanAbsoluteError value on hold-out data: 0.06616504490375519
Epoch: 1360
Loss on hold-out set: 0.007739372382244861
MeanAbsoluteError value on hold-out data: 0.06343544274568558
Epoch: 1361

Loss on hold-out set: 0.00888413951365995
MeanAbsoluteError value on hold-out data: 0.06832005083560944
Epoch: 1362

Loss on hold-out set: 0.009304007059157205
MeanAbsoluteError value on hold-out data: 0.06827882677316666
Epoch: 1363
Loss on hold-out set: 0.009125468560414447
MeanAbsoluteError value on hold-out data: 0.06647459417581558
Epoch: 1364
```

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Loss on hold-out set: 0.009491569776218966
MeanAbsoluteError value on hold-out data: 0.06898388266563416
Epoch: 1365

Loss on hold-out set: 0.008827160643965423
MeanAbsoluteError value on hold-out data: 0.06485673040151596
Epoch: 1366
Loss on hold-out set: 0.009358879475573
MeanAbsoluteError value on hold-out data: 0.06667876243591309
Epoch: 1367

Loss on hold-out set: 0.008708411959014483
MeanAbsoluteError value on hold-out data: 0.06696838140487671
Epoch: 1368

Loss on hold-out set: 0.010574194401597386
MeanAbsoluteError value on hold-out data: 0.07258827239274979
Epoch: 1369
Loss on hold-out set: 0.010958024666008441
MeanAbsoluteError value on hold-out data: 0.07311096787452698
Epoch: 1370

Loss on hold-out set: 0.011495029512540592
MeanAbsoluteError value on hold-out data: 0.07495914399623871
Epoch: 1371

Loss on hold-out set: 0.008998988364304144
MeanAbsoluteError value on hold-out data: 0.06809505075216293
Epoch: 1372
Loss on hold-out set: 0.010091341018887761
MeanAbsoluteError value on hold-out data: 0.0709109902381897
Epoch: 1373

Loss on hold-out set: 0.009369254579699676
MeanAbsoluteError value on hold-out data: 0.06908357888460159
Epoch: 1374

Loss on hold-out set: 0.008097595497092698
MeanAbsoluteError value on hold-out data: 0.06677964329719543
Epoch: 1375
```

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Loss on hold-out set: 0.010791738923677864
MeanAbsoluteError value on hold-out data: 0.07458952814340591
Epoch: 1376

Loss on hold-out set: 0.009518250217655198
MeanAbsoluteError value on hold-out data: 0.06940525770187378
Epoch: 1377

Loss on hold-out set: 0.009785588938442136
MeanAbsoluteError value on hold-out data: 0.07153733819723129
Epoch: 1378
Loss on hold-out set: 0.01144505762518141
MeanAbsoluteError value on hold-out data: 0.07667401432991028
Epoch: 1379

Loss on hold-out set: 0.010087151027886041
MeanAbsoluteError value on hold-out data: 0.07251618802547455
Epoch: 1380

Loss on hold-out set: 0.009864301671914229
MeanAbsoluteError value on hold-out data: 0.07003932446241379
Epoch: 1381
Loss on hold-out set: 0.009418137209771279
MeanAbsoluteError value on hold-out data: 0.0689825639128685
Epoch: 1382

Loss on hold-out set: 0.009533440001541748
MeanAbsoluteError value on hold-out data: 0.0665736272931099
Epoch: 1383

Loss on hold-out set: 0.009231097085090975
MeanAbsoluteError value on hold-out data: 0.06831686943769455
Epoch: 1384
Loss on hold-out set: 0.009677829682283725
MeanAbsoluteError value on hold-out data: 0.07123217731714249
Epoch: 1385

Loss on hold-out set: 0.009679300429585662
MeanAbsoluteError value on hold-out data: 0.07040353119373322
Epoch: 1386
```

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Loss on hold-out set: 0.009125462058318559
MeanAbsoluteError value on hold-out data: 0.06967294216156006
Epoch: 1387
Loss on hold-out set: 0.007999419024708914
MeanAbsoluteError value on hold-out data: 0.06412973999977112
Epoch: 1388

Loss on hold-out set: 0.008606505775023834
MeanAbsoluteError value on hold-out data: 0.06563079357147217
Epoch: 1389

Loss on hold-out set: 0.008842698058942914
MeanAbsoluteError value on hold-out data: 0.06804821640253067
Epoch: 1390
Loss on hold-out set: 0.009320451458067206
MeanAbsoluteError value on hold-out data: 0.06648354977369308
Epoch: 1391

Loss on hold-out set: 0.008661266910833385
MeanAbsoluteError value on hold-out data: 0.06678720563650131
Epoch: 1392

Loss on hold-out set: 0.009535573695787051
MeanAbsoluteError value on hold-out data: 0.06992349773645401
Epoch: 1393
Loss on hold-out set: 0.009139684179875379
MeanAbsoluteError value on hold-out data: 0.06863223761320114
Epoch: 1394

Loss on hold-out set: 0.009326539157439888
MeanAbsoluteError value on hold-out data: 0.07082291692495346
Epoch: 1395

Loss on hold-out set: 0.010512578371891929
MeanAbsoluteError value on hold-out data: 0.07221683859825134
Epoch: 1396
Loss on hold-out set: 0.008926786582778732
MeanAbsoluteError value on hold-out data: 0.06862125545740128
Epoch: 1397
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Loss on hold-out set: 0.008227566467176074
MeanAbsoluteError value on hold-out data: 0.06660780310630798
Epoch: 1398

Loss on hold-out set: 0.008737049163974006
MeanAbsoluteError value on hold-out data: 0.07017853111028671
Epoch: 1399
Loss on hold-out set: 0.00960113478982142
MeanAbsoluteError value on hold-out data: 0.07096263766288757
Epoch: 1400

Loss on hold-out set: 0.011653236364509212
MeanAbsoluteError value on hold-out data: 0.0748366042971611
Epoch: 1401

Loss on hold-out set: 0.008564132979712062
MeanAbsoluteError value on hold-out data: 0.06635642051696777
Epoch: 1402
Loss on hold-out set: 0.009630846770766463
MeanAbsoluteError value on hold-out data: 0.0686367005109787
Epoch: 1403

Loss on hold-out set: 0.009173227851730796
MeanAbsoluteError value on hold-out data: 0.06988360732793808
Epoch: 1404

Loss on hold-out set: 0.00769128988365992
MeanAbsoluteError value on hold-out data: 0.06357833743095398
Epoch: 1405
Loss on hold-out set: 0.008142255446194516
MeanAbsoluteError value on hold-out data: 0.06516314297914505
Epoch: 1406

Loss on hold-out set: 0.009816118511080276
MeanAbsoluteError value on hold-out data: 0.07202226668596268
Epoch: 1407

Loss on hold-out set: 0.008708521215060803
MeanAbsoluteError value on hold-out data: 0.06708455085754395
Epoch: 1408
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Loss on hold-out set: 0.010061764830024912
MeanAbsoluteError value on hold-out data: 0.0724935308098793
Epoch: 1409

Loss on hold-out set: 0.009880026236448127
MeanAbsoluteError value on hold-out data: 0.07059857994318008
Epoch: 1410

Loss on hold-out set: 0.00954706688435787
MeanAbsoluteError value on hold-out data: 0.06781236082315445
Epoch: 1411
Loss on hold-out set: 0.008039544948842377
MeanAbsoluteError value on hold-out data: 0.0665990337729454
Epoch: 1412

Loss on hold-out set: 0.009363767737060396
MeanAbsoluteError value on hold-out data: 0.06874231994152069
Epoch: 1413

Loss on hold-out set: 0.009813226501986112
MeanAbsoluteError value on hold-out data: 0.0698310062289238
Epoch: 1414
Loss on hold-out set: 0.009138035976710247
MeanAbsoluteError value on hold-out data: 0.06720361113548279
Epoch: 1415

Loss on hold-out set: 0.010272206149820703
MeanAbsoluteError value on hold-out data: 0.0711212083697319
Epoch: 1416

Loss on hold-out set: 0.009213901271359647
MeanAbsoluteError value on hold-out data: 0.06984133273363113
Epoch: 1417
Loss on hold-out set: 0.01068664544717952
MeanAbsoluteError value on hold-out data: 0.07232622057199478
Epoch: 1418

Loss on hold-out set: 0.009011195657391606
MeanAbsoluteError value on hold-out data: 0.06725489348173141
Epoch: 1419
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Loss on hold-out set: 0.008908872488251897
MeanAbsoluteError value on hold-out data: 0.07023479789495468
Epoch: 1420
Loss on hold-out set: 0.008608126761058278
MeanAbsoluteError value on hold-out data: 0.06595484912395477
Epoch: 1421

Loss on hold-out set: 0.010999736161302228
MeanAbsoluteError value on hold-out data: 0.07239297777414322
Epoch: 1422

Loss on hold-out set: 0.009040975933651984
MeanAbsoluteError value on hold-out data: 0.06874845921993256
Epoch: 1423
Loss on hold-out set: 0.010001300114648377
MeanAbsoluteError value on hold-out data: 0.07182488590478897
Epoch: 1424

Loss on hold-out set: 0.00994471753964414
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Epoch: 1425

Loss on hold-out set: 0.0078940843695212
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Epoch: 1426
Loss on hold-out set: 0.00918034707297314
MeanAbsoluteError value on hold-out data: 0.06935137510299683
Epoch: 1427

Loss on hold-out set: 0.009574858032659297
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Epoch: 1428

Loss on hold-out set: 0.008448094712366582
MeanAbsoluteError value on hold-out data: 0.0655941516160965
Epoch: 1429
Loss on hold-out set: 0.007982717463989198
MeanAbsoluteError value on hold-out data: 0.06457585096359253
Epoch: 1430
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Loss on hold-out set: 0.009058954989374495
MeanAbsoluteError value on hold-out data: 0.06865393370389938
Epoch: 1431

Loss on hold-out set: 0.00915296681584247
MeanAbsoluteError value on hold-out data: 0.06667353957891464
Epoch: 1432
Loss on hold-out set: 0.009164043503333233
MeanAbsoluteError value on hold-out data: 0.06834003329277039
Epoch: 1433

Loss on hold-out set: 0.009316867862720906
MeanAbsoluteError value on hold-out data: 0.0675119161605835
Epoch: 1434

Loss on hold-out set: 0.009345581926463637
MeanAbsoluteError value on hold-out data: 0.07093874365091324
Epoch: 1435
Loss on hold-out set: 0.007908806509658462
MeanAbsoluteError value on hold-out data: 0.06309828907251358
Epoch: 1436

Loss on hold-out set: 0.009127485007459957
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Epoch: 1437

Loss on hold-out set: 0.008810311187189654
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Epoch: 1438
Loss on hold-out set: 0.009550512024313017
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Epoch: 1439

Loss on hold-out set: 0.008098466968319068
MeanAbsoluteError value on hold-out data: 0.06613783538341522
Epoch: 1440

Loss on hold-out set: 0.00996181986839171
MeanAbsoluteError value on hold-out data: 0.07066215574741364
Epoch: 1441
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Loss on hold-out set: 0.010775570444069066
MeanAbsoluteError value on hold-out data: 0.07442086189985275
Epoch: 1442

Loss on hold-out set: 0.010193800596995668
MeanAbsoluteError value on hold-out data: 0.07256469130516052
Epoch: 1443

Loss on hold-out set: 0.010519536996919971
MeanAbsoluteError value on hold-out data: 0.07263576239347458
Epoch: 1444
Loss on hold-out set: 0.00983118718591868
MeanAbsoluteError value on hold-out data: 0.07017789036035538
Epoch: 1445

Loss on hold-out set: 0.008680471774957066
MeanAbsoluteError value on hold-out data: 0.06765969097614288
Epoch: 1446

Loss on hold-out set: 0.009717203718149298
MeanAbsoluteError value on hold-out data: 0.07021419703960419
Epoch: 1447
Loss on hold-out set: 0.010107962623624189
MeanAbsoluteError value on hold-out data: 0.07045496255159378
Epoch: 1448

Loss on hold-out set: 0.007861846281933442
MeanAbsoluteError value on hold-out data: 0.06537380069494247
Epoch: 1449

Loss on hold-out set: 0.009156258872014102
MeanAbsoluteError value on hold-out data: 0.06631415337324142
Epoch: 1450
Loss on hold-out set: 0.008708834006999193
MeanAbsoluteError value on hold-out data: 0.06749892234802246
Epoch: 1451

Loss on hold-out set: 0.009837832488894947
MeanAbsoluteError value on hold-out data: 0.07106711715459824
Epoch: 1452
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Loss on hold-out set: 0.009863812270553657
MeanAbsoluteError value on hold-out data: 0.07038823515176773
Epoch: 1453
Loss on hold-out set: 0.009514439530333523
MeanAbsoluteError value on hold-out data: 0.06934399902820587
Epoch: 1454

Loss on hold-out set: 0.00911903509950207
MeanAbsoluteError value on hold-out data: 0.06879253685474396
Epoch: 1455

Loss on hold-out set: 0.008280044406565898
MeanAbsoluteError value on hold-out data: 0.06525444239377975
Epoch: 1456
Loss on hold-out set: 0.009553806657495443
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Epoch: 1457

Loss on hold-out set: 0.008930338895903939
MeanAbsoluteError value on hold-out data: 0.06894383579492569
Epoch: 1458

Loss on hold-out set: 0.010761361645393966
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Epoch: 1459
Loss on hold-out set: 0.009329119593997652
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Epoch: 1460

Loss on hold-out set: 0.00910529590443275
MeanAbsoluteError value on hold-out data: 0.06765107065439224
Epoch: 1461

Loss on hold-out set: 0.007887005892541007
MeanAbsoluteError value on hold-out data: 0.06325935572385788
Epoch: 1462
Loss on hold-out set: 0.009800754677514002
MeanAbsoluteError value on hold-out data: 0.07042771577835083
Epoch: 1463
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Loss on hold-out set: 0.007676039603102254
MeanAbsoluteError value on hold-out data: 0.061115968972444534
Epoch: 1464

Loss on hold-out set: 0.010770604945379698
MeanAbsoluteError value on hold-out data: 0.07308114320039749
Epoch: 1465
Loss on hold-out set: 0.008621135815095235
MeanAbsoluteError value on hold-out data: 0.06858636438846588
Epoch: 1466

Loss on hold-out set: 0.009696406867891104
MeanAbsoluteError value on hold-out data: 0.06970228254795074
Epoch: 1467

Loss on hold-out set: 0.009277968177987836
MeanAbsoluteError value on hold-out data: 0.06829521805047989
Epoch: 1468
Loss on hold-out set: 0.009207553248149149
MeanAbsoluteError value on hold-out data: 0.06699071824550629
Epoch: 1469

Loss on hold-out set: 0.008402346342336386
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Epoch: 1470

Loss on hold-out set: 0.00842544515573536
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Epoch: 1471
Loss on hold-out set: 0.010686760318142963
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Epoch: 1472

Loss on hold-out set: 0.009598151899839043
MeanAbsoluteError value on hold-out data: 0.07064376026391983
Epoch: 1473

Loss on hold-out set: 0.009423898526183621
MeanAbsoluteError value on hold-out data: 0.07086556404829025
Epoch: 1474
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Loss on hold-out set: 0.009226034268491124
MeanAbsoluteError value on hold-out data: 0.06443937122821808
Epoch: 1475

Loss on hold-out set: 0.010359933768001307
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Epoch: 1476

Loss on hold-out set: 0.009633604041446232
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Epoch: 1477
Loss on hold-out set: 0.01023565030870183
MeanAbsoluteError value on hold-out data: 0.07144469022750854
Epoch: 1478

Loss on hold-out set: 0.010266002955807683
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Epoch: 1479

Loss on hold-out set: 0.008069514713182192
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Epoch: 1480
Loss on hold-out set: 0.009311488210939084
MeanAbsoluteError value on hold-out data: 0.06668686121702194
Epoch: 1481

Loss on hold-out set: 0.0083659119064968
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Epoch: 1482

Loss on hold-out set: 0.008964136182515548
MeanAbsoluteError value on hold-out data: 0.06725973635911942
Epoch: 1483
Loss on hold-out set: 0.008379188915423583
MeanAbsoluteError value on hold-out data: 0.06588548421859741
Epoch: 1484

Loss on hold-out set: 0.007968187101214426
MeanAbsoluteError value on hold-out data: 0.065202996134758
Epoch: 1485
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Loss on hold-out set: 0.008036277767581245
MeanAbsoluteError value on hold-out data: 0.06494872272014618
Epoch: 1486
Loss on hold-out set: 0.009628795133855117
MeanAbsoluteError value on hold-out data: 0.07053737342357635
Epoch: 1487

Loss on hold-out set: 0.008568724956154862
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Epoch: 1488

Loss on hold-out set: 0.008115460371263906
MeanAbsoluteError value on hold-out data: 0.06548667699098587
Epoch: 1489
Loss on hold-out set: 0.009543055583393046
MeanAbsoluteError value on hold-out data: 0.06786547601222992
Epoch: 1490

Loss on hold-out set: 0.008029532812721906
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Epoch: 1491

Loss on hold-out set: 0.009544132642622572
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Epoch: 1492
Loss on hold-out set: 0.008445838273258536
MeanAbsoluteError value on hold-out data: 0.06696510314941406
Epoch: 1493

Loss on hold-out set: 0.010543193584004863
MeanAbsoluteError value on hold-out data: 0.07320541143417358
Epoch: 1494

Loss on hold-out set: 0.008591142754885367
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Epoch: 1495
Loss on hold-out set: 0.009359936428359106
MeanAbsoluteError value on hold-out data: 0.06784959882497787
Epoch: 1496
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Loss on hold-out set: 0.008930359217647493
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Epoch: 1497

Loss on hold-out set: 0.008044302504645202
MeanAbsoluteError value on hold-out data: 0.0633368268609047
Epoch: 1498
Loss on hold-out set: 0.0093735147730816
MeanAbsoluteError value on hold-out data: 0.06644762307405472
Epoch: 1499

Loss on hold-out set: 0.009160897481973128
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Epoch: 1500

Loss on hold-out set: 0.008014489750154704
MeanAbsoluteError value on hold-out data: 0.0638061985373497
Epoch: 1501
Loss on hold-out set: 0.010190248629745232
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Epoch: 1502

Loss on hold-out set: 0.008199307049023143
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Epoch: 1503

Loss on hold-out set: 0.008397918555989842
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Epoch: 1504
Loss on hold-out set: 0.008621905581045818
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Epoch: 1505

Loss on hold-out set: 0.007545137163445664
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Epoch: 1506

Loss on hold-out set: 0.009639797944788977
MeanAbsoluteError value on hold-out data: 0.0696207731962204
Epoch: 1507
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Loss on hold-out set: 0.008437982789473608
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Epoch: 1508

Loss on hold-out set: 0.008558560114640084
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Epoch: 1509

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Epoch: 1510
Loss on hold-out set: 0.008314546161830852
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Epoch: 1511

Loss on hold-out set: 0.0100764388746029
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Epoch: 1512

Loss on hold-out set: 0.008174804971664 95
MeanAbsoluteError value on hold-out data: 0.06286295503377914
Epoch: 1513
Loss on hold-out set: 0.008940971238965478
MeanAbsoluteError value on hold-out data: 0.06834987550973892
Epoch: 1514

Loss on hold-out set: 0.009448370227067546
MeanAbsoluteError value on hold-out data: 0.07110743224620819
Epoch: 1515

Loss on hold-out set: 0.009076070669067727
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Epoch: 1516
Loss on hold-out set: 0.009340685405986733
MeanAbsoluteError value on hold-out data: 0.06872204691171646
Epoch: 1517

Loss on hold-out set: 0.00971612050945017
MeanAbsoluteError value on hold-out data: 0.06803333759307861
Epoch: 1518
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Loss on hold-out set: 0.008861223787334893
MeanAbsoluteError value on hold-out data: 0.06893342733383179
Epoch: 1519
Loss on hold-out set: 0.009204426783689997
MeanAbsoluteError value on hold-out data: 0.0683780238032341
Epoch: 1520

Loss on hold-out set: 0.009166484424264734
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Epoch: 1521

Loss on hold-out set: 0.009670307365328578
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Epoch: 1522
Loss on hold-out set: 0.00824974113565986
MeanAbsoluteError value on hold-out data: 0.06615208089351654
Epoch: 1523

Loss on hold-out set: 0.008094624589771228
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Epoch: 1524

Loss on hold-out set: 0.00894718480586486
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Epoch: 1525
Loss on hold-out set: 0.008487394208109435
MeanAbsoluteError value on hold-out data: 0.0658428892493248
Epoch: 1526

Loss on hold-out set: 0.009630044486081412
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Epoch: 1527

Loss on hold-out set: 0.0074767070971089806
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Epoch: 1528
Loss on hold-out set: 0.00904918928235323
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Epoch: 1529
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Loss on hold-out set: 0.008557249362217287
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Epoch: 1530

Loss on hold-out set: 0.0087200502707996
MeanAbsoluteError value on hold-out data: 0.06718507409095764
Epoch: 1531
Loss on hold-out set: 0.010358532382342673
MeanAbsoluteError value on hold-out data: 0.07333020865917206
Epoch: 1532

Loss on hold-out set: 0.010333376618776431
MeanAbsoluteError value on hold-out data: 0.0703720822930336
Epoch: 1533

Loss on hold-out set: 0.010047281112265409
MeanAbsoluteError value on hold-out data: 0.06782963126897812
Epoch: 1534
Loss on hold-out set: 0.006902280913266926
MeanAbsoluteError value on hold-out data: 0.05864354595541954
Epoch: 1535

Loss on hold-out set: 0.008333044966151040
MeanAbsoluteError value on hold-out data: 0.06663111597299576
Epoch: 1536

Loss on hold-out set: 0.01017854023071474
MeanAbsoluteError value on hold-out data: 0.0704607293009758
Epoch: 1537
Loss on hold-out set: 0.008108303210319719
MeanAbsoluteError value on hold-out data: 0.06447339057922363
Epoch: 1538

Loss on hold-out set: 0.0095481637432628
MeanAbsoluteError value on hold-out data: 0.06718724220991135
Epoch: 1539

Loss on hold-out set: 0.00840182542267333
MeanAbsoluteError value on hold-out data: 0.06572196632623672
Epoch: 1540
```

```
Loss on hold-out set: 0.008016558168701522
MeanAbsoluteError value on hold-out data: 0.06487404555082321
Epoch: 1541

Loss on hold-out set: 0.00965754623470275
MeanAbsoluteError value on hold-out data: 0.06964875757694244
Epoch: 1542

Loss on hold-out set: 0.008335103416784477
MeanAbsoluteError value on hold-out data: 0.06250657886266708
Epoch: 1543
Loss on hold-out set: 0.008066120149390675
MeanAbsoluteError value on hold-out data: 0.06378965824842453
Epoch: 1544

Loss on hold-out set: 0.008076670319539214
MeanAbsoluteError value on hold-out data: 0.06273153424263
Epoch: 1545

Loss on hold-out set: 0.008906056219869545
MeanAbsoluteError value on hold-out data: 0.06631741672754288
Epoch: 1546
Loss on hold-out set: 0.00842799776594499
MeanAbsoluteError value on hold-out data: 0.06628014147281647
Epoch: 1547

Loss on hold-out set: 0.009442984691413586
MeanAbsoluteError value on hold-out data: 0.06891615688800812
Epoch: 1548

Loss on hold-out set: 0.00811113397291289
MeanAbsoluteError value on hold-out data: 0.060538843274116516
Epoch: 1549
Loss on hold-out set: 0.009104374968471045
MeanAbsoluteError value on hold-out data: 0.06645972281694412
Epoch: 1550

Loss on hold-out set: 0.009134684860885802
MeanAbsoluteError value on hold-out data: 0.06666266918182373
Epoch: 1551
```

```
Loss on hold-out set: 0.008844542047590949
MeanAbsoluteError value on hold-out data: 0.0678412914276123
Epoch: 1552
Loss on hold-out set: 0.007905807382946174
MeanAbsoluteError value on hold-out data: 0.0625457614660263
Epoch: 1553

Loss on hold-out set: 0.00996154136043818
MeanAbsoluteError value on hold-out data: 0.0715404525399208
Epoch: 1554

Loss on hold-out set: 0.00889150752895451
MeanAbsoluteError value on hold-out data: 0.06385210901498795
Epoch: 1555
Loss on hold-out set: 0.010328435829336135
MeanAbsoluteError value on hold-out data: 0.07079603523015976
Epoch: 1556

Loss on hold-out set: 0.007731375761019687
MeanAbsoluteError value on hold-out data: 0.06499594449996948
Epoch: 1557

Loss on hold-out set: 0.009206598212137275
MeanAbsoluteError value on hold-out data: 0.06841696798801422
Epoch: 1558
Loss on hold-out set: 0.008035381179555164
MeanAbsoluteError value on hold-out data: 0.06541424244642258
Epoch: 1559

Loss on hold-out set: 0.009468799344229903
MeanAbsoluteError value on hold-out data: 0.06945297122001648
Epoch: 1560

Loss on hold-out set: 0.00801466701587742
MeanAbsoluteError value on hold-out data: 0.061562564224004745
Epoch: 1561
Loss on hold-out set: 0.009135005010052736
MeanAbsoluteError value on hold-out data: 0.067317895591259
Epoch: 1562
```

```
Loss on hold-out set: 0.009524264943223292
MeanAbsoluteError value on hold-out data: 0.06860677897930145
Epoch: 1563

Loss on hold-out set: 0.008434870432599079
MeanAbsoluteError value on hold-out data: 0.0658862441778183
Epoch: 1564
Loss on hold-out set: 0.008983775087156877
MeanAbsoluteError value on hold-out data: 0.06970664113759995
Epoch: 1565

Loss on hold-out set: 0.008550375138183882
MeanAbsoluteError value on hold-out data: 0.06575623899698257
Epoch: 1566

Loss on hold-out set: 0.00812022230355069
MeanAbsoluteError value on hold-out data: 0.06502456963062286
Epoch: 1567
Loss on hold-out set: 0.01062646059518253
MeanAbsoluteError value on hold-out data: 0.0707179605960846
Epoch: 1568

Loss on hold-out set: 0.007503626213425984
MeanAbsoluteError value on hold-out data: 0.060742612928152084
Epoch: 1569

Loss on hold-out set: 0.008093414951l2676
MeanAbsoluteError value on hold-out data: 0.0635593831539154
Epoch: 1570
Loss on hold-out set: 0.007708489866539215
MeanAbsoluteError value on hold-out data: 0.062291666865348816
Epoch: 1571

Loss on hold-out set: 0.008850175336071213
MeanAbsoluteError value on hold-out data: 0.06688192486763
Epoch: 1572

Loss on hold-out set: 0.009649615270285874
MeanAbsoluteError value on hold-out data: 0.06874042004346848
Epoch: 1573
```

```
Loss on hold-out set: 0.007515382975034299
MeanAbsoluteError value on hold-out data: 0.06345341354608536
Epoch: 1574

Loss on hold-out set: 0.008708447901196147
MeanAbsoluteError value on hold-out data: 0.06584059447050095
Epoch: 1575

Loss on hold-out set: 0.009683574636183039
MeanAbsoluteError value on hold-out data: 0.07016348093748093
Epoch: 1576
Loss on hold-out set: 0.008597150407246469
MeanAbsoluteError value on hold-out data: 0.06795293837785721
Epoch: 1577

Loss on hold-out set: 0.009850643553812311
MeanAbsoluteError value on hold-out data: 0.06984152644872665
Epoch: 1578

Loss on hold-out set: 0.008690916068978064
MeanAbsoluteError value on hold-out data: 0.068199522793293
Epoch: 1579
Loss on hold-out set: 0.0090862111322834
MeanAbsoluteError value on hold-out data: 0.06911426037549973
Epoch: 1580

Loss on hold-out set: 0.009754075882477386
MeanAbsoluteError value on hold-out data: 0.07053668051958084
Epoch: 1581

Loss on hold-out set: 0.008195871145532389
MeanAbsoluteError value on hold-out data: 0.06526172906160355
Epoch: 1582
Loss on hold-out set: 0.01014347805892612
MeanAbsoluteError value on hold-out data: 0.06877999007701874
Epoch: 1583

Loss on hold-out set: 0.008595175995709118
MeanAbsoluteError value on hold-out data: 0.06613890826702118
Epoch: 1584
```

```
Loss on hold-out set: 0.008276974200950159
MeanAbsoluteError value on hold-out data: 0.06422346085309982
Epoch: 1585
Loss on hold-out set: 0.008708782008422228
MeanAbsoluteError value on hold-out data: 0.06566876173019409
Epoch: 1586

Loss on hold-out set: 0.008646492494141664
MeanAbsoluteError value on hold-out data: 0.06717133522033691
Epoch: 1587

Loss on hold-out set: 0.00842394082986478
MeanAbsoluteError value on hold-out data: 0.06644277274608612
Epoch: 1588
Loss on hold-out set: 0.007931709281571482
MeanAbsoluteError value on hold-out data: 0.06619513779878616
Epoch: 1589

Loss on hold-out set: 0.008542095009906915
MeanAbsoluteError value on hold-out data: 0.06404415518045425
Epoch: 1590

Loss on hold-out set: 0.009102674665579494
MeanAbsoluteError value on hold-out data: 0.06659980863332748
Epoch: 1591
Loss on hold-out set: 0.008728789097246286
MeanAbsoluteError value on hold-out data: 0.06694886833429337
Epoch: 1592

Loss on hold-out set: 0.009720262969785835
MeanAbsoluteError value on hold-out data: 0.06822573393583298
Epoch: 1593

Loss on hold-out set: 0.008615891871013446
MeanAbsoluteError value on hold-out data: 0.0652318000793457
Epoch: 1594
Loss on hold-out set: 0.008581141375692217
MeanAbsoluteError value on hold-out data: 0.06528964638710022
Epoch: 1595
```

```
Loss on hold-out set: 0.008020253732623436
MeanAbsoluteError value on hold-out data: 0.06218317151069641
Epoch: 1596

Loss on hold-out set: 0.008594348337668029
MeanAbsoluteError value on hold-out data: 0.06474579870700836
Epoch: 1597
Loss on hold-out set: 0.008321628543065647
MeanAbsoluteError value on hold-out data: 0.06553219258785248
Epoch: 1598

Loss on hold-out set: 0.010326271231764016
MeanAbsoluteError value on hold-out data: 0.07099788635969162
Epoch: 1599

Loss on hold-out set: 0.008969845430868494
MeanAbsoluteError value on hold-out data: 0.06663668155670166
Epoch: 1600
Loss on hold-out set: 0.008119973787130827
MeanAbsoluteError value on hold-out data: 0.06475932151079178
Epoch: 1601

Loss on hold-out set: 0.008613192871125648
MeanAbsoluteError value on hold-out data: 0.06897170096635818
Epoch: 1602

Loss on hold-out set: 0.009125188078614883
MeanAbsoluteError value on hold-out data: 0.07096237689256668
Epoch: 1603
Loss on hold-out set: 0.008690139406577752
MeanAbsoluteError value on hold-out data: 0.06533991545438766
Epoch: 1604

Loss on hold-out set: 0.008573201746968
MeanAbsoluteError value on hold-out data: 0.06730927526950836
Epoch: 1605

Loss on hold-out set: 0.007795503738422364
MeanAbsoluteError value on hold-out data: 0.06269204616546631
Epoch: 1606
```

```
Loss on hold-out set: 0.008584218520300056
MeanAbsoluteError value on hold-out data: 0.06561292707920074
Epoch: 1607

Loss on hold-out set: 0.00792026305445082
MeanAbsoluteError value on hold-out data: 0.06427540630102158
Epoch: 1608

Loss on hold-out set: 0.0083793739645868
MeanAbsoluteError value on hold-out data: 0.06556174904108047
Epoch: 1609
Loss on hold-out set: 0.00881430796666488
MeanAbsoluteError value on hold-out data: 0.068758524954319
Epoch: 1610

Loss on hold-out set: 0.007954496189828813
MeanAbsoluteError value on hold-out data: 0.0648852288722992
Epoch: 1611

Loss on hold-out set: 0.008430413175228751
MeanAbsoluteError value on hold-out data: 0.06488311290740967
Epoch: 1612
Loss on hold-out set: 0.008855323886494565
MeanAbsoluteError value on hold-out data: 0.06611593812704086
Epoch: 1613

Loss on hold-out set: 0.00855599749442869
MeanAbsoluteError value on hold-out data: 0.06594781577587128
Epoch: 1614

Loss on hold-out set: 0.007943956902248223
MeanAbsoluteError value on hold-out data: 0.06609616428613663
Epoch: 1615
Loss on hold-out set: 0.007524692865560307
MeanAbsoluteError value on hold-out data: 0.06094708666205406
Epoch: 1616

Loss on hold-out set: 0.008004540719751579
MeanAbsoluteError value on hold-out data: 0.06359636038541794
Epoch: 1617
```

```
Loss on hold-out set: 0.00861310628320401
MeanAbsoluteError value on hold-out data: 0.06628071516752243
Epoch: 1618
Loss on hold-out set: 0.008097519283922642
MeanAbsoluteError value on hold-out data: 0.06305060535669327
Epoch: 1619

Loss on hold-out set: 0.0076203853532570065
MeanAbsoluteError value on hold-out data: 0.06198012828826904
Epoch: 1620

Loss on hold-out set: 0.007714468688864145
MeanAbsoluteError value on hold-out data: 0.06096365675330162
Epoch: 1621
Loss on hold-out set: 0.0074459682966577624
MeanAbsoluteError value on hold-out data: 0.061584461480379105
Epoch: 1622

Loss on hold-out set: 0.00841831878740777
MeanAbsoluteError value on hold-out data: 0.06454281508922577
Epoch: 1623

Loss on hold-out set: 0.008272382179626826
MeanAbsoluteError value on hold-out data: 0.06346271187067032
Epoch: 1624
Loss on hold-out set: 0.009110787704824664
MeanAbsoluteError value on hold-out data: 0.06882274150848389
Epoch: 1625

Loss on hold-out set: 0.008058926465074213
MeanAbsoluteError value on hold-out data: 0.06596768647432327
Epoch: 1626

Loss on hold-out set: 0.009118215949711158
MeanAbsoluteError value on hold-out data: 0.06885361671447754
Epoch: 1627
Loss on hold-out set: 0.00863402870845069
MeanAbsoluteError value on hold-out data: 0.06854302436113358
Epoch: 1628
```

```
Loss on hold-out set: 0.0073149648848630025
MeanAbsoluteError value on hold-out data: 0.06092769652605057
Epoch: 1629

Loss on hold-out set: 0.009034999137099172
MeanAbsoluteError value on hold-out data: 0.0691564753651619
Epoch: 1630
Loss on hold-out set: 0.007612098631198023
MeanAbsoluteError value on hold-out data: 0.06353012472391129
Epoch: 1631

Loss on hold-out set: 0.00811379527952037
MeanAbsoluteError value on hold-out data: 0.06230641156435013
Epoch: 1632

Loss on hold-out set: 0.008597435527481139
MeanAbsoluteError value on hold-out data: 0.06608078628778458
Epoch: 1633
Loss on hold-out set: 0.008983977202879032
MeanAbsoluteError value on hold-out data: 0.06862707436084747
Epoch: 1634

Loss on hold-out set: 0.007751523896337555
MeanAbsoluteError value on hold-out data: 0.06094666197896004
Epoch: 1635

Loss on hold-out set: 0.007006250245405757
MeanAbsoluteError value on hold-out data: 0.06073896959424019
Epoch: 1636
Loss on hold-out set: 0.008378022817438857
MeanAbsoluteError value on hold-out data: 0.06477528065443039
Epoch: 1637

Loss on hold-out set: 0.007957220848087067
MeanAbsoluteError value on hold-out data: 0.0650937557220459
Epoch: 1638

Loss on hold-out set: 0.008138109673503398
MeanAbsoluteError value on hold-out data: 0.0661090686917305
Epoch: 1639
```

```
Loss on hold-out set: 0.007391217614579849
MeanAbsoluteError value on hold-out data: 0.0623595304787159
Epoch: 1640

Loss on hold-out set: 0.008571529757255121
MeanAbsoluteError value on hold-out data: 0.0657058134675026
Epoch: 1641

Loss on hold-out set: 0.00876230598574087
MeanAbsoluteError value on hold-out data: 0.06660516560077667
Epoch: 1642
Loss on hold-out set: 0.008718787414172766
MeanAbsoluteError value on hold-out data: 0.06416051834821701
Epoch: 1643

Loss on hold-out set: 0.008619706068238885
MeanAbsoluteError value on hold-out data: 0.06428844481706619
Epoch: 1644

Loss on hold-out set: 0.0091173384723758
MeanAbsoluteError value on hold-out data: 0.06733822822570801
Epoch: 1645
Loss on hold-out set: 0.009716612414392405
MeanAbsoluteError value on hold-out data: 0.06874596327543259
Epoch: 1646

Loss on hold-out set: 0.008503779678339924
MeanAbsoluteError value on hold-out data: 0.06395415961742401
Epoch: 1647

Loss on hold-out set: 0.008612331847604461
MeanAbsoluteError value on hold-out data: 0.06475884467363358
Epoch: 1648
Loss on hold-out set: 0.010466551248731169
MeanAbsoluteError value on hold-out data: 0.07206196337938309
Epoch: 1649

Loss on hold-out set: 0.009529518751563349
MeanAbsoluteError value on hold-out data: 0.06896008551120758
Epoch: 1650
```

```
Loss on hold-out set: 0.008915916423544938
MeanAbsoluteError value on hold-out data: 0.06700672209262848
Epoch: 1651
Loss on hold-out set: 0.008296369045147002
MeanAbsoluteError value on hold-out data: 0.06433367729187012
Epoch: 1652

Loss on hold-out set: 0.008191798174872625
MeanAbsoluteError value on hold-out data: 0.06476234644651413
Epoch: 1653

Loss on hold-out set: 0.009226703448087695
MeanAbsoluteError value on hold-out data: 0.06872078031301498
Epoch: 1654
Loss on hold-out set: 0.007509155604827053
MeanAbsoluteError value on hold-out data: 0.06088245287537575
Epoch: 1655

Loss on hold-out set: 0.007983777760394635
MeanAbsoluteError value on hold-out data: 0.06269428879022598
Epoch: 1656

Loss on hold-out set: 0.009139452397818482
MeanAbsoluteError value on hold-out data: 0.06677339226007462
Epoch: 1657
Loss on hold-out set: 0.008162925199879585
MeanAbsoluteError value on hold-out data: 0.06393551826477051
Epoch: 1658

Loss on hold-out set: 0.008121202217783624
MeanAbsoluteError value on hold-out data: 0.06499995291233063
Epoch: 1659

Loss on hold-out set: 0.009714319161072732
MeanAbsoluteError value on hold-out data: 0.07029212266206741
Epoch: 1660
Loss on hold-out set: 0.009173402419680012
MeanAbsoluteError value on hold-out data: 0.06683089584112167
Epoch: 1661
```

```
Loss on hold-out set: 0.007549222130886241
MeanAbsoluteError value on hold-out data: 0.0610162727534771
Epoch: 1662

Loss on hold-out set: 0.008166246305700042
MeanAbsoluteError value on hold-out data: 0.06499747931957245
Early stopping at epoch 1661
Returned to Spot: Validation loss: 0.008166246305700042
----------------------------------------------

config: {'_L_in': 10, '_L_out': 1, 'l1': 16, 'dropout_prob': 0.1773189149831582, 'lr_mult': 9
Epoch: 1
Loss on hold-out set: 0.037980081072698034
MeanAbsoluteError value on hold-out data: 0.14980736374855042
Epoch: 2
Loss on hold-out set: 0.033456365431969365
MeanAbsoluteError value on hold-out data: 0.1449422389268875
Epoch: 3
Loss on hold-out set: 0.029346173585702975
MeanAbsoluteError value on hold-out data: 0.13307669758796692
Epoch: 4

Loss on hold-out set: 0.02195388051836441
MeanAbsoluteError value on hold-out data: 0.1183459460735321
Returned to Spot: Validation loss: 0.02195388051836441
----------------------------------------------

config: {'_L_in': 10, '_L_out': 1, 'l1': 32, 'dropout_prob': 0.3840970624671163, 'lr_mult': 4
Epoch: 1
Loss on hold-out set: 0.04162453455654414
MeanAbsoluteError value on hold-out data: 0.1621580421924591
Epoch: 2
Loss on hold-out set: 0.035018673362700564
MeanAbsoluteError value on hold-out data: 0.149415984749794
Epoch: 3
Loss on hold-out set: 0.03121924921134977
MeanAbsoluteError value on hold-out data: 0.13989323377609253
Epoch: 4

Loss on hold-out set: 0.025053968524413283
MeanAbsoluteError value on hold-out data: 0.1242491751909256
Epoch: 5
```

```
Loss on hold-out set: 0.01978819226650031
MeanAbsoluteError value on hold-out data: 0.10915625095367432
Epoch: 6
Loss on hold-out set: 0.020709060451113863
MeanAbsoluteError value on hold-out data: 0.11373443901538849
Epoch: 7
Loss on hold-out set: 0.015776645196111577
MeanAbsoluteError value on hold-out data: 0.10051628947257996
Epoch: 8
Loss on hold-out set: 0.01588355981450724
MeanAbsoluteError value on hold-out data: 0.09919997304677963
Epoch: 9
Loss on hold-out set: 0.01561054844090617
MeanAbsoluteError value on hold-out data: 0.09854402393102646
Epoch: 10
Loss on hold-out set: 0.013730227077183755
MeanAbsoluteError value on hold-out data: 0.09438498318195343
Epoch: 11

Loss on hold-out set: 0.01368838706740031
MeanAbsoluteError value on hold-out data: 0.09157217293977737
Epoch: 12
Loss on hold-out set: 0.010764725316364906
MeanAbsoluteError value on hold-out data: 0.08133082836866379
Epoch: 13
Loss on hold-out set: 0.010921864313882236
MeanAbsoluteError value on hold-out data: 0.08376362174749374
Epoch: 14
Loss on hold-out set: 0.010189914610236883
MeanAbsoluteError value on hold-out data: 0.07704208046197891
Epoch: 15

Loss on hold-out set: 0.010173072290949915
MeanAbsoluteError value on hold-out data: 0.07945419102907181
Epoch: 16
Loss on hold-out set: 0.011005734062851652
MeanAbsoluteError value on hold-out data: 0.08307905495166779
Epoch: 17
Loss on hold-out set: 0.008952430032781865
MeanAbsoluteError value on hold-out data: 0.07075503468513489
Epoch: 18
Loss on hold-out set: 0.00752502022690973
```

```
MeanAbsoluteError value on hold-out data: 0.06591420620679855
Epoch: 19
Loss on hold-out set: 0.0064794213394634426
MeanAbsoluteError value on hold-out data: 0.06309743225574493
Epoch: 20
Loss on hold-out set: 0.010541690277597425
MeanAbsoluteError value on hold-out data: 0.08053340762853622
Epoch: 21
Loss on hold-out set: 0.007285823374619021
MeanAbsoluteError value on hold-out data: 0.06426334381103516
Epoch: 22

Loss on hold-out set: 0.006909822858257317
MeanAbsoluteError value on hold-out data: 0.06106838956475258
Epoch: 23
Loss on hold-out set: 0.006802089425036684
MeanAbsoluteError value on hold-out data: 0.06287111341953278
Epoch: 24
Loss on hold-out set: 0.005960919526650717
MeanAbsoluteError value on hold-out data: 0.05859346315264702
Epoch: 25
Loss on hold-out set: 0.00592019882261459
MeanAbsoluteError value on hold-out data: 0.05890427157282829
Epoch: 26

Loss on hold-out set: 0.008436798834928164
MeanAbsoluteError value on hold-out data: 0.07215841114521027
Epoch: 27
Loss on hold-out set: 0.005576905662708573
MeanAbsoluteError value on hold-out data: 0.057693734765052795
Epoch: 28
Loss on hold-out set: 0.006834802683442831
MeanAbsoluteError value on hold-out data: 0.06245024502277374
Epoch: 29
Loss on hold-out set: 0.005399142382789011
MeanAbsoluteError value on hold-out data: 0.05601237714290619
Epoch: 30
Loss on hold-out set: 0.005615789985504786
MeanAbsoluteError value on hold-out data: 0.05531039088964462
Epoch: 31
Loss on hold-out set: 0.005043520743799347
MeanAbsoluteError value on hold-out data: 0.05278076231479645
```

```
Epoch: 32
Loss on hold-out set: 0.006363150234775324
MeanAbsoluteError value on hold-out data: 0.05785243213176727
Epoch: 33

Loss on hold-out set: 0.010093631207526318
MeanAbsoluteError value on hold-out data: 0.08412832021713257
Epoch: 34
Loss on hold-out set: 0.0052631969110255965
MeanAbsoluteError value on hold-out data: 0.0519043505191803
Epoch: 35
Loss on hold-out set: 0.004925179056284067
MeanAbsoluteError value on hold-out data: 0.05175652727484703
Epoch: 36
Loss on hold-out set: 0.0044646514457111295
MeanAbsoluteError value on hold-out data: 0.04853332042694092
Epoch: 37

Loss on hold-out set: 0.00450119595686709
MeanAbsoluteError value on hold-out data: 0.05128214880824089
Epoch: 38
Loss on hold-out set: 0.00507236968137716
MeanAbsoluteError value on hold-out data: 0.051961373537778854
Epoch: 39
Loss on hold-out set: 0.0053525119820781245
MeanAbsoluteError value on hold-out data: 0.05244479700922966
Epoch: 40
Loss on hold-out set: 0.005357589224953891
MeanAbsoluteError value on hold-out data: 0.05266338214278221
Epoch: 41
Loss on hold-out set: 0.007596486885296671
MeanAbsoluteError value on hold-out data: 0.0687146857380867
Epoch: 42
Loss on hold-out set: 0.0068069644897293885
MeanAbsoluteError value on hold-out data: 0.06032136455178261
Epoch: 43
Loss on hold-out set: 0.004082611241181822
MeanAbsoluteError value on hold-out data: 0.04707639291882515
Epoch: 44

Loss on hold-out set: 0.00885754126647953
MeanAbsoluteError value on hold-out data: 0.07074636220932007
```

```
Epoch: 45
Loss on hold-out set: 0.006079267768654972
MeanAbsoluteError value on hold-out data: 0.05501888319849968
Epoch: 46
Loss on hold-out set: 0.004224614190446262
MeanAbsoluteError value on hold-out data: 0.04825146496295929
Epoch: 47
Loss on hold-out set: 0.006316694222684754
MeanAbsoluteError value on hold-out data: 0.06084904819726944
Epoch: 48

Loss on hold-out set: 0.005189537891725961
MeanAbsoluteError value on hold-out data: 0.05239006131887436
Epoch: 49
Loss on hold-out set: 0.004999604622992736
MeanAbsoluteError value on hold-out data: 0.05193613842129707
Epoch: 50
Loss on hold-out set: 0.00456985471751786
MeanAbsoluteError value on hold-out data: 0.04960229992866516
Epoch: 51
Loss on hold-out set: 0.004852697875130137
MeanAbsoluteError value on hold-out data: 0.053340811282396317
Epoch: 52
Loss on hold-out set: 0.00560013609815781
MeanAbsoluteError value on hold-out data: 0.05734066665172577
Epoch: 53
Loss on hold-out set: 0.005491570762579182
MeanAbsoluteError value on hold-out data: 0.056136295199394226
Epoch: 54
Loss on hold-out set: 0.00451132889506162
MeanAbsoluteError value on hold-out data: 0.050318438559770584
Epoch: 55

Loss on hold-out set: 0.006183521338052263
MeanAbsoluteError value on hold-out data: 0.06291820108890533
Epoch: 56
Loss on hold-out set: 0.0038890015873077667
MeanAbsoluteError value on hold-out data: 0.046061232686042786
Epoch: 57
Loss on hold-out set: 0.005370511020852351
MeanAbsoluteError value on hold-out data: 0.056984953582286835
Epoch: 58
```

```
Loss on hold-out set: 0.004950609550992101
MeanAbsoluteError value on hold-out data: 0.04955887049436569
Epoch: 59

Loss on hold-out set: 0.00441817105380132
MeanAbsoluteError value on hold-out data: 0.054134026169776917
Epoch: 60
Loss on hold-out set: 0.004418885226569776
MeanAbsoluteError value on hold-out data: 0.04879685863852501
Epoch: 61
Loss on hold-out set: 0.0034427086402980707
MeanAbsoluteError value on hold-out data: 0.04365408793091774
Epoch: 62
Loss on hold-out set: 0.006342073988267465
MeanAbsoluteError value on hold-out data: 0.05707966536283493
Epoch: 63
Loss on hold-out set: 0.0041007586681333025
MeanAbsoluteError value on hold-out data: 0.0493709072470665
Epoch: 64
Loss on hold-out set: 0.004514962868262573
MeanAbsoluteError value on hold-out data: 0.048593949526548386
Epoch: 65
Loss on hold-out set: 0.0037854550081599307
MeanAbsoluteError value on hold-out data: 0.04685895889997482
Epoch: 66

Loss on hold-out set: 0.0060458032101833896
MeanAbsoluteError value on hold-out data: 0.05811258777976036
Epoch: 67
Loss on hold-out set: 0.006541760080788089
MeanAbsoluteError value on hold-out data: 0.06647490710020065
Epoch: 68
Loss on hold-out set: 0.0046721008777814476
MeanAbsoluteError value on hold-out data: 0.04951627552509308
Epoch: 69
Loss on hold-out set: 0.004138615827143535
MeanAbsoluteError value on hold-out data: 0.04554885998368263
Epoch: 70

Loss on hold-out set: 0.00467230294873987
MeanAbsoluteError value on hold-out data: 0.05192362889647484
Epoch: 71
```

```
Loss on hold-out set: 0.004695936654522819
MeanAbsoluteError value on hold-out data: 0.049896735697984695
Epoch: 72
Loss on hold-out set: 0.004578164616281069
MeanAbsoluteError value on hold-out data: 0.051998961716890335
Epoch: 73
Loss on hold-out set: 0.005236037034161487
MeanAbsoluteError value on hold-out data: 0.049841925501823425
Epoch: 74
Loss on hold-out set: 0.0053626795017503595
MeanAbsoluteError value on hold-out data: 0.057276345789432526
Epoch: 75
Loss on hold-out set: 0.004548724239851397
MeanAbsoluteError value on hold-out data: 0.04672649875283241
Epoch: 76
Loss on hold-out set: 0.0039512644227790205
MeanAbsoluteError value on hold-out data: 0.04287705570459366
Epoch: 77

Loss on hold-out set: 0.0037318268043332195
MeanAbsoluteError value on hold-out data: 0.044127654284238815
Epoch: 78
Loss on hold-out set: 0.004221019482142047
MeanAbsoluteError value on hold-out data: 0.04415994510054588
Epoch: 79
Loss on hold-out set: 0.00441224551698389
MeanAbsoluteError value on hold-out data: 0.04898590222001076
Epoch: 80
Loss on hold-out set: 0.004506376250279381
MeanAbsoluteError value on hold-out data: 0.051300644874572754
Epoch: 81

Loss on hold-out set: 0.004792862694318357
MeanAbsoluteError value on hold-out data: 0.051982685923576355
Epoch: 82
Loss on hold-out set: 0.003897931132661669
MeanAbsoluteError value on hold-out data: 0.045958299189805984
Epoch: 83
Loss on hold-out set: 0.005051184316950017
MeanAbsoluteError value on hold-out data: 0.05377531796693802
Epoch: 84
Loss on hold-out set: 0.004323222807618155
```

```
MeanAbsoluteError value on hold-out data: 0.04719084873795509
Epoch: 85
Loss on hold-out set: 0.0046568100224249065
MeanAbsoluteError value on hold-out data: 0.05041047930717468
Epoch: 86
Loss on hold-out set: 0.003801253750632321
MeanAbsoluteError value on hold-out data: 0.045934367924928665
Epoch: 87
Loss on hold-out set: 0.0068078346146074565
MeanAbsoluteError value on hold-out data: 0.06836696714162827
Epoch: 88

Loss on hold-out set: 0.004485277288997742
MeanAbsoluteError value on hold-out data: 0.04587513580918312
Epoch: 89
Loss on hold-out set: 0.004523134124036388
MeanAbsoluteError value on hold-out data: 0.04971607029438019
Epoch: 90
Loss on hold-out set: 0.004855781605185352
MeanAbsoluteError value on hold-out data: 0.05330764874815941
Epoch: 91
Loss on hold-out set: 0.0055569643553003275
MeanAbsoluteError value on hold-out data: 0.06167551502585411
Epoch: 92

Loss on hold-out set: 0.0035938942225919547
MeanAbsoluteError value on hold-out data: 0.04282427206635475
Epoch: 93
Loss on hold-out set: 0.005053822877878127
MeanAbsoluteError value on hold-out data: 0.052478816360235214
Epoch: 94
Loss on hold-out set: 0.004098142092851431
MeanAbsoluteError value on hold-out data: 0.05008871853351593
Epoch: 95
Loss on hold-out set: 0.0035454202029780533
MeanAbsoluteError value on hold-out data: 0.0414377897977829
Epoch: 96
Loss on hold-out set: 0.004918291700673045
MeanAbsoluteError value on hold-out data: 0.052780881524086
Epoch: 97
Loss on hold-out set: 0.004319863486575502
MeanAbsoluteError value on hold-out data: 0.045387811958789825
```

```
Epoch: 98
Loss on hold-out set: 0.004043505413727344
MeanAbsoluteError value on hold-out data: 0.04845498874783516
Epoch: 99

Loss on hold-out set: 0.004383438833572559
MeanAbsoluteError value on hold-out data: 0.049323346465826035
Epoch: 100
Loss on hold-out set: 0.0037150945450105752
MeanAbsoluteError value on hold-out data: 0.04562315717339516
Epoch: 101
Loss on hold-out set: 0.004393010319051284
MeanAbsoluteError value on hold-out data: 0.048016998916864395
Epoch: 102
Loss on hold-out set: 0.005752844766615645
MeanAbsoluteError value on hold-out data: 0.059303492307662964
Epoch: 103

Loss on hold-out set: 0.004510322556598112
MeanAbsoluteError value on hold-out data: 0.051399312913417816
Epoch: 104
Loss on hold-out set: 0.004534027123315211
MeanAbsoluteError value on hold-out data: 0.049497153609991074
Epoch: 105
Loss on hold-out set: 0.004507547991172606
MeanAbsoluteError value on hold-out data: 0.04648447409272194
Epoch: 106
Loss on hold-out set: 0.005203757300286701
MeanAbsoluteError value on hold-out data: 0.05310072377324104
Epoch: 107
Loss on hold-out set: 0.007250062588259186
MeanAbsoluteError value on hold-out data: 0.06252643465995789
Epoch: 108
Loss on hold-out set: 0.00809272976690217
MeanAbsoluteError value on hold-out data: 0.07497774809598923
Epoch: 109
Loss on hold-out set: 0.004850094562004271
MeanAbsoluteError value on hold-out data: 0.053726036101579666
Epoch: 110

Loss on hold-out set: 0.005006513575177738
MeanAbsoluteError value on hold-out data: 0.05028870701789856
```

```
Epoch: 111
Loss on hold-out set: 0.006866890953939506
MeanAbsoluteError value on hold-out data: 0.059415169060230255
Epoch: 112
Loss on hold-out set: 0.005253392908918231
MeanAbsoluteError value on hold-out data: 0.05804413929581642
Epoch: 113
Loss on hold-out set: 0.004495626539114471
MeanAbsoluteError value on hold-out data: 0.05016205459833145
Epoch: 114

Loss on hold-out set: 0.004156586329611999
MeanAbsoluteError value on hold-out data: 0.046760231256484985
Epoch: 115
Loss on hold-out set: 0.003577977314738459
MeanAbsoluteError value on hold-out data: 0.04444446042180061
Epoch: 116
Loss on hold-out set: 0.004107583611345801
MeanAbsoluteError value on hold-out data: 0.04792773723602295
Epoch: 117
Loss on hold-out set: 0.006358955490500911
MeanAbsoluteError value on hold-out data: 0.05954081937670708
Epoch: 118
Loss on hold-out set: 0.004804749492139213
MeanAbsoluteError value on hold-out data: 0.049203235656023026
Epoch: 119
Loss on hold-out set: 0.005739191827352012
MeanAbsoluteError value on hold-out data: 0.05543980747461319
Epoch: 120
Loss on hold-out set: 0.0037901917561325
MeanAbsoluteError value on hold-out data: 0.04426347464323044
Epoch: 121

Loss on hold-out set: 0.006254277455522434
MeanAbsoluteError value on hold-out data: 0.05909217894077301
Epoch: 122
Loss on hold-out set: 0.005746191704498702
MeanAbsoluteError value on hold-out data: 0.06100107729434967
Epoch: 123
Loss on hold-out set: 0.005617485461315434
MeanAbsoluteError value on hold-out data: 0.05874168500304222
Epoch: 124
```

```
Loss on hold-out set: 0.0052841324834030515
MeanAbsoluteError value on hold-out data: 0.05052933841943741
Epoch: 125

Loss on hold-out set: 0.004903351747136759
MeanAbsoluteError value on hold-out data: 0.047466158866882324
Early stopping at epoch 124
Returned to Spot: Validation loss: 0.004903351747136759
----------------------------------------------


config: {'_L_in': 10, '_L_out': 1, 'l1': 16, 'dropout_prob': 0.0026741299605018143, 'lr_mult


Epoch: 1
Loss on hold-out set: 0.027073639628820513
MeanAbsoluteError value on hold-out data: 0.13038764894008636
Epoch: 2
Loss on hold-out set: 0.025001559633222457
MeanAbsoluteError value on hold-out data: 0.12594066560268402
Epoch: 3
Loss on hold-out set: 0.018851742748857328
MeanAbsoluteError value on hold-out data: 0.10939624905586243
Epoch: 4
Loss on hold-out set: 0.012313775273995768
MeanAbsoluteError value on hold-out data: 0.0877893716096878
Epoch: 5
Loss on hold-out set: 0.007860597094373875
MeanAbsoluteError value on hold-out data: 0.06969592720270157
Epoch: 6
Loss on hold-out set: 0.003293935009615349
MeanAbsoluteError value on hold-out data: 0.04456436634063721
Epoch: 7
Loss on hold-out set: 0.0014028342120582238
MeanAbsoluteError value on hold-out data: 0.02726331725716591
Epoch: 8
Loss on hold-out set: 0.0010515891762655596
MeanAbsoluteError value on hold-out data: 0.01636393368244171
Epoch: 9
Loss on hold-out set: 0.0015143175759907248
MeanAbsoluteError value on hold-out data: 0.0185539573431015
Epoch: 10
```

```
Loss on hold-out set: 0.00022691024278892176
MeanAbsoluteError value on hold-out data: 0.006271648220717907
Epoch: 11


Loss on hold-out set: 0.0009629185967577015
MeanAbsoluteError value on hold-out data: 0.009045231156051159
Epoch: 12
Loss on hold-out set: 0.0007086533667844426
MeanAbsoluteError value on hold-out data: 0.016981052234768867
Epoch: 13
Loss on hold-out set: 0.000911569090117394
MeanAbsoluteError value on hold-out data: 0.016390126198530197
Epoch: 14
Loss on hold-out set: 0.0008783506176481943
MeanAbsoluteError value on hold-out data: 0.008729344233870506
Epoch: 15
Loss on hold-out set: 0.0007623853973774729
MeanAbsoluteError value on hold-out data: 0.01595020852982998
Epoch: 16
Loss on hold-out set: 0.0007405534176876628
MeanAbsoluteError value on hold-out data: 0.008716092444956303
Epoch: 17
Loss on hold-out set: 0.0012205813966973341
MeanAbsoluteError value on hold-out data: 0.02090904675424099
Epoch: 18
Loss on hold-out set: 0.0012974171555757302
MeanAbsoluteError value on hold-out data: 0.01792791858315468
Epoch: 19
Loss on hold-out set: 0.0021582138877803167
MeanAbsoluteError value on hold-out data: 0.04150253161787987
Epoch: 20
Loss on hold-out set: 0.00012906041047244798
MeanAbsoluteError value on hold-out data: 0.00654885359108448
Epoch: 21
Loss on hold-out set: 0.0007297511709973486
MeanAbsoluteError value on hold-out data: 0.012385338544845581
Epoch: 22
Loss on hold-out set: 0.0011523211810048164
MeanAbsoluteError value on hold-out data: 0.0091975387185812
Epoch: 23


Loss on hold-out set: 0.001767288758664539
```

```
MeanAbsoluteError value on hold-out data: 0.03809070587158203
Epoch: 24
Loss on hold-out set: 0.0003127608282332068
MeanAbsoluteError value on hold-out data: 0.004917656071484089
Epoch: 25
Loss on hold-out set: 0.00016161178797047845
MeanAbsoluteError value on hold-out data: 0.005298626609146595
Epoch: 26
Loss on hold-out set: 0.0008600990120995496
MeanAbsoluteError value on hold-out data: 0.022320950403809547
Epoch: 27
Loss on hold-out set: 0.0008508825648229839
MeanAbsoluteError value on hold-out data: 0.01538821030408144
Epoch: 28
Loss on hold-out set: 0.004340981206807651
MeanAbsoluteError value on hold-out data: 0.06349953263998032
Epoch: 29
Loss on hold-out set: 0.0007783378030006517
MeanAbsoluteError value on hold-out data: 0.01130770705640316
Epoch: 30
Loss on hold-out set: 0.0004274049169907812
MeanAbsoluteError value on hold-out data: 0.013579413294792175
Epoch: 31
Loss on hold-out set: 0.0002709011945338908
MeanAbsoluteError value on hold-out data: 0.005455156788229942
Epoch: 32
Loss on hold-out set: 0.00034972180813048527
MeanAbsoluteError value on hold-out data: 0.016514301300048828
Epoch: 33
Loss on hold-out set: 0.0009971942661075829
MeanAbsoluteError value on hold-out data: 0.016256187111139297
Epoch: 34
Loss on hold-out set: 0.0004340300928513323
MeanAbsoluteError value on hold-out data: 0.015587646514177322
Epoch: 35

Loss on hold-out set: 0.000498857881235668
MeanAbsoluteError value on hold-out data: 0.00969236996024847
Epoch: 36
Loss on hold-out set: 0.0008936673465493522
MeanAbsoluteError value on hold-out data: 0.010035977698862553
Epoch: 37
```

```
Loss on hold-out set: 0.0005274116447178825
MeanAbsoluteError value on hold-out data: 0.005229143891483545
Epoch: 38
Loss on hold-out set: 0.0007322044502870995
MeanAbsoluteError value on hold-out data: 0.01496453769505024
Epoch: 39
Loss on hold-out set: 0.00027508080998622493
MeanAbsoluteError value on hold-out data: 0.010171963833272457
Epoch: 40
Loss on hold-out set: 0.0004496648534289929
MeanAbsoluteError value on hold-out data: 0.015166025608778
Epoch: 41
Loss on hold-out set: 0.00048826724215407584
MeanAbsoluteError value on hold-out data: 0.011897427029907703
Epoch: 42
Loss on hold-out set: 0.00086313321432834
MeanAbsoluteError value on hold-out data: 0.0214308500289917
Epoch: 43
Loss on hold-out set: 0.00027137798084415598
MeanAbsoluteError value on hold-out data: 0.005552045535296202
Epoch: 44
Loss on hold-out set: 0.0005601563637978152
MeanAbsoluteError value on hold-out data: 0.019145090132951736
Epoch: 45
Loss on hold-out set: 0.0008476115089203967
MeanAbsoluteError value on hold-out data: 0.024378033354878426
Epoch: 46
Loss on hold-out set: 0.000363765247464854
MeanAbsoluteError value on hold-out data: 0.012644898146390915
Epoch: 47

Loss on hold-out set: 0.0003852359202842069
MeanAbsoluteError value on hold-out data: 0.008950951509177685
Epoch: 48
Loss on hold-out set: 0.0007173094723647841
MeanAbsoluteError value on hold-out data: 0.015278703533113003
Epoch: 49
Loss on hold-out set: 0.0004433615171077882
MeanAbsoluteError value on hold-out data: 0.011121589690446854
Epoch: 50
Loss on hold-out set: 0.0003310824402696629
MeanAbsoluteError value on hold-out data: 0.005454087629914284
```

```
Epoch: 51
Loss on hold-out set: 0.000871318039380161
MeanAbsoluteError value on hold-out data: 0.021547097712755203
Epoch: 52
Loss on hold-out set: 0.00036463893066914014
MeanAbsoluteError value on hold-out data: 0.008290141820907593
Epoch: 53
Loss on hold-out set: 0.0005900821920237688
MeanAbsoluteError value on hold-out data: 0.012272006832063198
Epoch: 54
Loss on hold-out set: 0.0006893862162925009
MeanAbsoluteError value on hold-out data: 0.02043706737458706
Epoch: 55
Loss on hold-out set: 0.0006670597753040248
MeanAbsoluteError value on hold-out data: 0.019175734370946884
Epoch: 56
Loss on hold-out set: 0.0006042370729645834
MeanAbsoluteError value on hold-out data: 0.009713546372950077
Epoch: 57
Loss on hold-out set: 0.0008444877810114505
MeanAbsoluteError value on hold-out data: 0.025195276364684105
Epoch: 58
Loss on hold-out set: 0.0004005993783051197
MeanAbsoluteError value on hold-out data: 0.013970044441521168
Epoch: 59

Loss on hold-out set: 0.0002907314317446052
MeanAbsoluteError value on hold-out data: 0.007925877347588539
Epoch: 60
Loss on hold-out set: 0.0005619130235189866
MeanAbsoluteError value on hold-out data: 0.015635550022125244
Epoch: 61
Loss on hold-out set: 0.000507578064666871
MeanAbsoluteError value on hold-out data: 0.009267096407711506
Epoch: 62
Loss on hold-out set: 0.0007842741790802009
MeanAbsoluteError value on hold-out data: 0.012113060802221298
Epoch: 63
Loss on hold-out set: 0.0002446198957745525
MeanAbsoluteError value on hold-out data: 0.00889498833566904
Epoch: 64
Loss on hold-out set: 0.0003425527727717724
```

```
MeanAbsoluteError value on hold-out data: 0.00825140904635191
Epoch: 65
Loss on hold-out set: 0.00020064497137259183
MeanAbsoluteError value on hold-out data: 0.007175350096076727
Epoch: 66
Loss on hold-out set: 0.0006210269924562645
MeanAbsoluteError value on hold-out data: 0.014909418299794197
Epoch: 67
Loss on hold-out set: 0.00028583560238434744
MeanAbsoluteError value on hold-out data: 0.006871865596622229
Epoch: 68
Loss on hold-out set: 0.00028875911790524506
MeanAbsoluteError value on hold-out data: 0.008154015988111496
Epoch: 69
Loss on hold-out set: 0.000249132163593171
MeanAbsoluteError value on hold-out data: 0.007751425262540579
Epoch: 70
Loss on hold-out set: 0.0019354122739873435
MeanAbsoluteError value on hold-out data: 0.042603395879268646
Epoch: 71

Loss on hold-out set: 0.0015084912041569815
MeanAbsoluteError value on hold-out data: 0.030015496537089348
Epoch: 72
Loss on hold-out set: 0.0010817430474593206
MeanAbsoluteError value on hold-out data: 0.01875687949359417
Epoch: 73
Loss on hold-out set: 0.0005423903011863953
MeanAbsoluteError value on hold-out data: 0.016571374610066414
Epoch: 74
Loss on hold-out set: 0.0005969935642904028
MeanAbsoluteError value on hold-out data: 0.008386338129639626
Epoch: 75
Loss on hold-out set: 0.00014616196924515336
MeanAbsoluteError value on hold-out data: 0.006290313322097063
Epoch: 76
Loss on hold-out set: 0.0007886390538404061
MeanAbsoluteError value on hold-out data: 0.009773983620107174
Epoch: 77
Loss on hold-out set: 0.0001110785480740991
MeanAbsoluteError value on hold-out data: 0.004739802796393633
Epoch: 78
```

```
Loss on hold-out set: 0.00021593686662862112
MeanAbsoluteError value on hold-out data: 0.007327436003834009
Epoch: 79
Loss on hold-out set: 0.0004394476709661065
MeanAbsoluteError value on hold-out data: 0.00753259751945734
Epoch: 80
Loss on hold-out set: 0.0006790951221390921
MeanAbsoluteError value on hold-out data: 0.0164109505712986
Epoch: 81
Loss on hold-out set: 0.0002799484672753974
MeanAbsoluteError value on hold-out data: 0.012071667239069939
Epoch: 82
Loss on hold-out set: 0.000319258305293452
MeanAbsoluteError value on hold-out data: 0.0064353980123996735
Epoch: 83

Loss on hold-out set: 0.00040904917032572773
MeanAbsoluteError value on hold-out data: 0.009127291850745678
Epoch: 84
Loss on hold-out set: 0.000184596820717113
MeanAbsoluteError value on hold-out data: 0.005014317110180855
Epoch: 85
Loss on hold-out set: 0.00026916443264206845
MeanAbsoluteError value on hold-out data: 0.010320853441953659
Epoch: 86
Loss on hold-out set: 0.0006207951440668886
MeanAbsoluteError value on hold-out data: 0.013814683072268963
Epoch: 87
Loss on hold-out set: 0.00020493457424508002
MeanAbsoluteError value on hold-out data: 0.007599215488880873
Epoch: 88
Loss on hold-out set: 0.0005081083452655309
MeanAbsoluteError value on hold-out data: 0.010914373211562634
Epoch: 89
Loss on hold-out set: 0.00019751337362992528
MeanAbsoluteError value on hold-out data: 0.008965713903307915
Epoch: 90
Loss on hold-out set: 0.0002291241552436412
MeanAbsoluteError value on hold-out data: 0.008848637342453003
Epoch: 91
Loss on hold-out set: 0.00020608282412276342
MeanAbsoluteError value on hold-out data: 0.006805697456002235
```

```
Epoch: 92
Loss on hold-out set: 0.0006091856470639437
MeanAbsoluteError value on hold-out data: 0.011200972832739353
Epoch: 93
Loss on hold-out set: 0.0005077291973161904
MeanAbsoluteError value on hold-out data: 0.016170954331755638
Epoch: 94

Loss on hold-out set: 0.00013140503515866216
MeanAbsoluteError value on hold-out data: 0.008497148752212524
Epoch: 95
Loss on hold-out set: 0.0006745719062899681
MeanAbsoluteError value on hold-out data: 0.021264152601361275
Epoch: 96
Loss on hold-out set: 0.0004047933504663984
MeanAbsoluteError value on hold-out data: 0.010834556072950363
Epoch: 97
Loss on hold-out set: 0.00048023158739708477
MeanAbsoluteError value on hold-out data: 0.008261611685156822
Epoch: 98
Loss on hold-out set: 9.528292357093673e-05
MeanAbsoluteError value on hold-out data: 0.0040877023711800575
Epoch: 99
Loss on hold-out set: 0.0006487046657160757
MeanAbsoluteError value on hold-out data: 0.017283890396356583
Epoch: 100
Loss on hold-out set: 0.00030992921021702626
MeanAbsoluteError value on hold-out data: 0.012321648187935352
Epoch: 101
Loss on hold-out set: 0.00040505245353989795
MeanAbsoluteError value on hold-out data: 0.016162384301424026
Epoch: 102
Loss on hold-out set: 0.00023625020015204332
MeanAbsoluteError value on hold-out data: 0.005790609400719404
Epoch: 103
Loss on hold-out set: 0.00030678643279794703
MeanAbsoluteError value on hold-out data: 0.009568986482918262
Epoch: 104
Loss on hold-out set: 0.0006284262697016331
MeanAbsoluteError value on hold-out data: 0.022010939195752144
Epoch: 105

Loss on hold-out set: 0.0006310377652162538
```

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MeanAbsoluteError value on hold-out data: 0.020101509988307953
Epoch: 106
Loss on hold-out set: 0.00025301157958031243
MeanAbsoluteError value on hold-out data: 0.008674909360706806
Epoch: 107
Loss on hold-out set: 8.219840237631472e-05
MeanAbsoluteError value on hold-out data: 0.0035286354832351208
Epoch: 108
Loss on hold-out set: 0.0002410692351603709
MeanAbsoluteError value on hold-out data: 0.010686726309359074
Epoch: 109
Loss on hold-out set: 0.00038236612128553373
MeanAbsoluteError value on hold-out data: 0.008875814266502857
Epoch: 110
Loss on hold-out set: 0.00028199693906572065
MeanAbsoluteError value on hold-out data: 0.005372038576751947
Epoch: 111
Loss on hold-out set: 0.00026039909243991133
MeanAbsoluteError value on hold-out data: 0.01064638327807188
Epoch: 112
Loss on hold-out set: 0.00019258354577208307
MeanAbsoluteError value on hold-out data: 0.007939090952277184
Epoch: 113
Loss on hold-out set: 0.0004948712369361218
MeanAbsoluteError value on hold-out data: 0.012139922939240932
Epoch: 114
Loss on hold-out set: 0.00032353152422920654
MeanAbsoluteError value on hold-out data: 0.014818751253187656
Epoch: 115
Loss on hold-out set: 0.0002546273729086878
MeanAbsoluteError value on hold-out data: 0.010059894062578678
Epoch: 116
Loss on hold-out set: 0.00016680068431110397
MeanAbsoluteError value on hold-out data: 0.007713356055319309
Epoch: 117

Loss on hold-out set: 0.0002334273545952065
MeanAbsoluteError value on hold-out data: 0.005120013374835253
Epoch: 118
Loss on hold-out set: 0.00025598648397518495
MeanAbsoluteError value on hold-out data: 0.009466566145420074
Epoch: 119
```

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Loss on hold-out set: 0.00010749437186811854
MeanAbsoluteError value on hold-out data: 0.007921264506876469
Epoch: 120
Loss on hold-out set: 0.00027273601469795193
MeanAbsoluteError value on hold-out data: 0.010937484912574291
Epoch: 121
Loss on hold-out set: 0.00030065884105792256
MeanAbsoluteError value on hold-out data: 0.008230084553360939
Epoch: 122
Loss on hold-out set: 0.00053542144336174
MeanAbsoluteError value on hold-out data: 0.018607642501592636
Epoch: 123
Loss on hold-out set: 0.00032675890696210494
MeanAbsoluteError value on hold-out data: 0.00999732781201601
Epoch: 124
Loss on hold-out set: 0.00019142567491240028
MeanAbsoluteError value on hold-out data: 0.0086003253236413
Epoch: 125
Loss on hold-out set: 0.00022531149519828002
MeanAbsoluteError value on hold-out data: 0.010862812399864197
Epoch: 126
Loss on hold-out set: 0.0003272934230297228
MeanAbsoluteError value on hold-out data: 0.01067075040191412
Epoch: 127
Loss on hold-out set: 0.00021402562444899033
MeanAbsoluteError value on hold-out data: 0.007387653924524784
Epoch: 128
Loss on hold-out set: 0.00029928805377877374
MeanAbsoluteError value on hold-out data: 0.007860359735786915
Epoch: 129

Loss on hold-out set: 0.0003124204267805908
MeanAbsoluteError value on hold-out data: 0.007199163548648357
Epoch: 130
Loss on hold-out set: 0.0003881136634797593
MeanAbsoluteError value on hold-out data: 0.013659954071044922
Epoch: 131
Loss on hold-out set: 0.0002118570036815838
MeanAbsoluteError value on hold-out data: 0.005953890271484852
Epoch: 132
Loss on hold-out set: 0.0002632729618581882
MeanAbsoluteError value on hold-out data: 0.010265099816024303
```

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Epoch: 133
Loss on hold-out set: 0.0005821115245405389
MeanAbsoluteError value on hold-out data: 0.019779523834586143
Epoch: 134
Loss on hold-out set: 0.0002619446009032943
MeanAbsoluteError value on hold-out data: 0.0077555980533361435
Epoch: 135
Loss on hold-out set: 0.0004117462861023868
MeanAbsoluteError value on hold-out data: 0.01273111067712307
Epoch: 136
Loss on hold-out set: 0.0001838672837290065
MeanAbsoluteError value on hold-out data: 0.005848581902682781
Epoch: 137
Loss on hold-out set: 0.00028162452317222853
MeanAbsoluteError value on hold-out data: 0.009085413999855518
Epoch: 138
Loss on hold-out set: 0.000305522973355054
MeanAbsoluteError value on hold-out data: 0.004941149614751339
Epoch: 139
Loss on hold-out set: 0.00011259347915208644
MeanAbsoluteError value on hold-out data: 0.0049913739785552025
Epoch: 140
Loss on hold-out set: 0.0006721582076830888
MeanAbsoluteError value on hold-out data: 0.016291873529553413
Epoch: 141

Loss on hold-out set: 0.001360812808056117
MeanAbsoluteError value on hold-out data: 0.03381902351975441
Epoch: 142
Loss on hold-out set: 0.00020961215963516704
MeanAbsoluteError value on hold-out data: 0.009927751496434212
Epoch: 143
Loss on hold-out set: 0.00021972418241938087
MeanAbsoluteError value on hold-out data: 0.009843568317592144
Epoch: 144
Loss on hold-out set: 0.00011800882219559801
MeanAbsoluteError value on hold-out data: 0.005561384372413158
Epoch: 145
Loss on hold-out set: 0.00046898170378546257
MeanAbsoluteError value on hold-out data: 0.012068449519574642
Epoch: 146
Loss on hold-out set: 0.00013364885633468236
```

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MeanAbsoluteError value on hold-out data: 0.0077013373374938965
Epoch: 147
Loss on hold-out set: 0.0003918371266512335
MeanAbsoluteError value on hold-out data: 0.010990392416715622
Epoch: 148
Loss on hold-out set: 0.0004192683370906468
MeanAbsoluteError value on hold-out data: 0.01325918547809124
Epoch: 149
Loss on hold-out set: 0.0004112143995275562
MeanAbsoluteError value on hold-out data: 0.010535080917179585
Epoch: 150
Loss on hold-out set: 0.00016678608847685514
MeanAbsoluteError value on hold-out data: 0.00722087686881423
Epoch: 151
Loss on hold-out set: 0.0003517969943411452
MeanAbsoluteError value on hold-out data: 0.013138104230165482
Epoch: 152
Loss on hold-out set: 0.00045109713502561614
MeanAbsoluteError value on hold-out data: 0.005443704780191183
Epoch: 153

Loss on hold-out set: 0.0002377222825711406
MeanAbsoluteError value on hold-out data: 0.006098559591919184
Epoch: 154
Loss on hold-out set: 0.0001352031630224366
MeanAbsoluteError value on hold-out data: 0.0039970893412828445
Epoch: 155
Loss on hold-out set: 0.0006336879875418258
MeanAbsoluteError value on hold-out data: 0.00974605605006218
Epoch: 156
Loss on hold-out set: 0.0004757542480164327
MeanAbsoluteError value on hold-out data: 0.007949390448629856
Epoch: 157
Loss on hold-out set: 8.624629288677075e-05
MeanAbsoluteError value on hold-out data: 0.004214747808873653
Epoch: 158
Loss on hold-out set: 0.0003452906993946894
MeanAbsoluteError value on hold-out data: 0.010480941273272038
Epoch: 159
Loss on hold-out set: 0.0004927444564313383
MeanAbsoluteError value on hold-out data: 0.015199963003396988
Epoch: 160
```

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Loss on hold-out set: 0.0003324262993134509
MeanAbsoluteError value on hold-out data: 0.011961866170167923
Epoch: 161
Loss on hold-out set: 0.0001684129479503769
MeanAbsoluteError value on hold-out data: 0.0061378153041005135
Epoch: 162
Loss on hold-out set: 0.00035388503685776653
MeanAbsoluteError value on hold-out data: 0.006458846386522055
Epoch: 163
Loss on hold-out set: 0.0004810309353017242
MeanAbsoluteError value on hold-out data: 0.0063047767616808414
Epoch: 164
Loss on hold-out set: 0.0003737839567628199
MeanAbsoluteError value on hold-out data: 0.016513388603925705
Epoch: 165
```

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Loss on hold-out set: 0.00044544836380641515
MeanAbsoluteError value on hold-out data: 0.016419950872659683
Epoch: 166
Loss on hold-out set: 0.0005216386481678407
MeanAbsoluteError value on hold-out data: 0.01838524267077446
Epoch: 167
Loss on hold-out set: 0.0002120044027833501
MeanAbsoluteError value on hold-out data: 0.008743823505938053
Epoch: 168
Loss on hold-out set: 0.000626063689292335
MeanAbsoluteError value on hold-out data: 0.02085873670876026
Epoch: 169
Loss on hold-out set: 0.00041382934336740477
MeanAbsoluteError value on hold-out data: 0.013559996150434017
Epoch: 170
Loss on hold-out set: 0.00031714195249246826
MeanAbsoluteError value on hold-out data: 0.013183890841901302
Epoch: 171
Loss on hold-out set: 0.00029064777290362765
MeanAbsoluteError value on hold-out data: 0.012103133834898472
Epoch: 172
Loss on hold-out set: 8.71349848119663e-05
MeanAbsoluteError value on hold-out data: 0.004513892345130444
Epoch: 173
Loss on hold-out set: 0.00011423539777560539
MeanAbsoluteError value on hold-out data: 0.005796311888843775
```

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Epoch: 174
Loss on hold-out set: 0.00021797028110588719
MeanAbsoluteError value on hold-out data: 0.005336158908903599
Epoch: 175
Loss on hold-out set: 0.00011489179553336726
MeanAbsoluteError value on hold-out data: 0.003756500082090497
Epoch: 176
Loss on hold-out set: 0.00023008097866151825
MeanAbsoluteError value on hold-out data: 0.012643963098526001
Epoch: 177

Loss on hold-out set: 0.0001809321734760105
MeanAbsoluteError value on hold-out data: 0.003930217586457729
Epoch: 178
Loss on hold-out set: 0.00012970706528616765
MeanAbsoluteError value on hold-out data: 0.0045120324939489365
Epoch: 179
Loss on hold-out set: 0.0005911719145890521
MeanAbsoluteError value on hold-out data: 0.015981929376721382
Epoch: 180
Loss on hold-out set: 0.00010297524771598738
MeanAbsoluteError value on hold-out data: 0.0068498835898935795
Epoch: 181
Loss on hold-out set: 0.0005377309308689865
MeanAbsoluteError value on hold-out data: 0.008818279951810837
Epoch: 182
Loss on hold-out set: 0.002912845928221941
MeanAbsoluteError value on hold-out data: 0.052359819412231445
Epoch: 183
Loss on hold-out set: 0.0017916466153750615
MeanAbsoluteError value on hold-out data: 0.008679056540131569
Epoch: 184
Loss on hold-out set: 0.0009850268473344745
MeanAbsoluteError value on hold-out data: 0.011022343300282955
Epoch: 185
Loss on hold-out set: 0.00014858969169788332
MeanAbsoluteError value on hold-out data: 0.007724056951701641
Epoch: 186
Loss on hold-out set: 0.0004239490873786915
MeanAbsoluteError value on hold-out data: 0.018213214352726936
Epoch: 187
Loss on hold-out set: 0.000506646594131828
```

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MeanAbsoluteError value on hold-out data: 0.009482202120125294
Epoch: 188
Loss on hold-out set: 0.0008842090597011664
MeanAbsoluteError value on hold-out data: 0.017172513529658318
Epoch: 189

Loss on hold-out set: 0.00020750331474884756
MeanAbsoluteError value on hold-out data: 0.006011306308209896
Epoch: 190
Loss on hold-out set: 0.0007119520285318446
MeanAbsoluteError value on hold-out data: 0.01074175164103508
Epoch: 191
Loss on hold-out set: 0.0005639780329626152
MeanAbsoluteError value on hold-out data: 0.0199363362044096
Epoch: 192
Loss on hold-out set: 0.0008062239246914702
MeanAbsoluteError value on hold-out data: 0.013622866943478584
Epoch: 193
Loss on hold-out set: 0.0006532909926471276
MeanAbsoluteError value on hold-out data: 0.014584975317120552
Epoch: 194
Loss on hold-out set: 0.0004536534721218662
MeanAbsoluteError value on hold-out data: 0.01264327485114336
Epoch: 195
Loss on hold-out set: 0.0002228167243832726
MeanAbsoluteError value on hold-out data: 0.004715439863502979
Epoch: 196
Loss on hold-out set: 0.0003070175534359901
MeanAbsoluteError value on hold-out data: 0.004694922361522913
Epoch: 197
Loss on hold-out set: 0.00018550785697650434
MeanAbsoluteError value on hold-out data: 0.005777482874691486
Epoch: 198
Loss on hold-out set: 0.00035299583183395474
MeanAbsoluteError value on hold-out data: 0.007157270330935717
Epoch: 199
Loss on hold-out set: 0.0007592120953057403
MeanAbsoluteError value on hold-out data: 0.019980935379862785
Epoch: 200
Loss on hold-out set: 0.00018336848318325027
MeanAbsoluteError value on hold-out data: 0.004420430865138769
Epoch: 201
```

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Loss on hold-out set: 0.0008041819382924587
MeanAbsoluteError value on hold-out data: 0.027031101286411285
Epoch: 202
Loss on hold-out set: 0.0004381078485829149
MeanAbsoluteError value on hold-out data: 0.006971651688218117
Epoch: 203
Loss on hold-out set: 0.000338618419307654
MeanAbsoluteError value on hold-out data: 0.008695987984538078
Epoch: 204
Loss on hold-out set: 7.094700270882688e-05
MeanAbsoluteError value on hold-out data: 0.0038003595545887947
Epoch: 205
Loss on hold-out set: 4.7682510572294155e-05
MeanAbsoluteError value on hold-out data: 0.004736706614494324
Epoch: 206
Loss on hold-out set: 0.00011193553047250086
MeanAbsoluteError value on hold-out data: 0.004701029043644667
Epoch: 207
Loss on hold-out set: 0.0001608864584245327
MeanAbsoluteError value on hold-out data: 0.011081133969128132
Epoch: 208
Loss on hold-out set: 0.0005120752466609702
MeanAbsoluteError value on hold-out data: 0.014132848009467125
Epoch: 209
Loss on hold-out set: 0.0004062346262416165
MeanAbsoluteError value on hold-out data: 0.016133975237607956
Epoch: 210
Loss on hold-out set: 0.0003815614796430485
MeanAbsoluteError value on hold-out data: 0.011084972880780697
Epoch: 211
Loss on hold-out set: 0.0003707666303518253
MeanAbsoluteError value on hold-out data: 0.01165374182164669
Epoch: 212
Loss on hold-out set: 0.0003698607893296101
MeanAbsoluteError value on hold-out data: 0.009192081168293953
Epoch: 213

Loss on hold-out set: 0.0006595634997785581
MeanAbsoluteError value on hold-out data: 0.022678228095173836
Epoch: 214
Loss on hold-out set: 0.00016818756490752813
MeanAbsoluteError value on hold-out data: 0.008822554722428322
```

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Epoch: 215
Loss on hold-out set: 0.00023353880966456737
MeanAbsoluteError value on hold-out data: 0.005726563278585672
Epoch: 216
Loss on hold-out set: 0.0004968744581818005
MeanAbsoluteError value on hold-out data: 0.010871359147131443
Epoch: 217
Loss on hold-out set: 0.00041287314103867273
MeanAbsoluteError value on hold-out data: 0.012838084250688553
Epoch: 218
Loss on hold-out set: 0.0001499732048064049
MeanAbsoluteError value on hold-out data: 0.0051224674098193645
Epoch: 219
Loss on hold-out set: 0.00019332079380929876
MeanAbsoluteError value on hold-out data: 0.010112368501722813
Epoch: 220
Loss on hold-out set: 7.049763371469453e-05
MeanAbsoluteError value on hold-out data: 0.007892418652772903
Epoch: 221
Loss on hold-out set: 0.00039820889000302965
MeanAbsoluteError value on hold-out data: 0.015822704881429672
Epoch: 222
Loss on hold-out set: 0.0004558606447780652
MeanAbsoluteError value on hold-out data: 0.019298916682600975
Epoch: 223
Loss on hold-out set: 3.577186021773645e-05
MeanAbsoluteError value on hold-out data: 0.002619055099785328
Epoch: 224
Loss on hold-out set: 0.00019781155185533432
MeanAbsoluteError value on hold-out data: 0.0029336754232645035
Epoch: 225

Loss on hold-out set: 0.006012681455008294
MeanAbsoluteError value on hold-out data: 0.07642911374568939
Epoch: 226
Loss on hold-out set: 9.570654859951326e-05
MeanAbsoluteError value on hold-out data: 0.005108587443828583
Epoch: 227
Loss on hold-out set: 0.0001663529274561657
MeanAbsoluteError value on hold-out data: 0.005583470221608877
Epoch: 228
Loss on hold-out set: 0.00014535769581638496
```

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MeanAbsoluteError value on hold-out data: 0.009935370646417141
Epoch: 229
Loss on hold-out set: 0.00040455524140270427
MeanAbsoluteError value on hold-out data: 0.015282298438251019
Epoch: 230
Loss on hold-out set: 0.0003698855109273848
MeanAbsoluteError value on hold-out data: 0.014351935125887394
Epoch: 231
Loss on hold-out set: 0.0003126683264590132
MeanAbsoluteError value on hold-out data: 0.008699178695678711
Epoch: 232
Loss on hold-out set: 0.0002636233335477444
MeanAbsoluteError value on hold-out data: 0.004831378348171711
Epoch: 233
Loss on hold-out set: 7.411806168465176e-05
MeanAbsoluteError value on hold-out data: 0.0029604071751236916
Epoch: 234
Loss on hold-out set: 0.00024818407339472816
MeanAbsoluteError value on hold-out data: 0.014025907963514328
Epoch: 235
Loss on hold-out set: 0.0002973262284955892
MeanAbsoluteError value on hold-out data: 0.012354829348623753
Epoch: 236
Loss on hold-out set: 5.471544572126157e-05
MeanAbsoluteError value on hold-out data: 0.0038994995411485434
Epoch: 237

Loss on hold-out set: 0.0002123384057612336
MeanAbsoluteError value on hold-out data: 0.005898152012377977
Epoch: 238
Loss on hold-out set: 0.0002982037097018819
MeanAbsoluteError value on hold-out data: 0.006741358432918787
Epoch: 239
Loss on hold-out set: 0.00018487013164160185
MeanAbsoluteError value on hold-out data: 0.006629966665059328
Epoch: 240
Loss on hold-out set: 0.00012024493271143768
MeanAbsoluteError value on hold-out data: 0.005414982791990042
Epoch: 241
Loss on hold-out set: 4.273436912913703e-05
MeanAbsoluteError value on hold-out data: 0.0028222438413649797
Epoch: 242
```

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Loss on hold-out set: 0.00030322709359384853
MeanAbsoluteError value on hold-out data: 0.007096508517861366
Epoch: 243
Loss on hold-out set: 5.630334546343587e-05
MeanAbsoluteError value on hold-out data: 0.003921168856322765
Epoch: 244
Loss on hold-out set: 0.0002854532525050576
MeanAbsoluteError value on hold-out data: 0.007292329333722591
Epoch: 245
Loss on hold-out set: 0.00010870322667917782
MeanAbsoluteError value on hold-out data: 0.005955347791314125
Epoch: 246
Loss on hold-out set: 0.00018390791332852755
MeanAbsoluteError value on hold-out data: 0.004489601589739323
Epoch: 247
Loss on hold-out set: 0.0014042915151405491
MeanAbsoluteError value on hold-out data: 0.03613438457250595
Epoch: 248
Loss on hold-out set: 0.00022179867990321087
MeanAbsoluteError value on hold-out data: 0.012739523313939571
Epoch: 249

Loss on hold-out set: 0.00045785892852061235
MeanAbsoluteError value on hold-out data: 0.015282205305993557
Epoch: 250
Loss on hold-out set: 0.00021732061237033027
MeanAbsoluteError value on hold-out data: 0.004911455325782299
Epoch: 251
Loss on hold-out set: 7.052430578668416e-05
MeanAbsoluteError value on hold-out data: 0.0030698946211487055
Epoch: 252
Loss on hold-out set: 0.0004149413921472962
MeanAbsoluteError value on hold-out data: 0.0036257009487599134
Epoch: 253
Loss on hold-out set: 0.0004510992818579421
MeanAbsoluteError value on hold-out data: 0.007214422337710857
Epoch: 254
Loss on hold-out set: 0.00028593420723896807
MeanAbsoluteError value on hold-out data: 0.0037286810111254454
Epoch: 255
Loss on hold-out set: 0.00011744655464883038
MeanAbsoluteError value on hold-out data: 0.0029803074430674314
```

```
Epoch: 256
Loss on hold-out set: 0.00036058600706287267
MeanAbsoluteError value on hold-out data: 0.010935173369944096
Epoch: 257
Loss on hold-out set: 0.00018582587953412593
MeanAbsoluteError value on hold-out data: 0.0067210388369858265
Epoch: 258
Loss on hold-out set: 0.0007042079094772864
MeanAbsoluteError value on hold-out data: 0.02408597059547901
Epoch: 259
Loss on hold-out set: 0.00010871348586916658
MeanAbsoluteError value on hold-out data: 0.004640659783035517
Epoch: 260
Loss on hold-out set: 0.0001765354751880391
MeanAbsoluteError value on hold-out data: 0.01012479979544878
Epoch: 261

Loss on hold-out set: 0.0001438195539025712
MeanAbsoluteError value on hold-out data: 0.0037591075524687767
Epoch: 262
Loss on hold-out set: 0.0005359662251353974
MeanAbsoluteError value on hold-out data: 0.015330251306295395
Epoch: 263
Loss on hold-out set: 0.00024332762258812805
MeanAbsoluteError value on hold-out data: 0.008328295312821865
Epoch: 264
Loss on hold-out set: 0.00013430367902114276
MeanAbsoluteError value on hold-out data: 0.005222398787736893
Epoch: 265
Loss on hold-out set: 0.0001359223313700472
MeanAbsoluteError value on hold-out data: 0.005654782056808472
Epoch: 266
Loss on hold-out set: 0.0002931532883514209
MeanAbsoluteError value on hold-out data: 0.01596049591898918
Epoch: 267
Loss on hold-out set: 0.00011497725125465015
MeanAbsoluteError value on hold-out data: 0.005816150456666946
Epoch: 268
Loss on hold-out set: 0.00011962936916557067
MeanAbsoluteError value on hold-out data: 0.009053381159901619
Epoch: 269
Loss on hold-out set: 0.00021120978645309437
```

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MeanAbsoluteError value on hold-out data: 0.010058256797492504
Epoch: 270
Loss on hold-out set: 0.0003198733721594755
MeanAbsoluteError value on hold-out data: 0.01055061537772417
Epoch: 271
Loss on hold-out set: 7.604191359022432e-05
MeanAbsoluteError value on hold-out data: 0.0031194135081022978
Epoch: 272
Loss on hold-out set: 5.264635879747833e-05
MeanAbsoluteError value on hold-out data: 0.004497845191508532
Epoch: 273

Loss on hold-out set: 9.525993313050812e-05
MeanAbsoluteError value on hold-out data: 0.004542115144431591
Epoch: 274
Loss on hold-out set: 0.0002158054077139432
MeanAbsoluteError value on hold-out data: 0.004697735887020826
Epoch: 275
Loss on hold-out set: 0.00011707317297518067
MeanAbsoluteError value on hold-out data: 0.005141308531165123
Epoch: 276
Loss on hold-out set: 0.0002594493621712134
MeanAbsoluteError value on hold-out data: 0.011657766066491604
Epoch: 277
Loss on hold-out set: 9.470128024029116e-05
MeanAbsoluteError value on hold-out data: 0.006804152391850948
Epoch: 278
Loss on hold-out set: 0.000318593766630664
MeanAbsoluteError value on hold-out data: 0.011307057924568653
Epoch: 279
Loss on hold-out set: 0.00024553576471781095
MeanAbsoluteError value on hold-out data: 0.007021516095846891
Epoch: 280
Loss on hold-out set: 0.00023530756506692056
MeanAbsoluteError value on hold-out data: 0.007990196347236633
Epoch: 281
Loss on hold-out set: 0.0001190551656481818
MeanAbsoluteError value on hold-out data: 0.004003368783742189
Epoch: 282
Loss on hold-out set: 0.0005925218276005532
MeanAbsoluteError value on hold-out data: 0.013980633579194546
Epoch: 283
```

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Loss on hold-out set: 0.0001037507089629224
MeanAbsoluteError value on hold-out data: 0.007337389048188925
Epoch: 284
Loss on hold-out set: 0.00018600391860290025
MeanAbsoluteError value on hold-out data: 0.00854494422674179
Epoch: 285

Loss on hold-out set: 0.00020093040860190645
MeanAbsoluteError value on hold-out data: 0.00880806241184473
Epoch: 286
Loss on hold-out set: 9.371085223775528e-05
MeanAbsoluteError value on hold-out data: 0.006110463757067919
Epoch: 287
Loss on hold-out set: 0.0003690759124430387
MeanAbsoluteError value on hold-out data: 0.017113322392106056
Epoch: 288
Loss on hold-out set: 5.597752539487326e-05
MeanAbsoluteError value on hold-out data: 0.0036076651886105537
Epoch: 289
Loss on hold-out set: 6.541099201297727e-05
MeanAbsoluteError value on hold-out data: 0.004494205117225647
Epoch: 290
Loss on hold-out set: 0.000455662189204687
MeanAbsoluteError value on hold-out data: 0.01956859976053238
Epoch: 291
Loss on hold-out set: 0.00016938182694789967
MeanAbsoluteError value on hold-out data: 0.006199441850185394
Epoch: 292
Loss on hold-out set: 0.0009416259402458213
MeanAbsoluteError value on hold-out data: 0.029968194663524628
Epoch: 293
Loss on hold-out set: 0.00011882890108656858
MeanAbsoluteError value on hold-out data: 0.005825145170092583
Epoch: 294
Loss on hold-out set: 0.0003932841300172042
MeanAbsoluteError value on hold-out data: 0.006391598377376795
Epoch: 295
Loss on hold-out set: 0.00010651873819705016
MeanAbsoluteError value on hold-out data: 0.003578254021704197
Epoch: 296
Loss on hold-out set: 0.00015297300828215636
MeanAbsoluteError value on hold-out data: 0.005266854539513588
Epoch: 297
```

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Loss on hold-out set: 0.00027286366591732457
MeanAbsoluteError value on hold-out data: 0.007067237049341202
Epoch: 298
Loss on hold-out set: 7.474497830404097e-05
MeanAbsoluteError value on hold-out data: 0.0036899049300700426
Epoch: 299
Loss on hold-out set: 0.00040771533172657753
MeanAbsoluteError value on hold-out data: 0.004994457121938467
Epoch: 300
Loss on hold-out set: 0.00010462066141994193
MeanAbsoluteError value on hold-out data: 0.007644437253475189
Epoch: 301
Loss on hold-out set: 0.00053259982776485
MeanAbsoluteError value on hold-out data: 0.01952328160405159
Epoch: 302
Loss on hold-out set: 0.00013737429818368247
MeanAbsoluteError value on hold-out data: 0.00778650538995862
Epoch: 303
Loss on hold-out set: 0.00016200905094209653
MeanAbsoluteError value on hold-out data: 0.0074271028861403465
Epoch: 304
Loss on hold-out set: 0.0001430222017868226
MeanAbsoluteError value on hold-out data: 0.004161669407039881
Epoch: 305
Loss on hold-out set: 6.564688584675375e-05
MeanAbsoluteError value on hold-out data: 0.007162464316934347
Epoch: 306
Loss on hold-out set: 0.0005430376094361572
MeanAbsoluteError value on hold-out data: 0.0182139091193676
Epoch: 307
Loss on hold-out set: 0.00018286769252696153
MeanAbsoluteError value on hold-out data: 0.00585591048002243
Epoch: 308
Loss on hold-out set: 0.00014508204276353354
MeanAbsoluteError value on hold-out data: 0.006066608242690563
Epoch: 309

Loss on hold-out set: 0.0002615039777179175
MeanAbsoluteError value on hold-out data: 0.012416939251124859
Epoch: 310
Loss on hold-out set: 0.0002888168383881413
MeanAbsoluteError value on hold-out data: 0.007221814710646868
```

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Epoch: 311
Loss on hold-out set: 0.00030114104476141157
MeanAbsoluteError value on hold-out data: 0.007273632567375898
Epoch: 312
Loss on hold-out set: 0.00020660174681995014
MeanAbsoluteError value on hold-out data: 0.010416830889880657
Epoch: 313
Loss on hold-out set: 0.00023825360046645839
MeanAbsoluteError value on hold-out data: 0.005441406741738319
Epoch: 314
Loss on hold-out set: 0.00010271902101521846
MeanAbsoluteError value on hold-out data: 0.004576968960464001
Epoch: 315
Loss on hold-out set: 9.033041485389204e-05
MeanAbsoluteError value on hold-out data: 0.0046510715037584305
Epoch: 316
Loss on hold-out set: 0.0008316887473675275
MeanAbsoluteError value on hold-out data: 0.022845663130283356
Epoch: 317
Loss on hold-out set: 0.00017649389670431877
MeanAbsoluteError value on hold-out data: 0.007839381694793701
Epoch: 318
Loss on hold-out set: 7.660179717636071e-05
MeanAbsoluteError value on hold-out data: 0.003776413155719638
Epoch: 319
Loss on hold-out set: 0.0001970361009194963
MeanAbsoluteError value on hold-out data: 0.009618036448955536
Epoch: 320
Loss on hold-out set: 0.00012933452801103398
MeanAbsoluteError value on hold-out data: 0.006226914469152689
Epoch: 321

Loss on hold-out set: 4.824216300317188e-05
MeanAbsoluteError value on hold-out data: 0.003773975418880582
Epoch: 322
Loss on hold-out set: 7.631086131859295e-05
MeanAbsoluteError value on hold-out data: 0.002830266486853361
Epoch: 323
Loss on hold-out set: 0.00020744052869160537
MeanAbsoluteError value on hold-out data: 0.010527534410357475
Epoch: 324
Loss on hold-out set: 7.562757910387805e-05
```

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MeanAbsoluteError value on hold-out data: 0.005145409144461155
Epoch: 325
Loss on hold-out set: 6.55129315837736e-05
MeanAbsoluteError value on hold-out data: 0.003625907003879547
Epoch: 326
Loss on hold-out set: 0.00014291624843041828
MeanAbsoluteError value on hold-out data: 0.008793883956968784
Epoch: 327
Loss on hold-out set: 0.0006406434113159776
MeanAbsoluteError value on hold-out data: 0.024936575442552567
Epoch: 328
Loss on hold-out set: 0.0003783401476347966
MeanAbsoluteError value on hold-out data: 0.01657368801534176
Epoch: 329
Loss on hold-out set: 4.1624114014906044e-05
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Epoch: 330
Loss on hold-out set: 0.00019782957047266935
MeanAbsoluteError value on hold-out data: 0.012251464650034904
Epoch: 331
Loss on hold-out set: 0.00010609801689784753
MeanAbsoluteError value on hold-out data: 0.008588295429944992
Epoch: 332
Loss on hold-out set: 0.0002850254331382243
MeanAbsoluteError value on hold-out data: 0.006936801131814718
Epoch: 333

Loss on hold-out set: 8.873656199619673e-05
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Epoch: 334
Loss on hold-out set: 2.8109238476310183e-05
MeanAbsoluteError value on hold-out data: 0.003872973844408989
Epoch: 335
Loss on hold-out set: 0.0001942703316001969
MeanAbsoluteError value on hold-out data: 0.009506231173872948
Epoch: 336
Loss on hold-out set: 0.0002686617154531153
MeanAbsoluteError value on hold-out data: 0.004563926253467798
Epoch: 337
Loss on hold-out set: 0.00032937045417431935
MeanAbsoluteError value on hold-out data: 0.015373196452856064
Epoch: 338
```

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Loss on hold-out set: 0.0002746540627221724
MeanAbsoluteError value on hold-out data: 0.011951952241361141
Epoch: 339
Loss on hold-out set: 0.00029916246742351705
MeanAbsoluteError value on hold-out data: 0.008541539311408997
Epoch: 340
Loss on hold-out set: 0.00018565003110301118
MeanAbsoluteError value on hold-out data: 0.009553304873406887
Epoch: 341
Loss on hold-out set: 0.0002205953572133455
MeanAbsoluteError value on hold-out data: 0.006768669933080673
Epoch: 342
Loss on hold-out set: 0.00016611999748611676
MeanAbsoluteError value on hold-out data: 0.008724900893867016
Epoch: 343
Loss on hold-out set: 0.000241775311511255
MeanAbsoluteError value on hold-out data: 0.01203866209834814
Epoch: 344
Loss on hold-out set: 5.2837180778384974e-05
MeanAbsoluteError value on hold-out data: 0.003441212233155966
Epoch: 345

Loss on hold-out set: 0.0006240039572156476
MeanAbsoluteError value on hold-out data: 0.02098272368311882
Epoch: 346
Loss on hold-out set: 0.0004903485705175339
MeanAbsoluteError value on hold-out data: 0.01859758421778679
Epoch: 347
Loss on hold-out set: 7.858821977367227e-05
MeanAbsoluteError value on hold-out data: 0.00666596507653594
Epoch: 348
Loss on hold-out set: 0.00017845901206065288
MeanAbsoluteError value on hold-out data: 0.010250956751406193
Epoch: 349
Loss on hold-out set: 9.420422073665242e-05
MeanAbsoluteError value on hold-out data: 0.004508937243372202
Epoch: 350
Loss on hold-out set: 9.001891229624897e-05
MeanAbsoluteError value on hold-out data: 0.005914447829127312
Epoch: 351
Loss on hold-out set: 0.0001616139990418512
MeanAbsoluteError value on hold-out data: 0.009879314340651035
```

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Epoch: 352
Loss on hold-out set: 0.00014677988782283902
MeanAbsoluteError value on hold-out data: 0.003592060413211584
Epoch: 353
Loss on hold-out set: 2.9599369398917924e-05
MeanAbsoluteError value on hold-out data: 0.0038590217009186745
Epoch: 354
Loss on hold-out set: 0.00023265090509850875
MeanAbsoluteError value on hold-out data: 0.011529187671840191
Epoch: 355
Loss on hold-out set: 0.0004140459323504106
MeanAbsoluteError value on hold-out data: 0.015227244235575199
Epoch: 356
Loss on hold-out set: 0.00011574072816170213
MeanAbsoluteError value on hold-out data: 0.008438673801720142
Epoch: 357

Loss on hold-out set: 0.00014915229506809018
MeanAbsoluteError value on hold-out data: 0.0075819604098796844
Epoch: 358
Loss on hold-out set: 3.877461481830611e-05
MeanAbsoluteError value on hold-out data: 0.003987150266766548
Epoch: 359
Loss on hold-out set: 0.00045666812533645977
MeanAbsoluteError value on hold-out data: 0.00707395700737834
Epoch: 360
Loss on hold-out set: 0.00011005888235989627
MeanAbsoluteError value on hold-out data: 0.006329933647066355
Epoch: 361
Loss on hold-out set: 6.908409097892026e-05
MeanAbsoluteError value on hold-out data: 0.0032070318702608347
Epoch: 362
Loss on hold-out set: 2.8537002163518894e-05
MeanAbsoluteError value on hold-out data: 0.002505701035261154
Epoch: 363
Loss on hold-out set: 6.252101990723627e-05
MeanAbsoluteError value on hold-out data: 0.006452368572354317
Epoch: 364
Loss on hold-out set: 0.0003012744828083669
MeanAbsoluteError value on hold-out data: 0.009625587612390518
Epoch: 365
Loss on hold-out set: 0.00019870174611768513
```

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MeanAbsoluteError value on hold-out data: 0.010300024412572384
Epoch: 366
Loss on hold-out set: 6.812188561717018e-05
MeanAbsoluteError value on hold-out data: 0.005032738670706749
Epoch: 367
Loss on hold-out set: 0.00022320769851017088
MeanAbsoluteError value on hold-out data: 0.005043026525527239
Epoch: 368
Loss on hold-out set: 0.00012965569122139927
MeanAbsoluteError value on hold-out data: 0.009801175445318222
Epoch: 369

Loss on hold-out set: 6.152230042444946e-05
MeanAbsoluteError value on hold-out data: 0.00446006515994668
Epoch: 370
Loss on hold-out set: 9.364805649918133e-05
MeanAbsoluteError value on hold-out data: 0.004742024932056665
Epoch: 371
Loss on hold-out set: 0.00010128984518144677
MeanAbsoluteError value on hold-out data: 0.006581603083759546
Epoch: 372
Loss on hold-out set: 0.00017741136522138396
MeanAbsoluteError value on hold-out data: 0.004151897504925728
Epoch: 373
Loss on hold-out set: 3.155132108196611e-05
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Epoch: 374
Loss on hold-out set: 0.00013703039542777238
MeanAbsoluteError value on hold-out data: 0.0058449734933674335
Epoch: 375
Loss on hold-out set: 6.986464754127634e-05
MeanAbsoluteError value on hold-out data: 0.005137030500918627
Epoch: 376
Loss on hold-out set: 0.00013121039484375566
MeanAbsoluteError value on hold-out data: 0.0072265686467289925
Epoch: 377
Loss on hold-out set: 0.00013957960292923657
MeanAbsoluteError value on hold-out data: 0.009213208220899105
Epoch: 378
Loss on hold-out set: 0.0003818993529636684
MeanAbsoluteError value on hold-out data: 0.00707149738445878
Epoch: 379
```

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Loss on hold-out set: 0.0001254496717855976
MeanAbsoluteError value on hold-out data: 0.006687126122415066
Epoch: 380
Loss on hold-out set: 0.00012179133471746402
MeanAbsoluteError value on hold-out data: 0.004153793677687645
Epoch: 381

Loss on hold-out set: 0.0002442648887824218
MeanAbsoluteError value on hold-out data: 0.0150334183126688
Epoch: 382
Loss on hold-out set: 0.00021158499217371603
MeanAbsoluteError value on hold-out data: 0.013498070649802685
Epoch: 383
Loss on hold-out set: 7.607400232844061e-05
MeanAbsoluteError value on hold-out data: 0.00578995980322361
Epoch: 384
Loss on hold-out set: 0.000385969170326318
MeanAbsoluteError value on hold-out data: 0.017399540171027184
Epoch: 385
Loss on hold-out set: 0.00010295021916375078
MeanAbsoluteError value on hold-out data: 0.005158308427780867
Epoch: 386
Loss on hold-out set: 0.00032760970766263967
MeanAbsoluteError value on hold-out data: 0.015988675877451897
Epoch: 387
Loss on hold-out set: 6.845400871737326e-05
MeanAbsoluteError value on hold-out data: 0.005071839317679405
Epoch: 388
Loss on hold-out set: 8.879780419216618e-05
MeanAbsoluteError value on hold-out data: 0.0036500096321105957
Epoch: 389
Loss on hold-out set: 0.00043600912000616327
MeanAbsoluteError value on hold-out data: 0.01977212354540825
Epoch: 390
Loss on hold-out set: 0.0002701929885293602
MeanAbsoluteError value on hold-out data: 0.01467385794967413
Epoch: 391
Loss on hold-out set: 0.000108299925183306
MeanAbsoluteError value on hold-out data: 0.005268788430839777
Epoch: 392
Loss on hold-out set: 0.00015619917413507784
MeanAbsoluteError value on hold-out data: 0.011320839636027813
Epoch: 393
```

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Loss on hold-out set: 0.000566677473742809
MeanAbsoluteError value on hold-out data: 0.013518319465219975
Epoch: 394
Loss on hold-out set: 0.00015740434445146284
MeanAbsoluteError value on hold-out data: 0.0057575455866754055
Epoch: 395
Loss on hold-out set: 0.00021554038195111054
MeanAbsoluteError value on hold-out data: 0.010762776248157024
Epoch: 396
Loss on hold-out set: 4.457999667513497e-05
MeanAbsoluteError value on hold-out data: 0.005159563850611448
Epoch: 397
Loss on hold-out set: 0.00010733083184420953
MeanAbsoluteError value on hold-out data: 0.007912497967481613
Epoch: 398
Loss on hold-out set: 9.362010283322626e-05
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Epoch: 399
Loss on hold-out set: 0.00012548274006755826
MeanAbsoluteError value on hold-out data: 0.007386618293821812
Epoch: 400
Loss on hold-out set: 0.00014612406978717205
MeanAbsoluteError value on hold-out data: 0.004635432735085487
Epoch: 401
Loss on hold-out set: 0.00017791458308642248
MeanAbsoluteError value on hold-out data: 0.003036793787032366
Epoch: 402
Loss on hold-out set: 0.0003119063533775165
MeanAbsoluteError value on hold-out data: 0.011561136692762375
Epoch: 403
Loss on hold-out set: 7.445356727418441e-05
MeanAbsoluteError value on hold-out data: 0.006402131635695696
Epoch: 404
Loss on hold-out set: 7.943522847965237e-05
MeanAbsoluteError value on hold-out data: 0.008071992546319962
Epoch: 405

Loss on hold-out set: 0.00010403463827470348
MeanAbsoluteError value on hold-out data: 0.0029168426990509033
Epoch: 406
Loss on hold-out set: 9.300519916091856e-05
MeanAbsoluteError value on hold-out data: 0.005543507169932127
```

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Epoch: 407
Loss on hold-out set: 0.00031193288616218764
MeanAbsoluteError value on hold-out data: 0.0056481207720935345
Epoch: 408
Loss on hold-out set: 0.00010799040022615564
MeanAbsoluteError value on hold-out data: 0.005550215020775795
Epoch: 409
Loss on hold-out set: 5.815306111631607e-05
MeanAbsoluteError value on hold-out data: 0.0037352275103330612
Epoch: 410
Loss on hold-out set: 2.3198493516630198e-05
MeanAbsoluteError value on hold-out data: 0.003362951334565878
Epoch: 411
Loss on hold-out set: 0.00011053357945313205
MeanAbsoluteError value on hold-out data: 0.00514068640768528
Epoch: 412
Loss on hold-out set: 0.00021491384541150182
MeanAbsoluteError value on hold-out data: 0.012556971982121468
Epoch: 413
Loss on hold-out set: 0.00027010037349914216
MeanAbsoluteError value on hold-out data: 0.004993476439267397
Epoch: 414
Loss on hold-out set: 5.601700888148212e-05
MeanAbsoluteError value on hold-out data: 0.004480902571231127
Epoch: 415
Loss on hold-out set: 0.0001242031190055346
MeanAbsoluteError value on hold-out data: 0.005591101478785276
Epoch: 416
Loss on hold-out set: 5.865379204662627e-05
MeanAbsoluteError value on hold-out data: 0.004618770442903042
Epoch: 417

Loss on hold-out set: 4.6866104831248156e-05
MeanAbsoluteError value on hold-out data: 0.004593057557940483
Epoch: 418
Loss on hold-out set: 0.00010404091218381501
MeanAbsoluteError value on hold-out data: 0.0027203287463635206
Epoch: 419
Loss on hold-out set: 7.870710432574637e-05
MeanAbsoluteError value on hold-out data: 0.005488495342433453
Epoch: 420
Loss on hold-out set: 0.00018919654053804966
```

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MeanAbsoluteError value on hold-out data: 0.0039048166945576668
Epoch: 421
Loss on hold-out set: 0.00010421412201522846
MeanAbsoluteError value on hold-out data: 0.004237624350935221
Epoch: 422
Loss on hold-out set: 0.00030726839257735455
MeanAbsoluteError value on hold-out data: 0.006389420013874769
Epoch: 423
Loss on hold-out set: 0.00017901148462921187
MeanAbsoluteError value on hold-out data: 0.005380718503147364
Epoch: 424
Loss on hold-out set: 0.0001996032247246292
MeanAbsoluteError value on hold-out data: 0.010432637296617031
Epoch: 425
Loss on hold-out set: 0.0001392935218494753
MeanAbsoluteError value on hold-out data: 0.008168000727891922
Epoch: 426
Loss on hold-out set: 0.00017021309481366953
MeanAbsoluteError value on hold-out data: 0.008903906680643559
Epoch: 427
Loss on hold-out set: 2.4607979627800984e-05
MeanAbsoluteError value on hold-out data: 0.002941992599517107
Epoch: 428
Loss on hold-out set: 0.00026203568191512634
MeanAbsoluteError value on hold-out data: 0.010515421628952026
Epoch: 429

Loss on hold-out set: 0.00011775812574916544
MeanAbsoluteError value on hold-out data: 0.009550156071782112
Epoch: 430
Loss on hold-out set: 0.00011683016300354978
MeanAbsoluteError value on hold-out data: 0.005366915836930275
Epoch: 431
Loss on hold-out set: 2.2913929201781446e-05
MeanAbsoluteError value on hold-out data: 0.0024949684739112854
Epoch: 432
Loss on hold-out set: 3.524170070752581e-05
MeanAbsoluteError value on hold-out data: 0.0040044840425252914
Epoch: 433
Loss on hold-out set: 0.0005131374690742968
MeanAbsoluteError value on hold-out data: 0.02163553051650524
Epoch: 434
```

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Loss on hold-out set: 0.0001442479524484952
MeanAbsoluteError value on hold-out data: 0.00577126257121563
Epoch: 435
Loss on hold-out set: 4.380218684362166e-05
MeanAbsoluteError value on hold-out data: 0.0038602992426604033
Epoch: 436
Loss on hold-out set: 8.946919678907618e-05
MeanAbsoluteError value on hold-out data: 0.006072705611586571
Epoch: 437
Loss on hold-out set: 8.951805987061035e-05
MeanAbsoluteError value on hold-out data: 0.004338324069976807
Epoch: 438
Loss on hold-out set: 0.00013691374595892788
MeanAbsoluteError value on hold-out data: 0.005327087827026844
Epoch: 439
Loss on hold-out set: 6.942068256122231e-05
MeanAbsoluteError value on hold-out data: 0.0069258068688213825
Epoch: 440
Loss on hold-out set: 3.240131606593135e-05
MeanAbsoluteError value on hold-out data: 0.0031963365618139505
Epoch: 441

Loss on hold-out set: 5.512904532990529e-05
MeanAbsoluteError value on hold-out data: 0.003976795356720686
Epoch: 442
Loss on hold-out set: 9.43546273399414e-05
MeanAbsoluteError value on hold-out data: 0.009063187055289745
Epoch: 443
Loss on hold-out set: 4.85696426901421e-05
MeanAbsoluteError value on hold-out data: 0.005590459797531366
Epoch: 444
Loss on hold-out set: 0.00015614904240417098
MeanAbsoluteError value on hold-out data: 0.011533299461007118
Epoch: 445
Loss on hold-out set: 2.9399052867742476e-05
MeanAbsoluteError value on hold-out data: 0.004286509472876787
Epoch: 446
Loss on hold-out set: 0.00013281904370830345
MeanAbsoluteError value on hold-out data: 0.010850192978978157
Epoch: 447
Loss on hold-out set: 0.00015308107360492853
MeanAbsoluteError value on hold-out data: 0.009670509025454521
```

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Epoch: 448
Loss on hold-out set: 0.00028750488208491954
MeanAbsoluteError value on hold-out data: 0.007448357064276934
Epoch: 449
Loss on hold-out set: 0.00019891041196579433
MeanAbsoluteError value on hold-out data: 0.00950294453650713
Epoch: 450
Loss on hold-out set: 9.711234448978327e-05
MeanAbsoluteError value on hold-out data: 0.005611020140349865
Epoch: 451
Loss on hold-out set: 9.296594165980902e-05
MeanAbsoluteError value on hold-out data: 0.007066003512591124
Epoch: 452
Loss on hold-out set: 0.00014768287296886373
MeanAbsoluteError value on hold-out data: 0.008239840157330036
Epoch: 453

Loss on hold-out set: 0.0001534641935091043
MeanAbsoluteError value on hold-out data: 0.007161466870456934
Epoch: 454
Loss on hold-out set: 4.412177545538342e-05
MeanAbsoluteError value on hold-out data: 0.0029536299407482147
Epoch: 455
Loss on hold-out set: 0.00020964346288708744
MeanAbsoluteError value on hold-out data: 0.004283635877072811
Epoch: 456
Loss on hold-out set: 5.6694621171597025e-05
MeanAbsoluteError value on hold-out data: 0.005021659191697836
Epoch: 457
Loss on hold-out set: 2.8046362944534946e-05
MeanAbsoluteError value on hold-out data: 0.0026938985101878643
Epoch: 458
Loss on hold-out set: 2.2055471513220637e-05
MeanAbsoluteError value on hold-out data: 0.002456226386129856
Epoch: 459
Loss on hold-out set: 4.9755083613203364e-05
MeanAbsoluteError value on hold-out data: 0.00432001193985343
Epoch: 460
Loss on hold-out set: 6.360786745804752e-05
MeanAbsoluteError value on hold-out data: 0.0037233266048133373
Epoch: 461
Loss on hold-out set: 1.6387159908055382e-05
```

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MeanAbsoluteError value on hold-out data: 0.0017510087927803397
Epoch: 462
Loss on hold-out set: 2.0814910594947977e-05
MeanAbsoluteError value on hold-out data: 0.002714491682127118
Epoch: 463
Loss on hold-out set: 0.00010553078824446665
MeanAbsoluteError value on hold-out data: 0.00638151029124856
Epoch: 464
Loss on hold-out set: 9.733174259676353e-05
MeanAbsoluteError value on hold-out data: 0.006881920620799065
Epoch: 465

Loss on hold-out set: 5.309506186198345e-05
MeanAbsoluteError value on hold-out data: 0.004741424694657326
Epoch: 466
Loss on hold-out set: 9.478743365769715e-05
MeanAbsoluteError value on hold-out data: 0.008278674446046352
Epoch: 467
Loss on hold-out set: 0.00015585071009569984
MeanAbsoluteError value on hold-out data: 0.006945969071239233
Epoch: 468
Loss on hold-out set: 0.00035566493146401817
MeanAbsoluteError value on hold-out data: 0.010316429659724236
Epoch: 469
Loss on hold-out set: 0.00012303586352477156
MeanAbsoluteError value on hold-out data: 0.006862234324216843
Epoch: 470
Loss on hold-out set: 0.00022165135875471415
MeanAbsoluteError value on hold-out data: 0.008084876462817192
Epoch: 471
Loss on hold-out set: 7.748935906037284e-05
MeanAbsoluteError value on hold-out data: 0.006544790230691433
Epoch: 472
Loss on hold-out set: 7.890777789941096e-05
MeanAbsoluteError value on hold-out data: 0.004532119259238243
Epoch: 473
Loss on hold-out set: 0.00018493055100215745
MeanAbsoluteError value on hold-out data: 0.01266787201166153
Epoch: 474
Loss on hold-out set: 9.123838055146687e-05
MeanAbsoluteError value on hold-out data: 0.007093149237334728
Epoch: 475
```

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Loss on hold-out set: 0.00016232475316332726
MeanAbsoluteError value on hold-out data: 0.007366497535258532
Epoch: 476
Loss on hold-out set: 5.5197533165004354e-05
MeanAbsoluteError value on hold-out data: 0.004839066416025162
Epoch: 477

Loss on hold-out set: 0.0001672694253150104
MeanAbsoluteError value on hold-out data: 0.011861369013786316
Epoch: 478
Loss on hold-out set: 0.00011022357236805347
MeanAbsoluteError value on hold-out data: 0.00862854439765215
Epoch: 479
Loss on hold-out set: 0.0001979979078657236
MeanAbsoluteError value on hold-out data: 0.006630516145378351
Epoch: 480
Loss on hold-out set: 9.073580024146634e-05
MeanAbsoluteError value on hold-out data: 0.006185135338455439
Epoch: 481
Loss on hold-out set: 2.259536676481395e-05
MeanAbsoluteError value on hold-out data: 0.0022479002363979816
Epoch: 482
Loss on hold-out set: 7.833968045719972e-05
MeanAbsoluteError value on hold-out data: 0.006891393568366766
Epoch: 483
Loss on hold-out set: 0.00026813131161792337
MeanAbsoluteError value on hold-out data: 0.007464287336915731
Epoch: 484
Loss on hold-out set: 0.00019160129350463025
MeanAbsoluteError value on hold-out data: 0.009825085289776325
Epoch: 485
Loss on hold-out set: 7.593418664136582e-05
MeanAbsoluteError value on hold-out data: 0.0066338637843728065
Epoch: 486
Loss on hold-out set: 0.00016568496175750624
MeanAbsoluteError value on hold-out data: 0.007945144549012184
Epoch: 487
Loss on hold-out set: 0.0002472817108068021
MeanAbsoluteError value on hold-out data: 0.00561857596039772
Epoch: 488
Loss on hold-out set: 7.540003437162867e-05
MeanAbsoluteError value on hold-out data: 0.005091600120067596 4
Epoch: 489
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Loss on hold-out set: 5.087203155534027e-05
MeanAbsoluteError value on hold-out data: 0.00485553964972496
Epoch: 490
Loss on hold-out set: 6.741601767221015e-05
MeanAbsoluteError value on hold-out data: 0.005035900045186281
Epoch: 491
Loss on hold-out set: 5.653136131992429e-05
MeanAbsoluteError value on hold-out data: 0.0058405594900250435
Epoch: 492
Loss on hold-out set: 0.00012650133174630404
MeanAbsoluteError value on hold-out data: 0.005651833955198526
Epoch: 493
Loss on hold-out set: 6.31367370021364e-05
MeanAbsoluteError value on hold-out data: 0.006347589194774628
Epoch: 494
Loss on hold-out set: 3.9954243938585644e-05
MeanAbsoluteError value on hold-out data: 0.0036410819739103317
Epoch: 495
Loss on hold-out set: 0.0003212871811947001
MeanAbsoluteError value on hold-out data: 0.012408330105245113
Epoch: 496
Loss on hold-out set: 3.352512998701155e-05
MeanAbsoluteError value on hold-out data: 0.002924605505540967
Epoch: 497
Loss on hold-out set: 4.494257244926446e-05
MeanAbsoluteError value on hold-out data: 0.0034801193978637457
Epoch: 498
Loss on hold-out set: 3.191128639388664e-05
MeanAbsoluteError value on hold-out data: 0.0022669497411698103
Epoch: 499
Loss on hold-out set: 5.2056836741604984e-05
MeanAbsoluteError value on hold-out data: 0.0038467245176434517
Epoch: 500
Loss on hold-out set: 0.00033467246267766885
MeanAbsoluteError value on hold-out data: 0.012796212919056416
Epoch: 501

Loss on hold-out set: 0.0006188489569467492
MeanAbsoluteError value on hold-out data: 0.016086263582110405
Epoch: 502
Loss on hold-out set: 2.9080804228885282e-05
MeanAbsoluteError value on hold-out data: 0.003482416970655322
```

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Epoch: 503
Loss on hold-out set: 7.236690773999343e-05
MeanAbsoluteError value on hold-out data: 0.00775107042863965
Epoch: 504
Loss on hold-out set: 8.503879124825624e-05
MeanAbsoluteError value on hold-out data: 0.006554629188030958
Epoch: 505
Loss on hold-out set: 0.00025892591082466473
MeanAbsoluteError value on hold-out data: 0.014753198251128197
Epoch: 506
Loss on hold-out set: 0.0001681456233439492
MeanAbsoluteError value on hold-out data: 0.005521786864846945
Epoch: 507
Loss on hold-out set: 3.9806813447285094e-05
MeanAbsoluteError value on hold-out data: 0.004242693539708853
Epoch: 508
Loss on hold-out set: 0.0002735568785666194
MeanAbsoluteError value on hold-out data: 0.014921586029231548
Epoch: 509
Loss on hold-out set: 0.0001246769452815275
MeanAbsoluteError value on hold-out data: 0.008881425485014915
Epoch: 510
Loss on hold-out set: 6.44739243278692e-05
MeanAbsoluteError value on hold-out data: 0.004172396846115589
Epoch: 511
Loss on hold-out set: 7.080831428059977e-05
MeanAbsoluteError value on hold-out data: 0.005957228597253561
Epoch: 512
Loss on hold-out set: 4.4927717394066825e-05
MeanAbsoluteError value on hold-out data: 0.004019557032734156
Epoch: 513

Loss on hold-out set: 6.863081429592536e-05
MeanAbsoluteError value on hold-out data: 0.002718450967222452
Epoch: 514
Loss on hold-out set: 9.296547334183982e-05
MeanAbsoluteError value on hold-out data: 0.004816493019461632
Epoch: 515
Loss on hold-out set: 5.6318815974296545e-05
MeanAbsoluteError value on hold-out data: 0.005035385023802519
Epoch: 516
Loss on hold-out set: 5.3418624187734644e-05
```

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MeanAbsoluteError value on hold-out data: 0.0040484084747731686
Epoch: 517
Loss on hold-out set: 2.5199166023077468e-05
MeanAbsoluteError value on hold-out data: 0.0038813615683466196
Epoch: 518
Loss on hold-out set: 1.6448331597243132e-05
MeanAbsoluteError value on hold-out data: 0.0027815704233944416
Epoch: 519
Loss on hold-out set: 0.000219983856942762
MeanAbsoluteError value on hold-out data: 0.012791207060217857
Epoch: 520
Loss on hold-out set: 0.00021280917338261038
MeanAbsoluteError value on hold-out data: 0.01136183924973011
Epoch: 521
Loss on hold-out set: 0.00017513798440248998
MeanAbsoluteError value on hold-out data: 0.011265788227319717
Epoch: 522
Loss on hold-out set: 0.00022780449650159235
MeanAbsoluteError value on hold-out data: 0.005516381468623877
Epoch: 523
Loss on hold-out set: 5.096415085111068e-05
MeanAbsoluteError value on hold-out data: 0.004777975380420685
Epoch: 524
Loss on hold-out set: 9.363652699041842e-05
MeanAbsoluteError value on hold-out data: 0.005876421928405762
Epoch: 525

Loss on hold-out set: 5.641324473440603e-05
MeanAbsoluteError value on hold-out data: 0.0026648002676665783
Epoch: 526
Loss on hold-out set: 0.00016978638278056964
MeanAbsoluteError value on hold-out data: 0.011513750068843365
Epoch: 527
Loss on hold-out set: 8.804068726787686e-05
MeanAbsoluteError value on hold-out data: 0.0036853135097771883
Epoch: 528
Loss on hold-out set: 8.886224016255016e-05
MeanAbsoluteError value on hold-out data: 0.00310801831074059
Epoch: 529
Loss on hold-out set: 0.00018038179759490673
MeanAbsoluteError value on hold-out data: 0.008877351880073547
Epoch: 530
```

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Loss on hold-out set: 0.00047438261801864047
MeanAbsoluteError value on hold-out data: 0.0058948867954313755
Epoch: 531
Loss on hold-out set: 4.340351194729776e-05
MeanAbsoluteError value on hold-out data: 0.003506212728098035
Epoch: 532
Loss on hold-out set: 3.328042776286709e-05
MeanAbsoluteError value on hold-out data: 0.003238668432459235
Epoch: 533
Loss on hold-out set: 0.00029600998938181683
MeanAbsoluteError value on hold-out data: 0.015546582639217377
Epoch: 534
Loss on hold-out set: 0.00010363369208215245
MeanAbsoluteError value on hold-out data: 0.005174047313630581
Epoch: 535
Loss on hold-out set: 0.00020388316797356024
MeanAbsoluteError value on hold-out data: 0.011823728680610657
Epoch: 536
Loss on hold-out set: 0.00021379974623414455
MeanAbsoluteError value on hold-out data: 0.005605872254818678
Epoch: 537

Loss on hold-out set: 4.600946420539817e-05
MeanAbsoluteError value on hold-out data: 0.0031987151596695185
Epoch: 538
Loss on hold-out set: 1.550583693032374e-05
MeanAbsoluteError value on hold-out data: 0.0020306988153606653
Epoch: 539
Loss on hold-out set: 2.8948668721951482e-05
MeanAbsoluteError value on hold-out data: 0.0033775444608181715
Epoch: 540
Loss on hold-out set: 4.257252235698903e-05
MeanAbsoluteError value on hold-out data: 0.004527441691607237
Epoch: 541
Loss on hold-out set: 0.0005437656042264088
MeanAbsoluteError value on hold-out data: 0.021449731662869453
Epoch: 542
Loss on hold-out set: 3.489794622318617e-05
MeanAbsoluteError value on hold-out data: 0.004613165743649006
Epoch: 543
Loss on hold-out set: 0.00011487271733226647
MeanAbsoluteError value on hold-out data: 0.006334126926958561
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Epoch: 544
Loss on hold-out set: 0.00012818159465448 27
MeanAbsoluteError value on hold-out data: 0.009989617392420769
Epoch: 545
Loss on hold-out set: 8.831460471762847e-05
MeanAbsoluteError value on hold-out data: 0.004733612760901451
Epoch: 546
Loss on hold-out set: 3.0306502074046493e-05
MeanAbsoluteError value on hold-out data: 0.003377618733793497
Epoch: 547
Loss on hold-out set: 0.00016711664399113752
MeanAbsoluteError value on hold-out data: 0.010550960898399353
Epoch: 548
Loss on hold-out set: 0.00012673886947978693
MeanAbsoluteError value on hold-out data: 0.006838774774223566
Epoch: 549


Loss on hold-out set: 0.00038710285796122134
MeanAbsoluteError value on hold-out data: 0.01903507299721241
Epoch: 550
Loss on hold-out set: 4.639876583735857e-05
MeanAbsoluteError value on hold-out data: 0.005045874044299126
Epoch: 551
Loss on hold-out set: 0.00020170460936098702
MeanAbsoluteError value on hold-out data: 0.012379148975014687
Epoch: 552
Loss on hold-out set: 8.774718796638281e-05
MeanAbsoluteError value on hold-out data: 0.006589869037270546
Epoch: 553
Loss on hold-out set: 7.337741374756565e-05
MeanAbsoluteError value on hold-out data: 0.005994034931063652
Epoch: 554
Loss on hold-out set: 3.498127840597781e-05
MeanAbsoluteError value on hold-out data: 0.003546253079548478
Epoch: 555
Loss on hold-out set: 2.410048562009443e-05
MeanAbsoluteError value on hold-out data: 0.002867012983188033
Epoch: 556
Loss on hold-out set: 1.99945621644522e-05
MeanAbsoluteError value on hold-out data: 0.00290124025195837
Epoch: 557
Loss on hold-out set: 7.710687806425803e-05
```

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MeanAbsoluteError value on hold-out data: 0.0038376501761376858
Epoch: 558
Loss on hold-out set: 7.581141443025492e-05
MeanAbsoluteError value on hold-out data: 0.005748969968408346
Epoch: 559
Loss on hold-out set: 4.588553298689428e-05
MeanAbsoluteError value on hold-out data: 0.003901205025613308
Epoch: 560
Loss on hold-out set: 4.146609531194132e-05
MeanAbsoluteError value on hold-out data: 0.003129207529127598
Epoch: 561

Loss on hold-out set: 0.0004683458158213302
MeanAbsoluteError value on hold-out data: 0.018045997247099876
Epoch: 562
Loss on hold-out set: 0.0001682502270820183
MeanAbsoluteError value on hold-out data: 0.011963005177676678
Epoch: 563
Loss on hold-out set: 0.00014704053708108607
MeanAbsoluteError value on hold-out data: 0.0027085833717137575
Epoch: 564
Loss on hold-out set: 4.8860350656660124e-05
MeanAbsoluteError value on hold-out data: 0.004074718803167343
Epoch: 565
Loss on hold-out set: 0.0002459898392101566
MeanAbsoluteError value on hold-out data: 0.010238206014037132
Epoch: 566
Loss on hold-out set: 2.0161717163534232e-05
MeanAbsoluteError value on hold-out data: 0.0025027357041835785
Epoch: 567
Loss on hold-out set: 4.4995292443529346e-05
MeanAbsoluteError value on hold-out data: 0.0028509716503322124
Epoch: 568
Loss on hold-out set: 2.8331555498832467e-05
MeanAbsoluteError value on hold-out data: 0.003125593764707446
Epoch: 569
Loss on hold-out set: 1.782041198414151e-05
MeanAbsoluteError value on hold-out data: 0.00182827515527606
Epoch: 570
Loss on hold-out set: 4.6797859550009124e-05
MeanAbsoluteError value on hold-out data: 0.002773449756205082
Epoch: 571
```

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Loss on hold-out set: 0.0001924915927223705
MeanAbsoluteError value on hold-out data: 0.005453599151223898
Epoch: 572
Loss on hold-out set: 3.458465258326645e-05
MeanAbsoluteError value on hold-out data: 0.0041857571341097355
Epoch: 573

Loss on hold-out set: 2.6188810101015597e-05
MeanAbsoluteError value on hold-out data: 0.0033793135080486536
Epoch: 574
Loss on hold-out set: 3.2177597033392214e-05
MeanAbsoluteError value on hold-out data: 0.003820507088676095
Epoch: 575
Loss on hold-out set: 6.244312254765598e-05
MeanAbsoluteError value on hold-out data: 0.00726272352039814
Epoch: 576
Loss on hold-out set: 8.342081133904637e-05
MeanAbsoluteError value on hold-out data: 0.002769666723906994
Epoch: 577
Loss on hold-out set: 2.9751169653249426e-05
MeanAbsoluteError value on hold-out data: 0.0028931577689945698
Epoch: 578
Loss on hold-out set: 2.0666912486956934e-05
MeanAbsoluteError value on hold-out data: 0.001981753623113036
Epoch: 579
Loss on hold-out set: 3.444221925076961e-05
MeanAbsoluteError value on hold-out data: 0.004651527386158705
Epoch: 580
Loss on hold-out set: 2.241586572668702e-05
MeanAbsoluteError value on hold-out data: 0.0035653149243444204
Epoch: 581
Loss on hold-out set: 3.216027455197802e-05
MeanAbsoluteError value on hold-out data: 0.002896606456488371
Epoch: 582
Loss on hold-out set: 3.612156957675133e-05
MeanAbsoluteError value on hold-out data: 0.004221586976200342
Epoch: 583
Loss on hold-out set: 2.3857014878702005e-05
MeanAbsoluteError value on hold-out data: 0.0034731619525700808
Epoch: 584
Loss on hold-out set: 0.00014555582789685823
MeanAbsoluteError value on hold-out data: 0.008097367361187935
Epoch: 585
```

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Loss on hold-out set: 7.075867468206285e-05
MeanAbsoluteError value on hold-out data: 0.004779414273798466
Epoch: 586
Loss on hold-out set: 5.914434677833924e-05
MeanAbsoluteError value on hold-out data: 0.005952280946075916
Epoch: 587
Loss on hold-out set: 3.3857506902055125e-05
MeanAbsoluteError value on hold-out data: 0.0037170276045799255
Epoch: 588
Loss on hold-out set: 0.00014096265735325257
MeanAbsoluteError value on hold-out data: 0.009674064815044403
Epoch: 589
Loss on hold-out set: 5.112984936922179e-05
MeanAbsoluteError value on hold-out data: 0.005055541172623634
Epoch: 590
Loss on hold-out set: 0.000830728570642685
MeanAbsoluteError value on hold-out data: 0.023062558844685555
Epoch: 591
Loss on hold-out set: 0.00027919875643228327
MeanAbsoluteError value on hold-out data: 0.01116678211838007
Epoch: 592
Loss on hold-out set: 0.00043803920782106855
MeanAbsoluteError value on hold-out data: 0.015057587996125221
Epoch: 593
Loss on hold-out set: 0.00018197578490224643
MeanAbsoluteError value on hold-out data: 0.0063879359513521194
Epoch: 594
Loss on hold-out set: 0.000340943888060888
MeanAbsoluteError value on hold-out data: 0.007327474188059568
Epoch: 595
Loss on hold-out set: 0.000890736763195539
MeanAbsoluteError value on hold-out data: 0.007580989971756935
Epoch: 596
Loss on hold-out set: 0.0001528149288644368
MeanAbsoluteError value on hold-out data: 0.006386760156601667
Epoch: 597

Loss on hold-out set: 0.00016451532003190406
MeanAbsoluteError value on hold-out data: 0.005926684942096472
Epoch: 598
Loss on hold-out set: 0.0004283276171008765
MeanAbsoluteError value on hold-out data: 0.005406417418271303
```

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Epoch: 599
Loss on hold-out set: 0.00014510726740761464
MeanAbsoluteError value on hold-out data: 0.008243574760854244
Epoch: 600
Loss on hold-out set: 0.00025158436446154635
MeanAbsoluteError value on hold-out data: 0.006006469018757343
Epoch: 601
Loss on hold-out set: 8.013655384562106e-05
MeanAbsoluteError value on hold-out data: 0.0040729898028075695
Epoch: 602
Loss on hold-out set: 0.00026595348861902543
MeanAbsoluteError value on hold-out data: 0.010064770467579365
Epoch: 603
Loss on hold-out set: 0.00017315186984265702
MeanAbsoluteError value on hold-out data: 0.008953290060162544
Epoch: 604
Loss on hold-out set: 8.570644302763915e-05
MeanAbsoluteError value on hold-out data: 0.005319781135767698
Epoch: 605
Loss on hold-out set: 0.0007094225295232766
MeanAbsoluteError value on hold-out data: 0.006767290644347668
Epoch: 606
Loss on hold-out set: 0.0009134105816644334
MeanAbsoluteError value on hold-out data: 0.013653379864990711
Epoch: 607
Loss on hold-out set: 0.00044886381013049305
MeanAbsoluteError value on hold-out data: 0.01460275799036026
Epoch: 608
Loss on hold-out set: 0.00034838929674438796
MeanAbsoluteError value on hold-out data: 0.005871864035725594
Epoch: 609

Loss on hold-out set: 0.00015406946797731123
MeanAbsoluteError value on hold-out data: 0.007537046447396278
Epoch: 610
Loss on hold-out set: 0.00036807788661750047
MeanAbsoluteError value on hold-out data: 0.010299844667315483
Epoch: 611
Loss on hold-out set: 0.00023879920933579437
MeanAbsoluteError value on hold-out data: 0.011732710525393486
Epoch: 612
Loss on hold-out set: 0.0007854973878956547
```

```
MeanAbsoluteError value on hold-out data: 0.024720869958400726
Epoch: 613
Loss on hold-out set: 0.000124578945731532
MeanAbsoluteError value on hold-out data: 0.0057813189923763275
Epoch: 614
Loss on hold-out set: 8.810742780808236e-05
MeanAbsoluteError value on hold-out data: 0.00602452177554369
Epoch: 615
Loss on hold-out set: 4.5820119830271945e-05
MeanAbsoluteError value on hold-out data: 0.0039130025543272495
Epoch: 616
Loss on hold-out set: 7.956332240753814e-05
MeanAbsoluteError value on hold-out data: 0.005173475947231054
Epoch: 617
Loss on hold-out set: 8.203524026540483e-05
MeanAbsoluteError value on hold-out data: 0.0036446622107177973
Epoch: 618
Loss on hold-out set: 8.208798724234312e-05
MeanAbsoluteError value on hold-out data: 0.00615115649998188
Epoch: 619
Loss on hold-out set: 5.467121987796992e-05
MeanAbsoluteError value on hold-out data: 0.0037975760642439127
Epoch: 620
Loss on hold-out set: 6.0061100121425913e-05
MeanAbsoluteError value on hold-out data: 0.003622813615947962
Epoch: 621

Loss on hold-out set: 6.774200160239879e-05
MeanAbsoluteError value on hold-out data: 0.0035783632192760706
Epoch: 622
Loss on hold-out set: 9.13577100020216e-05
MeanAbsoluteError value on hold-out data: 0.005101099610328674
Epoch: 623
Loss on hold-out set: 9.305274741228986e-05
MeanAbsoluteError value on hold-out data: 0.004954525735229254
Epoch: 624
Loss on hold-out set: 0.00017757763302334321
MeanAbsoluteError value on hold-out data: 0.004851804580539465
Epoch: 625
Loss on hold-out set: 0.0001305563643630816
MeanAbsoluteError value on hold-out data: 0.004083993844687939
Epoch: 626
```

```
Loss on hold-out set: 3.2222535896595983e-05
MeanAbsoluteError value on hold-out data: 0.004028264433145523
Epoch: 627
Loss on hold-out set: 5.244137469162524e-05
MeanAbsoluteError value on hold-out data: 0.0053923968225717545
Epoch: 628
Loss on hold-out set: 0.00014772633116272597
MeanAbsoluteError value on hold-out data: 0.007779079955071211
Epoch: 629
Loss on hold-out set: 0.00015488279742133896
MeanAbsoluteError value on hold-out data: 0.004294239915907383
Epoch: 630
Loss on hold-out set: 7.012639288835711e-05
MeanAbsoluteError value on hold-out data: 0.00523355882614851
Epoch: 631
Loss on hold-out set: 0.00010540661702706482
MeanAbsoluteError value on hold-out data: 0.005399046000093222
Epoch: 632
Loss on hold-out set: 5.499707093816285e-05
MeanAbsoluteError value on hold-out data: 0.003389033954590559
Epoch: 633

Loss on hold-out set: 0.00039058588495926845
MeanAbsoluteError value on hold-out data: 0.008813866414129734
Epoch: 634
Loss on hold-out set: 0.0003064473206139059
MeanAbsoluteError value on hold-out data: 0.011038723401725292
Epoch: 635
Loss on hold-out set: 7.892356168332826e-05
MeanAbsoluteError value on hold-out data: 0.0054082428105175495
Epoch: 636
Loss on hold-out set: 0.00015338188945622134
MeanAbsoluteError value on hold-out data: 0.0066000716760754585
Epoch: 637
Loss on hold-out set: 5.338049035536211e-05
MeanAbsoluteError value on hold-out data: 0.004732607398182154
Epoch: 638
Loss on hold-out set: 5.447511464234068e-05
MeanAbsoluteError value on hold-out data: 0.005397288128733635
Epoch: 639
Loss on hold-out set: 8.013574164291832e-05
MeanAbsoluteError value on hold-out data: 0.005266190506517887
```

```
Epoch: 640
Loss on hold-out set: 9.291551831019636e-05
MeanAbsoluteError value on hold-out data: 0.004765681456774473
Epoch: 641
Loss on hold-out set: 0.00015063721979171723
MeanAbsoluteError value on hold-out data: 0.009904350154101849
Epoch: 642
Loss on hold-out set: 0.00024552568141332715
MeanAbsoluteError value on hold-out data: 0.009086918085813522
Epoch: 643
Loss on hold-out set: 7.059098082831234e-05
MeanAbsoluteError value on hold-out data: 0.0038519264198839664
Epoch: 644
Loss on hold-out set: 3.3739563895395754e-05
MeanAbsoluteError value on hold-out data: 0.0025089567061513662
Epoch: 645

Loss on hold-out set: 7.409095025267513e-05
MeanAbsoluteError value on hold-out data: 0.00506669981405139
Epoch: 646
Loss on hold-out set: 3.901611640494115e-05
MeanAbsoluteError value on hold-out data: 0.003816202050074935
Epoch: 647
Loss on hold-out set: 0.00019025107318713564
MeanAbsoluteError value on hold-out data: 0.003637096146121621
Epoch: 648
Loss on hold-out set: 4.928864753214599e-05
MeanAbsoluteError value on hold-out data: 0.005252636503428221
Epoch: 649
Loss on hold-out set: 0.0001237260183092746
MeanAbsoluteError value on hold-out data: 0.008044007234275341
Epoch: 650
Loss on hold-out set: 9.004130056143224e-05
MeanAbsoluteError value on hold-out data: 0.00586165115237236
Epoch: 651
Loss on hold-out set: 0.00022789686351499863
MeanAbsoluteError value on hold-out data: 0.010409467853605747
Epoch: 652
Loss on hold-out set: 2.9453618319501784e-05
MeanAbsoluteError value on hold-out data: 0.0031944680958986282
Epoch: 653
Loss on hold-out set: 0.00031755767578320765
```

```
MeanAbsoluteError value on hold-out data: 0.0035691638477146626
Epoch: 654
Loss on hold-out set: 3.420478833504603e-05
MeanAbsoluteError value on hold-out data: 0.0038146264851093292
Epoch: 655
Loss on hold-out set: 0.00013874978676061515
MeanAbsoluteError value on hold-out data: 0.008927283808588982
Epoch: 656
Loss on hold-out set: 8.377706356106118e-05
MeanAbsoluteError value on hold-out data: 0.0061661796644330025
Epoch: 657

Loss on hold-out set: 0.00010408870699201973
MeanAbsoluteError value on hold-out data: 0.005711385980248451
Epoch: 658
Loss on hold-out set: 5.575146011132778e-05
MeanAbsoluteError value on hold-out data: 0.005182430148124695
Epoch: 659
Loss on hold-out set: 0.0001491934956088938
MeanAbsoluteError value on hold-out data: 0.007921947166323662
Epoch: 660
Loss on hold-out set: 4.468840892226772e-05
MeanAbsoluteError value on hold-out data: 0.003913837485015392
Epoch: 661
Loss on hold-out set: 5.938206946534832e-05
MeanAbsoluteError value on hold-out data: 0.0032589698676019907
Epoch: 662
Loss on hold-out set: 0.0001206058974084475
MeanAbsoluteError value on hold-out data: 0.005374016240239143
Epoch: 663
Loss on hold-out set: 7.634201861755603e-05
MeanAbsoluteError value on hold-out data: 0.007374465465545654
Epoch: 664
Loss on hold-out set: 0.0002687913197166237
MeanAbsoluteError value on hold-out data: 0.01491426769644022
Epoch: 665
Loss on hold-out set: 6.965477127538946e-05
MeanAbsoluteError value on hold-out data: 0.0061439587734639645
Epoch: 666
Loss on hold-out set: 4.7513688921179365e-05
MeanAbsoluteError value on hold-out data: 0.005025033839046955
Early stopping at epoch 665
```

```
Returned to Spot: Validation loss: 4.7513688921179365e-05
----------------------------------------------
```

```
spotPython tuning: 4.7513688921179365e-05 [##--------] 20.76%
```

```
config: {'_L_in': 10, '_L_out': 1, 'l1': 8, 'dropout_prob': 0.03599835051216971, 'lr_mult': 9
Epoch: 1
Loss on hold-out set: 0.023506755376920888
MeanAbsoluteError value on hold-out data: 0.11823632568120956
Epoch: 2
Loss on hold-out set: 0.021645339524471445
MeanAbsoluteError value on hold-out data: 0.11616384983062744
Epoch: 3
Loss on hold-out set: 0.025049097909543076
MeanAbsoluteError value on hold-out data: 0.12206988036632538
Epoch: 4
Loss on hold-out set: 0.02389913828014151
MeanAbsoluteError value on hold-out data: 0.120798759162426
Epoch: 5
Loss on hold-out set: 0.021896103972961243
MeanAbsoluteError value on hold-out data: 0.11543799191713333
Epoch: 6
Loss on hold-out set: 0.018787105788329716
MeanAbsoluteError value on hold-out data: 0.10286390036344528
Epoch: 7
Loss on hold-out set: 0.01620359894647998
MeanAbsoluteError value on hold-out data: 0.09515180438756943
Epoch: 8
Loss on hold-out set: 0.01327066442708632
MeanAbsoluteError value on hold-out data: 0.08592012524604797
Epoch: 9
Loss on hold-out set: 0.015411988476683436
MeanAbsoluteError value on hold-out data: 0.09204602241516113
Epoch: 10
Loss on hold-out set: 0.008982576527877859
MeanAbsoluteError value on hold-out data: 0.06711972504854202
Epoch: 11
Loss on hold-out set: 0.012268420183222349
MeanAbsoluteError value on hold-out data: 0.08522296696901321
Epoch: 12
```

```
Loss on hold-out set: 0.00524943964678402
MeanAbsoluteError value on hold-out data: 0.05508241802453995
Epoch: 13
Loss on hold-out set: 0.006631776269243442
MeanAbsoluteError value on hold-out data: 0.05701543018221855
Epoch: 14
Loss on hold-out set: 0.006207643330287139
MeanAbsoluteError value on hold-out data: 0.04336873069405556
Epoch: 15
Loss on hold-out set: 0.004877450244461407
MeanAbsoluteError value on hold-out data: 0.03928908333182335
Epoch: 16
Loss on hold-out set: 0.005912826198159325
MeanAbsoluteError value on hold-out data: 0.04265445098280907
Epoch: 17
Loss on hold-out set: 0.00403757426312567
MeanAbsoluteError value on hold-out data: 0.03242894634604454
Epoch: 18
Loss on hold-out set: 0.004187213806481419
MeanAbsoluteError value on hold-out data: 0.03371176868677139
Epoch: 19
Loss on hold-out set: 0.003291776591044924
MeanAbsoluteError value on hold-out data: 0.03536136448383331
Epoch: 20
Loss on hold-out set: 0.00473433100061907
MeanAbsoluteError value on hold-out data: 0.029089590534567833
Epoch: 21
Loss on hold-out set: 0.004207252190099098
MeanAbsoluteError value on hold-out data: 0.03703608736395836
Epoch: 22
Loss on hold-out set: 0.005945666871603431
MeanAbsoluteError value on hold-out data: 0.04292454198002815
Epoch: 23
Loss on hold-out set: 0.003963107287601911
MeanAbsoluteError value on hold-out data: 0.033460672944784164
Epoch: 24

Loss on hold-out set: 0.003912350774618589
MeanAbsoluteError value on hold-out data: 0.029717115685343742
Epoch: 25
Loss on hold-out set: 0.004195152647107055
MeanAbsoluteError value on hold-out data: 0.03930100053548813
```

```
Epoch: 26
Loss on hold-out set: 0.0052769907526549345
MeanAbsoluteError value on hold-out data: 0.03866568207740784
Epoch: 27
Loss on hold-out set: 0.004729577936048277
MeanAbsoluteError value on hold-out data: 0.04144865646958351
Epoch: 28
Loss on hold-out set: 0.0044518013578214635
MeanAbsoluteError value on hold-out data: 0.03721940889954567
Epoch: 29
Loss on hold-out set: 0.0038594441966300734
MeanAbsoluteError value on hold-out data: 0.03902621567249298
Epoch: 30
Loss on hold-out set: 0.005960505918330072
MeanAbsoluteError value on hold-out data: 0.05865637585520744
Epoch: 31
Loss on hold-out set: 0.004092534014489502
MeanAbsoluteError value on hold-out data: 0.03230636939406395
Epoch: 32
Loss on hold-out set: 0.003897556520314538
MeanAbsoluteError value on hold-out data: 0.02989809587597847
Epoch: 33
Loss on hold-out set: 0.004614161728041884
MeanAbsoluteError value on hold-out data: 0.03935886546969414
Epoch: 34
Loss on hold-out set: 0.003563264917159502
MeanAbsoluteError value on hold-out data: 0.030476966872811317
Epoch: 35

Loss on hold-out set: 0.003909348785160354
MeanAbsoluteError value on hold-out data: 0.03464643284678459
Epoch: 36
Loss on hold-out set: 0.004589684952454837
MeanAbsoluteError value on hold-out data: 0.039195526391267776
Epoch: 37
Loss on hold-out set: 0.003494114247395804
MeanAbsoluteError value on hold-out data: 0.029406366869807243
Epoch: 38
Loss on hold-out set: 0.003097347967348852
MeanAbsoluteError value on hold-out data: 0.027962341904640198
Epoch: 39
Loss on hold-out set: 0.0038137455443287955
```

```
MeanAbsoluteError value on hold-out data: 0.04565904289484024
Epoch: 40
Loss on hold-out set: 0.0037383195908899467
MeanAbsoluteError value on hold-out data: 0.03729192167520523
Epoch: 41
Loss on hold-out set: 0.0039083928924427665
MeanAbsoluteError value on hold-out data: 0.03559407591819763
Epoch: 42
Loss on hold-out set: 0.005880675382765108
MeanAbsoluteError value on hold-out data: 0.0580676831305027
Epoch: 43
Loss on hold-out set: 0.002954945903375598
MeanAbsoluteError value on hold-out data: 0.03274992108345032
Epoch: 44
Loss on hold-out set: 0.0022525465196131813
MeanAbsoluteError value on hold-out data: 0.022415626794099808
Epoch: 45
Loss on hold-out set: 0.004606472701293808
MeanAbsoluteError value on hold-out data: 0.039312172681093216
Epoch: 46

Loss on hold-out set: 0.003830523671479712
MeanAbsoluteError value on hold-out data: 0.030841099098324776
Epoch: 47
Loss on hold-out set: 0.004232613486812242
MeanAbsoluteError value on hold-out data: 0.03301343694329262
Epoch: 48
Loss on hold-out set: 0.0037502665602101174
MeanAbsoluteError value on hold-out data: 0.02961738035082817
Epoch: 49
Loss on hold-out set: 0.0030614403997931638
MeanAbsoluteError value on hold-out data: 0.02505178563296795
Epoch: 50
Loss on hold-out set: 0.0031463114557577923
MeanAbsoluteError value on hold-out data: 0.02775089256465435
Epoch: 51
Loss on hold-out set: 0.00367784569492582
MeanAbsoluteError value on hold-out data: 0.03425969183444977
Epoch: 52
Loss on hold-out set: 0.00524514938680161
MeanAbsoluteError value on hold-out data: 0.04778827726840973
Epoch: 53
```

```
Loss on hold-out set: 0.0060262372227091535
MeanAbsoluteError value on hold-out data: 0.049155570566654205
Epoch: 54
Loss on hold-out set: 0.003337106506622053
MeanAbsoluteError value on hold-out data: 0.03584633022546768
Epoch: 55
Loss on hold-out set: 0.003682627433399351
MeanAbsoluteError value on hold-out data: 0.03446376323699951
Epoch: 56
Loss on hold-out set: 0.003615960880492103
MeanAbsoluteError value on hold-out data: 0.03472927585244179
Epoch: 57
Loss on hold-out set: 0.004090971403600538
MeanAbsoluteError value on hold-out data: 0.035312581807374954
Epoch: 58

Loss on hold-out set: 0.004432214931033454
MeanAbsoluteError value on hold-out data: 0.045263949781656265
Epoch: 59
Loss on hold-out set: 0.004294873778761891
MeanAbsoluteError value on hold-out data: 0.033631183207035065
Epoch: 60
Loss on hold-out set: 0.003343501272626638
MeanAbsoluteError value on hold-out data: 0.03397911414504051
Epoch: 61
Loss on hold-out set: 0.00412887539622668
MeanAbsoluteError value on hold-out data: 0.03750883787870407
Epoch: 62
Loss on hold-out set: 0.004288393605843578
MeanAbsoluteError value on hold-out data: 0.047708019614219666
Epoch: 63
Loss on hold-out set: 0.0032711861432816428
MeanAbsoluteError value on hold-out data: 0.02524924837052822
Epoch: 64
Loss on hold-out set: 0.004063471301235136
MeanAbsoluteError value on hold-out data: 0.032303083688020706
Epoch: 65
Loss on hold-out set: 0.003169177853315456
MeanAbsoluteError value on hold-out data: 0.029346754774451256
Epoch: 66
Loss on hold-out set: 0.004942294213259102
MeanAbsoluteError value on hold-out data: 0.05798023194074631
```

```
Epoch: 67
Loss on hold-out set: 0.004457743375831724
MeanAbsoluteError value on hold-out data: 0.04222787544131279
Epoch: 68
Loss on hold-out set: 0.0036669657110905973
MeanAbsoluteError value on hold-out data: 0.028614871203899384
Epoch: 69
Loss on hold-out set: 0.0037091755063891852
MeanAbsoluteError value on hold-out data: 0.03384418040513992
Epoch: 70

Loss on hold-out set: 0.004829431920753498
MeanAbsoluteError value on hold-out data: 0.0548015832901001
Epoch: 71
Loss on hold-out set: 0.004579508040670159
MeanAbsoluteError value on hold-out data: 0.037141114473342896
Epoch: 72
Loss on hold-out set: 0.004471006244401858
MeanAbsoluteError value on hold-out data: 0.03048926405608654
Epoch: 73
Loss on hold-out set: 0.00417411467979515
MeanAbsoluteError value on hold-out data: 0.045929405838251114
Epoch: 74
Loss on hold-out set: 0.0037946471351652258
MeanAbsoluteError value on hold-out data: 0.03232954815030098
Epoch: 75
Loss on hold-out set: 0.004074415744980797
MeanAbsoluteError value on hold-out data: 0.0454457551240921
Epoch: 76
Loss on hold-out set: 0.0035127907103263793
MeanAbsoluteError value on hold-out data: 0.027179565280675888
Epoch: 77
Loss on hold-out set: 0.003962799128777605
MeanAbsoluteError value on hold-out data: 0.03405416011810303
Epoch: 78
Loss on hold-out set: 0.0033508850051715087
MeanAbsoluteError value on hold-out data: 0.034410420805215836
Epoch: 79
Loss on hold-out set: 0.0034548620085268723
MeanAbsoluteError value on hold-out data: 0.030934883281588554
Epoch: 80
Loss on hold-out set: 0.004921062328656645
```

```
MeanAbsoluteError value on hold-out data: 0.04676264151930809
Epoch: 81
Loss on hold-out set: 0.003953963460317985
MeanAbsoluteError value on hold-out data: 0.03125424683094025
Epoch: 82

Loss on hold-out set: 0.0034090657733797437
MeanAbsoluteError value on hold-out data: 0.03476287052035332
Epoch: 83
Loss on hold-out set: 0.0038920468845102924
MeanAbsoluteError value on hold-out data: 0.02933497168123722
Epoch: 84
Loss on hold-out set: 0.006047389231083032
MeanAbsoluteError value on hold-out data: 0.05457139387726784
Epoch: 85
Loss on hold-out set: 0.004100109363399066
MeanAbsoluteError value on hold-out data: 0.030111996456980705
Epoch: 86
Loss on hold-out set: 0.005198258341758782
MeanAbsoluteError value on hold-out data: 0.037879087030887604
Epoch: 87
Loss on hold-out set: 0.005655517464650697
MeanAbsoluteError value on hold-out data: 0.05233039706945419
Epoch: 88
Loss on hold-out set: 0.004128443409602991
MeanAbsoluteError value on hold-out data: 0.04871878772974014
Epoch: 89
Loss on hold-out set: 0.004078004664686313
MeanAbsoluteError value on hold-out data: 0.043244872242212296
Epoch: 90
Loss on hold-out set: 0.00455078297129244
MeanAbsoluteError value on hold-out data: 0.049303088337183
Epoch: 91
Loss on hold-out set: 0.00428071686981543
MeanAbsoluteError value on hold-out data: 0.03000505082309246
Epoch: 92
Loss on hold-out set: 0.003347336807277507
MeanAbsoluteError value on hold-out data: 0.027895009145140648
Epoch: 93
Loss on hold-out set: 0.0038882575337131704
MeanAbsoluteError value on hold-out data: 0.03569580242037773
Epoch: 94
```

```
Loss on hold-out set: 0.0031634161048139887
MeanAbsoluteError value on hold-out data: 0.03739279508590698
Epoch: 95
Loss on hold-out set: 0.003942356647856191
MeanAbsoluteError value on hold-out data: 0.035835448652505875
Epoch: 96
Loss on hold-out set: 0.004143179314987241
MeanAbsoluteError value on hold-out data: 0.02834319695830345
Epoch: 97
Loss on hold-out set: 0.0037965291041090446
MeanAbsoluteError value on hold-out data: 0.027210110798478127
Epoch: 98
Loss on hold-out set: 0.004737624063732494
MeanAbsoluteError value on hold-out data: 0.04312761127948761
Epoch: 99
Loss on hold-out set: 0.0034310324600052185
MeanAbsoluteError value on hold-out data: 0.03816285356879234
Epoch: 100
Loss on hold-out set: 0.00392508732674239
MeanAbsoluteError value on hold-out data: 0.02717173844575882
Epoch: 101
Loss on hold-out set: 0.00357358730003685
MeanAbsoluteError value on hold-out data: 0.030019845813512802
Epoch: 102
Loss on hold-out set: 0.006052477769308577
MeanAbsoluteError value on hold-out data: 0.07082431018352509
Epoch: 103
Loss on hold-out set: 0.003925610334064052
MeanAbsoluteError value on hold-out data: 0.030082352459430695
Epoch: 104
Loss on hold-out set: 0.004164503380276361
MeanAbsoluteError value on hold-out data: 0.04777068644762039
Epoch: 105
Loss on hold-out set: 0.003967613495780442
MeanAbsoluteError value on hold-out data: 0.025649065151810646
Epoch: 106

Loss on hold-out set: 0.0039953296739105625
MeanAbsoluteError value on hold-out data: 0.036126699298620224
Epoch: 107
Loss on hold-out set: 0.004205309180849183
MeanAbsoluteError value on hold-out data: 0.044948309659957886
```

```
Epoch: 108
Loss on hold-out set: 0.0032749201884718403
MeanAbsoluteError value on hold-out data: 0.027950722724199295
Epoch: 109
Loss on hold-out set: 0.0032735415810939707
MeanAbsoluteError value on hold-out data: 0.0317719466984272
Epoch: 110
Loss on hold-out set: 0.00472465786457944
MeanAbsoluteError value on hold-out data: 0.0572485476732254
Epoch: 111
Loss on hold-out set: 0.0036065473891779363
MeanAbsoluteError value on hold-out data: 0.02771439589560032
Epoch: 112
Loss on hold-out set: 0.004495589361268733
MeanAbsoluteError value on hold-out data: 0.044721804559230804
Epoch: 113
Loss on hold-out set: 0.003529879944261139
MeanAbsoluteError value on hold-out data: 0.02792082168161869
Epoch: 114
Loss on hold-out set: 0.0071089399770196335
MeanAbsoluteError value on hold-out data: 0.07493898272514343
Epoch: 115
Loss on hold-out set: 0.003386797149448141
MeanAbsoluteError value on hold-out data: 0.037081219255924225
Epoch: 116
Loss on hold-out set: 0.0036247298222633617
MeanAbsoluteError value on hold-out data: 0.02958139032125473
Epoch: 117
Loss on hold-out set: 0.005244555725336173
MeanAbsoluteError value on hold-out data: 0.04906816408038139
Epoch: 118

Loss on hold-out set: 0.005163547851751852
MeanAbsoluteError value on hold-out data: 0.04202842339873314
Epoch: 119
Loss on hold-out set: 0.00308869154512075
MeanAbsoluteError value on hold-out data: 0.02515309862792492
Epoch: 120
Loss on hold-out set: 0.004957641776663398
MeanAbsoluteError value on hold-out data: 0.03976450487971306
Epoch: 121
Loss on hold-out set: 0.003530481808794368
```

```
MeanAbsoluteError value on hold-out data: 0.03752899169921875
Epoch: 122
Loss on hold-out set: 0.004040482097862926
MeanAbsoluteError value on hold-out data: 0.030690599232912064
Epoch: 123
Loss on hold-out set: 0.0037393642675229593
MeanAbsoluteError value on hold-out data: 0.041350092738866806
Epoch: 124
Loss on hold-out set: 0.004311645792959577
MeanAbsoluteError value on hold-out data: 0.03683801740407944
Epoch: 125
Loss on hold-out set: 0.004201064099202324
MeanAbsoluteError value on hold-out data: 0.038029517978429794
Epoch: 126
Loss on hold-out set: 0.004716955170519405
MeanAbsoluteError value on hold-out data: 0.03515833616256714
Epoch: 127
Loss on hold-out set: 0.0037462445269212416
MeanAbsoluteError value on hold-out data: 0.02745225839316845
Epoch: 128
Loss on hold-out set: 0.0031938273088216143
MeanAbsoluteError value on hold-out data: 0.031873151659965515
Epoch: 129
Loss on hold-out set: 0.003276675981492429
MeanAbsoluteError value on hold-out data: 0.02790764719247818
Epoch: 130

Loss on hold-out set: 0.005806401169760839
MeanAbsoluteError value on hold-out data: 0.06280190497636795
Epoch: 131
Loss on hold-out set: 0.0038372349154087715
MeanAbsoluteError value on hold-out data: 0.03186299651861191
Epoch: 132
Loss on hold-out set: 0.0033389467942853165
MeanAbsoluteError value on hold-out data: 0.02770933136343956
Epoch: 133
Loss on hold-out set: 0.0032951531240159007
MeanAbsoluteError value on hold-out data: 0.03064795583486557
Epoch: 134
Loss on hold-out set: 0.00343839087949355
MeanAbsoluteError value on hold-out data: 0.026015784591436386
Epoch: 135
```

```
Loss on hold-out set: 0.004187680014518647
MeanAbsoluteError value on hold-out data: 0.028897473588585854
Epoch: 136
Loss on hold-out set: 0.004407088517741374
MeanAbsoluteError value on hold-out data: 0.03140385448932648
Epoch: 137
Loss on hold-out set: 0.004471265376579188
MeanAbsoluteError value on hold-out data: 0.03830045834183693
Epoch: 138
Loss on hold-out set: 0.002768352269700508
MeanAbsoluteError value on hold-out data: 0.025304431095719337
Epoch: 139
Loss on hold-out set: 0.003509225233038275
MeanAbsoluteError value on hold-out data: 0.033580031245946884
Epoch: 140
Loss on hold-out set: 0.004021906304651087
MeanAbsoluteError value on hold-out data: 0.039729174226522446
Epoch: 141
Loss on hold-out set: 0.00400826713303104
MeanAbsoluteError value on hold-out data: 0.047913238406181335
Epoch: 142

Loss on hold-out set: 0.004104289629475189
MeanAbsoluteError value on hold-out data: 0.03423422574996948
Epoch: 143
Loss on hold-out set: 0.0037940547303342577
MeanAbsoluteError value on hold-out data: 0.031117543578147888
Epoch: 144
Loss on hold-out set: 0.005350717231570008
MeanAbsoluteError value on hold-out data: 0.0333385206758976
Epoch: 145
Loss on hold-out set: 0.003568610991949658
MeanAbsoluteError value on hold-out data: 0.025235207751393318
Epoch: 146
Loss on hold-out set: 0.004143054486791554
MeanAbsoluteError value on hold-out data: 0.051568955183029175
Epoch: 147
Loss on hold-out set: 0.00620009526487832
MeanAbsoluteError value on hold-out data: 0.06823037564754486
Epoch: 148
Loss on hold-out set: 0.003464810836655823
MeanAbsoluteError value on hold-out data: 0.03633110225200653
```

```
Epoch: 149
Loss on hold-out set: 0.004393863656093201
MeanAbsoluteError value on hold-out data: 0.03302435949444771
Epoch: 150
Loss on hold-out set: 0.003546583837880079
MeanAbsoluteError value on hold-out data: 0.03092315047979355
Epoch: 151
Loss on hold-out set: 0.004335494442401748
MeanAbsoluteError value on hold-out data: 0.04442648962140083
Epoch: 152
Loss on hold-out set: 0.004666345287947287
MeanAbsoluteError value on hold-out data: 0.029212750494480133
Epoch: 153
Loss on hold-out set: 0.004167274062638171
MeanAbsoluteError value on hold-out data: 0.03567194193601608
Epoch: 154


Loss on hold-out set: 0.0033069047783436346
MeanAbsoluteError value on hold-out data: 0.02431568317115307
Epoch: 155
Loss on hold-out set: 0.004038105747895315
MeanAbsoluteError value on hold-out data: 0.04112785682082176
Epoch: 156
Loss on hold-out set: 0.0034057381440346177
MeanAbsoluteError value on hold-out data: 0.034562982618808746
Epoch: 157
Loss on hold-out set: 0.004079577484701172
MeanAbsoluteError value on hold-out data: 0.0406113862991333
Epoch: 158
Loss on hold-out set: 0.0037486618170269616
MeanAbsoluteError value on hold-out data: 0.0377655103802681
Epoch: 159
Loss on hold-out set: 0.004014640650558776
MeanAbsoluteError value on hold-out data: 0.04010860249400139
Epoch: 160
Loss on hold-out set: 0.004352242348862714
MeanAbsoluteError value on hold-out data: 0.045890867710113525
Epoch: 161
Loss on hold-out set: 0.003956653197268392
MeanAbsoluteError value on hold-out data: 0.039424724876880646
Epoch: 162
Loss on hold-out set: 0.003756246172997635
```

```
MeanAbsoluteError value on hold-out data: 0.0366213358938694
Epoch: 163
Loss on hold-out set: 0.005215217448207305
MeanAbsoluteError value on hold-out data: 0.06001477688550949
Epoch: 164
Loss on hold-out set: 0.00512870274006242
MeanAbsoluteError value on hold-out data: 0.05515990033745766
Epoch: 165
Loss on hold-out set: 0.0034553541788083842
MeanAbsoluteError value on hold-out data: 0.0327502116560936
Epoch: 166

Loss on hold-out set: 0.0033362752437824383
MeanAbsoluteError value on hold-out data: 0.03384982421994209
Epoch: 167
Loss on hold-out set: 0.0039494222958302615
MeanAbsoluteError value on hold-out data: 0.029834918677806854
Epoch: 168
Loss on hold-out set: 0.00545766597497277
MeanAbsoluteError value on hold-out data: 0.049748748540878296
Epoch: 169
Loss on hold-out set: 0.004420832418346484
MeanAbsoluteError value on hold-out data: 0.05470665544271469
Epoch: 170
Loss on hold-out set: 0.004125891113194245
MeanAbsoluteError value on hold-out data: 0.044031914323568344
Epoch: 171
Loss on hold-out set: 0.003935146042701825
MeanAbsoluteError value on hold-out data: 0.034695129841566086
Epoch: 172
Loss on hold-out set: 0.0048916869525687376
MeanAbsoluteError value on hold-out data: 0.04466831684112549
Early stopping at epoch 171
Returned to Spot: Validation loss: 0.0048916869525687376
----------------------------------------------
spotPython tuning: 4.7513688921179365e-05 [###-------] 26.44%


config: {'_L_in': 10, '_L_out': 1, 'l1': 32, 'dropout_prob': 0.0, 'lr_mult': 0.542368068091
Epoch: 1
Loss on hold-out set: 0.06165605871693084
MeanAbsoluteError value on hold-out data: 0.21007907390594482
```

```
Epoch: 2
Loss on hold-out set: 0.022031726658736404
MeanAbsoluteError value on hold-out data: 0.11526649445295334
Epoch: 3
Loss on hold-out set: 0.021139094030092422
MeanAbsoluteError value on hold-out data: 0.11424039304256439
Epoch: 4
Loss on hold-out set: 0.020320024120768432
MeanAbsoluteError value on hold-out data: 0.11232804507017136
Epoch: 5
Loss on hold-out set: 0.019426581939976467
MeanAbsoluteError value on hold-out data: 0.11019323021173477
Epoch: 6
Loss on hold-out set: 0.018451023748830744
MeanAbsoluteError value on hold-out data: 0.10792381316423416
Epoch: 7
Loss on hold-out set: 0.01737838413713402
MeanAbsoluteError value on hold-out data: 0.1053188368678093
Epoch: 8
Loss on hold-out set: 0.01611353455135893
MeanAbsoluteError value on hold-out data: 0.10164768993854523
Epoch: 9
Loss on hold-out set: 0.014631646280912193
MeanAbsoluteError value on hold-out data: 0.09672954678535461
Epoch: 10
Loss on hold-out set: 0.013084790246610186
MeanAbsoluteError value on hold-out data: 0.09123718738555908
Epoch: 11
Loss on hold-out set: 0.011536779788959967
MeanAbsoluteError value on hold-out data: 0.08550794422626495
Epoch: 12

Loss on hold-out set: 0.010017790886769561
MeanAbsoluteError value on hold-out data: 0.07943938672542572
Epoch: 13
Loss on hold-out set: 0.008612224340475606
MeanAbsoluteError value on hold-out data: 0.07349085807800293
Epoch: 14
Loss on hold-out set: 0.007315749722214318
MeanAbsoluteError value on hold-out data: 0.06749609857797623
Epoch: 15
Loss on hold-out set: 0.006141632349585725
```

```
MeanAbsoluteError value on hold-out data: 0.06165304034948349
Epoch: 16
Loss on hold-out set: 0.005084414004446252
MeanAbsoluteError value on hold-out data: 0.05610286071896553
Epoch: 17
Loss on hold-out set: 0.004130778432897243
MeanAbsoluteError value on hold-out data: 0.05042959749698639
Epoch: 18
Loss on hold-out set: 0.0032025797684725964
MeanAbsoluteError value on hold-out data: 0.044039130210876465
Epoch: 19
Loss on hold-out set: 0.002519158574470662
MeanAbsoluteError value on hold-out data: 0.03894106298685074
Epoch: 20
Loss on hold-out set: 0.0018923318512909311
MeanAbsoluteError value on hold-out data: 0.03362016752362251
Epoch: 21
Loss on hold-out set: 0.0013627327731994324
MeanAbsoluteError value on hold-out data: 0.02840455062687397
Epoch: 22
Loss on hold-out set: 0.0009561917360865903
MeanAbsoluteError value on hold-out data: 0.023637007921934128
Epoch: 23
Loss on hold-out set: 0.0006629488898876222
MeanAbsoluteError value on hold-out data: 0.019490890204906464
Epoch: 24

Loss on hold-out set: 0.00045532300971803794
MeanAbsoluteError value on hold-out data: 0.015958845615386963
Epoch: 25
Loss on hold-out set: 0.00031444793182201563
MeanAbsoluteError value on hold-out data: 0.013082779012620449
Epoch: 26
Loss on hold-out set: 0.000220692257674895
MeanAbsoluteError value on hold-out data: 0.010721614584326744
Epoch: 27
Loss on hold-out set: 0.0001612725375851273
MeanAbsoluteError value on hold-out data: 0.008886872790753841
Epoch: 28
Loss on hold-out set: 0.00012153516543453167
MeanAbsoluteError value on hold-out data: 0.007399498485028744
Epoch: 29
```

```
Loss on hold-out set: 9.617884526098925e-05
MeanAbsoluteError value on hold-out data: 0.006244088057428598
Epoch: 30
Loss on hold-out set: 8.048507525496749e-05
MeanAbsoluteError value on hold-out data: 0.005366947501897812
Epoch: 31
Loss on hold-out set: 7.018692017960635e-05
MeanAbsoluteError value on hold-out data: 0.004731531720608473
Epoch: 32
Loss on hold-out set: 6.214124509465604e-05
MeanAbsoluteError value on hold-out data: 0.004214134532958269
Epoch: 33
Loss on hold-out set: 5.631588971697822e-05
MeanAbsoluteError value on hold-out data: 0.0038181790150702
Epoch: 34
Loss on hold-out set: 5.120443021448744e-05
MeanAbsoluteError value on hold-out data: 0.0034870172385126352
Epoch: 35
Loss on hold-out set: 4.733781732487554e-05
MeanAbsoluteError value on hold-out data: 0.003249312750995159
Epoch: 36

Loss on hold-out set: 4.364964828901544e-05
MeanAbsoluteError value on hold-out data: 0.003030845895409584
Epoch: 37
Loss on hold-out set: 4.016576948635319e-05
MeanAbsoluteError value on hold-out data: 0.002836742904037237
Epoch: 38
Loss on hold-out set: 3.6991700522106074e-05
MeanAbsoluteError value on hold-out data: 0.002657828386873007
Epoch: 39
Loss on hold-out set: 3.40334596408435e-05
MeanAbsoluteError value on hold-out data: 0.0024895076639950275
Epoch: 40
Loss on hold-out set: 3.132611408617729e-05
MeanAbsoluteError value on hold-out data: 0.0023273518308997154
Epoch: 41
Loss on hold-out set: 2.888075572490092e-05
MeanAbsoluteError value on hold-out data: 0.0022307010367512703
Epoch: 42
Loss on hold-out set: 2.7027628769809253e-05
MeanAbsoluteError value on hold-out data: 0.0022243130952119827
```

```
Epoch: 43
Loss on hold-out set: 2.563186073027617e-05
MeanAbsoluteError value on hold-out data: 0.002302047796547413
Epoch: 44
Loss on hold-out set: 2.463823563546516e-05
MeanAbsoluteError value on hold-out data: 0.002405730076134205
Epoch: 45
Loss on hold-out set: 2.3826476879812137e-05
MeanAbsoluteError value on hold-out data: 0.002508131554350257
Epoch: 46
Loss on hold-out set: 2.289172720051475e-05
MeanAbsoluteError value on hold-out data: 0.0025161521043628454
Epoch: 47
Loss on hold-out set: 2.2047303206674867e-05
MeanAbsoluteError value on hold-out data: 0.0025203353725373745
Epoch: 48

Loss on hold-out set: 2.0977502458663366e-05
MeanAbsoluteError value on hold-out data: 0.00243104319088161
Epoch: 49
Loss on hold-out set: 1.998896140333416e-05
MeanAbsoluteError value on hold-out data: 0.0023446569684892893
Epoch: 50
Loss on hold-out set: 1.900936785516119e-05
MeanAbsoluteError value on hold-out data: 0.0022505803499370813
Epoch: 51
Loss on hold-out set: 1.8140645741033567e-05
MeanAbsoluteError value on hold-out data: 0.0021687305998057127
Epoch: 52
Loss on hold-out set: 1.730363089043414e-05
MeanAbsoluteError value on hold-out data: 0.002088887384161353
Epoch: 53
Loss on hold-out set: 1.6519743308220458e-05
MeanAbsoluteError value on hold-out data: 0.0020243003964424133
Epoch: 54
Loss on hold-out set: 1.5849790082412302e-05
MeanAbsoluteError value on hold-out data: 0.00199165940284729
Epoch: 55
Loss on hold-out set: 1.5150856051760505e-05
MeanAbsoluteError value on hold-out data: 0.001929821795783937
Epoch: 56
Loss on hold-out set: 1.453165945900094e-05
```

```
MeanAbsoluteError value on hold-out data: 0.001888805185444653
Epoch: 57
Loss on hold-out set: 1.3913566185034429e-05
MeanAbsoluteError value on hold-out data: 0.0018291441956534982
Epoch: 58
Loss on hold-out set: 1.3256607844955157e-05
MeanAbsoluteError value on hold-out data: 0.0017392002046108246
Epoch: 59
Loss on hold-out set: 1.2687373609160682e-05
MeanAbsoluteError value on hold-out data: 0.0016978365601971745
Epoch: 60

Loss on hold-out set: 1.2168241292891635e-05
MeanAbsoluteError value on hold-out data: 0.0016518813790753484
Epoch: 61
Loss on hold-out set: 1.1663744004408727e-05
MeanAbsoluteError value on hold-out data: 0.0016111009754240513
Epoch: 62
Loss on hold-out set: 1.120734246515703e-05
MeanAbsoluteError value on hold-out data: 0.0015927535714581609
Epoch: 63
Loss on hold-out set: 1.090364080662192e-05
MeanAbsoluteError value on hold-out data: 0.0016266503371298313
Epoch: 64
Loss on hold-out set: 1.066119013384387e-05
MeanAbsoluteError value on hold-out data: 0.0016679482068866491
Epoch: 65
Loss on hold-out set: 1.0492220369721844e-05
MeanAbsoluteError value on hold-out data: 0.0017235545674338937
Epoch: 66
Loss on hold-out set: 1.0328573800303562e-05
MeanAbsoluteError value on hold-out data: 0.0017706392100080848
Epoch: 67
Loss on hold-out set: 1.0085478001093706e-05
MeanAbsoluteError value on hold-out data: 0.0017837369814515114
Epoch: 68
Loss on hold-out set: 9.601789016462709e-06
MeanAbsoluteError value on hold-out data: 0.001712682656943798
Epoch: 69
Loss on hold-out set: 9.160697532563158e-06
MeanAbsoluteError value on hold-out data: 0.001647234777919948
Epoch: 70
```

```
Loss on hold-out set: 8.582013299773231e-06
MeanAbsoluteError value on hold-out data: 0.0015291754389181733
Epoch: 71
Loss on hold-out set: 7.996458573475856e-06
MeanAbsoluteError value on hold-out data: 0.0013841603649780154
Epoch: 72

Loss on hold-out set: 7.575177483276045e-06
MeanAbsoluteError value on hold-out data: 0.0012699905782938004
Epoch: 73
Loss on hold-out set: 7.42044893349047e-06
MeanAbsoluteError value on hold-out data: 0.0012509474763646722
Epoch: 74
Loss on hold-out set: 7.495629895297378e-06
MeanAbsoluteError value on hold-out data: 0.0013249072944745421
Epoch: 75
Loss on hold-out set: 7.74441567137118e-06
MeanAbsoluteError value on hold-out data: 0.0014566804748028517
Epoch: 76
Loss on hold-out set: 8.138933609595705e-06
MeanAbsoluteError value on hold-out data: 0.0016350888181477785
Epoch: 77
Loss on hold-out set: 8.718986829367886e-06
MeanAbsoluteError value on hold-out data: 0.0018492178060114384
Epoch: 78
Loss on hold-out set: 9.546711896147922e-06
MeanAbsoluteError value on hold-out data: 0.0021091459784656763
Epoch: 79
Loss on hold-out set: 1.069478972376122e-05
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Loss on hold-out set: 1.1945621496890549e-05
MeanAbsoluteError value on hold-out data: 0.00269072107039392
Epoch: 81
Loss on hold-out set: 1.3307709267744366e-05
MeanAbsoluteError value on hold-out data: 0.002959341276437044
Epoch: 82
Loss on hold-out set: 1.4263912948751423e-05
MeanAbsoluteError value on hold-out data: 0.003136030165478587
Epoch: 83
Loss on hold-out set: 1.4807217475639558e-05
MeanAbsoluteError value on hold-out data: 0.0032326807267963886
Epoch: 84
```

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Loss on hold-out set: 1.4479981258007588e-05
MeanAbsoluteError value on hold-out data: 0.0031920361798256636
Epoch: 85
Loss on hold-out set: 1.3775727175494754e-05
MeanAbsoluteError value on hold-out data: 0.0030879208352416754
Epoch: 86
Loss on hold-out set: 1.2714809827230056e-05
MeanAbsoluteError value on hold-out data: 0.002918706741183996
Epoch: 87
Loss on hold-out set: 1.130123457402844e-05
MeanAbsoluteError value on hold-out data: 0.002673239214345813
Epoch: 88
Loss on hold-out set: 9.713321841637049e-06
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Epoch: 89
Loss on hold-out set: 8.613182806608452e-06
MeanAbsoluteError value on hold-out data: 0.002145133912563324
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Loss on hold-out set: 7.6257977429792704e-06
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Epoch: 91
Loss on hold-out set: 7.010004102432121e-06
MeanAbsoluteError value on hold-out data: 0.0017890221206471324
Epoch: 92
Loss on hold-out set: 6.486021398562738e-06
MeanAbsoluteError value on hold-out data: 0.0016659387620165944
Epoch: 93
Loss on hold-out set: 5.96224205352021e-06
MeanAbsoluteError value on hold-out data: 0.0015429212944582105
Epoch: 94
Loss on hold-out set: 5.507287802312308e-06
MeanAbsoluteError value on hold-out data: 0.0014292871346697211
Epoch: 95
Loss on hold-out set: 5.2047491683544265e-06
MeanAbsoluteError value on hold-out data: 0.0013638208620250225
Epoch: 96

Loss on hold-out set: 5.062994066849426e-06
MeanAbsoluteError value on hold-out data: 0.0013542603701353073
Epoch: 97
Loss on hold-out set: 5.153015987808e-06
MeanAbsoluteError value on hold-out data: 0.0014084046706557274
```

```
Epoch: 98
Loss on hold-out set: 5.418002432945382e-06
MeanAbsoluteError value on hold-out data: 0.0015257701743394136
Epoch: 99
Loss on hold-out set: 6.0036511214141346e-06
MeanAbsoluteError value on hold-out data: 0.0017265334026888013
Epoch: 100
Loss on hold-out set: 6.533498363799146e-06
MeanAbsoluteError value on hold-out data: 0.001888974104076624
Epoch: 101
Loss on hold-out set: 6.697342742331545e-06
MeanAbsoluteError value on hold-out data: 0.0019483943469822407
Epoch: 102
Loss on hold-out set: 6.235959945474621e-06
MeanAbsoluteError value on hold-out data: 0.0018439380219206214
Epoch: 103
Loss on hold-out set: 5.475798329107899e-06
MeanAbsoluteError value on hold-out data: 0.0016456505982205272
Epoch: 104
Loss on hold-out set: 4.7455861518804e-06
MeanAbsoluteError value on hold-out data: 0.0014363813679665327
Epoch: 105
Loss on hold-out set: 4.272292791914592e-06
MeanAbsoluteError value on hold-out data: 0.0012985951034352183
Epoch: 106
Loss on hold-out set: 3.891868384336679e-06
MeanAbsoluteError value on hold-out data: 0.0011884691193699837
Epoch: 107
Loss on hold-out set: 3.6953530533579443e-06
MeanAbsoluteError value on hold-out data: 0.0011358786141499877
Epoch: 108

Loss on hold-out set: 3.543625087774528e-06
MeanAbsoluteError value on hold-out data: 0.0011009671725332737
Epoch: 109
Loss on hold-out set: 3.4905856518201674e-06
MeanAbsoluteError value on hold-out data: 0.0010945709655061364
Epoch: 110
Loss on hold-out set: 3.434013541362004e-06
MeanAbsoluteError value on hold-out data: 0.0010868232930079103
Epoch: 111
Loss on hold-out set: 3.307209470679745e-06
```

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MeanAbsoluteError value on hold-out data: 0.0010561661329120398
Epoch: 112
Loss on hold-out set: 3.094729933463357e-06
MeanAbsoluteError value on hold-out data: 0.0009938161820173264
Epoch: 113
Loss on hold-out set: 3.0314214584629886e-06
MeanAbsoluteError value on hold-out data: 0.0010130746522918344
Epoch: 114
Loss on hold-out set: 3.363009118342425e-06
MeanAbsoluteError value on hold-out data: 0.001180183026008308
Epoch: 115
Loss on hold-out set: 3.72739666126539e-06
MeanAbsoluteError value on hold-out data: 0.0013203879352658987
Epoch: 116
Loss on hold-out set: 3.823315392094771e-06
MeanAbsoluteError value on hold-out data: 0.0013605969725176692
Epoch: 117
Loss on hold-out set: 3.7108565838874903e-06
MeanAbsoluteError value on hold-out data: 0.001333116670139134
Epoch: 118
Loss on hold-out set: 3.664336632207204e-06
MeanAbsoluteError value on hold-out data: 0.0013183632399886847
Epoch: 119
Loss on hold-out set: 3.5681912240342603e-06
MeanAbsoluteError value on hold-out data: 0.001287728315219283
Epoch: 120

Loss on hold-out set: 3.465608570925389e-06
MeanAbsoluteError value on hold-out data: 0.0012555861612781882
Epoch: 121
Loss on hold-out set: 3.2304709640428835e-06
MeanAbsoluteError value on hold-out data: 0.001170622417703271
Epoch: 122
Loss on hold-out set: 3.036163290092095e-06
MeanAbsoluteError value on hold-out data: 0.001100545166991651
Epoch: 123
Loss on hold-out set: 2.9137060999729376e-06
MeanAbsoluteError value on hold-out data: 0.0010463560465723276
Epoch: 124
Loss on hold-out set: 2.8800081357877914e-06
MeanAbsoluteError value on hold-out data: 0.00103964121080935
Epoch: 125
```

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Loss on hold-out set: 2.7928268300576362e-06
MeanAbsoluteError value on hold-out data: 0.0010108259739354253
Epoch: 126
Loss on hold-out set: 2.780989023533134e-06
MeanAbsoluteError value on hold-out data: 0.0010047212708741426
Epoch: 127
Loss on hold-out set: 2.774787210575213e-06
MeanAbsoluteError value on hold-out data: 0.0010023179929703474
Epoch: 128
Loss on hold-out set: 2.772092114499078e-06
MeanAbsoluteError value on hold-out data: 0.0009994672145694494
Epoch: 129
Loss on hold-out set: 2.77106455900809e-06
MeanAbsoluteError value on hold-out data: 0.0009983236668631434
Epoch: 130
Loss on hold-out set: 2.769474355390182e-06
MeanAbsoluteError value on hold-out data: 0.0009982507908716798
Epoch: 131
Loss on hold-out set: 2.769112657724212e-06
MeanAbsoluteError value on hold-out data: 0.0009969375096261501
Epoch: 132

Loss on hold-out set: 2.7667270478858835e-06
MeanAbsoluteError value on hold-out data: 0.0009968033991754055
Epoch: 133
Loss on hold-out set: 2.7672979427961764e-06
MeanAbsoluteError value on hold-out data: 0.000994739937596023
Epoch: 134
Loss on hold-out set: 2.7672806257477963e-06
MeanAbsoluteError value on hold-out data: 0.000995590933598578
Epoch: 135
Loss on hold-out set: 2.770072998116216e-06
MeanAbsoluteError value on hold-out data: 0.0009937930153682828
Epoch: 136
Loss on hold-out set: 2.7698180381800116e-06
MeanAbsoluteError value on hold-out data: 0.0009935499401763082
Epoch: 137
Loss on hold-out set: 2.7732399499164354e-06
MeanAbsoluteError value on hold-out data: 0.0009931069798767567
Epoch: 138
Loss on hold-out set: 2.7758883708142286e-06
MeanAbsoluteError value on hold-out data: 0.0009936172282323241
```

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Epoch: 139
Loss on hold-out set: 2.7772820779522304e-06
MeanAbsoluteError value on hold-out data: 0.000993495574221015
Epoch: 140
Loss on hold-out set: 2.7814471238977936e-06
MeanAbsoluteError value on hold-out data: 0.0009934824192896485
Epoch: 141
Loss on hold-out set: 2.785143122632929e-06
MeanAbsoluteError value on hold-out data: 0.0009926448110491037
Epoch: 142
Loss on hold-out set: 2.7864936362519937e-06
MeanAbsoluteError value on hold-out data: 0.000992860528640449
Epoch: 143
Loss on hold-out set: 2.7876539308492377e-06
MeanAbsoluteError value on hold-out data: 0.0009929470252245665
Epoch: 144
```

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Loss on hold-out set: 2.7743935392340733e-06
MeanAbsoluteError value on hold-out data: 0.0009962572949007154
Epoch: 145
Loss on hold-out set: 2.735263232753632e-06
MeanAbsoluteError value on hold-out data: 0.0009924190817400813
Epoch: 146
Loss on hold-out set: 2.7386372090332817e-06
MeanAbsoluteError value on hold-out data: 0.0009910388616845012
Epoch: 147
Loss on hold-out set: 2.743061861116602e-06
MeanAbsoluteError value on hold-out data: 0.0009912424720823765
Epoch: 148
Loss on hold-out set: 2.7474245463939665e-06
MeanAbsoluteError value on hold-out data: 0.0009908111533150077
Epoch: 149
Loss on hold-out set: 2.749748383142727e-06
MeanAbsoluteError value on hold-out data: 0.0009911018423736095
Epoch: 150
Loss on hold-out set: 2.7518075516976943e-06
MeanAbsoluteError value on hold-out data: 0.0009913007961586118
Epoch: 151
Loss on hold-out set: 2.756036339310173e-06
MeanAbsoluteError value on hold-out data: 0.0009911381639540195
Epoch: 152
Loss on hold-out set: 2.7609627706899695e-06
```

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MeanAbsoluteError value on hold-out data: 0.000991879147477448
Epoch: 153
Loss on hold-out set: 2.7639192859097467e-06
MeanAbsoluteError value on hold-out data: 0.0009921141900122166
Epoch: 154
Loss on hold-out set: 2.768870907151435e-06
MeanAbsoluteError value on hold-out data: 0.000992203364148736
Epoch: 155
Loss on hold-out set: 2.7722015979155627e-06
MeanAbsoluteError value on hold-out data: 0.0009927218779921532
Epoch: 156

Loss on hold-out set: 2.778705856006749e-06
MeanAbsoluteError value on hold-out data: 0.0009929509833455086
Epoch: 157
Loss on hold-out set: 2.7824485179531907e-06
MeanAbsoluteError value on hold-out data: 0.0009925708873197436
Epoch: 158
Loss on hold-out set: 2.7894430333294383e-06
MeanAbsoluteError value on hold-out data: 0.0009929590160027146
Epoch: 159
Loss on hold-out set: 2.79262495589113e-06
MeanAbsoluteError value on hold-out data: 0.0009934265399351716
Epoch: 160
Loss on hold-out set: 2.7801771693702904e-06
MeanAbsoluteError value on hold-out data: 0.000997349969111383
Epoch: 161
Loss on hold-out set: 2.7410710968847764e-06
MeanAbsoluteError value on hold-out data: 0.0009924538899213076
Epoch: 162
Loss on hold-out set: 2.7458306703920243e-06
MeanAbsoluteError value on hold-out data: 0.0009913162793964148
Epoch: 163
Loss on hold-out set: 2.7493036140556703e-06
MeanAbsoluteError value on hold-out data: 0.0009918907890096307
Epoch: 164
Loss on hold-out set: 2.7563729353711382e-06
MeanAbsoluteError value on hold-out data: 0.0009925394551828504
Epoch: 165
Loss on hold-out set: 2.7587408145504206e-06
MeanAbsoluteError value on hold-out data: 0.0009930046508088708
Epoch: 166
```

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Loss on hold-out set: 2.7636949675680673e-06
MeanAbsoluteError value on hold-out data: 0.0009941061725839972
Epoch: 167
Loss on hold-out set: 2.770543372171711e-06
MeanAbsoluteError value on hold-out data: 0.00099332130048424
Epoch: 168

Loss on hold-out set: 2.774418011821772e-06
MeanAbsoluteError value on hold-out data: 0.0009938812581822276
Epoch: 169
Loss on hold-out set: 2.77975120423578e-06
MeanAbsoluteError value on hold-out data: 0.0009942830074578524
Epoch: 170
Loss on hold-out set: 2.784955975399546e-06
MeanAbsoluteError value on hold-out data: 0.0009938632138073444
Epoch: 171
Loss on hold-out set: 2.790929963674372e-06
MeanAbsoluteError value on hold-out data: 0.00099470023997128
Epoch: 172
Loss on hold-out set: 2.7940538079687223e-06
MeanAbsoluteError value on hold-out data: 0.0009951862739399076
Epoch: 173
Loss on hold-out set: 2.7988477066736252e-06
MeanAbsoluteError value on hold-out data: 0.000995137495920062
Epoch: 174
Loss on hold-out set: 2.804271295830356e-06
MeanAbsoluteError value on hold-out data: 0.0009956153808161616
Epoch: 175
Loss on hold-out set: 2.808511234476148e-06
MeanAbsoluteError value on hold-out data: 0.00099612632766366
Epoch: 176
Loss on hold-out set: 2.813849597397453e-06
MeanAbsoluteError value on hold-out data: 0.0009963023476302624
Epoch: 177
Loss on hold-out set: 2.804264809697088e-06
MeanAbsoluteError value on hold-out data: 0.0010006071534007788
Epoch: 178
Loss on hold-out set: 2.766916183143047e-06
MeanAbsoluteError value on hold-out data: 0.0009961522882804275
Epoch: 179
Loss on hold-out set: 2.772455027567096e-06
MeanAbsoluteError value on hold-out data: 0.0009954175911843777
Epoch: 180
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Loss on hold-out set: 2.7768778943183e-06
MeanAbsoluteError value on hold-out data: 0.0009956381982192397
Epoch: 181
Loss on hold-out set: 2.7821534572287995e-06
MeanAbsoluteError value on hold-out data: 0.000996166723780334
Epoch: 182
Loss on hold-out set: 2.7872256994573706e-06
MeanAbsoluteError value on hold-out data: 0.0009966822108253837
Epoch: 183
Loss on hold-out set: 2.7930166197620565e-06
MeanAbsoluteError value on hold-out data: 0.0009973591659218073
Epoch: 184
Loss on hold-out set: 2.800367419964507e-06
MeanAbsoluteError value on hold-out data: 0.0009972722036764026
Epoch: 185
Loss on hold-out set: 2.803449823162689e-06
MeanAbsoluteError value on hold-out data: 0.0009980122558772564
Epoch: 186
Loss on hold-out set: 2.808258258076086e-06
MeanAbsoluteError value on hold-out data: 0.0009978916496038437
Epoch: 187
Loss on hold-out set: 2.8138136244885906e-06
MeanAbsoluteError value on hold-out data: 0.0009984065545722842
Epoch: 188
Loss on hold-out set: 2.8190994341732797e-06
MeanAbsoluteError value on hold-out data: 0.0009989483514800668
Epoch: 189
Loss on hold-out set: 2.8266504795295222e-06
MeanAbsoluteError value on hold-out data: 0.00100043136626482
Epoch: 190
Loss on hold-out set: 2.8335453753183366e-06
MeanAbsoluteError value on hold-out data: 0.0010004001669585705
Epoch: 191
Loss on hold-out set: 2.840581078987127e-06
MeanAbsoluteError value on hold-out data: 0.0010001524351537228
Epoch: 192

Loss on hold-out set: 2.8321748401008574e-06
MeanAbsoluteError value on hold-out data: 0.0010063673835247755
Epoch: 193
Loss on hold-out set: 2.789837621644677e-06
MeanAbsoluteError value on hold-out data: 0.0009998572058975697
```

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Epoch: 194
Loss on hold-out set: 2.79463138497249e-06
MeanAbsoluteError value on hold-out data: 0.0009999251924455166
Epoch: 195
Loss on hold-out set: 2.8005951691056907e-06
MeanAbsoluteError value on hold-out data: 0.0010009696707129478
Epoch: 196
Loss on hold-out set: 2.806282583528149e-06
MeanAbsoluteError value on hold-out data: 0.0010018475586548448
Epoch: 197
Loss on hold-out set: 2.814597097330749e-06
MeanAbsoluteError value on hold-out data: 0.0010033686412498355
Epoch: 198
Loss on hold-out set: 2.819652026250639e-06
MeanAbsoluteError value on hold-out data: 0.0010030982084572315
Epoch: 199
Loss on hold-out set: 2.827167451725568e-06
MeanAbsoluteError value on hold-out data: 0.001005430705845356
Epoch: 200
Loss on hold-out set: 2.8337027179017433e-06
MeanAbsoluteError value on hold-out data: 0.0010047436226159334
Epoch: 201
Loss on hold-out set: 2.839874861586778e-06
MeanAbsoluteError value on hold-out data: 0.0010056743631139398
Epoch: 202
Loss on hold-out set: 2.8468154946375237e-06
MeanAbsoluteError value on hold-out data: 0.0010067065013572574
Epoch: 203
Loss on hold-out set: 2.8531565133885363e-06
MeanAbsoluteError value on hold-out data: 0.001007566344924271
Epoch: 204

Loss on hold-out set: 2.8628224525487224e-06
MeanAbsoluteError value on hold-out data: 0.0010096020996570587
Epoch: 205
Loss on hold-out set: 2.866946453058823e-06
MeanAbsoluteError value on hold-out data: 0.0010087437694892287
Epoch: 206
Loss on hold-out set: 2.872216077327338e-06
MeanAbsoluteError value on hold-out data: 0.0010098448256030679
Epoch: 207
Loss on hold-out set: 2.878581672629671e-06
```

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MeanAbsoluteError value on hold-out data: 0.0010100408690050244
Epoch: 208
Loss on hold-out set: 2.8834982618706672e-06
MeanAbsoluteError value on hold-out data: 0.0010110524017363787
Epoch: 209
Loss on hold-out set: 2.8899625687616114e-06
MeanAbsoluteError value on hold-out data: 0.0010119539219886065
Epoch: 210
Loss on hold-out set: 2.883158913391526e-06
MeanAbsoluteError value on hold-out data: 0.001017540693283081
Epoch: 211
Loss on hold-out set: 2.8422048314412583e-06
MeanAbsoluteError value on hold-out data: 0.0010132193565368652
Epoch: 212
Loss on hold-out set: 2.84579642452268e-06
MeanAbsoluteError value on hold-out data: 0.0010112762684002519
Epoch: 213
Loss on hold-out set: 2.851055929167351e-06
MeanAbsoluteError value on hold-out data: 0.0010112174786627293
Epoch: 214
Loss on hold-out set: 2.8564912849117863e-06
MeanAbsoluteError value on hold-out data: 0.0010119462385773659
Epoch: 215
Loss on hold-out set: 2.8617252541464134e-06
MeanAbsoluteError value on hold-out data: 0.0010125029366463423
Epoch: 216

Loss on hold-out set: 2.8690602503825415e-06
MeanAbsoluteError value on hold-out data: 0.001013192581012845
Epoch: 217
Loss on hold-out set: 2.873621335646404e-06
MeanAbsoluteError value on hold-out data: 0.0010141063248738647
Epoch: 218
Loss on hold-out set: 2.8786751471443495e-06
MeanAbsoluteError value on hold-out data: 0.0010147300781682134
Epoch: 219
Loss on hold-out set: 2.8808620346341595e-06
MeanAbsoluteError value on hold-out data: 0.001014145091176033
Epoch: 220
Loss on hold-out set: 2.8855444125347754e-06
MeanAbsoluteError value on hold-out data: 0.00101480633020401
Epoch: 221
```

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Loss on hold-out set: 2.891162059139979e-06
MeanAbsoluteError value on hold-out data: 0.0010159688536077738
Epoch: 222
Loss on hold-out set: 2.8973159486081625e-06
MeanAbsoluteError value on hold-out data: 0.0010161093669012189
Epoch: 223
Loss on hold-out set: 2.9021665695656915e-06
MeanAbsoluteError value on hold-out data: 0.0010154321789741516
Epoch: 224
Loss on hold-out set: 2.9067342120170953e-06
MeanAbsoluteError value on hold-out data: 0.0010157546494156122
Epoch: 225
Loss on hold-out set: 2.9111886410766217e-06
MeanAbsoluteError value on hold-out data: 0.001015961286611855
Epoch: 226
Loss on hold-out set: 2.9091212795899415e-06
MeanAbsoluteError value on hold-out data: 0.001023662043735385
Epoch: 227
Loss on hold-out set: 2.8592204982583337e-06
MeanAbsoluteError value on hold-out data: 0.0010155235650017858
Epoch: 228

Loss on hold-out set: 2.8676873651384563e-06
MeanAbsoluteError value on hold-out data: 0.0010170454625040293
Epoch: 229
Loss on hold-out set: 2.873961844927994e-06
MeanAbsoluteError value on hold-out data: 0.001019394607283175
Epoch: 230
Loss on hold-out set: 2.8747209790636636e-06
MeanAbsoluteError value on hold-out data: 0.0010171766625717282
Epoch: 231
Loss on hold-out set: 2.877142914838403e-06
MeanAbsoluteError value on hold-out data: 0.001016298308968544
Epoch: 232
Loss on hold-out set: 2.8897107957965616e-06
MeanAbsoluteError value on hold-out data: 0.0010202352423220873
Epoch: 233
Loss on hold-out set: 2.893083469913156e-06
MeanAbsoluteError value on hold-out data: 0.0010185542050749063
Epoch: 234
Loss on hold-out set: 2.8984091560041156e-06
MeanAbsoluteError value on hold-out data: 0.0010193759808316827
```

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Epoch: 235
Loss on hold-out set: 2.904717254188271e-06
MeanAbsoluteError value on hold-out data: 0.0010195651557296515
Epoch: 236
Loss on hold-out set: 2.910356522982894e-06
MeanAbsoluteError value on hold-out data: 0.001020069932565093
Epoch: 237
Loss on hold-out set: 2.9163008831215177e-06
MeanAbsoluteError value on hold-out data: 0.0010207670275121927
Epoch: 238
Loss on hold-out set: 2.921991972919769e-06
MeanAbsoluteError value on hold-out data: 0.0010214769281446934
Epoch: 239
Loss on hold-out set: 2.929320945249377e-06
MeanAbsoluteError value on hold-out data: 0.001023076823912561
Epoch: 240


Loss on hold-out set: 2.9332864296580545e-06
MeanAbsoluteError value on hold-out data: 0.0010202541016042233
Epoch: 241
Loss on hold-out set: 2.9372509185589624e-06
MeanAbsoluteError value on hold-out data: 0.0010189545573666692
Epoch: 242
Loss on hold-out set: 2.9391847840243874e-06
MeanAbsoluteError value on hold-out data: 0.0010304305469617248
Epoch: 243
Loss on hold-out set: 2.8853384531215088e-06
MeanAbsoluteError value on hold-out data: 0.0010173750342801213
Epoch: 244
Loss on hold-out set: 2.8935729493409063e-06
MeanAbsoluteError value on hold-out data: 0.0010178020456805825
Epoch: 245
Loss on hold-out set: 2.899438126597057e-06
MeanAbsoluteError value on hold-out data: 0.0010188554879277945
Epoch: 246
Loss on hold-out set: 2.9040663895629176e-06
MeanAbsoluteError value on hold-out data: 0.0010186481522396207
Epoch: 247
Loss on hold-out set: 2.910783901723478e-06
MeanAbsoluteError value on hold-out data: 0.0010189656168222427
Epoch: 248
Loss on hold-out set: 2.9173071440206846e-06
```

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MeanAbsoluteError value on hold-out data: 0.001019820338115096
Epoch: 249
Loss on hold-out set: 2.9195615786947154e-06
MeanAbsoluteError value on hold-out data: 0.0010193372145295143
Epoch: 250
Loss on hold-out set: 2.927023818923963e-06
MeanAbsoluteError value on hold-out data: 0.0010214633075520396
Epoch: 251
Loss on hold-out set: 2.934682195126171e-06
MeanAbsoluteError value on hold-out data: 0.0010235040681436658
Epoch: 252

Loss on hold-out set: 2.9422469001055537e-06
MeanAbsoluteError value on hold-out data: 0.0010248231701552868
Epoch: 253
Loss on hold-out set: 2.9423157629157447e-06
MeanAbsoluteError value on hold-out data: 0.0010188278974965215
Epoch: 254
Loss on hold-out set: 2.9536556951370585e-06
MeanAbsoluteError value on hold-out data: 0.001023011514917016
Epoch: 255
Loss on hold-out set: 2.9535001648115977e-06
MeanAbsoluteError value on hold-out data: 0.0010187035659328103
Epoch: 256
Loss on hold-out set: 2.9623517127974036e-06
MeanAbsoluteError value on hold-out data: 0.0010237713577225804
Epoch: 257
Loss on hold-out set: 2.972370657816052e-06
MeanAbsoluteError value on hold-out data: 0.0010276349494233727
Epoch: 258
Loss on hold-out set: 2.9774578446282056e-06
MeanAbsoluteError value on hold-out data: 0.001027860096655786
Epoch: 259
Loss on hold-out set: 2.9857360788666577e-06
MeanAbsoluteError value on hold-out data: 0.0010392735712230206
Epoch: 260
Loss on hold-out set: 2.9180722699014664e-06
MeanAbsoluteError value on hold-out data: 0.0010174746857956052
Epoch: 261
Loss on hold-out set: 2.928344691691851e-06
MeanAbsoluteError value on hold-out data: 0.0010240614647045732
Epoch: 262
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Loss on hold-out set: 2.9299962824624298e-06
MeanAbsoluteError value on hold-out data: 0.0010209172032773495
Epoch: 263
Loss on hold-out set: 2.935570039964755e-06
MeanAbsoluteError value on hold-out data: 0.0010198723757639527
Epoch: 264

Loss on hold-out set: 2.9411567345804495e-06
MeanAbsoluteError value on hold-out data: 0.0010190337197855115
Epoch: 265
Loss on hold-out set: 2.947360154860833e-06
MeanAbsoluteError value on hold-out data: 0.0010189875029027462
Epoch: 266
Loss on hold-out set: 2.9566470404138033e-06
MeanAbsoluteError value on hold-out data: 0.001024065655656159
Epoch: 267
Loss on hold-out set: 2.958827002729729e-06
MeanAbsoluteError value on hold-out data: 0.0010200816905125976
Epoch: 268
Loss on hold-out set: 2.9650843374970225e-06
MeanAbsoluteError value on hold-out data: 0.0010232600616291165
Epoch: 269
Loss on hold-out set: 2.9687928522554628e-06
MeanAbsoluteError value on hold-out data: 0.0010223054559901357
Epoch: 270
Loss on hold-out set: 2.9742237510270954e-06
MeanAbsoluteError value on hold-out data: 0.001019444316625595
Epoch: 271
Loss on hold-out set: 2.988018673471216e-06
MeanAbsoluteError value on hold-out data: 0.0010269838385283947
Epoch: 272
Loss on hold-out set: 2.988715267879103e-06
MeanAbsoluteError value on hold-out data: 0.0010224570287391543
Epoch: 273
Loss on hold-out set: 2.990768328010362e-06
MeanAbsoluteError value on hold-out data: 0.001018886687234044
Early stopping at epoch 272
Returned to Spot: Validation loss: 2.990768328010362e-06
----------------------------------------------

spotPython tuning: 2.990768328010362e-06 [####------] 36.12%
```

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Epoch: 1
Loss on hold-out set: 0.021144543406798652
MeanAbsoluteError value on hold-out data: 0.11299854516983032
Epoch: 2
Loss on hold-out set: 0.01864982121256425
MeanAbsoluteError value on hold-out data: 0.1074831485748291
Epoch: 3
Loss on hold-out set: 0.01689325846535595
MeanAbsoluteError value on hold-out data: 0.102147176861763
Epoch: 4
Loss on hold-out set: 0.015001475964182694
MeanAbsoluteError value on hold-out data: 0.0961916595697403
Epoch: 5
Loss on hold-out set: 0.013049825940183118
MeanAbsoluteError value on hold-out data: 0.08969798684120178
Epoch: 6
Loss on hold-out set: 0.010968730481660091
MeanAbsoluteError value on hold-out data: 0.08209596574306488
Epoch: 7
Loss on hold-out set: 0.008970730034266844
MeanAbsoluteError value on hold-out data: 0.07419640570878983
Epoch: 8

Loss on hold-out set: 0.007190555193167376
MeanAbsoluteError value on hold-out data: 0.06631728261709213
Epoch: 9
Loss on hold-out set: 0.0055570039303826264
MeanAbsoluteError value on hold-out data: 0.05801951885223389
Epoch: 10
Loss on hold-out set: 0.004058583146328793
MeanAbsoluteError value on hold-out data: 0.049393102526664734
Epoch: 11
Loss on hold-out set: 0.002835970999991619
MeanAbsoluteError value on hold-out data: 0.04112968593835831
Epoch: 12
Loss on hold-out set: 0.0018917736980304319
MeanAbsoluteError value on hold-out data: 0.03370613604784012
Epoch: 13
Loss on hold-out set: 0.0012288278782139777
MeanAbsoluteError value on hold-out data: 0.027133680880069733
```

```
Epoch: 14
Loss on hold-out set: 0.0008413641790914545
MeanAbsoluteError value on hold-out data: 0.022338036447763443
Epoch: 15
Loss on hold-out set: 0.0006017756530031635
MeanAbsoluteError value on hold-out data: 0.018782837316393852
Epoch: 16

Loss on hold-out set: 0.0004471077280820617
MeanAbsoluteError value on hold-out data: 0.016124024987220764
Epoch: 17
Loss on hold-out set: 0.00034828567693598176
MeanAbsoluteError value on hold-out data: 0.014387537725269794
Epoch: 18
Loss on hold-out set: 0.0002814359295849786
MeanAbsoluteError value on hold-out data: 0.012903667986392975
Epoch: 19
Loss on hold-out set: 0.00023340395110656238
MeanAbsoluteError value on hold-out data: 0.011834411881864071
Epoch: 20
Loss on hold-out set: 0.00020426730129417448
MeanAbsoluteError value on hold-out data: 0.01112251915037632
Epoch: 21
Loss on hold-out set: 0.00017996581271673725
MeanAbsoluteError value on hold-out data: 0.010413188487291336
Epoch: 22
Loss on hold-out set: 0.00016285254126782283
MeanAbsoluteError value on hold-out data: 0.009859826415777206
Epoch: 23
Loss on hold-out set: 0.00014946048644273296
MeanAbsoluteError value on hold-out data: 0.009392823092639446
Epoch: 24

Loss on hold-out set: 0.00013869923388579321
MeanAbsoluteError value on hold-out data: 0.00899242702871561
Epoch: 25
Loss on hold-out set: 0.00012982442115715362
MeanAbsoluteError value on hold-out data: 0.008647576905786991
Epoch: 26
Loss on hold-out set: 0.00012273670711836435
MeanAbsoluteError value on hold-out data: 0.008340937085449696
Epoch: 27
```

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Loss on hold-out set: 0.00011674526319295278
MeanAbsoluteError value on hold-out data: 0.00807284377515316
Epoch: 28
Loss on hold-out set: 0.00011221339929378653
MeanAbsoluteError value on hold-out data: 0.007859751582145691
Epoch: 29
Loss on hold-out set: 0.00010800065501825884
MeanAbsoluteError value on hold-out data: 0.007666457444429398
Epoch: 30
Loss on hold-out set: 0.00010416740884753189
MeanAbsoluteError value on hold-out data: 0.00748062040656805
Epoch: 31
Loss on hold-out set: 0.0001006995504499891
MeanAbsoluteError value on hold-out data: 0.0073202126659452915
Epoch: 32

Loss on hold-out set: 9.748388602977349e-05
MeanAbsoluteError value on hold-out data: 0.007156087551265955
Epoch: 33
Loss on hold-out set: 9.475920040514259e-05
MeanAbsoluteError value on hold-out data: 0.007026509381830692
Epoch: 34
Loss on hold-out set: 9.193873273417059e-05
MeanAbsoluteError value on hold-out data: 0.00688090780749917
Epoch: 35
Loss on hold-out set: 8.9500881921068e-05
MeanAbsoluteError value on hold-out data: 0.006751501467078924
Epoch: 36
Loss on hold-out set: 8.73660256777504e-05
MeanAbsoluteError value on hold-out data: 0.00664951978251338
Epoch: 37
Loss on hold-out set: 8.555023137696001e-05
MeanAbsoluteError value on hold-out data: 0.006559817586094141
Epoch: 38
Loss on hold-out set: 8.397250861124026e-05
MeanAbsoluteError value on hold-out data: 0.006483125500380993
Epoch: 39
Loss on hold-out set: 8.26989963618536e-05
MeanAbsoluteError value on hold-out data: 0.0064225695095956326
Epoch: 40

Loss on hold-out set: 8.175756274316595e-05
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MeanAbsoluteError value on hold-out data: 0.006381985731422901
Epoch: 41
Loss on hold-out set: 8.109663916624605e-05
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Epoch: 42
Loss on hold-out set: 8.020316236549039e-05
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Loss on hold-out set: 8.00141671884615e-05
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Loss on hold-out set: 7.954015494473616e-05
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Loss on hold-out set: 7.983726429397633e-05
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Loss on hold-out set: 7.938386751878792e-05
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Epoch: 48

Loss on hold-out set: 7.827583002788168e-05
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Loss on hold-out set: 7.671740367617244e-05
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Loss on hold-out set: 7.54839961461441e-05
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Epoch: 52
Loss on hold-out set: 7.19978225118355e-05
MeanAbsoluteError value on hold-out data: 0.005951022729277611
Epoch: 53
Loss on hold-out set: 7.03485782555378e-05
MeanAbsoluteError value on hold-out data: 0.005868029780685902
Epoch: 54
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Loss on hold-out set: 6.848281799121698e-05
MeanAbsoluteError value on hold-out data: 0.005759445950388908
Epoch: 55
Loss on hold-out set: 6.64675011122247e-05
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Epoch: 56

Loss on hold-out set: 6.485002861728917e-05
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Loss on hold-out set: 6.345604556133224e-05
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Loss on hold-out set: 5.732213249805347e-05
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Loss on hold-out set: 5.6535714209435117e-05
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Loss on hold-out set: 5.6318792159895804e-05
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Loss on hold-out set: 5.573202598067215e-05
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Loss on hold-out set: 5.518346700371598e-05
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Epoch: 72

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Epoch: 80

Loss on hold-out set: 5.0760018439177657e-05
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Epoch: 81
Loss on hold-out set: 4.985964353995529e-05
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Loss on hold-out set: 4.912921033457295e-05
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Epoch: 84
Loss on hold-out set: 4.848345910383949e-05
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Epoch: 85
Loss on hold-out set: 4.8009592068123506e-05
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Loss on hold-out set: 4.738062790765023e-05
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Epoch: 87
Loss on hold-out set: 4.687282196420327e-05
MeanAbsoluteError value on hold-out data: 0.0044333189725875854
Epoch: 88
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Loss on hold-out set: 4.6146362736085155e-05
MeanAbsoluteError value on hold-out data: 0.004373013041913509
Epoch: 89
Loss on hold-out set: 4.601492810252239e-05
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Loss on hold-out set: 4.461208664595592e-05
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Epoch: 94
Loss on hold-out set: 4.417224718173728e-05
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MeanAbsoluteError value on hold-out data: 0.004197387024760246
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Loss on hold-out set: 4.4085742753228065e-05
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Epoch: 96

Loss on hold-out set: 4.359049726070608e-05
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Loss on hold-out set: 4.338142488043224e-05
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Loss on hold-out set: 4.417377690994104e-05
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Loss on hold-out set: 4.353462437441187e-05
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Loss on hold-out set: 4.408136329689832e-05
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Epoch: 101
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MeanAbsoluteError value on hold-out data: 0.004081760998815298
Epoch: 102
Loss on hold-out set: 4.325039324277512e-05
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Loss on hold-out set: 4.2846794114762144e-05
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Epoch: 104

Loss on hold-out set: 4.238057551662534e-05
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Epoch: 107
Loss on hold-out set: 4.168262090555991e-05
MeanAbsoluteError value on hold-out data: 0.003936083521693945
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Epoch: 108
Loss on hold-out set: 4.105397977127723e-05
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Epoch: 110
Loss on hold-out set: 4.039593071818097e-05
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Loss on hold-out set: 4.021969583558721e-05
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Epoch: 112

Loss on hold-out set: 3.977660217838332e-05
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Loss on hold-out set: 3.943814096816679e-05
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Loss on hold-out set: 3.874127939621088e-05
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Epoch: 115
Loss on hold-out set: 3.892125503948831e-05
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Epoch: 120

Loss on hold-out set: 3.751879006586023e-05
MeanAbsoluteError value on hold-out data: 0.0036027138121426105
Epoch: 121
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```
Loss on hold-out set: 3.7049535454738556e-05
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Epoch: 122
Loss on hold-out set: 3.713397356364112e-05
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Epoch: 123
Loss on hold-out set: 3.6543398191736886e-05
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Epoch: 124
Loss on hold-out set: 3.671761540670703e-05
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Epoch: 125
Loss on hold-out set: 3.620080843802498e-05
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Loss on hold-out set: 3.623234979505995e-05
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Epoch: 127
Loss on hold-out set: 3.5990236221706305e-05
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Epoch: 128

Loss on hold-out set: 3.5979464278649464e-05
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Loss on hold-out set: 3.5780999643233567e-05
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Loss on hold-out set: 3.5765987804911436e-05
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Loss on hold-out set: 3.5426445411925864e-05
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Loss on hold-out set: 3.478240574850133e-05
MeanAbsoluteError value on hold-out data: 0.0034232521429657936
Epoch: 134
Loss on hold-out set: 3.5531235024982856e-05
MeanAbsoluteError value on hold-out data: 0.0035045193508267403
```

```
Epoch: 135
Loss on hold-out set: 3.4543105058267097e-05
MeanAbsoluteError value on hold-out data: 0.0034171268343925476
Epoch: 136

Loss on hold-out set: 3.4007917125372365e-05
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Epoch: 137
Loss on hold-out set: 3.409361501158664e-05
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Loss on hold-out set: 3.41420896192128e-05
MeanAbsoluteError value on hold-out data: 0.0034045949578285217
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Loss on hold-out set: 3.3505248262300534e-05
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Loss on hold-out set: 3.48139470696352e-05
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Loss on hold-out set: 3.5100797875106526e-05
MeanAbsoluteError value on hold-out data: 0.0035241241566836834
Epoch: 142
Loss on hold-out set: 3.368773046699253e-05
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Loss on hold-out set: 3.557063037437489e-05
MeanAbsoluteError value on hold-out data: 0.003600397612899542
Epoch: 144

Loss on hold-out set: 3.4367985605106364e-05
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Loss on hold-out set: 3.701911344634075e-05
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Epoch: 146
Loss on hold-out set: 3.3484953297901434e-05
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Epoch: 147
Loss on hold-out set: 3.517286731230821e-05
MeanAbsoluteError value on hold-out data: 0.003592459252104163
Epoch: 148
```

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Loss on hold-out set: 3.2977031812726254e-05
MeanAbsoluteError value on hold-out data: 0.0033580183517187834
Epoch: 149
Loss on hold-out set: 3.3461262331145823e-05
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Loss on hold-out set: 3.3996055728829033e-05
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Epoch: 151
Loss on hold-out set: 3.5631102814716686e-05
MeanAbsoluteError value on hold-out data: 0.0036669394467025995
Epoch: 152

Loss on hold-out set: 3.2918958924567144e-05
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Epoch: 153
Loss on hold-out set: 3.31929912159754e-05
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Epoch: 154
Loss on hold-out set: 3.392294316702311e-05
MeanAbsoluteError value on hold-out data: 0.0034890584647655487
Epoch: 155
Loss on hold-out set: 3.524978072427506e-05
MeanAbsoluteError value on hold-out data: 0.003596882103011012
Epoch: 156
Loss on hold-out set: 3.4824345831159585e-05
MeanAbsoluteError value on hold-out data: 0.003564988262951374
Epoch: 157
Loss on hold-out set: 3.340082147779436e-05
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Epoch: 158
Loss on hold-out set: 3.225841816713096e-05
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Epoch: 159
Loss on hold-out set: 3.222537808249782e-05
MeanAbsoluteError value on hold-out data: 0.0032653489615768194
Epoch: 160

Loss on hold-out set: 3.127234568386197e-05
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Loss on hold-out set: 3.085261292462268e-05
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MeanAbsoluteError value on hold-out data: 0.0031527101527899504
Epoch: 162
Loss on hold-out set: 3.255095750893432e-05
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Loss on hold-out set: 3.259445908330044e-05
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Loss on hold-out set: 3.285881795914305e-05
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Loss on hold-out set: 4.164497515471579e-05
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Loss on hold-out set: 3.5354410906500944e-05
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Loss on hold-out set: 5.495922625031151e-05
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Epoch: 168

Loss on hold-out set: 3.4281835077739454e-05
MeanAbsoluteError value on hold-out data: 0.003487016772851348
Epoch: 169
Loss on hold-out set: 4.055813863152779e-05
MeanAbsoluteError value on hold-out data: 0.004583609290421009
Epoch: 170
Loss on hold-out set: 3.2290430178698826e-05
MeanAbsoluteError value on hold-out data: 0.0033137209247797728
Epoch: 171
Loss on hold-out set: 4.5987379914884896e-05
MeanAbsoluteError value on hold-out data: 0.004627566318958998
Epoch: 172
Loss on hold-out set: 3.4023189514480114e-05
MeanAbsoluteError value on hold-out data: 0.0032373121939599514
Epoch: 173
Loss on hold-out set: 5.793483638913849e-05
MeanAbsoluteError value on hold-out data: 0.005987516604363918
Epoch: 174
Loss on hold-out set: 5.651119456735231e-05
MeanAbsoluteError value on hold-out data: 0.005837700795382261
Epoch: 175
```

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Loss on hold-out set: 3.941186849045296e-05
MeanAbsoluteError value on hold-out data: 0.0037927301600575447
Epoch: 176

Loss on hold-out set: 7.870172823076198e-05
MeanAbsoluteError value on hold-out data: 0.0069758836179971695
Epoch: 177
Loss on hold-out set: 4.990859746325632e-05
MeanAbsoluteError value on hold-out data: 0.00523187313228845
Epoch: 178
Loss on hold-out set: 3.022609498777073e-05
MeanAbsoluteError value on hold-out data: 0.0034588396083563566
Epoch: 179
Loss on hold-out set: 3.0373469222037163e-05
MeanAbsoluteError value on hold-out data: 0.003426746465265751
Epoch: 180
Loss on hold-out set: 3.0815070287740366e-05
MeanAbsoluteError value on hold-out data: 0.0034778197295963764
Epoch: 181
Loss on hold-out set: 3.080243300246366e-05
MeanAbsoluteError value on hold-out data: 0.0034929621033370495
Epoch: 182
Loss on hold-out set: 3.0755229222210656e-05
MeanAbsoluteError value on hold-out data: 0.0035014129243791103
Epoch: 183
Loss on hold-out set: 3.109736424353047e-05
MeanAbsoluteError value on hold-out data: 0.0035540657117962837
Epoch: 184

Loss on hold-out set: 3.106798278981602e-05
MeanAbsoluteError value on hold-out data: 0.003569953143596649
Epoch: 185
Loss on hold-out set: 3.1212467415810496e-05
MeanAbsoluteError value on hold-out data: 0.0035940627567470074
Epoch: 186
Loss on hold-out set: 3.099535115325125e-05
MeanAbsoluteError value on hold-out data: 0.003580202581360936
Epoch: 187
Loss on hold-out set: 3.091619013455209e-05
MeanAbsoluteError value on hold-out data: 0.003575340611860156
Epoch: 188
Loss on hold-out set: 3.0887483154928254e-05
```

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MeanAbsoluteError value on hold-out data: 0.003573318012058735
Epoch: 189
Loss on hold-out set: 3.062931660966378e-05
MeanAbsoluteError value on hold-out data: 0.00354087189771235
Epoch: 190
Loss on hold-out set: 3.063294678596369e-05
MeanAbsoluteError value on hold-out data: 0.0035409582778811455
Epoch: 191
Loss on hold-out set: 3.0151661366959926e-05
MeanAbsoluteError value on hold-out data: 0.0034745666198432446
Epoch: 192

Loss on hold-out set: 2.9776324296156082e-05
MeanAbsoluteError value on hold-out data: 0.0034187110140919685
Epoch: 193
Loss on hold-out set: 2.94869733615518e-05
MeanAbsoluteError value on hold-out data: 0.0033685925882309675
Epoch: 194
Loss on hold-out set: 2.9110093093645684e-05
MeanAbsoluteError value on hold-out data: 0.003303160658106208
Epoch: 195
Loss on hold-out set: 2.9290521476803788e-05
MeanAbsoluteError value on hold-out data: 0.003317577764391899
Epoch: 196
Loss on hold-out set: 2.8758229297253773e-05
MeanAbsoluteError value on hold-out data: 0.003231366164982319
Epoch: 197
Loss on hold-out set: 2.8668516135535594e-05
MeanAbsoluteError value on hold-out data: 0.0031967752147465944
Epoch: 198
Loss on hold-out set: 2.8298094713064576e-05
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Epoch: 199
Loss on hold-out set: 2.8319694730558503e-05
MeanAbsoluteError value on hold-out data: 0.0031477403827011585
Epoch: 200

Loss on hold-out set: 2.851911146033097e-05
MeanAbsoluteError value on hold-out data: 0.00316136167384684
Epoch: 201
Loss on hold-out set: 2.87242941232379e-05
MeanAbsoluteError value on hold-out data: 0.0031883087940514088
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Epoch: 202
Loss on hold-out set: 2.9206430931002326e-05
MeanAbsoluteError value on hold-out data: 0.00324555323459208
Epoch: 203
Loss on hold-out set: 2.9168813278757672e-05
MeanAbsoluteError value on hold-out data: 0.0032435853499919176
Epoch: 204
Loss on hold-out set: 2.92090595561795e-05
MeanAbsoluteError value on hold-out data: 0.0032493933103978634
Epoch: 205
Loss on hold-out set: 2.9303607609682858e-05
MeanAbsoluteError value on hold-out data: 0.0032518107909709215
Epoch: 206
Loss on hold-out set: 2.914683762499312e-05
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Epoch: 207
Loss on hold-out set: 2.944664818546459e-05
MeanAbsoluteError value on hold-out data: 0.003275152761489153
Epoch: 208

Loss on hold-out set: 2.976660082846425e-05
MeanAbsoluteError value on hold-out data: 0.0033203207422047853
Epoch: 209
Loss on hold-out set: 3.0325334651742626e-05
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Epoch: 210
Loss on hold-out set: 3.1094340849784585e-05
MeanAbsoluteError value on hold-out data: 0.003481275634840131
Epoch: 211
Loss on hold-out set: 3.0303926702177514e-05
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Epoch: 212
Loss on hold-out set: 3.140357874766969e-05
MeanAbsoluteError value on hold-out data: 0.0035174095537513494
Epoch: 213
Loss on hold-out set: 3.088240298079894e-05
MeanAbsoluteError value on hold-out data: 0.003456562291830778
Epoch: 214
Loss on hold-out set: 3.083802550319984e-05
MeanAbsoluteError value on hold-out data: 0.0034519266337156296
Epoch: 215
Loss on hold-out set: 3.145379393668248e-05
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MeanAbsoluteError value on hold-out data: 0.0035271907690912485
Epoch: 216

Loss on hold-out set: 3.083008574609075e-05
MeanAbsoluteError value on hold-out data: 0.003451854456216097
Epoch: 217
Loss on hold-out set: 3.117286686765989e-05
MeanAbsoluteError value on hold-out data: 0.0034975740127265453
Epoch: 218
Loss on hold-out set: 3.154429545678508e-05
MeanAbsoluteError value on hold-out data: 0.0035365568473935127
Epoch: 219
Loss on hold-out set: 3.2592620623530055e-05
MeanAbsoluteError value on hold-out data: 0.0036742996890097857
Epoch: 220
Loss on hold-out set: 3.2565916590580234e-05
MeanAbsoluteError value on hold-out data: 0.00366417458280921
Epoch: 221
Loss on hold-out set: 3.251121966298486e-05
MeanAbsoluteError value on hold-out data: 0.0036694530863314867
Epoch: 222
Loss on hold-out set: 3.249778810162465e-05
MeanAbsoluteError value on hold-out data: 0.003657911205664277
Epoch: 223
Loss on hold-out set: 3.717857783301856e-05
MeanAbsoluteError value on hold-out data: 0.004180110525339842
Epoch: 224

Loss on hold-out set: 3.588362315703738e-05
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Epoch: 225
Loss on hold-out set: 3.518984620218122e-05
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Epoch: 226
Loss on hold-out set: 3.19935210020623e-05
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Epoch: 227
Loss on hold-out set: 3.484179773007973e-05
MeanAbsoluteError value on hold-out data: 0.003998731728643179
Epoch: 228
Loss on hold-out set: 3.718060145873e-05
MeanAbsoluteError value on hold-out data: 0.004244120791554451
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Epoch: 229
Loss on hold-out set: 3.1109387159152614e-05
MeanAbsoluteError value on hold-out data: 0.003547204425558448
Epoch: 230
Loss on hold-out set: 3.303922675226395e-05
MeanAbsoluteError value on hold-out data: 0.0038160295225679874
Epoch: 231
Loss on hold-out set: 3.03632782680851e-05
MeanAbsoluteError value on hold-out data: 0.003481052815914154
Epoch: 232

Loss on hold-out set: 3.1769885014766354e-05
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Epoch: 233
Loss on hold-out set: 3.0443257233664074e-05
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Epoch: 234
Loss on hold-out set: 3.548516647960672e-05
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Epoch: 235
Loss on hold-out set: 3.967698773378384e-05
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Epoch: 236
Loss on hold-out set: 4.1102567664845415e-05
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Epoch: 237
Loss on hold-out set: 5.047818615965202e-05
MeanAbsoluteError value on hold-out data: 0.005479974672198296
Epoch: 238
Loss on hold-out set: 5.958705203642909e-05
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Epoch: 239
Loss on hold-out set: 3.420869480626272e-05
MeanAbsoluteError value on hold-out data: 0.0037603951059281826
Epoch: 240

Loss on hold-out set: 2.4236316287322935e-05
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Epoch: 241
Loss on hold-out set: 2.4993677509667722e-05
MeanAbsoluteError value on hold-out data: 0.002858503954485059
Epoch: 242
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Loss on hold-out set: 2.7218958130585013e-05
MeanAbsoluteError value on hold-out data: 0.0031315009109675884
Epoch: 243
Loss on hold-out set: 2.7786915061848338e-05
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Epoch: 244
Loss on hold-out set: 2.8745587943184976e-05
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Epoch: 245
Loss on hold-out set: 2.8630112201187186e-05
MeanAbsoluteError value on hold-out data: 0.003167272312566638
Epoch: 246
Loss on hold-out set: 2.7372053660943302e-05
MeanAbsoluteError value on hold-out data: 0.0030179289169609547
Epoch: 247
Loss on hold-out set: 2.567196144666109e-05
MeanAbsoluteError value on hold-out data: 0.0028113170992583036
Epoch: 248

Loss on hold-out set: 2.5942575309488203e-05
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Epoch: 249
Loss on hold-out set: 3.469983202146403e-05
MeanAbsoluteError value on hold-out data: 0.0042837499640882015
Epoch: 250
Loss on hold-out set: 2.7317616920634846e-05
MeanAbsoluteError value on hold-out data: 0.003140183398500085
Epoch: 251
Loss on hold-out set: 2.835842129618533e-05
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Epoch: 252
Loss on hold-out set: 2.698933617526372e-05
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Epoch: 253
Loss on hold-out set: 2.9170562769602265e-05
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Epoch: 254
Loss on hold-out set: 3.225835081665489e-05
MeanAbsoluteError value on hold-out data: 0.0036553184036165476
Epoch: 255
Loss on hold-out set: 3.811271953006661e-05
MeanAbsoluteError value on hold-out data: 0.0042844507843256
Epoch: 256
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Loss on hold-out set: 4.4888152172605166e-05
MeanAbsoluteError value on hold-out data: 0.004922044929116964
Epoch: 257
Loss on hold-out set: 6.079525380635843e-05
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Epoch: 258
Loss on hold-out set: 5.603083268636654e-05
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Epoch: 259
Loss on hold-out set: 3.1739548286455634e-05
MeanAbsoluteError value on hold-out data: 0.0033397667575627565
Epoch: 260
Loss on hold-out set: 4.935115798855948e-05
MeanAbsoluteError value on hold-out data: 0.005469508934766054
Epoch: 261
Loss on hold-out set: 7.031688471071998e-05
MeanAbsoluteError value on hold-out data: 0.007117562927305698
Epoch: 262
Loss on hold-out set: 3.627787412752743e-05
MeanAbsoluteError value on hold-out data: 0.0037934824358671904
Epoch: 263
Loss on hold-out set: 3.723734837541614e-05
MeanAbsoluteError value on hold-out data: 0.0038100082892924547
Epoch: 264

Loss on hold-out set: 4.586025538868087e-05
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Epoch: 265
Loss on hold-out set: 3.738695843486838e-05
MeanAbsoluteError value on hold-out data: 0.004297858104109764
Epoch: 266
Loss on hold-out set: 2.8426076321346428e-05
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Epoch: 267
Loss on hold-out set: 2.51155477323999e-05
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Epoch: 268
Loss on hold-out set: 2.495188637471744e-05
MeanAbsoluteError value on hold-out data: 0.002893375465646386
Epoch: 269
Loss on hold-out set: 2.507758918718058e-05
MeanAbsoluteError value on hold-out data: 0.0028925256337970495
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Epoch: 270
Loss on hold-out set: 2.5194838910561213e-05
MeanAbsoluteError value on hold-out data: 0.0029013899620622396
Epoch: 271
Loss on hold-out set: 2.521122354736642e-05
MeanAbsoluteError value on hold-out data: 0.0029054307378828526
Epoch: 272

Loss on hold-out set: 2.5151868971749392e-05
MeanAbsoluteError value on hold-out data: 0.002894857432693243
Epoch: 273
Loss on hold-out set: 2.4948678126173418e-05
MeanAbsoluteError value on hold-out data: 0.0028634443879127502
Epoch: 274
Loss on hold-out set: 2.469149799373171e-05
MeanAbsoluteError value on hold-out data: 0.0028226529248058796
Epoch: 275
Loss on hold-out set: 2.451219901152064e-05
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Epoch: 276
Loss on hold-out set: 2.418566719454343e-05
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Epoch: 277
Loss on hold-out set: 2.4116075119189573e-05
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Epoch: 278
Loss on hold-out set: 2.4062193996374653e-05
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Epoch: 279
Loss on hold-out set: 2.4049343425615104e-05
MeanAbsoluteError value on hold-out data: 0.0027206572704017162
Epoch: 280

Loss on hold-out set: 2.4083861418196312e-05
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Epoch: 281
Loss on hold-out set: 2.4194317374717923e-05
MeanAbsoluteError value on hold-out data: 0.0027377840597182512
Epoch: 282
Loss on hold-out set: 2.4312542537149728e-05
MeanAbsoluteError value on hold-out data: 0.0027450842317193747
Epoch: 283
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Loss on hold-out set: 2.4366762348013015e-05
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Loss on hold-out set: 2.450094446035827e-05
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Loss on hold-out set: 2.453313846361102e-05
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Epoch: 286
Loss on hold-out set: 2.4538248118532418e-05
MeanAbsoluteError value on hold-out data: 0.002766251564025879
Epoch: 287
Loss on hold-out set: 2.462553766834294e-05
MeanAbsoluteError value on hold-out data: 0.0027476719114929438
Epoch: 288

Loss on hold-out set: 2.473072145161687e-05
MeanAbsoluteError value on hold-out data: 0.0027493417728692293
Epoch: 289
Loss on hold-out set: 2.4774705073133718e-05
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Epoch: 290
Loss on hold-out set: 2.48459494819623e-05
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Loss on hold-out set: 2.5075775304709457e-05
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Epoch: 292
Loss on hold-out set: 2.5218747402122015e-05
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Epoch: 293
Loss on hold-out set: 2.5785675902804877e-05
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Epoch: 294
Loss on hold-out set: 2.5862751592261414e-05
MeanAbsoluteError value on hold-out data: 0.0028346253093332052
Epoch: 295
Loss on hold-out set: 2.601760491559521e-05
MeanAbsoluteError value on hold-out data: 0.002844299888238311
Epoch: 296

Loss on hold-out set: 2.6222601694538944e-05
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MeanAbsoluteError value on hold-out data: 0.002870506141334772
Epoch: 297
Loss on hold-out set: 2.653326800471309e-05
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Epoch: 298
Loss on hold-out set: 2.666374825821549e-05
MeanAbsoluteError value on hold-out data: 0.002928986446931958
Epoch: 299
Loss on hold-out set: 2.6932627900135375e-05
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Epoch: 300
Loss on hold-out set: 2.6925994796712122e-05
MeanAbsoluteError value on hold-out data: 0.0029715292621403933
Epoch: 301
Loss on hold-out set: 2.7206123125946952e-05
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Epoch: 302
Loss on hold-out set: 2.7053951821711197e-05
MeanAbsoluteError value on hold-out data: 0.0030048517510294914
Epoch: 303
Loss on hold-out set: 2.7299609858968516e-05
MeanAbsoluteError value on hold-out data: 0.00304723740555346
Epoch: 304

Loss on hold-out set: 2.727900536420317e-05
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Epoch: 305
Loss on hold-out set: 2.763114185941767e-05
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Epoch: 306
Loss on hold-out set: 2.7382475249587994e-05
MeanAbsoluteError value on hold-out data: 0.00308619299903512
Epoch: 307
Loss on hold-out set: 2.743985316412459e-05
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Epoch: 308
Loss on hold-out set: 2.7895038340973672e-05
MeanAbsoluteError value on hold-out data: 0.003178368089720607
Epoch: 309
Loss on hold-out set: 2.7497845442332236e-05
MeanAbsoluteError value on hold-out data: 0.0031354320235550404
Epoch: 310
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Loss on hold-out set: 2.8201742721696638e-05
MeanAbsoluteError value on hold-out data: 0.00323789706453681
Epoch: 311
Loss on hold-out set: 2.77391416267691e-05
MeanAbsoluteError value on hold-out data: 0.003178637707605958
Epoch: 312

Loss on hold-out set: 2.791311893408994e-05
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Epoch: 313
Loss on hold-out set: 2.814550999861048e-05
MeanAbsoluteError value on hold-out data: 0.003253684611991048
Epoch: 314
Loss on hold-out set: 2.8732929099293725e-05
MeanAbsoluteError value on hold-out data: 0.0033324910327792168
Epoch: 315
Loss on hold-out set: 2.8666584895338593e-05
MeanAbsoluteError value on hold-out data: 0.0033282891381531954
Epoch: 316
Loss on hold-out set: 2.816029007733864e-05
MeanAbsoluteError value on hold-out data: 0.0032625377643853426
Epoch: 317
Loss on hold-out set: 2.7779249050677447e-05
MeanAbsoluteError value on hold-out data: 0.0032194668892771006
Epoch: 318
Loss on hold-out set: 2.736840164480351e-05
MeanAbsoluteError value on hold-out data: 0.003176274709403515
Epoch: 319
Loss on hold-out set: 2.6609741254153624e-05
MeanAbsoluteError value on hold-out data: 0.0030924943275749683
Epoch: 320

Loss on hold-out set: 2.7119577835994852e-05
MeanAbsoluteError value on hold-out data: 0.003166560549288988
Epoch: 321
Loss on hold-out set: 2.701617937586171e-05
MeanAbsoluteError value on hold-out data: 0.0031690208707004786
Epoch: 322
Loss on hold-out set: 2.805458604215298e-05
MeanAbsoluteError value on hold-out data: 0.0033025313168764114
Epoch: 323
Loss on hold-out set: 2.8291265870824357e-05
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MeanAbsoluteError value on hold-out data: 0.0033418091479688883
Epoch: 324
Loss on hold-out set: 3.204758796097227e-05
MeanAbsoluteError value on hold-out data: 0.0037962046917527914
Epoch: 325
Loss on hold-out set: 4.569239995601636e-05
MeanAbsoluteError value on hold-out data: 0.005166532937437296
Epoch: 326
Loss on hold-out set: 9.30130609049229e-05
MeanAbsoluteError value on hold-out data: 0.008391072042286396
Epoch: 327
Loss on hold-out set: 3.376526705036859e-05
MeanAbsoluteError value on hold-out data: 0.003767650807276368
Epoch: 328

Loss on hold-out set: 2.8116440082732497e-05
MeanAbsoluteError value on hold-out data: 0.003258990589529276
Epoch: 329
Loss on hold-out set: 2.616477395708659e-05
MeanAbsoluteError value on hold-out data: 0.002941574202850461
Epoch: 330
Loss on hold-out set: 2.6857159462834763e-05
MeanAbsoluteError value on hold-out data: 0.003006374929100275
Epoch: 331
Loss on hold-out set: 2.7678490087773273e-05
MeanAbsoluteError value on hold-out data: 0.00312783638946712
Epoch: 332
Loss on hold-out set: 2.8947292207703867e-05
MeanAbsoluteError value on hold-out data: 0.003251883666962385
Epoch: 333
Loss on hold-out set: 2.999333704984134e-05
MeanAbsoluteError value on hold-out data: 0.0033718172926455736
Epoch: 334
Loss on hold-out set: 3.077584481041796e-05
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Epoch: 335
Loss on hold-out set: 3.1873436611069915e-05
MeanAbsoluteError value on hold-out data: 0.003555078525096178
Epoch: 336

Loss on hold-out set: 3.230360805087242e-05
MeanAbsoluteError value on hold-out data: 0.003602150361984968
```

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Epoch: 337
Loss on hold-out set: 3.275756075469728e-05
MeanAbsoluteError value on hold-out data: 0.003640314331278205
Epoch: 338
Loss on hold-out set: 3.1121600374574067e-05
MeanAbsoluteError value on hold-out data: 0.0034384382888674736
Epoch: 339
Loss on hold-out set: 2.9771061451212615e-05
MeanAbsoluteError value on hold-out data: 0.003285326063632965
Epoch: 340
Loss on hold-out set: 2.6814548870166427e-05
MeanAbsoluteError value on hold-out data: 0.0029383115470409393
Epoch: 341
Loss on hold-out set: 2.54962563746487e-05
MeanAbsoluteError value on hold-out data: 0.002873597200959921
Epoch: 342
Loss on hold-out set: 2.7149413582312837e-05
MeanAbsoluteError value on hold-out data: 0.00318407011218369
Epoch: 343
Loss on hold-out set: 4.3654147870448036e-05
MeanAbsoluteError value on hold-out data: 0.005227862391620874
Epoch: 344

Loss on hold-out set: 7.023918078630231e-05
MeanAbsoluteError value on hold-out data: 0.007327461149543524
Epoch: 345
Loss on hold-out set: 8.031453944568057e-05
MeanAbsoluteError value on hold-out data: 0.007894459180533886
Epoch: 346
Loss on hold-out set: 5.743704495168793e-05
MeanAbsoluteError value on hold-out data: 0.006237540859729052
Epoch: 347
Loss on hold-out set: 3.2697673179283905e-05
MeanAbsoluteError value on hold-out data: 0.003661565715447068
Epoch: 348
Loss on hold-out set: 3.568240905032757e-05
MeanAbsoluteError value on hold-out data: 0.003857401665300131
Epoch: 349
Loss on hold-out set: 3.346211172739506e-05
MeanAbsoluteError value on hold-out data: 0.0038785601500421762
Epoch: 350
Loss on hold-out set: 2.455803183023052e-05
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MeanAbsoluteError value on hold-out data: 0.002999967196956277
Epoch: 351
Loss on hold-out set: 2.1866609634008982e-05
MeanAbsoluteError value on hold-out data: 0.002639259910210967
Epoch: 352

Loss on hold-out set: 2.1746589888942636e-05
MeanAbsoluteError value on hold-out data: 0.0025729413609951735
Epoch: 353
Loss on hold-out set: 2.18161065600055e-05
MeanAbsoluteError value on hold-out data: 0.0025582348462194204
Epoch: 354
Loss on hold-out set: 2.1939941324202855e-05
MeanAbsoluteError value on hold-out data: 0.0025673694908618927
Epoch: 355
Loss on hold-out set: 2.200259137010251e-05
MeanAbsoluteError value on hold-out data: 0.002578641287982464
Epoch: 356
Loss on hold-out set: 2.2041969510897424e-05
MeanAbsoluteError value on hold-out data: 0.0025914034340530634
Epoch: 357
Loss on hold-out set: 2.2115625639392084e-05
MeanAbsoluteError value on hold-out data: 0.002604201203212142
Epoch: 358
Loss on hold-out set: 2.215851809763224e-05
MeanAbsoluteError value on hold-out data: 0.0026134962681680918
Epoch: 359
Loss on hold-out set: 2.212856759342685e-05
MeanAbsoluteError value on hold-out data: 0.0026104585267603397
Epoch: 360

Loss on hold-out set: 2.2163927149832536e-05
MeanAbsoluteError value on hold-out data: 0.002611984731629491
Epoch: 361
Loss on hold-out set: 2.2082443443220034e-05
MeanAbsoluteError value on hold-out data: 0.002595789497718215
Epoch: 362
Loss on hold-out set: 2.2163593173804418e-05
MeanAbsoluteError value on hold-out data: 0.0025988377165049314
Epoch: 363
Loss on hold-out set: 2.2132151864178396e-05
MeanAbsoluteError value on hold-out data: 0.0025824387557804585
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Epoch: 364
Loss on hold-out set: 2.2193448193033155e-05
MeanAbsoluteError value on hold-out data: 0.002585909329354763
Epoch: 365
Loss on hold-out set: 2.2271468292513563e-05
MeanAbsoluteError value on hold-out data: 0.0025895927101373672
Epoch: 366
Loss on hold-out set: 2.239987509854377e-05
MeanAbsoluteError value on hold-out data: 0.0026109120808541775
Epoch: 367
Loss on hold-out set: 2.2465120154217738e-05
MeanAbsoluteError value on hold-out data: 0.0026216725818812847
Epoch: 368

Loss on hold-out set: 2.2767893728757227e-05
MeanAbsoluteError value on hold-out data: 0.0026630626525729895
Epoch: 369
Loss on hold-out set: 2.2833035431128673e-05
MeanAbsoluteError value on hold-out data: 0.0026730976533144712
Epoch: 370
Loss on hold-out set: 2.3018600107829307e-05
MeanAbsoluteError value on hold-out data: 0.0026902034878730774
Epoch: 371
Loss on hold-out set: 2.310845908189214e-05
MeanAbsoluteError value on hold-out data: 0.002692727604880929
Epoch: 372
Loss on hold-out set: 2.313912511908711e-05
MeanAbsoluteError value on hold-out data: 0.0026766094379127026
Epoch: 373
Loss on hold-out set: 2.3214469401385652e-05
MeanAbsoluteError value on hold-out data: 0.0026679602451622486
Epoch: 374
Loss on hold-out set: 2.3300105184668945e-05
MeanAbsoluteError value on hold-out data: 0.002672965172678232
Epoch: 375
Loss on hold-out set: 2.3357986289116334e-05
MeanAbsoluteError value on hold-out data: 0.0026636417023837566
Epoch: 376

Loss on hold-out set: 2.3434296999288274e-05
MeanAbsoluteError value on hold-out data: 0.002653266303241253
Epoch: 377
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Loss on hold-out set: 2.3553691724038417e-05
MeanAbsoluteError value on hold-out data: 0.002647615969181061
Epoch: 378
Loss on hold-out set: 2.364539013318503e-05
MeanAbsoluteError value on hold-out data: 0.0026392429135739803
Epoch: 379
Loss on hold-out set: 2.3749530609357432e-05
MeanAbsoluteError value on hold-out data: 0.0026305452920496464
Epoch: 380
Loss on hold-out set: 2.387908515880841e-05
MeanAbsoluteError value on hold-out data: 0.0026319846510887146
Epoch: 381
Loss on hold-out set: 2.404194185900403e-05
MeanAbsoluteError value on hold-out data: 0.0026376538444310427
Epoch: 382
Loss on hold-out set: 2.4163722897403778e-05
MeanAbsoluteError value on hold-out data: 0.00265823514200747
Epoch: 383
Loss on hold-out set: 2.4005078019303926e-05
MeanAbsoluteError value on hold-out data: 0.0026566076558083296
Epoch: 384

Loss on hold-out set: 2.4027998527368543e-05
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Epoch: 385
Loss on hold-out set: 2.3915790288691297e-05
MeanAbsoluteError value on hold-out data: 0.0026659027207642794
Epoch: 386
Loss on hold-out set: 2.3705423715407386e-05
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Epoch: 387
Loss on hold-out set: 2.3467542204894255e-05
MeanAbsoluteError value on hold-out data: 0.0026231424417346716
Epoch: 388
Loss on hold-out set: 2.3352996017341577e-05
MeanAbsoluteError value on hold-out data: 0.0026179212145507336
Epoch: 389
Loss on hold-out set: 2.325370315989666e-05
MeanAbsoluteError value on hold-out data: 0.0026110108010470867
Epoch: 390
Loss on hold-out set: 2.325962987613725e-05
MeanAbsoluteError value on hold-out data: 0.002617591992020607
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Epoch: 391
Loss on hold-out set: 2.3337125729707814e-05
MeanAbsoluteError value on hold-out data: 0.002620482351630926
Epoch: 392

Loss on hold-out set: 2.3418972354623913e-05
MeanAbsoluteError value on hold-out data: 0.002634358825162053
Epoch: 393
Loss on hold-out set: 2.3461423704941952e-05
MeanAbsoluteError value on hold-out data: 0.002638111589476466
Epoch: 394
Loss on hold-out set: 2.3572631430636792e-05
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Epoch: 395
Loss on hold-out set: 2.396644954148398e-05
MeanAbsoluteError value on hold-out data: 0.002696140669286251
Epoch: 396
Loss on hold-out set: 2.4082467803054897e-05
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Epoch: 397
Loss on hold-out set: 2.426289118399214e-05
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Epoch: 398
Loss on hold-out set: 2.4180851117929897e-05
MeanAbsoluteError value on hold-out data: 0.002724252175539732
Epoch: 399
Loss on hold-out set: 2.4200315872229494e-05
MeanAbsoluteError value on hold-out data: 0.002734479960054159
Epoch: 400

Loss on hold-out set: 2.4237088214967546e-05
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Epoch: 401
Loss on hold-out set: 2.441408171187887e-05
MeanAbsoluteError value on hold-out data: 0.0027717642951756716
Epoch: 402
Loss on hold-out set: 2.447459653347706e-05
MeanAbsoluteError value on hold-out data: 0.0027828102465718985
Epoch: 403
Loss on hold-out set: 2.4770661507557778e-05
MeanAbsoluteError value on hold-out data: 0.0028293696232140064
Epoch: 404
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Loss on hold-out set: 2.453718318998941e-05
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Epoch: 405
Loss on hold-out set: 2.4754410297215434e-05
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Epoch: 406
Loss on hold-out set: 2.5701362717786413e-05
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Epoch: 407
Loss on hold-out set: 2.730458031931592e-05
MeanAbsoluteError value on hold-out data: 0.0031579306814819574
Epoch: 408

Loss on hold-out set: 2.76051933054221e-05
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Epoch: 409
Loss on hold-out set: 3.22275944582591e-05
MeanAbsoluteError value on hold-out data: 0.0037991504650563
Epoch: 410
Loss on hold-out set: 5.048112588586886e-05
MeanAbsoluteError value on hold-out data: 0.005542780738323927
Epoch: 411
Loss on hold-out set: 7.353331818050815e-05
MeanAbsoluteError value on hold-out data: 0.007034954149276018
Epoch: 412
Loss on hold-out set: 4.717696338287313e-05
MeanAbsoluteError value on hold-out data: 0.0055782971903681755
Epoch: 413
Loss on hold-out set: 2.7623460183397247e-05
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Epoch: 414
Loss on hold-out set: 2.7646832551765426e-05
MeanAbsoluteError value on hold-out data: 0.00309788272716105
Epoch: 415
Loss on hold-out set: 2.9417084587485558e-05
MeanAbsoluteError value on hold-out data: 0.003405170049518347
Epoch: 416

Loss on hold-out set: 3.4868355370283675e-05
MeanAbsoluteError value on hold-out data: 0.004225096665322781
Epoch: 417
Loss on hold-out set: 4.34744853057629e-05
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MeanAbsoluteError value on hold-out data: 0.005178345832973719
Epoch: 418
Loss on hold-out set: 4.945266238409156e-05
MeanAbsoluteError value on hold-out data: 0.005730315111577511
Epoch: 419
Loss on hold-out set: 3.088440942184733e-05
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Epoch: 420
Loss on hold-out set: 4.862156916523849e-05
MeanAbsoluteError value on hold-out data: 0.005447939038276672
Epoch: 421
Loss on hold-out set: 6.355612942187643e-05
MeanAbsoluteError value on hold-out data: 0.00668472982943058
Epoch: 422
Loss on hold-out set: 2.929243672305778e-05
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Epoch: 423
Loss on hold-out set: 2.9783855067858223e-05
MeanAbsoluteError value on hold-out data: 0.003156443126499653
Epoch: 424

Loss on hold-out set: 3.3349553764070917e-05
MeanAbsoluteError value on hold-out data: 0.0037342889700084925
Epoch: 425
Loss on hold-out set: 3.784168357493687e-05
MeanAbsoluteError value on hold-out data: 0.00439856294542551
Epoch: 426
Loss on hold-out set: 3.389374728612893e-05
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Epoch: 427
Loss on hold-out set: 2.5012641907252193e-05
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Epoch: 428
Loss on hold-out set: 2.180062241869133e-05
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Epoch: 429
Loss on hold-out set: 2.1728396590285564e-05
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Epoch: 430
Loss on hold-out set: 2.196668447440013e-05
MeanAbsoluteError value on hold-out data: 0.002507873810827732
Epoch: 431
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Loss on hold-out set: 2.222440671056048e-05
MeanAbsoluteError value on hold-out data: 0.0025455355644226074
Epoch: 432


Loss on hold-out set: 2.2414171403876314e-05
MeanAbsoluteError value on hold-out data: 0.0025811553932726383
Epoch: 433
Loss on hold-out set: 2.2535833621580087e-05
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Epoch: 434
Loss on hold-out set: 2.2539351894130577e-05
MeanAbsoluteError value on hold-out data: 0.0026262146420776844
Epoch: 435
Loss on hold-out set: 2.2479615070455782e-05
MeanAbsoluteError value on hold-out data: 0.0026230497751384974
Epoch: 436
Loss on hold-out set: 2.2485826063625847e-05
MeanAbsoluteError value on hold-out data: 0.0026294314302504063
Epoch: 437
Loss on hold-out set: 2.230205905705493e-05
MeanAbsoluteError value on hold-out data: 0.002606729744002223
Epoch: 438
Loss on hold-out set: 2.2184009699350626e-05
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Epoch: 439
Loss on hold-out set: 2.209678728161778e-05
MeanAbsoluteError value on hold-out data: 0.002563470508903265
Epoch: 440


Loss on hold-out set: 2.2047309986000503e-05
MeanAbsoluteError value on hold-out data: 0.0025436566211283207
Epoch: 441
Loss on hold-out set: 2.2074975145426978e-05
MeanAbsoluteError value on hold-out data: 0.0025352088268846273
Epoch: 442
Loss on hold-out set: 2.2123831253171183e-05
MeanAbsoluteError value on hold-out data: 0.002534771803766489
Epoch: 443
Loss on hold-out set: 2.2197380731445026e-05
MeanAbsoluteError value on hold-out data: 0.002542634727433324
Epoch: 444
Loss on hold-out set: 2.2260715112272584e-05
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MeanAbsoluteError value on hold-out data: 0.0025473907589912415
Epoch: 445
Loss on hold-out set: 2.2329729912790324e-05
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Epoch: 446
Loss on hold-out set: 2.2401451061389372e-05
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Epoch: 447
Loss on hold-out set: 2.2496657499304045e-05
MeanAbsoluteError value on hold-out data: 0.0025519095361232758
Epoch: 448

Loss on hold-out set: 2.255657867815324e-05
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Loss on hold-out set: 2.2687617573817414e-05
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Epoch: 450
Loss on hold-out set: 2.2807507584251364e-05
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Epoch: 451
Loss on hold-out set: 2.290209067723481e-05
MeanAbsoluteError value on hold-out data: 0.002568316413089633
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Loss on hold-out set: 2.3012228941871926e-05
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Epoch: 453
Loss on hold-out set: 2.3132831846564123e-05
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Epoch: 454
Loss on hold-out set: 2.3243819495483447e-05
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Epoch: 455
Loss on hold-out set: 2.3350407912546773e-05
MeanAbsoluteError value on hold-out data: 0.0025821467861533165
Epoch: 456

Loss on hold-out set: 2.3436380974759996e-05
MeanAbsoluteError value on hold-out data: 0.002585062524303794
Epoch: 457
Loss on hold-out set: 2.348735556791469e-05
MeanAbsoluteError value on hold-out data: 0.002587925875559449
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Epoch: 458
Loss on hold-out set: 2.351941180067067e-05
MeanAbsoluteError value on hold-out data: 0.0025914344005286694
Epoch: 459
Loss on hold-out set: 2.3541873657139052e-05
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Epoch: 460
Loss on hold-out set: 2.35944676385196e-05
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Epoch: 461
Loss on hold-out set: 2.355556952543817e-05
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Epoch: 462
Loss on hold-out set: 2.3639676454111298e-05
MeanAbsoluteError value on hold-out data: 0.0025956733152270317
Epoch: 463
Loss on hold-out set: 2.362024875274552e-05
MeanAbsoluteError value on hold-out data: 0.0026059281080961227
Epoch: 464

Loss on hold-out set: 2.347191271287317e-05
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Epoch: 465
Loss on hold-out set: 2.353078025108564e-05
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Epoch: 466
Loss on hold-out set: 2.3470070818563582e-05
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Epoch: 467
Loss on hold-out set: 2.350708978395376e-05
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Epoch: 468
Loss on hold-out set: 2.3508327486572517e-05
MeanAbsoluteError value on hold-out data: 0.002591228112578392
Epoch: 469
Loss on hold-out set: 2.353651910281865e-05
MeanAbsoluteError value on hold-out data: 0.0026028132997453213
Epoch: 470
Loss on hold-out set: 2.3476763799049206e-05
MeanAbsoluteError value on hold-out data: 0.002592839300632477
Epoch: 471
Loss on hold-out set: 2.379600436154904e-05
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MeanAbsoluteError value on hold-out data: 0.002628968097269535
Epoch: 472

Loss on hold-out set: 2.3582306572447315e-05
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Epoch: 473
Loss on hold-out set: 2.351808039018004e-05
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Epoch: 474
Loss on hold-out set: 2.344477713964615e-05
MeanAbsoluteError value on hold-out data: 0.0026179079432040453
Epoch: 475
Loss on hold-out set: 2.335183374294789e-05
MeanAbsoluteError value on hold-out data: 0.002615217352285981
Epoch: 476
Loss on hold-out set: 2.3300609768739378e-05
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Epoch: 477
Loss on hold-out set: 2.3162987477725867e-05
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Epoch: 478
Loss on hold-out set: 2.3249793176355044e-05
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Epoch: 479
Loss on hold-out set: 2.3312586168494338e-05
MeanAbsoluteError value on hold-out data: 0.0026375865563750267
Epoch: 480

Loss on hold-out set: 2.3625160517775312e-05
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Epoch: 481
Loss on hold-out set: 2.4090262112813914e-05
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Epoch: 482
Loss on hold-out set: 2.4382875410896975e-05
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Epoch: 483
Loss on hold-out set: 2.4780379847374878e-05
MeanAbsoluteError value on hold-out data: 0.0027991319075226784
Epoch: 484
Loss on hold-out set: 2.5149361823950083e-05
MeanAbsoluteError value on hold-out data: 0.0028412279207259417
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Epoch: 485
Loss on hold-out set: 2.6211113340411285e-05
MeanAbsoluteError value on hold-out data: 0.002959529170766473
Epoch: 486
Loss on hold-out set: 3.189834355429124e-05
MeanAbsoluteError value on hold-out data: 0.0036700114142149687
Epoch: 487
Loss on hold-out set: 5.6846770109443335e-05
MeanAbsoluteError value on hold-out data: 0.005903264973312616
Epoch: 488

Loss on hold-out set: 3.651874171258609e-05
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Epoch: 489
Loss on hold-out set: 5.633303949013536e-05
MeanAbsoluteError value on hold-out data: 0.006375846453011036
Epoch: 490
Loss on hold-out set: 3.16297863312349e-05
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Epoch: 491
Loss on hold-out set: 3.0183200854145597e-05
MeanAbsoluteError value on hold-out data: 0.00368160055950284
Epoch: 492
Loss on hold-out set: 2.8558111999269674e-05
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Epoch: 493
Loss on hold-out set: 2.7235141039071958e-05
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Epoch: 494
Loss on hold-out set: 2.6457273017848293e-05
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Epoch: 495
Loss on hold-out set: 2.6074435152766358e-05
MeanAbsoluteError value on hold-out data: 0.002930251881480217
Epoch: 496

Loss on hold-out set: 2.601075808690056e-05
MeanAbsoluteError value on hold-out data: 0.00289732264354825
Epoch: 497
Loss on hold-out set: 2.6174556410296645e-05
MeanAbsoluteError value on hold-out data: 0.002908992348238826
Epoch: 498
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Loss on hold-out set: 2.640728908581399e-05
MeanAbsoluteError value on hold-out data: 0.0029507498256862164
Epoch: 499
Loss on hold-out set: 2.6866649196371757e-05
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Epoch: 500
Loss on hold-out set: 2.7101715383986103e-05
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Epoch: 501
Loss on hold-out set: 2.774154519389221e-05
MeanAbsoluteError value on hold-out data: 0.0031945002265274525
Epoch: 502
Loss on hold-out set: 2.8303291245672307e-05
MeanAbsoluteError value on hold-out data: 0.0033091953955590725
Epoch: 503
Loss on hold-out set: 2.9971096864755964e-05
MeanAbsoluteError value on hold-out data: 0.003568575717508793
Epoch: 504

Loss on hold-out set: 3.009413827433156e-05
MeanAbsoluteError value on hold-out data: 0.003571852808818221
Epoch: 505
Loss on hold-out set: 3.142260310309403e-05
MeanAbsoluteError value on hold-out data: 0.0037713011261075735
Epoch: 506
Loss on hold-out set: 3.2217447728486915e-05
MeanAbsoluteError value on hold-out data: 0.0038762250915169716
Epoch: 507
Loss on hold-out set: 3.074264504663772e-05
MeanAbsoluteError value on hold-out data: 0.0036291321739554405
Epoch: 508
Loss on hold-out set: 2.7142675124100368e-05
MeanAbsoluteError value on hold-out data: 0.002944658510386944
Epoch: 509
Loss on hold-out set: 4.111683061206637e-05
MeanAbsoluteError value on hold-out data: 0.0042627546936273575
Epoch: 510
Loss on hold-out set: 7.066766394066355e-05
MeanAbsoluteError value on hold-out data: 0.007159987930208445
Epoch: 511
Loss on hold-out set: 3.4478634927980144e-05
MeanAbsoluteError value on hold-out data: 0.003979329485446215
Epoch: 512
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Loss on hold-out set: 3.177873285446702e-05
MeanAbsoluteError value on hold-out data: 0.003349390346556902
Epoch: 513
Loss on hold-out set: 3.7635960588407836e-05
MeanAbsoluteError value on hold-out data: 0.0042227706871926785
Epoch: 514
Loss on hold-out set: 3.848126356100884e-05
MeanAbsoluteError value on hold-out data: 0.004473027773201466
Epoch: 515
Loss on hold-out set: 3.344928492017636e-05
MeanAbsoluteError value on hold-out data: 0.004073867574334145
Epoch: 516
Loss on hold-out set: 2.6699962542184757e-05
MeanAbsoluteError value on hold-out data: 0.0033338756766170263
Epoch: 517
Loss on hold-out set: 2.1921550772898818e-05
MeanAbsoluteError value on hold-out data: 0.0026676401030272245
Epoch: 518
Loss on hold-out set: 2.0899359812999234e-05
MeanAbsoluteError value on hold-out data: 0.0024241344071924686
Epoch: 519
Loss on hold-out set: 2.102441425820775e-05
MeanAbsoluteError value on hold-out data: 0.002395621035248041
Epoch: 520

Loss on hold-out set: 2.1168461653599623e-05
MeanAbsoluteError value on hold-out data: 0.002409013221040368
Epoch: 521
Loss on hold-out set: 2.1282879458794923e-05
MeanAbsoluteError value on hold-out data: 0.002429959364235401
Epoch: 522
Loss on hold-out set: 2.126960478826253e-05
MeanAbsoluteError value on hold-out data: 0.0024364939890801907
Epoch: 523
Loss on hold-out set: 2.122343624484146e-05
MeanAbsoluteError value on hold-out data: 0.002434380818158388
Epoch: 524
Loss on hold-out set: 2.113820921285998e-05
MeanAbsoluteError value on hold-out data: 0.002417732495814562
Epoch: 525
Loss on hold-out set: 2.104756888711204e-05
MeanAbsoluteError value on hold-out data: 0.002401395235210657
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Epoch: 526
Loss on hold-out set: 2.0996303803892596e-05
MeanAbsoluteError value on hold-out data: 0.002396144438534975
Epoch: 527
Loss on hold-out set: 2.1019927020024386e-05
MeanAbsoluteError value on hold-out data: 0.0024044422898441553
Epoch: 528
Loss on hold-out set: 2.1107276377338885e-05
MeanAbsoluteError value on hold-out data: 0.0024378590751439333
Epoch: 529
Loss on hold-out set: 2.1300074724637708e-05
MeanAbsoluteError value on hold-out data: 0.00249158195219934
Epoch: 530
Loss on hold-out set: 2.1526327495729148e-05
MeanAbsoluteError value on hold-out data: 0.002550571458414197
Epoch: 531
Loss on hold-out set: 2.170573063901764e-05
MeanAbsoluteError value on hold-out data: 0.0026024074759334326
Epoch: 532
Loss on hold-out set: 2.183299894616204e-05
MeanAbsoluteError value on hold-out data: 0.002627393463626504
Epoch: 533
Loss on hold-out set: 2.1785172853134626e-05
MeanAbsoluteError value on hold-out data: 0.0026190916541963816
Epoch: 534
Loss on hold-out set: 2.1892634774040314e-05
MeanAbsoluteError value on hold-out data: 0.0026367492973804474
Epoch: 535
Loss on hold-out set: 2.183097911998438e-05
MeanAbsoluteError value on hold-out data: 0.0026165449526160955
Epoch: 536
Loss on hold-out set: 2.1995337644224862e-05
MeanAbsoluteError value on hold-out data: 0.0026369320694357157
Epoch: 537
Loss on hold-out set: 2.1960573370075797e-05
MeanAbsoluteError value on hold-out data: 0.0026257652789354324
Epoch: 538
Loss on hold-out set: 2.1867174798205125e-05
MeanAbsoluteError value on hold-out data: 0.002583088120445609
Epoch: 539
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Loss on hold-out set: 2.191531367064894e-05
MeanAbsoluteError value on hold-out data: 0.0025901563931256533
Epoch: 540
Loss on hold-out set: 2.202136748732492e-05
MeanAbsoluteError value on hold-out data: 0.0025886588264256716
Epoch: 541
Loss on hold-out set: 2.1911823386002843e-05
MeanAbsoluteError value on hold-out data: 0.002568774623796344
Epoch: 542
Loss on hold-out set: 2.1945262227219293e-05
MeanAbsoluteError value on hold-out data: 0.0025444296188652515
Epoch: 543
Loss on hold-out set: 2.1963465805559902e-05
MeanAbsoluteError value on hold-out data: 0.002536675427109003
Epoch: 544
```

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Loss on hold-out set: 2.2016303175501218e-05
MeanAbsoluteError value on hold-out data: 0.0025339575950056314
Epoch: 545
Loss on hold-out set: 2.20690794357755e-05
MeanAbsoluteError value on hold-out data: 0.0025311170611530542
Epoch: 546
Loss on hold-out set: 2.212597948264853e-05
MeanAbsoluteError value on hold-out data: 0.002525696065276861
Epoch: 547
Loss on hold-out set: 2.220719838868191e-05
MeanAbsoluteError value on hold-out data: 0.002531973645091057
Epoch: 548
Loss on hold-out set: 2.2264731228460732e-05
MeanAbsoluteError value on hold-out data: 0.002544030314311385
Epoch: 549
Loss on hold-out set: 2.229543925499169e-05
MeanAbsoluteError value on hold-out data: 0.002542962320148945
Epoch: 550
Loss on hold-out set: 2.225436121773926e-05
MeanAbsoluteError value on hold-out data: 0.0025385478511452675
Epoch: 551
Loss on hold-out set: 2.2206064500096545e-05
MeanAbsoluteError value on hold-out data: 0.0025314688682556152
Epoch: 552
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Loss on hold-out set: 2.228340332222663e-05
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MeanAbsoluteError value on hold-out data: 0.0025413609109818935
Epoch: 553
Loss on hold-out set: 2.237044779612437e-05
MeanAbsoluteError value on hold-out data: 0.0025408153887838125
Epoch: 554
Loss on hold-out set: 2.2353355336092233e-05
MeanAbsoluteError value on hold-out data: 0.00254015251994133
Epoch: 555
Loss on hold-out set: 2.2430752078674376e-05
MeanAbsoluteError value on hold-out data: 0.0025479281321167946
Epoch: 556
Loss on hold-out set: 2.2645427941070967e-05
MeanAbsoluteError value on hold-out data: 0.0025663296692073345
Epoch: 557
Loss on hold-out set: 2.257780585966286e-05
MeanAbsoluteError value on hold-out data: 0.002561506349593401
Epoch: 558
Loss on hold-out set: 2.2760714113258617e-05
MeanAbsoluteError value on hold-out data: 0.0025778694543987513
Epoch: 559
Loss on hold-out set: 2.2730059658658175e-05
MeanAbsoluteError value on hold-out data: 0.0025714831426739693
Epoch: 560

Loss on hold-out set: 2.2750828960445352e-05
MeanAbsoluteError value on hold-out data: 0.0025773881934583187
Epoch: 561
Loss on hold-out set: 2.266230354495603e-05
MeanAbsoluteError value on hold-out data: 0.002569063100963831
Epoch: 562
Loss on hold-out set: 2.2827423009630365e-05
MeanAbsoluteError value on hold-out data: 0.00257908389903605
Epoch: 563
Loss on hold-out set: 2.3005190975685475e-05
MeanAbsoluteError value on hold-out data: 0.0025866739451885223
Epoch: 564
Loss on hold-out set: 2.2927317385629547e-05
MeanAbsoluteError value on hold-out data: 0.0025711115449666977
Epoch: 565
Loss on hold-out set: 2.2948002291394387e-05
MeanAbsoluteError value on hold-out data: 0.002574096666648984
Epoch: 566
```

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Loss on hold-out set: 2.2878082054495807e-05
MeanAbsoluteError value on hold-out data: 0.0025667857844382524
Epoch: 567
Loss on hold-out set: 2.303778550963455e-05
MeanAbsoluteError value on hold-out data: 0.002570121316239238
Epoch: 568

Loss on hold-out set: 2.303757243955835e-05
MeanAbsoluteError value on hold-out data: 0.002580069238319993
Epoch: 569
Loss on hold-out set: 2.3239191788984737e-05
MeanAbsoluteError value on hold-out data: 0.002587250666692853
Epoch: 570
Loss on hold-out set: 2.31058603114769e-05
MeanAbsoluteError value on hold-out data: 0.0025981073267757893
Epoch: 571
Loss on hold-out set: 2.3136154368330608e-05
MeanAbsoluteError value on hold-out data: 0.0026143037248402834
Epoch: 572
Loss on hold-out set: 2.333358453729249e-05
MeanAbsoluteError value on hold-out data: 0.002644674153998494
Epoch: 573
Loss on hold-out set: 2.3417462500674446e-05
MeanAbsoluteError value on hold-out data: 0.0026891359593719244
Epoch: 574
Loss on hold-out set: 2.429117915581676e-05
MeanAbsoluteError value on hold-out data: 0.0028545535169541836
Epoch: 575
Loss on hold-out set: 2.5848272822546087e-05
MeanAbsoluteError value on hold-out data: 0.0031625451520085335
Epoch: 576

Loss on hold-out set: 2.989867831322619e-05
MeanAbsoluteError value on hold-out data: 0.0037649984005838633
Epoch: 577
Loss on hold-out set: 4.628925073216363e-05
MeanAbsoluteError value on hold-out data: 0.005602765828371048
Epoch: 578
Loss on hold-out set: 2.8174981875245546e-05
MeanAbsoluteError value on hold-out data: 0.0031910056713968515
Epoch: 579
Loss on hold-out set: 4.047016007366198e-05
```

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MeanAbsoluteError value on hold-out data: 0.004548525437712669
Epoch: 580
Loss on hold-out set: 3.647417686711139e-05
MeanAbsoluteError value on hold-out data: 0.004088740795850754
Epoch: 581
Loss on hold-out set: 2.796024984706348e-05
MeanAbsoluteError value on hold-out data: 0.0031510619446635246
Epoch: 582
Loss on hold-out set: 2.4048117154507054e-05
MeanAbsoluteError value on hold-out data: 0.002708811080083251
Epoch: 583
Loss on hold-out set: 2.3829073119199357e-05
MeanAbsoluteError value on hold-out data: 0.002738571958616376
Epoch: 584

Loss on hold-out set: 2.4225222372670512e-05
MeanAbsoluteError value on hold-out data: 0.002801109803840518
Epoch: 585
Loss on hold-out set: 2.447587829872071e-05
MeanAbsoluteError value on hold-out data: 0.002851128112524748
Epoch: 586
Loss on hold-out set: 2.5208495724439816e-05
MeanAbsoluteError value on hold-out data: 0.002998245181515813
Epoch: 587
Loss on hold-out set: 2.6726497307400248e-05
MeanAbsoluteError value on hold-out data: 0.003279405413195491
Epoch: 588
Loss on hold-out set: 2.999050754600543e-05
MeanAbsoluteError value on hold-out data: 0.0037508539389818907
Epoch: 589
Loss on hold-out set: 3.641348669254129e-05
MeanAbsoluteError value on hold-out data: 0.0045612710528075695
Epoch: 590
Loss on hold-out set: 4.813942436349431e-05
MeanAbsoluteError value on hold-out data: 0.00575614906847477
Epoch: 591
Loss on hold-out set: 5.206632216102566e-05
MeanAbsoluteError value on hold-out data: 0.006035652477294207
Epoch: 592

Loss on hold-out set: 7.573040875286097e-05
MeanAbsoluteError value on hold-out data: 0.007511972449719906
```

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Epoch: 593
Loss on hold-out set: 3.131129366058878e-05
MeanAbsoluteError value on hold-out data: 0.0034044974017888308
Epoch: 594
Loss on hold-out set: 3.8996556381071536e-05
MeanAbsoluteError value on hold-out data: 0.0044782403856515884
Epoch: 595
Loss on hold-out set: 4.219196393693748e-05
MeanAbsoluteError value on hold-out data: 0.004901156295090914
Epoch: 596
Loss on hold-out set: 4.136209228913925e-05
MeanAbsoluteError value on hold-out data: 0.004894892685115337
Epoch: 597
Loss on hold-out set: 3.5557827447375624e-05
MeanAbsoluteError value on hold-out data: 0.004354760982096195
Epoch: 598
Loss on hold-out set: 2.8559353423636486e-05
MeanAbsoluteError value on hold-out data: 0.0035799590405076742
Epoch: 599
Loss on hold-out set: 2.4048059284914896e-05
MeanAbsoluteError value on hold-out data: 0.002989776898175478
Epoch: 600


Loss on hold-out set: 2.251960923235617e-05
MeanAbsoluteError value on hold-out data: 0.002740244846791029
Epoch: 601
Loss on hold-out set: 2.2208092033045096e-05
MeanAbsoluteError value on hold-out data: 0.0026679199654608965
Epoch: 602
Loss on hold-out set: 2.2071857167223864e-05
MeanAbsoluteError value on hold-out data: 0.002636362798511982
Epoch: 603
Loss on hold-out set: 2.208554368627646e-05
MeanAbsoluteError value on hold-out data: 0.0026337425224483013
Epoch: 604
Loss on hold-out set: 2.199480500047158e-05
MeanAbsoluteError value on hold-out data: 0.0026175801176577806
Epoch: 605
Loss on hold-out set: 2.1988049393497166e-05
MeanAbsoluteError value on hold-out data: 0.002617636928334832
Epoch: 606
Loss on hold-out set: 2.1883141695716884e-05
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MeanAbsoluteError value on hold-out data: 0.0026009136345237494
Epoch: 607
Loss on hold-out set: 2.1618912192503847e-05
MeanAbsoluteError value on hold-out data: 0.002561625326052308
Epoch: 608

Loss on hold-out set: 2.1350270727500748e-05
MeanAbsoluteError value on hold-out data: 0.002514423569664359
Epoch: 609
Loss on hold-out set: 2.1130404161938616e-05
MeanAbsoluteError value on hold-out data: 0.0024632818531244993
Epoch: 610
Loss on hold-out set: 2.0930777540833762e-05
MeanAbsoluteError value on hold-out data: 0.0024253258015960455
Epoch: 611
Loss on hold-out set: 2.0810263993248075e-05
MeanAbsoluteError value on hold-out data: 0.0023998140823096037
Epoch: 612
Loss on hold-out set: 2.0778162636166765e-05
MeanAbsoluteError value on hold-out data: 0.0023928165901452303
Epoch: 613
Loss on hold-out set: 2.0799123315908363e-05
MeanAbsoluteError value on hold-out data: 0.0023907225113362074
Epoch: 614
Loss on hold-out set: 2.076429778435041e-05
MeanAbsoluteError value on hold-out data: 0.0024018757976591587
Epoch: 615
Loss on hold-out set: 2.0942661428485483e-05
MeanAbsoluteError value on hold-out data: 0.002421128796413541
Epoch: 616

Loss on hold-out set: 2.093684669247116e-05
MeanAbsoluteError value on hold-out data: 0.0024453969672322273
Epoch: 617
Loss on hold-out set: 2.1096502500670878e-05
MeanAbsoluteError value on hold-out data: 0.002468629740178585
Epoch: 618
Loss on hold-out set: 2.102311301380897e-05
MeanAbsoluteError value on hold-out data: 0.0024662737268954515
Epoch: 619
Loss on hold-out set: 2.118417731628896e-05
MeanAbsoluteError value on hold-out data: 0.002482661511749029
```

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Epoch: 620
Loss on hold-out set: 2.1214857360525074e-05
MeanAbsoluteError value on hold-out data: 0.002502255141735077
Epoch: 621
Loss on hold-out set: 2.138295917051748e-05
MeanAbsoluteError value on hold-out data: 0.002511990023776889
Epoch: 622
Loss on hold-out set: 2.1458928077472112e-05
MeanAbsoluteError value on hold-out data: 0.002528361277654767
Epoch: 623
Loss on hold-out set: 2.1461339668492558e-05
MeanAbsoluteError value on hold-out data: 0.002532601822167635
Epoch: 624

Loss on hold-out set: 2.1499410624564436e-05
MeanAbsoluteError value on hold-out data: 0.0025123897939920425
Epoch: 625
Loss on hold-out set: 2.1533434260402972e-05
MeanAbsoluteError value on hold-out data: 0.0025198066141456366
Epoch: 626
Loss on hold-out set: 2.1554342589225645e-05
MeanAbsoluteError value on hold-out data: 0.0025158715434372425
Epoch: 627
Loss on hold-out set: 2.1535220708445097e-05
MeanAbsoluteError value on hold-out data: 0.0025020348839461803
Epoch: 628
Loss on hold-out set: 2.1573862526517923e-05
MeanAbsoluteError value on hold-out data: 0.0024998681619763374
Epoch: 629
Loss on hold-out set: 2.1718879350517357e-05
MeanAbsoluteError value on hold-out data: 0.0025111644063144922
Epoch: 630
Loss on hold-out set: 2.1768490784636112e-05
MeanAbsoluteError value on hold-out data: 0.002516456414014101
Epoch: 631
Loss on hold-out set: 2.1794434785174655e-05
MeanAbsoluteError value on hold-out data: 0.0025217346847057343
Epoch: 632

Loss on hold-out set: 2.1822180228450872e-05
MeanAbsoluteError value on hold-out data: 0.0025231707841157913
Epoch: 633
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Loss on hold-out set: 2.1811195180912602e-05
MeanAbsoluteError value on hold-out data: 0.0025200534146279097
Epoch: 634
Loss on hold-out set: 2.1862732945752022e-05
MeanAbsoluteError value on hold-out data: 0.002528757555410266
Epoch: 635
Loss on hold-out set: 2.1860226892936464e-05
MeanAbsoluteError value on hold-out data: 0.0025369571521878242
Epoch: 636
Loss on hold-out set: 2.181706404551158e-05
MeanAbsoluteError value on hold-out data: 0.0025371420197188854
Epoch: 637
Loss on hold-out set: 2.1832105912117666e-05
MeanAbsoluteError value on hold-out data: 0.0025339939165860415
Epoch: 638
Loss on hold-out set: 2.1665430112031908e-05
MeanAbsoluteError value on hold-out data: 0.002523653907701373
Epoch: 639
Loss on hold-out set: 2.1901313420800617e-05
MeanAbsoluteError value on hold-out data: 0.0025338279083371162
Epoch: 640

Loss on hold-out set: 2.1647546930125827e-05
MeanAbsoluteError value on hold-out data: 0.002522845985367894
Epoch: 641
Loss on hold-out set: 2.1929388726436483e-05
MeanAbsoluteError value on hold-out data: 0.0025397329591214657
Epoch: 642
Loss on hold-out set: 2.165817721489523e-05
MeanAbsoluteError value on hold-out data: 0.0025223703123629093
Epoch: 643
Loss on hold-out set: 2.1945315887406697e-05
MeanAbsoluteError value on hold-out data: 0.002537863329052925
Epoch: 644
Loss on hold-out set: 2.182833268785831e-05
MeanAbsoluteError value on hold-out data: 0.00253851106390357
Epoch: 645
Loss on hold-out set: 2.193418670590051e-05
MeanAbsoluteError value on hold-out data: 0.002537558786571026
Epoch: 646
Loss on hold-out set: 2.195386248690499e-05
MeanAbsoluteError value on hold-out data: 0.002543920185416937
```

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Epoch: 647
Loss on hold-out set: 2.2100581358436582e-05
MeanAbsoluteError value on hold-out data: 0.0025507044047117233
Epoch: 648

Loss on hold-out set: 2.2161535543761457e-05
MeanAbsoluteError value on hold-out data: 0.002559024840593338
Epoch: 649
Loss on hold-out set: 2.2175749345359164e-05
MeanAbsoluteError value on hold-out data: 0.0025635771453380585
Epoch: 650
Loss on hold-out set: 2.2252913583399374e-05
MeanAbsoluteError value on hold-out data: 0.0025696703232824802
Epoch: 651
Loss on hold-out set: 2.23372653755704e-05
MeanAbsoluteError value on hold-out data: 0.0025787095073610544
Epoch: 652
Loss on hold-out set: 2.2399501092781737e-05
MeanAbsoluteError value on hold-out data: 0.0025994423776865005
Epoch: 653
Loss on hold-out set: 2.2441046086753074e-05
MeanAbsoluteError value on hold-out data: 0.0025969422422349453
Epoch: 654
Loss on hold-out set: 2.248700460122085e-05
MeanAbsoluteError value on hold-out data: 0.0026076766662299633
Epoch: 655
Loss on hold-out set: 2.2578010178844316e-05
MeanAbsoluteError value on hold-out data: 0.0026268267538398504
Epoch: 656

Loss on hold-out set: 2.2594131068169526e-05
MeanAbsoluteError value on hold-out data: 0.0026401730719953775
Epoch: 657
Loss on hold-out set: 2.2801300252994177e-05
MeanAbsoluteError value on hold-out data: 0.0026492043398320675
Epoch: 658
Loss on hold-out set: 2.2902761890308237e-05
MeanAbsoluteError value on hold-out data: 0.002680234145373106
Epoch: 659
Loss on hold-out set: 2.3445564525708935e-05
MeanAbsoluteError value on hold-out data: 0.002785733435302973
Epoch: 660
```

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Loss on hold-out set: 2.4240600521950812e-05
MeanAbsoluteError value on hold-out data: 0.00293036550283432
Epoch: 661
Loss on hold-out set: 2.5482887341049238e-05
MeanAbsoluteError value on hold-out data: 0.003129452932626009
Epoch: 662
Loss on hold-out set: 2.7862881887286723e-05
MeanAbsoluteError value on hold-out data: 0.0034978517796844244
Epoch: 663
Loss on hold-out set: 3.4143114733428536e-05
MeanAbsoluteError value on hold-out data: 0.004323938395828009
Epoch: 664
```

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Loss on hold-out set: 3.673913543503946e-05
MeanAbsoluteError value on hold-out data: 0.004587624687701464
Epoch: 665
Loss on hold-out set: 4.259174295982934e-05
MeanAbsoluteError value on hold-out data: 0.004770677071064711
Epoch: 666
Loss on hold-out set: 3.336154551154897e-05
MeanAbsoluteError value on hold-out data: 0.003836631076410413
Epoch: 667
Loss on hold-out set: 2.6374476904397614e-05
MeanAbsoluteError value on hold-out data: 0.002963354578241706
Epoch: 668
Loss on hold-out set: 2.4178830872905994e-05
MeanAbsoluteError value on hold-out data: 0.0027016103267669678
Epoch: 669
Loss on hold-out set: 2.367352300026189e-05
MeanAbsoluteError value on hold-out data: 0.002704355400055647
Epoch: 670
Loss on hold-out set: 2.412363532979917e-05
MeanAbsoluteError value on hold-out data: 0.0028141760267317295
Epoch: 671
Loss on hold-out set: 2.6565557549785905e-05
MeanAbsoluteError value on hold-out data: 0.003241711063310504
Epoch: 672
```

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Loss on hold-out set: 3.8123846360050316e-05
MeanAbsoluteError value on hold-out data: 0.004744827747344971
Epoch: 673
Loss on hold-out set: 9.374700283316135e-05
```

```
MeanAbsoluteError value on hold-out data: 0.008828893303871155
Epoch: 674
Loss on hold-out set: 8.105570678277505e-05
MeanAbsoluteError value on hold-out data: 0.008023583330214024
Epoch: 675
Loss on hold-out set: 3.2625066464070664e-05
MeanAbsoluteError value on hold-out data: 0.003821634454652667
Epoch: 676
Loss on hold-out set: 3.75000822953696e-05
MeanAbsoluteError value on hold-out data: 0.004478735383599997
Epoch: 677
Loss on hold-out set: 4.192860114926589e-05
MeanAbsoluteError value on hold-out data: 0.004949897527694702
Epoch: 678
Loss on hold-out set: 4.114763978099003e-05
MeanAbsoluteError value on hold-out data: 0.00490230368450284
Epoch: 679
Loss on hold-out set: 3.730922251059766e-05
MeanAbsoluteError value on hold-out data: 0.004544183146208525
Epoch: 680

Loss on hold-out set: 3.0040073158345064e-05
MeanAbsoluteError value on hold-out data: 0.0037775759119540453
Epoch: 681
Loss on hold-out set: 2.494572277100815e-05
MeanAbsoluteError value on hold-out data: 0.0031360257416963577
Epoch: 682
Loss on hold-out set: 2.283729006529412e-05
MeanAbsoluteError value on hold-out data: 0.002791397273540497
Epoch: 683
Loss on hold-out set: 2.2076764145439436e-05
MeanAbsoluteError value on hold-out data: 0.0026467612478882074
Epoch: 684
Loss on hold-out set: 2.1917393945314917e-05
MeanAbsoluteError value on hold-out data: 0.0026088920421898365
Epoch: 685
Loss on hold-out set: 2.1918226177843425e-05
MeanAbsoluteError value on hold-out data: 0.00260201096534729
Epoch: 686
Loss on hold-out set: 2.1849630145784193e-05
MeanAbsoluteError value on hold-out data: 0.0025956726167351007
Epoch: 687
```

```
Loss on hold-out set: 2.1898953234181374e-05
MeanAbsoluteError value on hold-out data: 0.002595180179923773
Epoch: 688

Loss on hold-out set: 2.1874998460110585e-05
MeanAbsoluteError value on hold-out data: 0.0025945513043552637
Epoch: 689
Loss on hold-out set: 2.172395551568977e-05
MeanAbsoluteError value on hold-out data: 0.002563148271292448
Epoch: 690
Loss on hold-out set: 2.1557978162658592e-05
MeanAbsoluteError value on hold-out data: 0.0025376221165060997
Epoch: 691
Loss on hold-out set: 2.1461108450406946e-05
MeanAbsoluteError value on hold-out data: 0.0024974001571536064
Epoch: 692
Loss on hold-out set: 2.1084402596060453e-05
MeanAbsoluteError value on hold-out data: 0.002458578906953335
Epoch: 693
Loss on hold-out set: 2.1143319806445727e-05
MeanAbsoluteError value on hold-out data: 0.002440011128783226
Epoch: 694
Loss on hold-out set: 2.0978544027552982e-05
MeanAbsoluteError value on hold-out data: 0.0024155995342880487
Epoch: 695
Loss on hold-out set: 2.102756977700138e-05
MeanAbsoluteError value on hold-out data: 0.002409519860520959
Epoch: 696

Loss on hold-out set: 2.0948965434878407e-05
MeanAbsoluteError value on hold-out data: 0.0024041084107011557
Epoch: 697
Loss on hold-out set: 2.1075551803493764e-05
MeanAbsoluteError value on hold-out data: 0.0024131035897880793
Epoch: 698
Loss on hold-out set: 2.1108973184805347e-05
MeanAbsoluteError value on hold-out data: 0.002418740186840296
Epoch: 699
Loss on hold-out set: 2.1160347945157665e-05
MeanAbsoluteError value on hold-out data: 0.002428073436021805
Epoch: 700
Loss on hold-out set: 2.1210928849768607e-05
```

```
MeanAbsoluteError value on hold-out data: 0.00243747397325933
Epoch: 701
Loss on hold-out set: 2.1243443340704527e-05
MeanAbsoluteError value on hold-out data: 0.002449600724503398
Epoch: 702
Loss on hold-out set: 2.1310945949213228e-05
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Epoch: 703
Loss on hold-out set: 2.139840425217555e-05
MeanAbsoluteError value on hold-out data: 0.0024850566405802965
Epoch: 704

Loss on hold-out set: 2.1395947816185262e-05
MeanAbsoluteError value on hold-out data: 0.0024769322481006384
Epoch: 705
Loss on hold-out set: 2.1430546490520148e-05
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Epoch: 706
Loss on hold-out set: 2.1443126791765327e-05
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Epoch: 707
Loss on hold-out set: 2.14843420191133e-05
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Epoch: 708
Loss on hold-out set: 2.1541467441166834e-05
MeanAbsoluteError value on hold-out data: 0.002469116123393178
Epoch: 709
Loss on hold-out set: 2.151127633971172e-05
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Epoch: 710
Loss on hold-out set: 2.1544610487317666e-05
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Epoch: 711
Loss on hold-out set: 2.1494441703476984e-05
MeanAbsoluteError value on hold-out data: 0.002462090691551566
Epoch: 712

Loss on hold-out set: 2.1560317783927242e-05
MeanAbsoluteError value on hold-out data: 0.0024650755804032087
Epoch: 713
Loss on hold-out set: 2.1566898528578205e-05
MeanAbsoluteError value on hold-out data: 0.002460744697600603
```

```
Epoch: 714
Loss on hold-out set: 2.1605571033121935e-05
MeanAbsoluteError value on hold-out data: 0.0024638804607093334
Epoch: 715
Loss on hold-out set: 2.1470628177822665e-05
MeanAbsoluteError value on hold-out data: 0.002461228286847472
Epoch: 716
Loss on hold-out set: 2.2081841187197203e-05
MeanAbsoluteError value on hold-out data: 0.002512505743652582
Epoch: 717
Loss on hold-out set: 2.1950447121884952e-05
MeanAbsoluteError value on hold-out data: 0.0024929845239967108
Epoch: 718
Loss on hold-out set: 2.1800574914047837e-05
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Epoch: 719
Loss on hold-out set: 2.1958548009144196e-05
MeanAbsoluteError value on hold-out data: 0.0025020777247846127
Epoch: 720

Loss on hold-out set: 2.2020619760017946e-05
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Epoch: 721
Loss on hold-out set: 2.222207421266974e-05
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Epoch: 722
Loss on hold-out set: 2.2232657297955054e-05
MeanAbsoluteError value on hold-out data: 0.0025235330685973167
Epoch: 723
Loss on hold-out set: 2.2042071794646146e-05
MeanAbsoluteError value on hold-out data: 0.002506537362933159
Epoch: 724
Loss on hold-out set: 2.2004705427709842e-05
MeanAbsoluteError value on hold-out data: 0.002515166997909546
Epoch: 725
Loss on hold-out set: 2.2041807526600104e-05
MeanAbsoluteError value on hold-out data: 0.002514167223125696
Epoch: 726
Loss on hold-out set: 2.2489579229637745e-05
MeanAbsoluteError value on hold-out data: 0.002558007836341858
Epoch: 727
Loss on hold-out set: 2.2772692940825916e-05
```

```
MeanAbsoluteError value on hold-out data: 0.002596236765384674
Epoch: 728

Loss on hold-out set: 2.2866018524250887e-05
MeanAbsoluteError value on hold-out data: 0.002602960215881467
Epoch: 729
Loss on hold-out set: 2.3259534648451863e-05
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Epoch: 730
Loss on hold-out set: 2.3980507906248693e-05
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Epoch: 731
Loss on hold-out set: 2.485589815729614e-05
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Epoch: 732
Loss on hold-out set: 2.734081838178482e-05
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Epoch: 733
Loss on hold-out set: 3.611673166328968e-05
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Epoch: 734
Loss on hold-out set: 7.007415345134704e-05
MeanAbsoluteError value on hold-out data: 0.007096356712281704
Epoch: 735
Loss on hold-out set: 5.585646077203197e-05
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Epoch: 736

Loss on hold-out set: 2.6702715289454653e-05
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Epoch: 737
Loss on hold-out set: 2.548535399838377e-05
MeanAbsoluteError value on hold-out data: 0.003015626687556505
Epoch: 738
Loss on hold-out set: 2.716182043633652e-05
MeanAbsoluteError value on hold-out data: 0.003414359875023365
Epoch: 739
Loss on hold-out set: 2.667265040432348e-05
MeanAbsoluteError value on hold-out data: 0.0033149314112961292
Epoch: 740
Loss on hold-out set: 2.6440252054870046e-05
MeanAbsoluteError value on hold-out data: 0.0032597389072179794
```

```
Epoch: 741
Loss on hold-out set: 2.6300939129884538e-05
MeanAbsoluteError value on hold-out data: 0.0032169842161238194
Epoch: 742
Loss on hold-out set: 2.6386430052202502e-05
MeanAbsoluteError value on hold-out data: 0.0031843530014157295
Early stopping at epoch 741
Returned to Spot: Validation loss: 2.6386430052202502e-05
----------------------------------------------

spotPython tuning: 2.990768328010362e-06 [#######---] 72.25%


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Epoch: 1
Loss on hold-out set: 0.6566525540853801
MeanAbsoluteError value on hold-out data: 0.792605459690094
Epoch: 2
Loss on hold-out set: 0.6068961683072542
MeanAbsoluteError value on hold-out data: 0.760794460773468
Epoch: 3
Loss on hold-out set: 0.5584481476168883
MeanAbsoluteError value on hold-out data: 0.7284072637557983
Epoch: 4
Loss on hold-out set: 0.50824174284935
MeanAbsoluteError value on hold-out data: 0.6935147047042847
Epoch: 5
Loss on hold-out set: 0.4580830555213125
MeanAbsoluteError value on hold-out data: 0.6567140817642212
Epoch: 6
Loss on hold-out set: 0.4073299349922883
MeanAbsoluteError value on hold-out data: 0.6172866225242615
Epoch: 7
Loss on hold-out set: 0.35662329667492915
MeanAbsoluteError value on hold-out data: 0.5752472281455994
Epoch: 8
Loss on hold-out set: 0.306756571719521
MeanAbsoluteError value on hold-out data: 0.530718207359314
Epoch: 9
Loss on hold-out set: 0.2585488487231104
MeanAbsoluteError value on hold-out data: 0.4838523268699646
Epoch: 10
```

```
Loss on hold-out set: 0.21278008681378865
MeanAbsoluteError value on hold-out data: 0.4348420202732086
Epoch: 11

Loss on hold-out set: 0.17020753261290097
MeanAbsoluteError value on hold-out data: 0.3843924403190613
Epoch: 12
Loss on hold-out set: 0.13159330542150297
MeanAbsoluteError value on hold-out data: 0.33267462253570557
Epoch: 13
Loss on hold-out set: 0.09777579907523959
MeanAbsoluteError value on hold-out data: 0.28033825755119324
Epoch: 14
Loss on hold-out set: 0.07022295480496005
MeanAbsoluteError value on hold-out data: 0.2314593493938446
Epoch: 15
Loss on hold-out set: 0.04993043800717906
MeanAbsoluteError value on hold-out data: 0.19029955565929413
Epoch: 16
Loss on hold-out set: 0.036537813145275176
MeanAbsoluteError value on hold-out data: 0.16008780896663666
Epoch: 17
Loss on hold-out set: 0.028239425063427342
MeanAbsoluteError value on hold-out data: 0.1385476142168045
Epoch: 18
Loss on hold-out set: 0.02335013011715522
MeanAbsoluteError value on hold-out data: 0.12433335930109024
Epoch: 19
Loss on hold-out set: 0.020602672985803924
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Epoch: 20
Loss on hold-out set: 0.019128635568593285
MeanAbsoluteError value on hold-out data: 0.11016995459794998
Epoch: 21
Loss on hold-out set: 0.01837172072478815
MeanAbsoluteError value on hold-out data: 0.10740473121404648
Epoch: 22
Loss on hold-out set: 0.01798798589305462
MeanAbsoluteError value on hold-out data: 0.10582340508699417
Epoch: 23

Loss on hold-out set: 0.017801632424571404
```

```
MeanAbsoluteError value on hold-out data: 0.10490293055772781
Epoch: 24
Loss on hold-out set: 0.01770465691132765
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Epoch: 25
Loss on hold-out set: 0.01764996341233583
MeanAbsoluteError value on hold-out data: 0.10401441156864166
Epoch: 26
Loss on hold-out set: 0.01761218934246388
MeanAbsoluteError value on hold-out data: 0.10378609597682953
Epoch: 27
Loss on hold-out set: 0.017580706638431077
MeanAbsoluteError value on hold-out data: 0.10363439470529556
Epoch: 28
Loss on hold-out set: 0.01755094308234555
MeanAbsoluteError value on hold-out data: 0.10351984202861786
Epoch: 29
Loss on hold-out set: 0.017521246158713966
MeanAbsoluteError value on hold-out data: 0.10341481119394302
Epoch: 30
Loss on hold-out set: 0.0174909736593499
MeanAbsoluteError value on hold-out data: 0.1033148542046547
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Loss on hold-out set: 0.017459904511557205
MeanAbsoluteError value on hold-out data: 0.10321705788373947
Epoch: 32
Loss on hold-out set: 0.017427960821231336
MeanAbsoluteError value on hold-out data: 0.10312019288539886
Epoch: 33
Loss on hold-out set: 0.01740873436517033
MeanAbsoluteError value on hold-out data: 0.10322268307209015
Epoch: 34
Loss on hold-out set: 0.017361407388785954
MeanAbsoluteError value on hold-out data: 0.1029229387640953
Epoch: 35

Loss on hold-out set: 0.017326798142963333
MeanAbsoluteError value on hold-out data: 0.1028212159872055
Epoch: 36
Loss on hold-out set: 0.017291581729966168
MeanAbsoluteError value on hold-out data: 0.10271159559488297
Epoch: 37
```

```
Loss on hold-out set: 0.0173041962369002
MeanAbsoluteError value on hold-out data: 0.10279778391122818
Epoch: 38
Loss on hold-out set: 0.017218470083255517
MeanAbsoluteError value on hold-out data: 0.10249049216508865
Epoch: 39
Loss on hold-out set: 0.01718058975683035
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Loss on hold-out set: 0.017141248969557255
MeanAbsoluteError value on hold-out data: 0.10226770490407944
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Loss on hold-out set: 0.017101124578498696
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Loss on hold-out set: 0.017409677482455185
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Loss on hold-out set: 0.017018459712792384
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Loss on hold-out set: 0.016975838991225158
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Loss on hold-out set: 0.01693234356781958
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Loss on hold-out set: 0.016887968375445588
MeanAbsoluteError value on hold-out data: 0.10152782499790192
Epoch: 47

Loss on hold-out set: 0.016842717807249802
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Loss on hold-out set: 0.017336841384684176
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Epoch: 49
Loss on hold-out set: 0.01675055502595282
MeanAbsoluteError value on hold-out data: 0.10111115127801895
Epoch: 50
Loss on hold-out set: 0.016702530905604362
MeanAbsoluteError value on hold-out data: 0.10097367316484451
```

```
Epoch: 51
Loss on hold-out set: 0.01665368548128754
MeanAbsoluteError value on hold-out data: 0.10083110630512238
Epoch: 52
Loss on hold-out set: 0.016604047574985185
MeanAbsoluteError value on hold-out data: 0.10068418085575104
Epoch: 53
Loss on hold-out set: 0.016554563900602882
MeanAbsoluteError value on hold-out data: 0.10052046924829483
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Loss on hold-out set: 0.01650291949044913
MeanAbsoluteError value on hold-out data: 0.10037441551685333
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Loss on hold-out set: 0.016450529967091586
MeanAbsoluteError value on hold-out data: 0.10022289305925369
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Loss on hold-out set: 0.016401262610758607
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Loss on hold-out set: 0.016345622410115442
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Loss on hold-out set: 0.01629031077027321
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Epoch: 59

Loss on hold-out set: 0.016236566050027153
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Loss on hold-out set: 0.016180215507598694
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Loss on hold-out set: 0.01606443174501979
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Loss on hold-out set: 0.016005874237682866
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Loss on hold-out set: 0.01594659794538625
```

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Epoch: 65
Loss on hold-out set: 0.01582851148774161
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Loss on hold-out set: 0.015884625566142955
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Loss on hold-out set: 0.01570489256961369
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Epoch: 71

Loss on hold-out set: 0.01571771894630633
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Loss on hold-out set: 0.015251599889444677
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Loss on hold-out set: 0.015184175339527428
MeanAbsoluteError value on hold-out data: 0.09636127203702927
Epoch: 77
Loss on hold-out set: 0.015118732693065939
MeanAbsoluteError value on hold-out data: 0.09613966941833496
Epoch: 78
```

```
Loss on hold-out set: 0.015048536888666843
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Loss on hold-out set: 0.014978969261344326
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Loss on hold-out set: 0.014825648064480015
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Loss on hold-out set: 0.01483902980352899
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Epoch: 82

Loss on hold-out set: 0.015276066278793701
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Loss on hold-out set: 0.014696875201097052
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Loss on hold-out set: 0.014626754404927948
MeanAbsoluteError value on hold-out data: 0.09460803121328354
Epoch: 85
Loss on hold-out set: 0.014553221494057461
MeanAbsoluteError value on hold-out data: 0.09439040720462799
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Loss on hold-out set: 0.014612523213911214
MeanAbsoluteError value on hold-out data: 0.09464887529611588
Epoch: 87
Loss on hold-out set: 0.014406878611465035
MeanAbsoluteError value on hold-out data: 0.09393124282360077
Epoch: 88
Loss on hold-out set: 0.014333119615912437
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Loss on hold-out set: 0.014258928652117519
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Loss on hold-out set: 0.014184317312595484
MeanAbsoluteError value on hold-out data: 0.09322576224803925
Epoch: 91
Loss on hold-out set: 0.014109301472719955
MeanAbsoluteError value on hold-out data: 0.0929863303899765
```

```
Epoch: 92
Loss on hold-out set: 0.01403388474136591
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Loss on hold-out set: 0.013958085126145497
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Loss on hold-out set: 0.013652509795256743
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Loss on hold-out set: 0.01357469439972192
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Loss on hold-out set: 0.013496838436511002
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Epoch: 100
Loss on hold-out set: 0.013418584590238569
MeanAbsoluteError value on hold-out data: 0.09074444323778152
Epoch: 101
Loss on hold-out set: 0.01334030546345993
MeanAbsoluteError value on hold-out data: 0.09048374742269516
Epoch: 102
Loss on hold-out set: 0.013261610066126051
MeanAbsoluteError value on hold-out data: 0.09022237360477448
Epoch: 103
Loss on hold-out set: 0.01318262904073651
MeanAbsoluteError value on hold-out data: 0.08995907753705978
Epoch: 104

Loss on hold-out set: 0.013117660933762397
MeanAbsoluteError value on hold-out data: 0.0896356999874115
Epoch: 105
```

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Loss on hold-out set: 0.013029603354975973
MeanAbsoluteError value on hold-out data: 0.0894276350736618
Epoch: 106
Loss on hold-out set: 0.012948434995977502
MeanAbsoluteError value on hold-out data: 0.08917266875505447
Epoch: 107
Loss on hold-out set: 0.013098989049658963
MeanAbsoluteError value on hold-out data: 0.08964996784925461
Epoch: 108
Loss on hold-out set: 0.012788536302794359
MeanAbsoluteError value on hold-out data: 0.08863097429275513
Epoch: 109
Loss on hold-out set: 0.012708261370119689
MeanAbsoluteError value on hold-out data: 0.0883568748831749
Epoch: 110
Loss on hold-out set: 0.012630588552718492
MeanAbsoluteError value on hold-out data: 0.08806419372558594
Epoch: 111
Loss on hold-out set: 0.012548451900090041
MeanAbsoluteError value on hold-out data: 0.08780185878276825
Epoch: 112
Loss on hold-out set: 0.012467078564345445
MeanAbsoluteError value on hold-out data: 0.0875270664691925
Epoch: 113
Loss on hold-out set: 0.012387427550397422
MeanAbsoluteError value on hold-out data: 0.08723723143339157
Epoch: 114
Loss on hold-out set: 0.01230587991640756
MeanAbsoluteError value on hold-out data: 0.08696119487285614
Epoch: 115
Loss on hold-out set: 0.012223927782064206
MeanAbsoluteError value on hold-out data: 0.08668412268161774
Epoch: 116

Loss on hold-out set: 0.012142520085418303
MeanAbsoluteError value on hold-out data: 0.08639860153198242
Epoch: 117
Loss on hold-out set: 0.012060823623630168
MeanAbsoluteError value on hold-out data: 0.08611254394054413
Epoch: 118
Loss on hold-out set: 0.011989364106404153
MeanAbsoluteError value on hold-out data: 0.08578728139400482
```

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Epoch: 119
Loss on hold-out set: 0.012276224363105078
MeanAbsoluteError value on hold-out data: 0.08639588952064514
Epoch: 120
Loss on hold-out set: 0.011831539070331737
MeanAbsoluteError value on hold-out data: 0.08520781248807907
Epoch: 121
Loss on hold-out set: 0.011740654945912721
MeanAbsoluteError value on hold-out data: 0.08497410267591476
Epoch: 122
Loss on hold-out set: 0.01258190561968245
MeanAbsoluteError value on hold-out data: 0.08590296655893326
Epoch: 123
Loss on hold-out set: 0.011575424339083073
MeanAbsoluteError value on hold-out data: 0.08439307659864426
Epoch: 124
Loss on hold-out set: 0.011497184836403712
MeanAbsoluteError value on hold-out data: 0.0840708315372467
Epoch: 125
Loss on hold-out set: 0.011414227357722427
MeanAbsoluteError value on hold-out data: 0.08378884941339493
Epoch: 126
Loss on hold-out set: 0.01216662902458522
MeanAbsoluteError value on hold-out data: 0.08460519462823868
Epoch: 127
Loss on hold-out set: 0.011247036751898887
MeanAbsoluteError value on hold-out data: 0.08321195095777512
Epoch: 128

Loss on hold-out set: 0.011164182821582807
MeanAbsoluteError value on hold-out data: 0.08291047066450119
Epoch: 129
Loss on hold-out set: 0.01108122792854709
MeanAbsoluteError value on hold-out data: 0.08260729163885117
Epoch: 130
Loss on hold-out set: 0.011002700843260084
MeanAbsoluteError value on hold-out data: 0.08229710161685944
Epoch: 131
Loss on hold-out set: 0.013934280815240192
MeanAbsoluteError value on hold-out data: 0.08500873297452927
Epoch: 132
Loss on hold-out set: 0.010834735830461508
```

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MeanAbsoluteError value on hold-out data: 0.0817040503025055
Epoch: 133
Loss on hold-out set: 0.010751834941880875
MeanAbsoluteError value on hold-out data: 0.08140233904123306
Epoch: 134
Loss on hold-out set: 0.01066827494038367
MeanAbsoluteError value on hold-out data: 0.08108934760093689
Epoch: 135
Loss on hold-out set: 0.01100486153614168
MeanAbsoluteError value on hold-out data: 0.08170530200004578
Epoch: 136
Loss on hold-out set: 0.010503864939030456
MeanAbsoluteError value on hold-out data: 0.08046382665634155
Epoch: 137
Loss on hold-out set: 0.010390802709336736
MeanAbsoluteError value on hold-out data: 0.0800301805138588
Epoch: 138
Loss on hold-out set: 0.010335281589313558
MeanAbsoluteError value on hold-out data: 0.07984979450702667
Epoch: 139
Loss on hold-out set: 0.010252381478877444
MeanAbsoluteError value on hold-out data: 0.07952765375375748
Epoch: 140

Loss on hold-out set: 0.010171014570484036
MeanAbsoluteError value on hold-out data: 0.07920366525650024
Epoch: 141
Loss on hold-out set: 0.010095161398088462
MeanAbsoluteError value on hold-out data: 0.07885541766881943
Epoch: 142
Loss on hold-out set: 0.01000942400730166
MeanAbsoluteError value on hold-out data: 0.0785660520195961
Epoch: 143
Loss on hold-out set: 0.009941574063544211
MeanAbsoluteError value on hold-out data: 0.07820305228233337
Epoch: 144
Loss on hold-out set: 0.009849642642381551
MeanAbsoluteError value on hold-out data: 0.07793744653463364
Epoch: 145
Loss on hold-out set: 0.010075586443570884
MeanAbsoluteError value on hold-out data: 0.07854591310024261
Epoch: 146
```

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Loss on hold-out set: 0.009653467476662052
MeanAbsoluteError value on hold-out data: 0.07720010727643967
Epoch: 147
Loss on hold-out set: 0.009596199520226372
MeanAbsoluteError value on hold-out data: 0.07699839025735855
Epoch: 148
Loss on hold-out set: 0.009512909994411626
MeanAbsoluteError value on hold-out data: 0.07667071372270584
Epoch: 149
Loss on hold-out set: 0.009429636331716259
MeanAbsoluteError value on hold-out data: 0.07634127885103226
Epoch: 150
Loss on hold-out set: 0.009346379769818955
MeanAbsoluteError value on hold-out data: 0.07601010799407959
Epoch: 151
Loss on hold-out set: 0.009267074858622723
MeanAbsoluteError value on hold-out data: 0.07567673921585083
Epoch: 152

Loss on hold-out set: 0.009185793699304523
MeanAbsoluteError value on hold-out data: 0.07534198462963104
Epoch: 153
Loss on hold-out set: 0.009545331624777694
MeanAbsoluteError value on hold-out data: 0.07599932700395584
Epoch: 154
Loss on hold-out set: 0.009017081483953485
MeanAbsoluteError value on hold-out data: 0.074691042304039
Epoch: 155
Loss on hold-out set: 0.008934006922094053
MeanAbsoluteError value on hold-out data: 0.07435349375009537
Epoch: 156
Loss on hold-out set: 0.00885098548851123
MeanAbsoluteError value on hold-out data: 0.07401416450738907
Epoch: 157
Loss on hold-out set: 0.008768031293967445
MeanAbsoluteError value on hold-out data: 0.07367438077926636
Epoch: 158
Loss on hold-out set: 0.008728517905661934
MeanAbsoluteError value on hold-out data: 0.07352355867624283
Epoch: 159
Loss on hold-out set: 0.008602341257133767
MeanAbsoluteError value on hold-out data: 0.0729958564043045
```

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Epoch: 160
Loss on hold-out set: 0.008528241238213684
MeanAbsoluteError value on hold-out data: 0.0726386234164238
Epoch: 161
Loss on hold-out set: 0.008391523611192641
MeanAbsoluteError value on hold-out data: 0.07211114466190338
Epoch: 162
Loss on hold-out set: 0.008356718181044255
MeanAbsoluteError value on hold-out data: 0.07197609543800354
Epoch: 163
Loss on hold-out set: 0.008274435537475111
MeanAbsoluteError value on hold-out data: 0.07163340598344803
Epoch: 164
```

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Loss on hold-out set: 0.008192251289361402
MeanAbsoluteError value on hold-out data: 0.07129056006669998
Epoch: 165
Loss on hold-out set: 0.00811017750713386
MeanAbsoluteError value on hold-out data: 0.0709465965628624
Epoch: 166
Loss on hold-out set: 0.008028222027381784
MeanAbsoluteError value on hold-out data: 0.07060122489929199
Epoch: 167
Loss on hold-out set: 0.00794639082404932
MeanAbsoluteError value on hold-out data: 0.07025407254695892
Epoch: 168
Loss on hold-out set: 0.007878276929994555
MeanAbsoluteError value on hold-out data: 0.06992683559656143
Epoch: 169
Loss on hold-out set: 0.007792107381024643
MeanAbsoluteError value on hold-out data: 0.0695987343788147
Epoch: 170
Loss on hold-out set: 0.007711497993257485
MeanAbsoluteError value on hold-out data: 0.06924822181463242
Epoch: 171
Loss on hold-out set: 0.0076308269727681025
MeanAbsoluteError value on hold-out data: 0.06889669597148895
Epoch: 172
Loss on hold-out set: 0.00766056606325468
MeanAbsoluteError value on hold-out data: 0.06884508579969406
Epoch: 173
Loss on hold-out set: 0.0074698753275075245
```

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MeanAbsoluteError value on hold-out data: 0.06818833947181702
Epoch: 174
Loss on hold-out set: 0.0073917167671760054
MeanAbsoluteError value on hold-out data: 0.06783293932676315
Epoch: 175
Loss on hold-out set: 0.007737776491251823
MeanAbsoluteError value on hold-out data: 0.06850849092006683
Epoch: 176

Loss on hold-out set: 0.007238166118775935
MeanAbsoluteError value on hold-out data: 0.0671195462346077
Epoch: 177
Loss on hold-out set: 0.007152856900479253
MeanAbsoluteError value on hold-out data: 0.06677651405334473
Epoch: 178
Loss on hold-out set: 0.007073609287066287
MeanAbsoluteError value on hold-out data: 0.06641606986522675
Epoch: 179
Loss on hold-out set: 0.006997038643978732
MeanAbsoluteError value on hold-out data: 0.06609812378883362
Epoch: 180
Loss on hold-out set: 0.006941675821221189
MeanAbsoluteError value on hold-out data: 0.06583545356988907
Epoch: 181
Loss on hold-out set: 0.006836478178707981
MeanAbsoluteError value on hold-out data: 0.065326027572155
Epoch: 182
Loss on hold-out set: 0.006757841905039784
MeanAbsoluteError value on hold-out data: 0.06495903432369232
Epoch: 183
Loss on hold-out set: 0.0072773894950698475
MeanAbsoluteError value on hold-out data: 0.06575385481119156
Epoch: 184
Loss on hold-out set: 0.007039198857168422
MeanAbsoluteError value on hold-out data: 0.06535929441452026
Epoch: 185
Loss on hold-out set: 0.006456385228758384
MeanAbsoluteError value on hold-out data: 0.0635766088962555
Epoch: 186
Loss on hold-out set: 0.006439099526400433
MeanAbsoluteError value on hold-out data: 0.06329069286584854
Epoch: 187
```

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Loss on hold-out set: 0.006384580408370024
MeanAbsoluteError value on hold-out data: 0.06316136568784714
Epoch: 188

Loss on hold-out set: 0.006309650893519192
MeanAbsoluteError value on hold-out data: 0.06282592564821243
Epoch: 189
Loss on hold-out set: 0.006233597713473596
MeanAbsoluteError value on hold-out data: 0.062454890459775925
Epoch: 190
Loss on hold-out set: 0.006157689053859366
MeanAbsoluteError value on hold-out data: 0.06208416074514389
Epoch: 191
Loss on hold-out set: 0.006082020586626114
MeanAbsoluteError value on hold-out data: 0.06171542406082153
Epoch: 192
Loss on hold-out set: 0.00600660700461288
MeanAbsoluteError value on hold-out data: 0.061344876885414124
Epoch: 193
Loss on hold-out set: 0.0059314565304176585
MeanAbsoluteError value on hold-out data: 0.06097247451543808
Epoch: 194
Loss on hold-out set: 0.005856578752986695
MeanAbsoluteError value on hold-out data: 0.06059827283024788
Epoch: 195
Loss on hold-out set: 0.005781986588293589
MeanAbsoluteError value on hold-out data: 0.06022229045629501
Epoch: 196
Loss on hold-out set: 0.006926741015999333
MeanAbsoluteError value on hold-out data: 0.06234235689043999
Epoch: 197
Loss on hold-out set: 0.005640344816799227
MeanAbsoluteError value on hold-out data: 0.05945068225264549
Epoch: 198
Loss on hold-out set: 0.0055607213994095985
MeanAbsoluteError value on hold-out data: 0.059091053903102875
Epoch: 199
Loss on hold-out set: 0.005487631822593118
MeanAbsoluteError value on hold-out data: 0.05870670825242996
Epoch: 200

Loss on hold-out set: 0.005414568362635021
```

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MeanAbsoluteError value on hold-out data: 0.058322157710790634
Epoch: 201
Loss on hold-out set: 0.005341864589258637
MeanAbsoluteError value on hold-out data: 0.057935938239097595
Epoch: 202
Loss on hold-out set: 0.005269518388606804
MeanAbsoluteError value on hold-out data: 0.057548101991415024
Epoch: 203
Loss on hold-out set: 0.005197535572254932
MeanAbsoluteError value on hold-out data: 0.057158730924129486
Epoch: 204
Loss on hold-out set: 0.00516175815075832
MeanAbsoluteError value on hold-out data: 0.05696316435933113
Epoch: 205
Loss on hold-out set: 0.005061830458304796
MeanAbsoluteError value on hold-out data: 0.05637683346867561
Epoch: 206
Loss on hold-out set: 0.004986653848869824
MeanAbsoluteError value on hold-out data: 0.05599909648299217
Epoch: 207
Loss on hold-out set: 0.00491491172425939
MeanAbsoluteError value on hold-out data: 0.05561252683401108
Epoch: 208
Loss on hold-out set: 0.00484674289749053
MeanAbsoluteError value on hold-out data: 0.055208899080753326
Epoch: 209
Loss on hold-out set: 0.00975917239894012
MeanAbsoluteError value on hold-out data: 0.0585281178355217
Epoch: 210
Loss on hold-out set: 0.004707929580227325
MeanAbsoluteError value on hold-out data: 0.0544155053794384
Epoch: 211
Loss on hold-out set: 0.004639212553707981
MeanAbsoluteError value on hold-out data: 0.05401661619544029
Epoch: 212

Loss on hold-out set: 0.004570928742300327
MeanAbsoluteError value on hold-out data: 0.05361716076731682
Epoch: 213
Loss on hold-out set: 0.00450308100430687
MeanAbsoluteError value on hold-out data: 0.05321815609931946
Epoch: 214
```

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Loss on hold-out set: 0.004435687019538723
MeanAbsoluteError value on hold-out data: 0.05281843990087509
Epoch: 215
Loss on hold-out set: 0.004368745446156122
MeanAbsoluteError value on hold-out data: 0.05242115631699562
Epoch: 216
Loss on hold-out set: 0.004302276034937485
MeanAbsoluteError value on hold-out data: 0.052022784948349
Epoch: 217
Loss on hold-out set: 0.004236270832878195
MeanAbsoluteError value on hold-out data: 0.051624901592731476
Epoch: 218
Loss on hold-out set: 0.004178222850896418
MeanAbsoluteError value on hold-out data: 0.05126981809735298
Epoch: 219
Loss on hold-out set: 0.004129759345424215
MeanAbsoluteError value on hold-out data: 0.05090148374438286
Epoch: 220
Loss on hold-out set: 0.004052212115646781
MeanAbsoluteError value on hold-out data: 0.05051027983427048
Epoch: 221
Loss on hold-out set: 0.003989068095841886
MeanAbsoluteError value on hold-out data: 0.05011197552084923
Epoch: 222
Loss on hold-out set: 0.0039258135488796
MeanAbsoluteError value on hold-out data: 0.04971526190638542
Epoch: 223
Loss on hold-out set: 0.0038630543460481262
MeanAbsoluteError value on hold-out data: 0.04931750148534775
Epoch: 224

Loss on hold-out set: 0.003800779599451313
MeanAbsoluteError value on hold-out data: 0.04892003536224365
Epoch: 225
Loss on hold-out set: 0.0037389953688130176
MeanAbsoluteError value on hold-out data: 0.04852232336997986
Epoch: 226
Loss on hold-out set: 0.003677708439921078
MeanAbsoluteError value on hold-out data: 0.04812408611178398
Epoch: 227
Loss on hold-out set: 0.00362289663539023
MeanAbsoluteError value on hold-out data: 0.04777374118566513
```

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Epoch: 228
Loss on hold-out set: 0.003727332970715667
MeanAbsoluteError value on hold-out data: 0.04790375009179115
Epoch: 229
Loss on hold-out set: 0.0035092584562095765
MeanAbsoluteError value on hold-out data: 0.04697467014193535
Epoch: 230
Loss on hold-out set: 0.0034458390038803613
MeanAbsoluteError value on hold-out data: 0.04658859968185425
Epoch: 231
Loss on hold-out set: 0.0034023066660953
MeanAbsoluteError value on hold-out data: 0.04624620079994202
Epoch: 232
Loss on hold-out set: 0.003359383774774247
MeanAbsoluteError value on hold-out data: 0.04590652137994766
Epoch: 233
Loss on hold-out set: 0.0032904330414327745
MeanAbsoluteError value on hold-out data: 0.04551680386066437
Epoch: 234
Loss on hold-out set: 0.0032344702631235123
MeanAbsoluteError value on hold-out data: 0.045119065791368484
Epoch: 235
Loss on hold-out set: 0.003171009310263846
MeanAbsoluteError value on hold-out data: 0.04461439326405525
Epoch: 236

Loss on hold-out set: 0.0037561942789532047
MeanAbsoluteError value on hold-out data: 0.045787133276462555
Epoch: 237
Loss on hold-out set: 0.0030735256257589513
MeanAbsoluteError value on hold-out data: 0.04396602138876915
Epoch: 238
Loss on hold-out set: 0.003021997983236552
MeanAbsoluteError value on hold-out data: 0.043602101504802704
Epoch: 239
Loss on hold-out set: 0.003601736534619704
MeanAbsoluteError value on hold-out data: 0.044626571238040924
Epoch: 240
Loss on hold-out set: 0.002916891402013502
MeanAbsoluteError value on hold-out data: 0.04281553998589516
Epoch: 241
Loss on hold-out set: 0.0028646482050565907
```

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MeanAbsoluteError value on hold-out data: 0.042423125356435776
Epoch: 242
Loss on hold-out set: 0.0031241386114791232
MeanAbsoluteError value on hold-out data: 0.0430041141808033
Epoch: 243
Loss on hold-out set: 0.0027737270345249655
MeanAbsoluteError value on hold-out data: 0.04167207330465317
Epoch: 244
Loss on hold-out set: 0.0027138404747299653
MeanAbsoluteError value on hold-out data: 0.04127379506826401
Epoch: 245
Loss on hold-out set: 0.0026634462441219703
MeanAbsoluteError value on hold-out data: 0.040881797671318054
Epoch: 246
Loss on hold-out set: 0.002613587643473262
MeanAbsoluteError value on hold-out data: 0.04048973694443703
Epoch: 247
Loss on hold-out set: 0.002967713219971445
MeanAbsoluteError value on hold-out data: 0.04119588062167168
Epoch: 248

Loss on hold-out set: 0.002515310536469578
MeanAbsoluteError value on hold-out data: 0.0397055521607399
Epoch: 249
Loss on hold-out set: 0.0024669209348135873
MeanAbsoluteError value on hold-out data: 0.03931478038430214
Epoch: 250
Loss on hold-out set: 0.002419037831714377
MeanAbsoluteError value on hold-out data: 0.0389234684407711
Epoch: 251
Loss on hold-out set: 0.0029049906680531997
MeanAbsoluteError value on hold-out data: 0.04007386788725853
Epoch: 252
Loss on hold-out set: 0.002326513904048816
MeanAbsoluteError value on hold-out data: 0.038151904940605164
Epoch: 253
Loss on hold-out set: 0.002280033830749361
MeanAbsoluteError value on hold-out data: 0.03775966539978981
Epoch: 254
Loss on hold-out set: 0.002236734613114478
MeanAbsoluteError value on hold-out data: 0.037405483424663544
Epoch: 255
```

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Loss on hold-out set: 0.0021933721635784757
MeanAbsoluteError value on hold-out data: 0.0370219387114048
Epoch: 256
Loss on hold-out set: 0.0021474355889949948
MeanAbsoluteError value on hold-out data: 0.0366373211145401
Epoch: 257
Loss on hold-out set: 0.0021046212212623735
MeanAbsoluteError value on hold-out data: 0.03625739365816116
Epoch: 258
Loss on hold-out set: 0.0020613584079240497
MeanAbsoluteError value on hold-out data: 0.03587758168578148
Epoch: 259
Loss on hold-out set: 0.002018533340704284
MeanAbsoluteError value on hold-out data: 0.03549737110733986
Epoch: 260
```

```
Loss on hold-out set: 0.001976206915538856
MeanAbsoluteError value on hold-out data: 0.03511759266257286
Epoch: 261
Loss on hold-out set: 0.0019343795858348084
MeanAbsoluteError value on hold-out data: 0.03473754972219467
Epoch: 262
Loss on hold-out set: 0.0018930509609881004
MeanAbsoluteError value on hold-out data: 0.03435732051730156
Epoch: 263
Loss on hold-out set: 0.0025711647620865782
MeanAbsoluteError value on hold-out data: 0.0354846753180027
Epoch: 264
Loss on hold-out set: 0.0029353362624533474
MeanAbsoluteError value on hold-out data: 0.03537846729159355
Epoch: 265
Loss on hold-out set: 0.001774615211424565
MeanAbsoluteError value on hold-out data: 0.03326284885406494
Epoch: 266
Loss on hold-out set: 0.00173513245413472
MeanAbsoluteError value on hold-out data: 0.03289263695478439
Epoch: 267
Loss on hold-out set: 0.0016961772818927113
MeanAbsoluteError value on hold-out data: 0.03252236172556877
Epoch: 268
Loss on hold-out set: 0.0016577416559142109
MeanAbsoluteError value on hold-out data: 0.03215200453996658
```

```
Epoch: 269
Loss on hold-out set: 0.0016198114133562501
MeanAbsoluteError value on hold-out data: 0.03178153187036514
Epoch: 270
Loss on hold-out set: 0.002370055144542436
MeanAbsoluteError value on hold-out data: 0.03288590908050537
Epoch: 271
Loss on hold-out set: 0.0015454885693830683
MeanAbsoluteError value on hold-out data: 0.031049534678459167
Epoch: 272

Loss on hold-out set: 0.0015090907461279513
MeanAbsoluteError value on hold-out data: 0.03068610280752182
Epoch: 273
Loss on hold-out set: 0.001473201170723003
MeanAbsoluteError value on hold-out data: 0.030323438346385956
Epoch: 274
Loss on hold-out set: 0.001437820399204563
MeanAbsoluteError value on hold-out data: 0.029961321502923965
Epoch: 275
Loss on hold-out set: 0.0014050691901693905
MeanAbsoluteError value on hold-out data: 0.02962208352982998
Epoch: 276
Loss on hold-out set: 0.001373601956354258
MeanAbsoluteError value on hold-out data: 0.029294615611433983
Epoch: 277
Loss on hold-out set: 0.0022434858003275862
MeanAbsoluteError value on hold-out data: 0.030621707439422607
Epoch: 278
Loss on hold-out set: 0.0013077963430030075
MeanAbsoluteError value on hold-out data: 0.028597354888916016
Epoch: 279
Loss on hold-out set: 0.0012752257178745869
MeanAbsoluteError value on hold-out data: 0.028246119618415833
Epoch: 280
Loss on hold-out set: 0.0012431298819137737
MeanAbsoluteError value on hold-out data: 0.027894753962755203
Epoch: 281
Loss on hold-out set: 0.0012114991979232353
MeanAbsoluteError value on hold-out data: 0.02754412591457367
Epoch: 282
Loss on hold-out set: 0.001186477618543186
```

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MeanAbsoluteError value on hold-out data: 0.02726254053413868
Epoch: 283
Loss on hold-out set: 0.001154066194430925
MeanAbsoluteError value on hold-out data: 0.026894651353359222
Epoch: 284

Loss on hold-out set: 0.0011241509277361299
MeanAbsoluteError value on hold-out data: 0.026554062962532043
Epoch: 285
Loss on hold-out set: 0.0010957850961284222
MeanAbsoluteError value on hold-out data: 0.02622215822339058
Epoch: 286
Loss on hold-out set: 0.001066596566632047
MeanAbsoluteError value on hold-out data: 0.02587972581386566
Epoch: 287
Loss on hold-out set: 0.0010377958487400687
MeanAbsoluteError value on hold-out data: 0.025536952540278435
Epoch: 288
Loss on hold-out set: 0.002213923412215847
MeanAbsoluteError value on hold-out data: 0.02712313085794449
Epoch: 289
Loss on hold-out set: 0.0018781011496780832
MeanAbsoluteError value on hold-out data: 0.026477139443159103
Epoch: 290
Loss on hold-out set: 0.0009544472291293603
MeanAbsoluteError value on hold-out data: 0.024528393521904945
Epoch: 291
Loss on hold-out set: 0.0009316853247582912
MeanAbsoluteError value on hold-out data: 0.024242818355560303
Epoch: 292
Loss on hold-out set: 0.0009069226967097309
MeanAbsoluteError value on hold-out data: 0.023930342867970467
Epoch: 293
Loss on hold-out set: 0.0008809837730184786
MeanAbsoluteError value on hold-out data: 0.023598041385412216
Epoch: 294
Loss on hold-out set: 0.0008553971113686107
MeanAbsoluteError value on hold-out data: 0.023264706134796143
Epoch: 295
Loss on hold-out set: 0.0008302328282489294
MeanAbsoluteError value on hold-out data: 0.022931182757019997
Epoch: 296
```

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Loss on hold-out set: 0.0008090550334983211
MeanAbsoluteError value on hold-out data: 0.022642415016889572
Epoch: 297
Loss on hold-out set: 0.0007936859263664749
MeanAbsoluteError value on hold-out data: 0.022417932748794556
Epoch: 298
Loss on hold-out set: 0.00224905773479565
MeanAbsoluteError value on hold-out data: 0.0251003485172987
Epoch: 299
Loss on hold-out set: 0.0007411858245368899
MeanAbsoluteError value on hold-out data: 0.02170342206954956
Epoch: 300
Loss on hold-out set: 0.0007184941155413215
MeanAbsoluteError value on hold-out data: 0.021380091086030006
Epoch: 301
Loss on hold-out set: 0.0006969215529878918
MeanAbsoluteError value on hold-out data: 0.021076835691928864
Epoch: 302
Loss on hold-out set: 0.0012794558045386925
MeanAbsoluteError value on hold-out data: 0.022237496450543404
Epoch: 303
Loss on hold-out set: 0.0006600934008785867
MeanAbsoluteError value on hold-out data: 0.02051480859518051
Epoch: 304
Loss on hold-out set: 0.0006393531768576634
MeanAbsoluteError value on hold-out data: 0.020200258120894432
Epoch: 305
Loss on hold-out set: 0.0014294475350700516
MeanAbsoluteError value on hold-out data: 0.021509971469640732
Epoch: 306
Loss on hold-out set: 0.0005989916443420378
MeanAbsoluteError value on hold-out data: 0.019571054726839066
Epoch: 307
Loss on hold-out set: 0.0012867175162108125
MeanAbsoluteError value on hold-out data: 0.02079399675130844
Epoch: 308

Loss on hold-out set: 0.000560049961725446
MeanAbsoluteError value on hold-out data: 0.01894250698387623
Epoch: 309
Loss on hold-out set: 0.0005411152386314873
MeanAbsoluteError value on hold-out data: 0.018628884106874466
```

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Epoch: 310
Loss on hold-out set: 0.000526787725424296
MeanAbsoluteError value on hold-out data: 0.01841084286570549
Epoch: 311
Loss on hold-out set: 0.0005103926569542015
MeanAbsoluteError value on hold-out data: 0.018110761418938637
Epoch: 312
Loss on hold-out set: 0.0004929949404628898
MeanAbsoluteError value on hold-out data: 0.017805712297558784
Epoch: 313
Loss on hold-out set: 0.00047502900461519236
MeanAbsoluteError value on hold-out data: 0.017496535554528236
Epoch: 314
Loss on hold-out set: 0.0004823360922225555
MeanAbsoluteError value on hold-out data: 0.017489494755864143
Epoch: 315
Loss on hold-out set: 0.00044763201156839435
MeanAbsoluteError value on hold-out data: 0.01697603613138199
Epoch: 316
Loss on hold-out set: 0.0011468291413621046
MeanAbsoluteError value on hold-out data: 0.018213320523500443
Epoch: 317
Loss on hold-out set: 0.0004151063361572788
MeanAbsoluteError value on hold-out data: 0.01637098379433155
Epoch: 318
Loss on hold-out set: 0.00040014832101357907
MeanAbsoluteError value on hold-out data: 0.016075966879725456
Epoch: 319
Loss on hold-out set: 0.00038529399362711335
MeanAbsoluteError value on hold-out data: 0.015786368399858475
Epoch: 320

Loss on hold-out set: 0.0003713521218742244
MeanAbsoluteError value on hold-out data: 0.01549327839165926
Epoch: 321
Loss on hold-out set: 0.0003570155066355303
MeanAbsoluteError value on hold-out data: 0.015197506174445152
Epoch: 322
Loss on hold-out set: 0.0003430242899125197
MeanAbsoluteError value on hold-out data: 0.014902359806001186
Epoch: 323
Loss on hold-out set: 0.00032934703459001246
```

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MeanAbsoluteError value on hold-out data: 0.014607562683522701
Epoch: 324
Loss on hold-out set: 0.0003159855855062089
MeanAbsoluteError value on hold-out data: 0.014313234016299248
Epoch: 325
Loss on hold-out set: 0.00030283648696862847
MeanAbsoluteError value on hold-out data: 0.01402564998716116
Epoch: 326
Loss on hold-out set: 0.0002905221368373053
MeanAbsoluteError value on hold-out data: 0.01373392902314663
Epoch: 327
Loss on hold-out set: 0.0002780851301443028
MeanAbsoluteError value on hold-out data: 0.013441355898976326
Epoch: 328
Loss on hold-out set: 0.0002660018255578746
MeanAbsoluteError value on hold-out data: 0.013150511309504509
Epoch: 329
Loss on hold-out set: 0.00025423610790503996
MeanAbsoluteError value on hold-out data: 0.012860552407801151
Epoch: 330
Loss on hold-out set: 0.0006243918639819114
MeanAbsoluteError value on hold-out data: 0.013667378574609756
Epoch: 331
Loss on hold-out set: 0.00023430771110916364
MeanAbsoluteError value on hold-out data: 0.012352469377219677
Epoch: 332

Loss on hold-out set: 0.00022368595282865785
MeanAbsoluteError value on hold-out data: 0.012065893970429897
Epoch: 333
Loss on hold-out set: 0.00021489243973567347
MeanAbsoluteError value on hold-out data: 0.011839831247925758
Epoch: 334
Loss on hold-out set: 0.0025626979748171594
MeanAbsoluteError value on hold-out data: 0.014415696263313293
Epoch: 335
Loss on hold-out set: 0.0002002572664902178
MeanAbsoluteError value on hold-out data: 0.011426212266087532
Epoch: 336
Loss on hold-out set: 0.00019135760837678774
MeanAbsoluteError value on hold-out data: 0.011173068545758724
Epoch: 337
```

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Loss on hold-out set: 0.0001826196309450193
MeanAbsoluteError value on hold-out data: 0.010918361134827137
Epoch: 338
Loss on hold-out set: 0.00017411297946972283
MeanAbsoluteError value on hold-out data: 0.010664255358278751
Epoch: 339
Loss on hold-out set: 0.00018708400574197234
MeanAbsoluteError value on hold-out data: 0.010653539560735226
Epoch: 340
Loss on hold-out set: 0.0009449355659039851
MeanAbsoluteError value on hold-out data: 0.011773856356739998
Epoch: 341
Loss on hold-out set: 0.00015021581528248804
MeanAbsoluteError value on hold-out data: 0.009915635921061039
Epoch: 342
Loss on hold-out set: 0.00014672090860825082
MeanAbsoluteError value on hold-out data: 0.009792323224246502
Epoch: 343
Loss on hold-out set: 0.0010930644757057675
MeanAbsoluteError value on hold-out data: 0.011300592683255672
Epoch: 344

Loss on hold-out set: 0.00013213369818817897
MeanAbsoluteError value on hold-out data: 0.009300370700657368
Epoch: 345
Loss on hold-out set: 0.00012465185567347553
MeanAbsoluteError value on hold-out data: 0.009035944007337093
Epoch: 346
Loss on hold-out set: 0.0010332208705796419
MeanAbsoluteError value on hold-out data: 0.011388035491108894
Epoch: 347
Loss on hold-out set: 0.00011522307690220738
MeanAbsoluteError value on hold-out data: 0.00868206936866045
Epoch: 348
Loss on hold-out set: 0.00010944198756509362
MeanAbsoluteError value on hold-out data: 0.008466627448797226
Epoch: 349
Loss on hold-out set: 0.00010383781945596351
MeanAbsoluteError value on hold-out data: 0.008249382488429546
Epoch: 350
Loss on hold-out set: 9.863299850334634e-05
MeanAbsoluteError value on hold-out data: 0.008041792549192905
```

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Epoch: 351
Loss on hold-out set: 9.334892633648308e-05
MeanAbsoluteError value on hold-out data: 0.00782635249197483
Epoch: 352
Loss on hold-out set: 9.033456617065607e-05
MeanAbsoluteError value on hold-out data: 0.007687652949243784
Epoch: 353
Loss on hold-out set: 8.421453582597773e-05
MeanAbsoluteError value on hold-out data: 0.00744003988802433
Epoch: 354
Loss on hold-out set: 7.955998549541139e-05
MeanAbsoluteError value on hold-out data: 0.007232388481497765
Epoch: 355
Loss on hold-out set: 0.000101009913793716
MeanAbsoluteError value on hold-out data: 0.0072866687551140785
Epoch: 356


Loss on hold-out set: 0.00090059004062488
MeanAbsoluteError value on hold-out data: 0.00845850259065628
Epoch: 357
Loss on hold-out set: 6.651251207681765e-05
MeanAbsoluteError value on hold-out data: 0.006619091145694256
Epoch: 358
Loss on hold-out set: 6.248022275126699e-05
MeanAbsoluteError value on hold-out data: 0.006417278666049242
Epoch: 359
Loss on hold-out set: 5.8746609571052864e-05
MeanAbsoluteError value on hold-out data: 0.006221778690814972
Epoch: 360
Loss on hold-out set: 5.499509858820698e-05
MeanAbsoluteError value on hold-out data: 0.006022768095135689
Epoch: 361
Loss on hold-out set: 5.393887685338421e-05
MeanAbsoluteError value on hold-out data: 0.005960994400084019
Epoch: 362
Loss on hold-out set: 5.04425448334108e-05
MeanAbsoluteError value on hold-out data: 0.0057622878812253475
Epoch: 363
Loss on hold-out set: 4.723508381606447e-05
MeanAbsoluteError value on hold-out data: 0.005579470656812191
Epoch: 364
Loss on hold-out set: 4.419374779804217e-05
```

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MeanAbsoluteError value on hold-out data: 0.0053985039703547955
Epoch: 365
Loss on hold-out set: 4.1280997002583097e-05
MeanAbsoluteError value on hold-out data: 0.005219890270382166
Epoch: 366
Loss on hold-out set: 3.849618386945957e-05
MeanAbsoluteError value on hold-out data: 0.005043014418333769
Epoch: 367
Loss on hold-out set: 3.5838646310462775e-05
MeanAbsoluteError value on hold-out data: 0.004868033807724714
Epoch: 368

Loss on hold-out set: 3.3306266088498216e-05
MeanAbsoluteError value on hold-out data: 0.004695051349699497
Epoch: 369
Loss on hold-out set: 3.089805369726444e-05
MeanAbsoluteError value on hold-out data: 0.00452421884983778
Epoch: 370
Loss on hold-out set: 0.0008403842835162466
MeanAbsoluteError value on hold-out data: 0.005968965124338865
Epoch: 371
Loss on hold-out set: 2.6445337138475704e-05
MeanAbsoluteError value on hold-out data: 0.00418948894366622
Epoch: 372
Loss on hold-out set: 2.4397049784104302e-05
MeanAbsoluteError value on hold-out data: 0.004025839734822512
Epoch: 373
Loss on hold-out set: 2.2465364078303346e-05
MeanAbsoluteError value on hold-out data: 0.0038649141788482666
Epoch: 374
Loss on hold-out set: 2.064670203301495e-05
MeanAbsoluteError value on hold-out data: 0.0037067290395498276
Epoch: 375
Loss on hold-out set: 1.8939999575339146e-05
MeanAbsoluteError value on hold-out data: 0.003551510162651539
Epoch: 376
Loss on hold-out set: 1.7341299888740697e-05
MeanAbsoluteError value on hold-out data: 0.0033992906101047993
Epoch: 377
Loss on hold-out set: 1.5848135885071795e-05
MeanAbsoluteError value on hold-out data: 0.00325089693069458
Epoch: 378
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Loss on hold-out set: 1.4457570973478906e-05
MeanAbsoluteError value on hold-out data: 0.003106001066043973
Epoch: 379
Loss on hold-out set: 1.316548769194158e-05
MeanAbsoluteError value on hold-out data: 0.0029646381735801697
Epoch: 380

Loss on hold-out set: 1.1968134937265667e-05
MeanAbsoluteError value on hold-out data: 0.0028267179150134325
Epoch: 381
Loss on hold-out set: 1.0861528177261598e-05
MeanAbsoluteError value on hold-out data: 0.002692975103855133
Epoch: 382
Loss on hold-out set: 9.84101398228775e-06
MeanAbsoluteError value on hold-out data: 0.0025633268523961306
Epoch: 383
Loss on hold-out set: 8.902221356708507e-06
MeanAbsoluteError value on hold-out data: 0.0024377568624913692
Epoch: 384
Loss on hold-out set: 1.2986946689795187e-05
MeanAbsoluteError value on hold-out data: 0.002944300416857004
Epoch: 385
Loss on hold-out set: 0.001707482095418144
MeanAbsoluteError value on hold-out data: 0.005841395817697048
Epoch: 386
Loss on hold-out set: 8.157284917998416e-06
MeanAbsoluteError value on hold-out data: 0.0023419673088937998
Epoch: 387
Loss on hold-out set: 7.41910472649914e-06
MeanAbsoluteError value on hold-out data: 0.002232852391898632
Epoch: 388
Loss on hold-out set: 0.002100526894082577
MeanAbsoluteError value on hold-out data: 0.005006410181522369
Epoch: 389
Loss on hold-out set: 6.7249670492904105e-06
MeanAbsoluteError value on hold-out data: 0.0021237831097096205
Epoch: 390
Loss on hold-out set: 6.127370313965673e-06
MeanAbsoluteError value on hold-out data: 0.002026632893830538
Epoch: 391
Loss on hold-out set: 5.580368152598232e-06
MeanAbsoluteError value on hold-out data: 0.0019328139023855329
Epoch: 392
```

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Loss on hold-out set: 5.077530341910269e-06
MeanAbsoluteError value on hold-out data: 0.0018426692113280296
Epoch: 393
Loss on hold-out set: 0.0017159775807906378
MeanAbsoluteError value on hold-out data: 0.005399491172283888
Epoch: 394
Loss on hold-out set: 4.193233843053397e-06
MeanAbsoluteError value on hold-out data: 0.0016736562829464674
Epoch: 395
Loss on hold-out set: 5.006603723694225e-06
MeanAbsoluteError value on hold-out data: 0.001820481033064425
Epoch: 396
Loss on hold-out set: 1.638479274764617e-05
MeanAbsoluteError value on hold-out data: 0.003423490095883608
Epoch: 397
Loss on hold-out set: 0.0012120525817276996
MeanAbsoluteError value on hold-out data: 0.00409401161596179
Epoch: 398
Loss on hold-out set: 6.031787028118024e-06
MeanAbsoluteError value on hold-out data: 0.0019882076885551214
Epoch: 399
Loss on hold-out set: 2.6184643119402034e-05
MeanAbsoluteError value on hold-out data: 0.004674302414059639
Epoch: 400
Loss on hold-out set: 0.0006368124275671729
MeanAbsoluteError value on hold-out data: 0.0034321669954806566
Epoch: 401
Loss on hold-out set: 5.431354775522011e-06
MeanAbsoluteError value on hold-out data: 0.0018937699496746063
Epoch: 402
Loss on hold-out set: 5.008827501066997e-06
MeanAbsoluteError value on hold-out data: 0.001822694786824286
Epoch: 403
Loss on hold-out set: 4.6216441899703474e-06
MeanAbsoluteError value on hold-out data: 0.0017543778521940112
Epoch: 404

Loss on hold-out set: 4.266347248535328e-06
MeanAbsoluteError value on hold-out data: 0.001688268966972828
Epoch: 405
Loss on hold-out set: 6.730367646780092e-06
MeanAbsoluteError value on hold-out data: 0.0020700758323073387
```

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Epoch: 406
Loss on hold-out set: 4.747736164446044e-06
MeanAbsoluteError value on hold-out data: 0.0017801413778215647
Epoch: 407
Loss on hold-out set: 0.0013036916869970426
MeanAbsoluteError value on hold-out data: 0.0038095370400696993
Epoch: 408
Loss on hold-out set: 4.071978157514279e-06
MeanAbsoluteError value on hold-out data: 0.0016529385466128588
Epoch: 409
Loss on hold-out set: 3.829959681704502e-06
MeanAbsoluteError value on hold-out data: 0.001604406046681106
Epoch: 410
Loss on hold-out set: 3.5077652629106046e-06
MeanAbsoluteError value on hold-out data: 0.0015335724456235766
Epoch: 411
Loss on hold-out set: 3.248588077559888e-06
MeanAbsoluteError value on hold-out data: 0.0014757185708731413
Epoch: 412
Loss on hold-out set: 3.0569231267020914e-06
MeanAbsoluteError value on hold-out data: 0.0014299690956249833
Epoch: 413
Loss on hold-out set: 2.790256644402689e-06
MeanAbsoluteError value on hold-out data: 0.0013657717499881983
Epoch: 414
Loss on hold-out set: 2.5892046805534176e-06
MeanAbsoluteError value on hold-out data: 0.0013149380683898926
Epoch: 415
Loss on hold-out set: 2.404888668276104e-06
MeanAbsoluteError value on hold-out data: 0.0012663389788940549
Epoch: 416

Loss on hold-out set: 2.235985633840181e-06
MeanAbsoluteError value on hold-out data: 0.0012196074239909649
Epoch: 417
Loss on hold-out set: 4.3837150686062826e-06
MeanAbsoluteError value on hold-out data: 0.0017333863070234656
Epoch: 418
Loss on hold-out set: 1.953969404523473e-06
MeanAbsoluteError value on hold-out data: 0.001139543834142387
Epoch: 419
Loss on hold-out set: 1.8220161375905406e-06
```

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MeanAbsoluteError value on hold-out data: 0.0010999208316206932
Epoch: 420
Loss on hold-out set: 5.490197899785256e-05
MeanAbsoluteError value on hold-out data: 0.002646639244630933
Epoch: 421
Loss on hold-out set: 0.0009812172323865741
MeanAbsoluteError value on hold-out data: 0.00296195549890399
Epoch: 422
Loss on hold-out set: 1.9152039385517128e-06
MeanAbsoluteError value on hold-out data: 0.0011157827684655786
Epoch: 423
Loss on hold-out set: 5.725650628033021e-05
MeanAbsoluteError value on hold-out data: 0.007497773040086031
Epoch: 424
Loss on hold-out set: 3.521503066095695e-05
MeanAbsoluteError value on hold-out data: 0.0058204252272844315
Epoch: 425
Loss on hold-out set: 2.17137685647111e-06
MeanAbsoluteError value on hold-out data: 0.0011847035493701696
Epoch: 426
Loss on hold-out set: 2.0699299730160035e-06
MeanAbsoluteError value on hold-out data: 0.0011555709643289447
Epoch: 427
Loss on hold-out set: 1.944075319814051e-06
MeanAbsoluteError value on hold-out data: 0.001120895380154252
Epoch: 428

Loss on hold-out set: 1.8300871491455359e-06
MeanAbsoluteError value on hold-out data: 0.0010880258632823825
Epoch: 429
Loss on hold-out set: 1.725235099576438e-06
MeanAbsoluteError value on hold-out data: 0.0010569640435278416
Epoch: 430
Loss on hold-out set: 3.959957074297754e-05
MeanAbsoluteError value on hold-out data: 0.003200236242264509
Epoch: 431
Loss on hold-out set: 3.364556340856277e-06
MeanAbsoluteError value on hold-out data: 0.001479120459407568
Epoch: 432
Loss on hold-out set: 2.111847927129642e-06
MeanAbsoluteError value on hold-out data: 0.001184646738693118
Epoch: 433
```

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Loss on hold-out set: 1.988998850253522e-06
MeanAbsoluteError value on hold-out data: 0.0011462626280263066
Epoch: 434
Loss on hold-out set: 2.2439357229885853e-06
MeanAbsoluteError value on hold-out data: 0.0012061118613928556
Epoch: 435
Loss on hold-out set: 1.9030301440412394e-06
MeanAbsoluteError value on hold-out data: 0.0011241569882258773
Epoch: 436
Loss on hold-out set: 1.797405415896049e-06
MeanAbsoluteError value on hold-out data: 0.001092287595383823
Epoch: 437
Loss on hold-out set: 1.70207124184392e-06
MeanAbsoluteError value on hold-out data: 0.0010624324204400182
Epoch: 438
Loss on hold-out set: 0.0007195902814128443
MeanAbsoluteError value on hold-out data: 0.0025908220559358597
Epoch: 439
Loss on hold-out set: 0.003966172373446553
MeanAbsoluteError value on hold-out data: 0.0046632359735667706
Epoch: 440

Loss on hold-out set: 1.9782095011434743e-06
MeanAbsoluteError value on hold-out data: 0.0011448082514107227
Epoch: 441
Loss on hold-out set: 1.7249449752542109e-06
MeanAbsoluteError value on hold-out data: 0.0010753493988886476
Epoch: 442
Loss on hold-out set: 0.0004933939183817565
MeanAbsoluteError value on hold-out data: 0.0023286857176572084
Epoch: 443
Loss on hold-out set: 1.5372297938435957e-06
MeanAbsoluteError value on hold-out data: 0.0010137942153960466
Epoch: 444
Loss on hold-out set: 1.458580902934907e-06
MeanAbsoluteError value on hold-out data: 0.0009862036677077413
Epoch: 445
Loss on hold-out set: 1.3873601581711849e-06
MeanAbsoluteError value on hold-out data: 0.0009603203507140279
Epoch: 446
Loss on hold-out set: 1.322858879186577e-06
MeanAbsoluteError value on hold-out data: 0.000936373951844871
```

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Epoch: 447
Loss on hold-out set: 1.2644094026295773e-06
MeanAbsoluteError value on hold-out data: 0.0009152282145805657
Epoch: 448
Loss on hold-out set: 1.2114246751001413e-06
MeanAbsoluteError value on hold-out data: 0.0008950437186285853
Epoch: 449
Loss on hold-out set: 1.163299945448527e-06
MeanAbsoluteError value on hold-out data: 0.0008758674957789481
Epoch: 450
Loss on hold-out set: 0.0005429980389177864
MeanAbsoluteError value on hold-out data: 0.002209464553743601
Epoch: 451
Loss on hold-out set: 1.4884630125403707e-06
MeanAbsoluteError value on hold-out data: 0.0009943392360582948
Epoch: 452

Loss on hold-out set: 1.3147084027758338e-06
MeanAbsoluteError value on hold-out data: 0.0009383286815136671
Epoch: 453
Loss on hold-out set: 1.2377877784262494e-06
MeanAbsoluteError value on hold-out data: 0.0009090390522032976
Epoch: 454
Loss on hold-out set: 2.4224856861259898e-05
MeanAbsoluteError value on hold-out data: 0.0011611300287768245
Epoch: 455
Loss on hold-out set: 7.145257730275931e-05
MeanAbsoluteError value on hold-out data: 0.008401812054216862
Epoch: 456
Loss on hold-out set: 1.9831859375292546e-06
MeanAbsoluteError value on hold-out data: 0.0011236262507736683
Epoch: 457
Loss on hold-out set: 1.8605554198589551e-06
MeanAbsoluteError value on hold-out data: 0.0010907640680670738
Epoch: 458
Loss on hold-out set: 1.7510077344097322e-06
MeanAbsoluteError value on hold-out data: 0.0010605709394440055
Epoch: 459
Loss on hold-out set: 0.0014020910866141896
MeanAbsoluteError value on hold-out data: 0.003204351756721735
Epoch: 460
Loss on hold-out set: 1.5616588357440713e-06
```

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MeanAbsoluteError value on hold-out data: 0.0010039233602583408
Epoch: 461
Loss on hold-out set: 0.0005497186241457616
MeanAbsoluteError value on hold-out data: 0.0024217970203608274
Epoch: 462
Loss on hold-out set: 1.4186727840201217e-06
MeanAbsoluteError value on hold-out data: 0.0009593890863470733
Epoch: 463
Loss on hold-out set: 1.349691679682732e-06
MeanAbsoluteError value on hold-out data: 0.0009352151537314057
Epoch: 464

Loss on hold-out set: 2.4955240950188646e-06
MeanAbsoluteError value on hold-out data: 0.001282201730646193
Epoch: 465
Loss on hold-out set: 1.441866556349755e-06
MeanAbsoluteError value on hold-out data: 0.0009617736795917153
Epoch: 466
Loss on hold-out set: 2.4405827691440973e-06
MeanAbsoluteError value on hold-out data: 0.0009934917325153947
Epoch: 467
Loss on hold-out set: 1.2946229766815744e-06
MeanAbsoluteError value on hold-out data: 0.0009114696295000613
Epoch: 468
Loss on hold-out set: 1.2354330001591352e-06
MeanAbsoluteError value on hold-out data: 0.0008903824491426349
Epoch: 469
Loss on hold-out set: 1.1818084505863992e-06
MeanAbsoluteError value on hold-out data: 0.0008710201364010572
Epoch: 470
Loss on hold-out set: 1.1332508037005602e-06
MeanAbsoluteError value on hold-out data: 0.0008526315214112401
Epoch: 471
Loss on hold-out set: 1.0892689054368308e-06
MeanAbsoluteError value on hold-out data: 0.0008350380230695009
Epoch: 472
Loss on hold-out set: 1.42202726973856e-06
MeanAbsoluteError value on hold-out data: 0.0009569230605848134
Epoch: 473
Loss on hold-out set: 2.8467456445468997e-06
MeanAbsoluteError value on hold-out data: 0.0013793435646221042
Epoch: 474
```

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Loss on hold-out set: 1.6436904044631343e-06
MeanAbsoluteError value on hold-out data: 0.0010196407092735171
Epoch: 475
Loss on hold-out set: 3.0252520350347222e-06
MeanAbsoluteError value on hold-out data: 0.0014004638651385903
Epoch: 476

Loss on hold-out set: 3.7966339110234434e-06
MeanAbsoluteError value on hold-out data: 0.0015967172803357244
Epoch: 477
Loss on hold-out set: 1.0458514344990314e-05
MeanAbsoluteError value on hold-out data: 0.002886152593418956
Epoch: 478
Loss on hold-out set: 3.215462567440179e-05
MeanAbsoluteError value on hold-out data: 0.0016177977668121457
Epoch: 479
Loss on hold-out set: 0.0005386391156919576
MeanAbsoluteError value on hold-out data: 0.00260434509254992
Epoch: 480
Loss on hold-out set: 2.381333460059403e-06
MeanAbsoluteError value on hold-out data: 0.0012203424703329802
Epoch: 481
Loss on hold-out set: 2.2247537332843516e-06
MeanAbsoluteError value on hold-out data: 0.0011800472857430577
Epoch: 482
Loss on hold-out set: 1.9245278982799918e-05
MeanAbsoluteError value on hold-out data: 0.0013811896787956357
Epoch: 483
Loss on hold-out set: 3.3468560152533953e-06
MeanAbsoluteError value on hold-out data: 0.0014848043210804462
Epoch: 484
Loss on hold-out set: 2.337028923037858e-06
MeanAbsoluteError value on hold-out data: 0.001232100767083466
Epoch: 485
Loss on hold-out set: 0.0004952080151084422
MeanAbsoluteError value on hold-out data: 0.0024666087701916695
Epoch: 486
Loss on hold-out set: 0.0006520514194834815
MeanAbsoluteError value on hold-out data: 0.0026215803809463978
Epoch: 487
Loss on hold-out set: 1.9053253272192562e-06
MeanAbsoluteError value on hold-out data: 0.001104953931644559
Epoch: 488
```

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Loss on hold-out set: 1.7915987903530838e-06
MeanAbsoluteError value on hold-out data: 0.001071070902980864
Epoch: 489
Loss on hold-out set: 1.7182739662458563e-06
MeanAbsoluteError value on hold-out data: 0.001056872308254242
Epoch: 490
Loss on hold-out set: 1.6083163499938803e-06
MeanAbsoluteError value on hold-out data: 0.001016827765852213
Epoch: 491
Loss on hold-out set: 1.5220868117706375e-06
MeanAbsoluteError value on hold-out data: 0.0009882260346785188
Epoch: 492
Loss on hold-out set: 1.4430002639337066e-06
MeanAbsoluteError value on hold-out data: 0.0009612747235223651
Epoch: 493
Loss on hold-out set: 1.370842985699327e-06
MeanAbsoluteError value on hold-out data: 0.0009372913627885282
Epoch: 494
Loss on hold-out set: 0.0007655278297988843
MeanAbsoluteError value on hold-out data: 0.0025171467568725348
Epoch: 495
Loss on hold-out set: 1.245025379447677e-06
MeanAbsoluteError value on hold-out data: 0.0008936977246776223
Epoch: 496
Loss on hold-out set: 1.1904506554796363e-06
MeanAbsoluteError value on hold-out data: 0.0008735167211852968
Epoch: 497
Loss on hold-out set: 1.1408140449619072e-06
MeanAbsoluteError value on hold-out data: 0.000854361045639962
Epoch: 498
Loss on hold-out set: 1.0957718022777236e-06
MeanAbsoluteError value on hold-out data: 0.0008362501976080239
Epoch: 499
Loss on hold-out set: 1.0549720599328793e-06
MeanAbsoluteError value on hold-out data: 0.0008197611896321177
Epoch: 500

Loss on hold-out set: 1.0180277277078476e-06
MeanAbsoluteError value on hold-out data: 0.0008046079892665148
Epoch: 501
Loss on hold-out set: 0.004590991590272384
MeanAbsoluteError value on hold-out data: 0.013103347271680832
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Epoch: 502
Loss on hold-out set: 1.3506143126936589e-06
MeanAbsoluteError value on hold-out data: 0.0009358747629448771
Epoch: 503
Loss on hold-out set: 1.3103736442213918e-05
MeanAbsoluteError value on hold-out data: 0.0012829789193347096
Epoch: 504
Loss on hold-out set: 1.753024804429515e-06
MeanAbsoluteError value on hold-out data: 0.0010559394722804427
Epoch: 505
Loss on hold-out set: 1.6252048842608547e-06
MeanAbsoluteError value on hold-out data: 0.0010198223171755672
Epoch: 506
Loss on hold-out set: 1.5186594393263045e-06
MeanAbsoluteError value on hold-out data: 0.0009875602554529905
Epoch: 507
Loss on hold-out set: 1.4258771967122715e-06
MeanAbsoluteError value on hold-out data: 0.0009582062484696507
Epoch: 508
Loss on hold-out set: 2.6589581478363377e-06
MeanAbsoluteError value on hold-out data: 0.001316752634011209
Epoch: 509
Loss on hold-out set: 3.499638948692576e-06
MeanAbsoluteError value on hold-out data: 0.0015034452080726624
Epoch: 510
Loss on hold-out set: 0.0006305685733034233
MeanAbsoluteError value on hold-out data: 0.0027493946254253387
Epoch: 511
Loss on hold-out set: 0.00041923505320758185
MeanAbsoluteError value on hold-out data: 0.002562778303399682
Epoch: 512

Loss on hold-out set: 0.004108801296337704
MeanAbsoluteError value on hold-out data: 0.0053100730292499065
Epoch: 513
Loss on hold-out set: 1.9664966274783516e-06
MeanAbsoluteError value on hold-out data: 0.0011361031793057919
Epoch: 514
Loss on hold-out set: 0.0007001853530479558
MeanAbsoluteError value on hold-out data: 0.0026271063834428787
Epoch: 515
Loss on hold-out set: 1.6771503869437622e-06
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MeanAbsoluteError value on hold-out data: 0.0010525494581088424
Epoch: 516
Loss on hold-out set: 1.5608216772845577e-06
MeanAbsoluteError value on hold-out data: 0.0010165264829993248
Epoch: 517
Loss on hold-out set: 1.4598225793574067e-06
MeanAbsoluteError value on hold-out data: 0.000983262900263071
Epoch: 518
Loss on hold-out set: 1.3720164829285415e-06
MeanAbsoluteError value on hold-out data: 0.0009532325202599168
Epoch: 519
Loss on hold-out set: 0.0019992425089665595
MeanAbsoluteError value on hold-out data: 0.004588761366903782
Epoch: 520
Loss on hold-out set: 0.0009925301381014748
MeanAbsoluteError value on hold-out data: 0.002727310638874769
Epoch: 521
Loss on hold-out set: 1.1701207630434702e-06
MeanAbsoluteError value on hold-out data: 0.0008767988183535635
Epoch: 522
Loss on hold-out set: 1.5413450202722264e-06
MeanAbsoluteError value on hold-out data: 0.0009914463153108954
Epoch: 523
Loss on hold-out set: 1.2041830411877335e-06
MeanAbsoluteError value on hold-out data: 0.0008914837962947786
Epoch: 524

Loss on hold-out set: 1.1561764673136789e-06
MeanAbsoluteError value on hold-out data: 0.0008745533414185047
Epoch: 525
Loss on hold-out set: 0.0004782216172699057
MeanAbsoluteError value on hold-out data: 0.0021257612388581038
Epoch: 526
Loss on hold-out set: 1.0782039091258123e-06
MeanAbsoluteError value on hold-out data: 0.0008432342438027263
Epoch: 527
Loss on hold-out set: 1.033806411424178e-06
MeanAbsoluteError value on hold-out data: 0.0008232786785811186
Epoch: 528
Loss on hold-out set: 9.989416335991719e-07
MeanAbsoluteError value on hold-out data: 0.0008071385091170669
Epoch: 529
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Loss on hold-out set: 9.688297045553746e-07
MeanAbsoluteError value on hold-out data: 0.0007927424157969654
Epoch: 530
Loss on hold-out set: 9.418631432673033e-07
MeanAbsoluteError value on hold-out data: 0.0007804547203704715
Epoch: 531
Loss on hold-out set: 9.175892659497645e-07
MeanAbsoluteError value on hold-out data: 0.0007694257656112313
Epoch: 532
Loss on hold-out set: 8.956947763600079e-07
MeanAbsoluteError value on hold-out data: 0.0007590944296680391
Epoch: 533
Loss on hold-out set: 8.759226308017643e-07
MeanAbsoluteError value on hold-out data: 0.0007496020407415926
Epoch: 534
Loss on hold-out set: 8.580812564823167e-07
MeanAbsoluteError value on hold-out data: 0.0007410269463434815
Epoch: 535
Loss on hold-out set: 8.421070927361621e-07
MeanAbsoluteError value on hold-out data: 0.0007330614607781172
Epoch: 536

Loss on hold-out set: 8.277936401375547e-07
MeanAbsoluteError value on hold-out data: 0.0007255274686031044
Epoch: 537
Loss on hold-out set: 8.150923947955323e-07
MeanAbsoluteError value on hold-out data: 0.000718449882697314
Epoch: 538
Loss on hold-out set: 4.161649150390938e-05
MeanAbsoluteError value on hold-out data: 0.006393030285835266
Epoch: 539
Loss on hold-out set: 1.370745399012058e-06
MeanAbsoluteError value on hold-out data: 0.0009384224540553987
Epoch: 540
Loss on hold-out set: 1.1694033617004607e-06
MeanAbsoluteError value on hold-out data: 0.0008577060652896762
Epoch: 541
Loss on hold-out set: 0.0006181120678308473
MeanAbsoluteError value on hold-out data: 0.002302907407283783
Epoch: 542
Loss on hold-out set: 1.0414389732348258e-06
MeanAbsoluteError value on hold-out data: 0.0008050536853261292
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Epoch: 543
Loss on hold-out set: 1.323529603855365e-06
MeanAbsoluteError value on hold-out data: 0.0009010343928821385
Epoch: 544
Loss on hold-out set: 1.2090654697778136e-06
MeanAbsoluteError value on hold-out data: 0.0008531786734238267
Epoch: 545
Loss on hold-out set: 1.1403634875693426e-06
MeanAbsoluteError value on hold-out data: 0.0008280816255137324
Epoch: 546
Loss on hold-out set: 2.0533863840611095e-06
MeanAbsoluteError value on hold-out data: 0.0011492095654830337
Epoch: 547
Loss on hold-out set: 1.4391853345554601e-06
MeanAbsoluteError value on hold-out data: 0.000932212162297219
Epoch: 548
```

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Loss on hold-out set: 1.3431348691028688e-06
MeanAbsoluteError value on hold-out data: 0.0008996164542622864
Epoch: 549
Loss on hold-out set: 6.21224686662907e-06
MeanAbsoluteError value on hold-out data: 0.002157955663278699
Epoch: 550
Loss on hold-out set: 0.0009203595250210727
MeanAbsoluteError value on hold-out data: 0.0027780127711594105
Epoch: 551
Loss on hold-out set: 1.4097254650455158e-05
MeanAbsoluteError value on hold-out data: 0.0034214577171951532
Epoch: 552
Loss on hold-out set: 2.1156436763416615e-06
MeanAbsoluteError value on hold-out data: 0.0011369917774572968
Epoch: 553
Loss on hold-out set: 0.0008430376780471473
MeanAbsoluteError value on hold-out data: 0.002762571442872286
Epoch: 554
Loss on hold-out set: 1.7900031103205326e-06
MeanAbsoluteError value on hold-out data: 0.0010437582386657596
Epoch: 555
Loss on hold-out set: 1.6729939856855038e-06
MeanAbsoluteError value on hold-out data: 0.0010090396972373128
Epoch: 556
Loss on hold-out set: 1.5687217763857724e-06
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MeanAbsoluteError value on hold-out data: 0.0009770869510248303
Epoch: 557
Loss on hold-out set: 1.0066556013187342e-05
MeanAbsoluteError value on hold-out data: 0.0028338974807411432
Epoch: 558
Loss on hold-out set: 0.0008520603959485278
MeanAbsoluteError value on hold-out data: 0.002776549896225333
Epoch: 559
Loss on hold-out set: 0.00047474446135634265
MeanAbsoluteError value on hold-out data: 0.0022854339331388474
Epoch: 560

Loss on hold-out set: 1.6070871050774975e-06
MeanAbsoluteError value on hold-out data: 0.000994016882032156
Epoch: 561
Loss on hold-out set: 1.507505074689681e-06
MeanAbsoluteError value on hold-out data: 0.0009635228780098259
Epoch: 562
Loss on hold-out set: 1.4200934551330359e-06
MeanAbsoluteError value on hold-out data: 0.0009368050377815962
Epoch: 563
Loss on hold-out set: 1.7570740453720646e-06
MeanAbsoluteError value on hold-out data: 0.0010572397150099277
Epoch: 564
Loss on hold-out set: 1.466145462066044e-06
MeanAbsoluteError value on hold-out data: 0.000968567153904587
Epoch: 565
Loss on hold-out set: 1.3901050558136997e-06
MeanAbsoluteError value on hold-out data: 0.0009412794024683535
Epoch: 566
Loss on hold-out set: 1.3201595325690027e-06
MeanAbsoluteError value on hold-out data: 0.0009164767689071596
Epoch: 567
Loss on hold-out set: 9.958084737903797e-06
MeanAbsoluteError value on hold-out data: 0.001091337064281106
Epoch: 568
Loss on hold-out set: 1.2750495871291366e-06
MeanAbsoluteError value on hold-out data: 0.0009034332470037043
Epoch: 569
Loss on hold-out set: 7.177822740949953e-06
MeanAbsoluteError value on hold-out data: 0.002364035928621888
Epoch: 570
```

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Loss on hold-out set: 1.5705682989463592e-06
MeanAbsoluteError value on hold-out data: 0.0009979276219382882
Epoch: 571
Loss on hold-out set: 1.0175020399198107e-05
MeanAbsoluteError value on hold-out data: 0.0011377918999642134
Epoch: 572

Loss on hold-out set: 1.3957972420915833e-06
MeanAbsoluteError value on hold-out data: 0.0009439605637453496
Epoch: 573
Loss on hold-out set: 3.0283243784436454e-06
MeanAbsoluteError value on hold-out data: 0.0014305926160886884
Epoch: 574
Loss on hold-out set: 4.857828475666649e-06
MeanAbsoluteError value on hold-out data: 0.0018752922769635916
Epoch: 575
Loss on hold-out set: 1.5763862243626424e-06
MeanAbsoluteError value on hold-out data: 0.0009868424385786057
Epoch: 576
Loss on hold-out set: 1.4914012129601792e-06
MeanAbsoluteError value on hold-out data: 0.0009603428770788014
Epoch: 577
Loss on hold-out set: 1.4158658365503423e-06
MeanAbsoluteError value on hold-out data: 0.0009366226149722934
Epoch: 578
Loss on hold-out set: 1.3474456675579092e-06
MeanAbsoluteError value on hold-out data: 0.0009144514915533364
Epoch: 579
Loss on hold-out set: 1.285622190787188e-06
MeanAbsoluteError value on hold-out data: 0.0008936593658290803
Epoch: 580
Loss on hold-out set: 5.199330928462587e-06
MeanAbsoluteError value on hold-out data: 0.0019534919410943985
Epoch: 581
Loss on hold-out set: 1.6176893540743645e-06
MeanAbsoluteError value on hold-out data: 0.0010187417501583695
Epoch: 582
Loss on hold-out set: 1.5282353893709161e-06
MeanAbsoluteError value on hold-out data: 0.0009914080146700144
Epoch: 583
Loss on hold-out set: 1.4474090559552247e-06
MeanAbsoluteError value on hold-out data: 0.0009646827238611877
Epoch: 584
```

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Loss on hold-out set: 1.3741077597878279e-06
MeanAbsoluteError value on hold-out data: 0.0009402922005392611
Epoch: 585
Loss on hold-out set: 1.5247218856840942e-06
MeanAbsoluteError value on hold-out data: 0.0010004102950915694
Epoch: 586
Loss on hold-out set: 1.4262776862719157e-06
MeanAbsoluteError value on hold-out data: 0.0009649528074078262
Epoch: 587
Loss on hold-out set: 1.3643955949610723e-06
MeanAbsoluteError value on hold-out data: 0.0009477831772528589
Epoch: 588
Loss on hold-out set: 3.60485856142053e-05
MeanAbsoluteError value on hold-out data: 0.001261591911315918
Epoch: 589
Loss on hold-out set: 1.9729422269009727e-06
MeanAbsoluteError value on hold-out data: 0.0011350843124091625
Epoch: 590
Loss on hold-out set: 2.5642131633000978e-06
MeanAbsoluteError value on hold-out data: 0.0012844816083088517
Epoch: 591
Loss on hold-out set: 0.001781089055196174
MeanAbsoluteError value on hold-out data: 0.004450970329344273
Epoch: 592
Loss on hold-out set: 1.4704494273437854e-06
MeanAbsoluteError value on hold-out data: 0.0009698866633698344
Epoch: 593
Loss on hold-out set: 1.3935198883006563e-06
MeanAbsoluteError value on hold-out data: 0.0009454446844756603
Epoch: 594
Loss on hold-out set: 1.3239938889335845e-06
MeanAbsoluteError value on hold-out data: 0.0009226826950907707
Epoch: 595
Loss on hold-out set: 1.2612064734328573e-06
MeanAbsoluteError value on hold-out data: 0.0009013917297124863
Epoch: 596

Loss on hold-out set: 1.204536967012054e-06
MeanAbsoluteError value on hold-out data: 0.0008811339503154159
Epoch: 597
Loss on hold-out set: 1.1533358318908875e-06
MeanAbsoluteError value on hold-out data: 0.0008621124434284866
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Epoch: 598
Loss on hold-out set: 1.107110664945235e-06
MeanAbsoluteError value on hold-out data: 0.0008437681244686246
Epoch: 599
Loss on hold-out set: 1.065364039887802e-06
MeanAbsoluteError value on hold-out data: 0.0008268358651548624
Epoch: 600
Loss on hold-out set: 1.027642916166147e-06
MeanAbsoluteError value on hold-out data: 0.0008114523952826858
Epoch: 601
Loss on hold-out set: 4.603025074270829e-06
MeanAbsoluteError value on hold-out data: 0.001880987430922687
Epoch: 602
Loss on hold-out set: 1.2865074163408663e-06
MeanAbsoluteError value on hold-out data: 0.0009038217831403017
Epoch: 603
Loss on hold-out set: 1.2181826904404596e-06
MeanAbsoluteError value on hold-out data: 0.0008781580254435539
Epoch: 604
Loss on hold-out set: 1.1615179917761883e-06
MeanAbsoluteError value on hold-out data: 0.0008579271961934865
Epoch: 605
Loss on hold-out set: 1.1117334844057997e-06
MeanAbsoluteError value on hold-out data: 0.0008392592426389456
Epoch: 606
Loss on hold-out set: 1.5783623499182317e-06
MeanAbsoluteError value on hold-out data: 0.0009942823089659214
Epoch: 607
Loss on hold-out set: 0.00008534136074175828
MeanAbsoluteError value on hold-out data: 0.002652808791026473
Epoch: 608

Loss on hold-out set: 1.3770579788510269e-06
MeanAbsoluteError value on hold-out data: 0.0009306882857345045
Epoch: 609
Loss on hold-out set: 1.3015674264687205e-06
MeanAbsoluteError value on hold-out data: 0.000903995824046433
Epoch: 610
Loss on hold-out set: 1.2350971348352783e-06
MeanAbsoluteError value on hold-out data: 0.0008808863931335509
Epoch: 611
Loss on hold-out set: 1.8783211610178496e-06
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MeanAbsoluteError value on hold-out data: 0.0010950615396723151
Epoch: 612
Loss on hold-out set: 1.2640658028610568e-06
MeanAbsoluteError value on hold-out data: 0.0009043101454153657
Epoch: 613
Loss on hold-out set: 0.0006085946890961898
MeanAbsoluteError value on hold-out data: 0.0023119335528463125
Epoch: 614
Loss on hold-out set: 1.1407234021470158e-06
MeanAbsoluteError value on hold-out data: 0.0008571420330554247
Epoch: 615
Loss on hold-out set: 1.091434872304681e-06
MeanAbsoluteError value on hold-out data: 0.0008366636466234922
Epoch: 616
Loss on hold-out set: 1.048074775972533e-06
MeanAbsoluteError value on hold-out data: 0.0008185114129446447
Epoch: 617
Loss on hold-out set: 1.0098858009960646e-06
MeanAbsoluteError value on hold-out data: 0.0008025220595300198
Epoch: 618
Loss on hold-out set: 1.3273516726174325e-05
MeanAbsoluteError value on hold-out data: 0.0009872342925518751
Epoch: 619
Loss on hold-out set: 9.460646826877755e-07
MeanAbsoluteError value on hold-out data: 0.0007761671440675855
Epoch: 620

Loss on hold-out set: 9.195395696343966e-07
MeanAbsoluteError value on hold-out data: 0.0007649897015653551
Epoch: 621
Loss on hold-out set: 8.960064278833096e-07
MeanAbsoluteError value on hold-out data: 0.0007545646512880921
Epoch: 622
Loss on hold-out set: 8.75200405247549e-07
MeanAbsoluteError value on hold-out data: 0.0007449566619470716
Epoch: 623
Loss on hold-out set: 9.937478601410764e-07
MeanAbsoluteError value on hold-out data: 0.0007922207587398589
Epoch: 624
Loss on hold-out set: 9.560523750451466e-07
MeanAbsoluteError value on hold-out data: 0.0007773349061608315
Epoch: 625
```

```
Loss on hold-out set: 1.3627766053870897e-06
MeanAbsoluteError value on hold-out data: 0.0009218262857757509
Epoch: 626
Loss on hold-out set: 1.4491976109435488e-06
MeanAbsoluteError value on hold-out data: 0.0009578077006153762
Epoch: 627
Loss on hold-out set: 5.2695714609734224e-05
MeanAbsoluteError value on hold-out data: 0.007206391543149948
Epoch: 628
Loss on hold-out set: 1.5293981828347712e-06
MeanAbsoluteError value on hold-out data: 0.0009991178521886468
Epoch: 629
Loss on hold-out set: 1.3329011853544983e-06
MeanAbsoluteError value on hold-out data: 0.0009294638875871897
Epoch: 630
Loss on hold-out set: 1.2985066783693055e-06
MeanAbsoluteError value on hold-out data: 0.0009177933097817004
Epoch: 631
Loss on hold-out set: 4.731809092405863e-05
MeanAbsoluteError value on hold-out data: 0.001285732607357204
Epoch: 632

Loss on hold-out set: 3.1388071785218734e-06
MeanAbsoluteError value on hold-out data: 0.0014828575076535344
Epoch: 633
Loss on hold-out set: 1.3203708345157026e-06
MeanAbsoluteError value on hold-out data: 0.0009255912154912949
Epoch: 634
Loss on hold-out set: 0.00052826168457437433
MeanAbsoluteError value on hold-out data: 0.0022595131304115057
Epoch: 635
Loss on hold-out set: 1.2888164274284606e-06
MeanAbsoluteError value on hold-out data: 0.0009096485446207225
Epoch: 636
Loss on hold-out set: 2.132768364198886e-05
MeanAbsoluteError value on hold-out data: 0.00450445432215929
Epoch: 637
Loss on hold-out set: 1.6846303840099465e-06
MeanAbsoluteError value on hold-out data: 0.001058797468431294
Epoch: 638
Loss on hold-out set: 1.5527278004643257e-06
MeanAbsoluteError value on hold-out data: 0.0010127779096364975
```

```
Epoch: 639
Loss on hold-out set: 2.4554306635668342e-06
MeanAbsoluteError value on hold-out data: 0.0012750511523336172
Epoch: 640
Loss on hold-out set: 1.934956103648227e-06
MeanAbsoluteError value on hold-out data: 0.0011170099023729563
Epoch: 641
Loss on hold-out set: 1.811936162934408e-06
MeanAbsoluteError value on hold-out data: 0.001084088464267552
Epoch: 642
Loss on hold-out set: 1.7242378715452919e-06
MeanAbsoluteError value on hold-out data: 0.0010668847244232893
Epoch: 643
Loss on hold-out set: 1.6196433585647402e-06
MeanAbsoluteError value on hold-out data: 0.0010255260858684778
Epoch: 644


Loss on hold-out set: 1.5299415819850094e-06
MeanAbsoluteError value on hold-out data: 0.0009967336663976312
Epoch: 645
Loss on hold-out set: 1.4473790052330803e-06
MeanAbsoluteError value on hold-out data: 0.0009698097710497677
Epoch: 646
Loss on hold-out set: 1.3718976854187004e-06
MeanAbsoluteError value on hold-out data: 0.0009445851901546121
Epoch: 647
Loss on hold-out set: 1.5541104283712276e-06
MeanAbsoluteError value on hold-out data: 0.0010085084941238165
Epoch: 648
Loss on hold-out set: 1.3914501805270686e-06
MeanAbsoluteError value on hold-out data: 0.0009475123952142894
Epoch: 649
Loss on hold-out set: 1.318963485705114e-06
MeanAbsoluteError value on hold-out data: 0.000918680801987648
Epoch: 650
Loss on hold-out set: 1.2561914553244652e-06
MeanAbsoluteError value on hold-out data: 0.000896015961188823
Epoch: 651
Loss on hold-out set: 1.1992866036866632e-06
MeanAbsoluteError value on hold-out data: 0.0008745630620978773
Epoch: 652
Loss on hold-out set: 1.1479044275120032e-06
```

```
MeanAbsoluteError value on hold-out data: 0.0008556580287404358
Epoch: 653
Loss on hold-out set: 1.110171058521222e-06
MeanAbsoluteError value on hold-out data: 0.0008391421870328486
Epoch: 654
Loss on hold-out set: 1.064148224229125e-06
MeanAbsoluteError value on hold-out data: 0.000821509980596602
Epoch: 655
Loss on hold-out set: 3.7594306921786675e-06
MeanAbsoluteError value on hold-out data: 0.001592538203112781
Epoch: 656

Loss on hold-out set: 0.000683950447902242
MeanAbsoluteError value on hold-out data: 0.0027464821469038725
Epoch: 657
Loss on hold-out set: 2.247179359552607e-06
MeanAbsoluteError value on hold-out data: 0.0011926573934033513
Epoch: 658
Loss on hold-out set: 8.452637853463929e-06
MeanAbsoluteError value on hold-out data: 0.002583366120234132
Epoch: 659
Loss on hold-out set: 2.482769641992969e-06
MeanAbsoluteError value on hold-out data: 0.0012654504971578717
Epoch: 660
Loss on hold-out set: 0.0009241917078862858
MeanAbsoluteError value on hold-out data: 0.0029752315022051334
Epoch: 661
Loss on hold-out set: 2.5896655430594698e-06
MeanAbsoluteError value on hold-out data: 0.001298966002650559
Epoch: 662
Loss on hold-out set: 2.3459443346047535e-06
MeanAbsoluteError value on hold-out data: 0.0012356991646811366
Epoch: 663
Loss on hold-out set: 0.001245066101933832
MeanAbsoluteError value on hold-out data: 0.00346363615244627
Epoch: 664
Loss on hold-out set: 2.431300234356489e-06
MeanAbsoluteError value on hold-out data: 0.00126487179659307
Epoch: 665
Loss on hold-out set: 2.230668578225672e-06
MeanAbsoluteError value on hold-out data: 0.0012121755862608552
Early stopping at epoch 664
```

```
Returned to Spot: Validation loss: 2.230668578225672e-06
----------------------------------------------

spotPython tuning: 2.230668578225672e-06 [#########-] 94.91%

config: {'_L_in': 10, '_L_out': 1, 'l1': 8, 'dropout_prob': 0.0021023959517033936, 'lr_mult'
Epoch: 1
Loss on hold-out set: 0.3048287614395744
MeanAbsoluteError value on hold-out data: 0.5271492600440979
Epoch: 2
Loss on hold-out set: 0.27609286418086604
MeanAbsoluteError value on hold-out data: 0.49933603405952454
Epoch: 3
Loss on hold-out set: 0.2459882842866998
MeanAbsoluteError value on hold-out data: 0.4687897264957428
Epoch: 4
Loss on hold-out set: 0.21688768718587725
MeanAbsoluteError value on hold-out data: 0.43736621737480164
Epoch: 5
Loss on hold-out set: 0.19123441843610062
MeanAbsoluteError value on hold-out data: 0.4076530635356903
Epoch: 6
Loss on hold-out set: 0.17201495209806844
MeanAbsoluteError value on hold-out data: 0.3835340142250061
Epoch: 7
Loss on hold-out set: 0.1564298991702105
MeanAbsoluteError value on hold-out data: 0.3624511659145355
Epoch: 8
Loss on hold-out set: 0.14630421956903056
MeanAbsoluteError value on hold-out data: 0.34794825315475464
Epoch: 9
Loss on hold-out set: 0.14088672732836321
MeanAbsoluteError value on hold-out data: 0.3401965796947479
Epoch: 10
Loss on hold-out set: 0.13690214545318954
MeanAbsoluteError value on hold-out data: 0.33434388041496277
Epoch: 11

Loss on hold-out set: 0.13282198988293348
MeanAbsoluteError value on hold-out data: 0.32832998037338257
Epoch: 12
```

```
Loss on hold-out set: 0.128687967987437
MeanAbsoluteError value on hold-out data: 0.3225102126598358
Epoch: 13
Loss on hold-out set: 0.1242935223210799
MeanAbsoluteError value on hold-out data: 0.3157675564289093
Epoch: 14
Loss on hold-out set: 0.1198169183182089
MeanAbsoluteError value on hold-out data: 0.30896738171577454
Epoch: 15
Loss on hold-out set: 0.11497862019429081
MeanAbsoluteError value on hold-out data: 0.30144596099853516
Epoch: 16
Loss on hold-out set: 0.11014275517510741
MeanAbsoluteError value on hold-out data: 0.29376083612442017
Epoch: 17
Loss on hold-out set: 0.10499521393917109
MeanAbsoluteError value on hold-out data: 0.2853637933731079
Epoch: 18
Loss on hold-out set: 0.09966245156369712
MeanAbsoluteError value on hold-out data: 0.27684685587882996
Epoch: 19
Loss on hold-out set: 0.09432294023664374
MeanAbsoluteError value on hold-out data: 0.267972856760025
Epoch: 20
Loss on hold-out set: 0.08911513164639473
MeanAbsoluteError value on hold-out data: 0.2593613564968109
Epoch: 21
Loss on hold-out set: 0.0840103660563105
MeanAbsoluteError value on hold-out data: 0.2508181929588318
Epoch: 22
Loss on hold-out set: 0.07897784560918808
MeanAbsoluteError value on hold-out data: 0.2423117756843567
Epoch: 23

Loss on hold-out set: 0.07414384176464457
MeanAbsoluteError value on hold-out data: 0.23385001718997955
Epoch: 24
Loss on hold-out set: 0.0696296414458438
MeanAbsoluteError value on hold-out data: 0.22556081414222717
Epoch: 25
Loss on hold-out set: 0.06515387131979591
MeanAbsoluteError value on hold-out data: 0.21738024055957794
```

```
Epoch: 26
Loss on hold-out set: 0.060998323447021996
MeanAbsoluteError value on hold-out data: 0.209408238530159
Epoch: 27
Loss on hold-out set: 0.05697202381040705
MeanAbsoluteError value on hold-out data: 0.20149366557598114
Epoch: 28
Loss on hold-out set: 0.053196488144366366
MeanAbsoluteError value on hold-out data: 0.19392254948616028
Epoch: 29
Loss on hold-out set: 0.04972212136674084
MeanAbsoluteError value on hold-out data: 0.1865120381116867
Epoch: 30
Loss on hold-out set: 0.04665522909674205
MeanAbsoluteError value on hold-out data: 0.1799125373363495
Epoch: 31
Loss on hold-out set: 0.0435932041390946
MeanAbsoluteError value on hold-out data: 0.17308950424194336
Epoch: 32
Loss on hold-out set: 0.04089149521467717
MeanAbsoluteError value on hold-out data: 0.16688454151153564
Epoch: 33
Loss on hold-out set: 0.0384898674919417
MeanAbsoluteError value on hold-out data: 0.16130146384239197
Epoch: 34
Loss on hold-out set: 0.03646559993687429
MeanAbsoluteError value on hold-out data: 0.1564873456954956
Epoch: 35

Loss on hold-out set: 0.03468046452556001
MeanAbsoluteError value on hold-out data: 0.15259717404842377
Epoch: 36
Loss on hold-out set: 0.03298481634670967
MeanAbsoluteError value on hold-out data: 0.1483570784330368
Epoch: 37
Loss on hold-out set: 0.03166371576586052
MeanAbsoluteError value on hold-out data: 0.1449597179889679
Epoch: 38
Loss on hold-out set: 0.030714998193281263
MeanAbsoluteError value on hold-out data: 0.14255021512508392
Epoch: 39
Loss on hold-out set: 0.030028947432966607
```

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MeanAbsoluteError value on hold-out data: 0.1403529942035675
Epoch: 40
Loss on hold-out set: 0.028961865868615478
MeanAbsoluteError value on hold-out data: 0.13783450424671173
Epoch: 41
Loss on hold-out set: 0.028455483825191072
MeanAbsoluteError value on hold-out data: 0.13631688058376312
Epoch: 42
Loss on hold-out set: 0.027998581479646657
MeanAbsoluteError value on hold-out data: 0.1347573697566986
Epoch: 43
Loss on hold-out set: 0.027793377025150938
MeanAbsoluteError value on hold-out data: 0.13399040699005127
Epoch: 44
Loss on hold-out set: 0.0274380738111703
MeanAbsoluteError value on hold-out data: 0.13272011280059814
Epoch: 45
Loss on hold-out set: 0.02724254165629023
MeanAbsoluteError value on hold-out data: 0.13145850598812103
Epoch: 46
Loss on hold-out set: 0.027837919083570962
MeanAbsoluteError value on hold-out data: 0.13227508962154388
Epoch: 47

Loss on hold-out set: 0.02722478346703084
MeanAbsoluteError value on hold-out data: 0.1312483698129654
Epoch: 48
Loss on hold-out set: 0.027004946329581895
MeanAbsoluteError value on hold-out data: 0.1305149495601654
Epoch: 49
Loss on hold-out set: 0.026790104071168525
MeanAbsoluteError value on hold-out data: 0.12941506505012512
Epoch: 50
Loss on hold-out set: 0.026868341490626335
MeanAbsoluteError value on hold-out data: 0.12974338233470917
Epoch: 51
Loss on hold-out set: 0.027223864925633137
MeanAbsoluteError value on hold-out data: 0.13059569895267487
Epoch: 52
Loss on hold-out set: 0.02722656587138772
MeanAbsoluteError value on hold-out data: 0.13050785660743713
Epoch: 53
```

```
Loss on hold-out set: 0.02675908237793728
MeanAbsoluteError value on hold-out data: 0.12924684584140778
Epoch: 54
Loss on hold-out set: 0.026814411100196212
MeanAbsoluteError value on hold-out data: 0.12949250638484955
Epoch: 55
Loss on hold-out set: 0.026815766860779962
MeanAbsoluteError value on hold-out data: 0.12939533591270447
Epoch: 56
Loss on hold-out set: 0.026520928147395973
MeanAbsoluteError value on hold-out data: 0.1286599487066269
Epoch: 57
Loss on hold-out set: 0.02664731228479037
MeanAbsoluteError value on hold-out data: 0.12896232306957245
Epoch: 58
Loss on hold-out set: 0.026698299340511624
MeanAbsoluteError value on hold-out data: 0.12897475063800812
Epoch: 59

Loss on hold-out set: 0.027118319988642867
MeanAbsoluteError value on hold-out data: 0.12957514822483063
Epoch: 60
Loss on hold-out set: 0.02656494361642552
MeanAbsoluteError value on hold-out data: 0.12887372076511383
Epoch: 61
Loss on hold-out set: 0.02673196547517651
MeanAbsoluteError value on hold-out data: 0.12935037910938263
Epoch: 62
Loss on hold-out set: 0.02687797306938783
MeanAbsoluteError value on hold-out data: 0.1295158714056015
Epoch: 63
Loss on hold-out set: 0.026538964581528778
MeanAbsoluteError value on hold-out data: 0.12874279916286469
Epoch: 64
Loss on hold-out set: 0.02648393195857735
MeanAbsoluteError value on hold-out data: 0.1284165233373642
Epoch: 65
Loss on hold-out set: 0.026531868736798827
MeanAbsoluteError value on hold-out data: 0.12869632244110107
Epoch: 66
Loss on hold-out set: 0.02651175714441036
MeanAbsoluteError value on hold-out data: 0.12858596444129944
```

```
Epoch: 67
Loss on hold-out set: 0.02650597194013627
MeanAbsoluteError value on hold-out data: 0.12837491929531097
Epoch: 68
Loss on hold-out set: 0.026372369231754227
MeanAbsoluteError value on hold-out data: 0.12813599407672882
Epoch: 69
Loss on hold-out set: 0.026402672483144624
MeanAbsoluteError value on hold-out data: 0.12837326526641846
Epoch: 70
Loss on hold-out set: 0.026248856815264413
MeanAbsoluteError value on hold-out data: 0.1279018670320511
Epoch: 71
```

```
Loss on hold-out set: 0.02658462512159818
MeanAbsoluteError value on hold-out data: 0.12876535952091217
Epoch: 72
Loss on hold-out set: 0.02630557328168499
MeanAbsoluteError value on hold-out data: 0.12808440625667572
Epoch: 73
Loss on hold-out set: 0.026223002467304468
MeanAbsoluteError value on hold-out data: 0.1277598887681961
Epoch: 74
Loss on hold-out set: 0.02639487121058138
MeanAbsoluteError value on hold-out data: 0.1284489929676056
Epoch: 75
Loss on hold-out set: 0.026579678083132757
MeanAbsoluteError value on hold-out data: 0.12839262187480927
Epoch: 76
Loss on hold-out set: 0.026190788166499453
MeanAbsoluteError value on hold-out data: 0.12765268981456757
Epoch: 77
Loss on hold-out set: 0.02610810863246259
MeanAbsoluteError value on hold-out data: 0.12755131721496582
Epoch: 78
Loss on hold-out set: 0.026204248779992525
MeanAbsoluteError value on hold-out data: 0.12780366837978363
Epoch: 79
Loss on hold-out set: 0.02599416012679668
MeanAbsoluteError value on hold-out data: 0.12712471187114716
Epoch: 80
Loss on hold-out set: 0.02599700312375238
```

```
MeanAbsoluteError value on hold-out data: 0.12717922031879425
Epoch: 81
Loss on hold-out set: 0.02612000240601207
MeanAbsoluteError value on hold-out data: 0.12788060307502747
Epoch: 82
Loss on hold-out set: 0.025963385638437773
MeanAbsoluteError value on hold-out data: 0.12722380459308624
Epoch: 83

Loss on hold-out set: 0.02595048537477851
MeanAbsoluteError value on hold-out data: 0.12710992991924286
Epoch: 84
Loss on hold-out set: 0.02601903887759698
MeanAbsoluteError value on hold-out data: 0.12742982804775238
Epoch: 85
Loss on hold-out set: 0.025847030092815037
MeanAbsoluteError value on hold-out data: 0.1268673986196518
Epoch: 86
Loss on hold-out set: 0.0261861076333413
MeanAbsoluteError value on hold-out data: 0.12742088735103607
Epoch: 87
Loss on hold-out set: 0.0257552095664371
MeanAbsoluteError value on hold-out data: 0.1266488879919052
Epoch: 88
Loss on hold-out set: 0.025718326851921647
MeanAbsoluteError value on hold-out data: 0.1264687329530716
Epoch: 89
Loss on hold-out set: 0.025805451024911906
MeanAbsoluteError value on hold-out data: 0.12654022872447968
Epoch: 90
Loss on hold-out set: 0.025774790096635882
MeanAbsoluteError value on hold-out data: 0.1265661120414734
Epoch: 91
Loss on hold-out set: 0.025679982634947487
MeanAbsoluteError value on hold-out data: 0.12631148099899292
Epoch: 92
Loss on hold-out set: 0.025519928012631442
MeanAbsoluteError value on hold-out data: 0.12598761916160583
Epoch: 93
Loss on hold-out set: 0.0255287455541915
MeanAbsoluteError value on hold-out data: 0.12592683732509613
Epoch: 94
```

```
Loss on hold-out set: 0.025728601472158l8
MeanAbsoluteError value on hold-out data: 0.12648305296897888
Epoch: 95


Loss on hold-out set: 0.025405139858393294
MeanAbsoluteError value on hold-out data: 0.12579086422920227
Epoch: 96
Loss on hold-out set: 0.025441712197406513
MeanAbsoluteError value on hold-out data: 0.12586243450641632
Epoch: 97
Loss on hold-out set: 0.025294369723843902
MeanAbsoluteError value on hold-out data: 0.12535600364208221
Epoch: 98
Loss on hold-out set: 0.026022098382542793
MeanAbsoluteError value on hold-out data: 0.12653273344039917
Epoch: 99
Loss on hold-out set: 0.025274154288988365
MeanAbsoluteError value on hold-out data: 0.12524379789829254
Epoch: 100
Loss on hold-out set: 0.025342532629637343
MeanAbsoluteError value on hold-out data: 0.1254248321056366
Epoch: 101
Loss on hold-out set: 0.025275816736546785
MeanAbsoluteError value on hold-out data: 0.1256813108921051
Epoch: 102
Loss on hold-out set: 0.025054682977497578
MeanAbsoluteError value on hold-out data: 0.12493644654750824
Epoch: 103
Loss on hold-out set: 0.025643332015821023
MeanAbsoluteError value on hold-out data: 0.12596997618675232
Epoch: 104
Loss on hold-out set: 0.02529926158144678
MeanAbsoluteError value on hold-out data: 0.1256384402513504
Epoch: 105
Loss on hold-out set: 0.02494800862807192
MeanAbsoluteError value on hold-out data: 0.12466468662023544
Epoch: 106
Loss on hold-out set: 0.024989770198436945
MeanAbsoluteError value on hold-out data: 0.12467258423566818
Epoch: 107


Loss on hold-out set: 0.025470320711304482
```

```
MeanAbsoluteError value on hold-out data: 0.12564067542552948
Epoch: 108
Loss on hold-out set: 0.02485045436524639
MeanAbsoluteError value on hold-out data: 0.12429437041282654
Epoch: 109
Loss on hold-out set: 0.024975155602748458
MeanAbsoluteError value on hold-out data: 0.12462691962718964
Epoch: 110
Loss on hold-out set: 0.024768585915138062
MeanAbsoluteError value on hold-out data: 0.12404388189315796
Epoch: 111
Loss on hold-out set: 0.024838450720141594
MeanAbsoluteError value on hold-out data: 0.12414255738258362
Epoch: 112
Loss on hold-out set: 0.02515716086092748
MeanAbsoluteError value on hold-out data: 0.12486433982849121
Epoch: 113
Loss on hold-out set: 0.02501183277682254
MeanAbsoluteError value on hold-out data: 0.12478899955749512
Epoch: 114
Loss on hold-out set: 0.024569721757679394
MeanAbsoluteError value on hold-out data: 0.12329961359500885
Epoch: 115
Loss on hold-out set: 0.024704860302766685
MeanAbsoluteError value on hold-out data: 0.12395669519901276
Epoch: 116
Loss on hold-out set: 0.02463421789243033
MeanAbsoluteError value on hold-out data: 0.12366852164268494
Epoch: 117
Loss on hold-out set: 0.02449997851478034
MeanAbsoluteError value on hold-out data: 0.1233515664935112
Epoch: 118
Loss on hold-out set: 0.024596529130480792
MeanAbsoluteError value on hold-out data: 0.12386653572320938
Epoch: 119

Loss on hold-out set: 0.024394744725309704
MeanAbsoluteError value on hold-out data: 0.12297400087118149
Epoch: 120
Loss on hold-out set: 0.024447484726184292
MeanAbsoluteError value on hold-out data: 0.1231502890586853
Epoch: 121
```

```
Loss on hold-out set: 0.024330606782122663
MeanAbsoluteError value on hold-out data: 0.12298104912042618
Epoch: 122
Loss on hold-out set: 0.02426962969873689
MeanAbsoluteError value on hold-out data: 0.12288174778223038
Epoch: 123
Loss on hold-out set: 0.024287805341086106
MeanAbsoluteError value on hold-out data: 0.1227460503578186
Epoch: 124
Loss on hold-out set: 0.024154443122250468
MeanAbsoluteError value on hold-out data: 0.12258925288915634
Epoch: 125
Loss on hold-out set: 0.02415498112034249
MeanAbsoluteError value on hold-out data: 0.12230180203914642
Epoch: 126
Loss on hold-out set: 0.02400260345128022
MeanAbsoluteError value on hold-out data: 0.12232830375432968
Epoch: 127
Loss on hold-out set: 0.02404377522486213
MeanAbsoluteError value on hold-out data: 0.12233951687812805
Epoch: 128
Loss on hold-out set: 0.024015303247755294
MeanAbsoluteError value on hold-out data: 0.12213721871376038
Epoch: 129
Loss on hold-out set: 0.02391769469862706
MeanAbsoluteError value on hold-out data: 0.12185724824666977
Epoch: 130
Loss on hold-out set: 0.023772662934406025
MeanAbsoluteError value on hold-out data: 0.12147453427314758
Epoch: 131

Loss on hold-out set: 0.02398172047871508
MeanAbsoluteError value on hold-out data: 0.12234565615653992
Epoch: 132
Loss on hold-out set: 0.02360044552111312
MeanAbsoluteError value on hold-out data: 0.12100835144519806
Epoch: 133
Loss on hold-out set: 0.023632085489991465
MeanAbsoluteError value on hold-out data: 0.12093475461006165
Epoch: 134
Loss on hold-out set: 0.023725422773216116
MeanAbsoluteError value on hold-out data: 0.12151487916707993
```

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Epoch: 135
Loss on hold-out set: 0.023853050054688203
MeanAbsoluteError value on hold-out data: 0.1218339279294014
Epoch: 136
Loss on hold-out set: 0.023494179470856722
MeanAbsoluteError value on hold-out data: 0.1207524761557579
Epoch: 137
Loss on hold-out set: 0.023376969571568464
MeanAbsoluteError value on hold-out data: 0.12044396996498108
Epoch: 138
Loss on hold-out set: 0.023481334522856695
MeanAbsoluteError value on hold-out data: 0.12104296684265137
Epoch: 139
Loss on hold-out set: 0.0232942614728879
MeanAbsoluteError value on hold-out data: 0.12011905759572983
Epoch: 140
Loss on hold-out set: 0.02321134784602021
MeanAbsoluteError value on hold-out data: 0.11981537938117981
Epoch: 141
Loss on hold-out set: 0.023404302173539213
MeanAbsoluteError value on hold-out data: 0.12108772248029709
Epoch: 142
Loss on hold-out set: 0.023255320707041966
MeanAbsoluteError value on hold-out data: 0.12021604925394058
Epoch: 143

Loss on hold-out set: 0.02322356350180742
MeanAbsoluteError value on hold-out data: 0.12075341492891312
Epoch: 144
Loss on hold-out set: 0.023054781100271565
MeanAbsoluteError value on hold-out data: 0.1198543831706047
Epoch: 145
Loss on hold-out set: 0.023160834747709726
MeanAbsoluteError value on hold-out data: 0.12023603916168213
Epoch: 146
Loss on hold-out set: 0.022904943466480625
MeanAbsoluteError value on hold-out data: 0.11925747990608215
Epoch: 147
Loss on hold-out set: 0.02294220782718376
MeanAbsoluteError value on hold-out data: 0.11952020972967148
Epoch: 148
Loss on hold-out set: 0.022747315343861516
```

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MeanAbsoluteError value on hold-out data: 0.118761345744133
Epoch: 149
Loss on hold-out set: 0.022816916768390098
MeanAbsoluteError value on hold-out data: 0.119159035384655
Epoch: 150
Loss on hold-out set: 0.02323412966277254
MeanAbsoluteError value on hold-out data: 0.12041532248258591
Epoch: 151
Loss on hold-out set: 0.02371508497009544
MeanAbsoluteError value on hold-out data: 0.1204964816570282
Epoch: 152
Loss on hold-out set: 0.022731374593843754
MeanAbsoluteError value on hold-out data: 0.11898672580718994
Epoch: 153
Loss on hold-out set: 0.02201898484245727
MeanAbsoluteError value on hold-out data: 0.1174682229757309
Epoch: 154
Loss on hold-out set: 0.022419455828831383
MeanAbsoluteError value on hold-out data: 0.11802501976490021
Epoch: 155

Loss on hold-out set: 0.022735292851728827
MeanAbsoluteError value on hold-out data: 0.11874179542064667
Epoch: 156
Loss on hold-out set: 0.02224703484803046
MeanAbsoluteError value on hold-out data: 0.11745789647102356
Epoch: 157
Loss on hold-out set: 0.02217813524858732
MeanAbsoluteError value on hold-out data: 0.11724356561899185
Epoch: 158
Loss on hold-out set: 0.022113482700660825
MeanAbsoluteError value on hold-out data: 0.11710062623023987
Epoch: 159
Loss on hold-out set: 0.022074303026066014
MeanAbsoluteError value on hold-out data: 0.11711381375789642
Epoch: 160
Loss on hold-out set: 0.02201893482063162
MeanAbsoluteError value on hold-out data: 0.11700514703989029
Epoch: 161
Loss on hold-out set: 0.021880102809518576
MeanAbsoluteError value on hold-out data: 0.11640316247940063
Epoch: 162
```

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Loss on hold-out set: 0.022206538883773 12
MeanAbsoluteError value on hold-out data: 0.11721035093069077
Epoch: 163
Loss on hold-out set: 0.022044504674053507
MeanAbsoluteError value on hold-out data: 0.1168762594461441
Epoch: 164
Loss on hold-out set: 0.02197988903591115
MeanAbsoluteError value on hold-out data: 0.11646906286478043
Epoch: 165
Loss on hold-out set: 0.02149726883018095
MeanAbsoluteError value on hold-out data: 0.11564431339502335
Epoch: 166
Loss on hold-out set: 0.021599578818208294
MeanAbsoluteError value on hold-out data: 0.11583277583122253
Epoch: 167

Loss on hold-out set: 0.02149677543753856
MeanAbsoluteError value on hold-out data: 0.11548933386802673
Epoch: 168
Loss on hold-out set: 0.021461594837570663
MeanAbsoluteError value on hold-out data: 0.11493607610464096
Epoch: 169
Loss on hold-out set: 0.021604271311508983
MeanAbsoluteError value on hold-out data: 0.11596634984016418
Epoch: 170
Loss on hold-out set: 0.021244466966508252
MeanAbsoluteError value on hold-out data: 0.11462870240211487
Epoch: 171
Loss on hold-out set: 0.021162835488978186
MeanAbsoluteError value on hold-out data: 0.11436320096254349
Epoch: 172
Loss on hold-out set: 0.021126096087851022
MeanAbsoluteError value on hold-out data: 0.11514865607023239
Epoch: 173
Loss on hold-out set: 0.02103935688194868
MeanAbsoluteError value on hold-out data: 0.1142163947224617
Epoch: 174
Loss on hold-out set: 0.02097133882833939
MeanAbsoluteError value on hold-out data: 0.113898865878582
Epoch: 175
Loss on hold-out set: 0.02084683569295234
MeanAbsoluteError value on hold-out data: 0.11371830105781555
```

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Epoch: 176
Loss on hold-out set: 0.020990824363635557
MeanAbsoluteError value on hold-out data: 0.11416617035865784
Epoch: 177
Loss on hold-out set: 0.020701149882944792
MeanAbsoluteError value on hold-out data: 0.11333094537258148
Epoch: 178
Loss on hold-out set: 0.020706516604772525
MeanAbsoluteError value on hold-out data: 0.11353622376918793
Epoch: 179


Loss on hold-out set: 0.02057993633819646
MeanAbsoluteError value on hold-out data: 0.11328785121440887
Epoch: 180
Loss on hold-out set: 0.020556342996362793
MeanAbsoluteError value on hold-out data: 0.11286275088787079
Epoch: 181
Loss on hold-out set: 0.02027700592665688
MeanAbsoluteError value on hold-out data: 0.11229156702756882
Epoch: 182
Loss on hold-out set: 0.020382636410527323
MeanAbsoluteError value on hold-out data: 0.1125444546341896
Epoch: 183
Loss on hold-out set: 0.02042289450764656
MeanAbsoluteError value on hold-out data: 0.11240524053573608
Epoch: 184
Loss on hold-out set: 0.022255818947757546
MeanAbsoluteError value on hold-out data: 0.11524369567632675
Epoch: 185
Loss on hold-out set: 0.020242043305188417
MeanAbsoluteError value on hold-out data: 0.11245092749595642
Epoch: 186
Loss on hold-out set: 0.020099554701071037
MeanAbsoluteError value on hold-out data: 0.11194059997797012
Epoch: 187
Loss on hold-out set: 0.020051058528846817
MeanAbsoluteError value on hold-out data: 0.11172562837600708
Epoch: 188
Loss on hold-out set: 0.020052113656052632
MeanAbsoluteError value on hold-out data: 0.1116037517786026
Epoch: 189
Loss on hold-out set: 0.020660553703476723
```

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MeanAbsoluteError value on hold-out data: 0.11233679205179214
Epoch: 190
Loss on hold-out set: 0.019692650640775498
MeanAbsoluteError value on hold-out data: 0.11060049384832382
Epoch: 191

Loss on hold-out set: 0.019659190475450533
MeanAbsoluteError value on hold-out data: 0.11057350039482117
Epoch: 192
Loss on hold-out set: 0.019743375688497173
MeanAbsoluteError value on hold-out data: 0.11055788397789001
Epoch: 193
Loss on hold-out set: 0.019549553110999495
MeanAbsoluteError value on hold-out data: 0.11036047339439392
Epoch: 194
Loss on hold-out set: 0.01938988800209604
MeanAbsoluteError value on hold-out data: 0.1099090725183487
Epoch: 195
Loss on hold-out set: 0.019463114354661422
MeanAbsoluteError value on hold-out data: 0.1100471094250679
Epoch: 196
Loss on hold-out set: 0.019355935485739457
MeanAbsoluteError value on hold-out data: 0.1097554937005043
Epoch: 197
Loss on hold-out set: 0.019186926785072212
MeanAbsoluteError value on hold-out data: 0.10925649106502533
Epoch: 198
Loss on hold-out set: 0.01914098633355216
MeanAbsoluteError value on hold-out data: 0.10898471623659134
Epoch: 199
Loss on hold-out set: 0.019011451078480797
MeanAbsoluteError value on hold-out data: 0.10858611762523651
Epoch: 200
Loss on hold-out set: 0.018969312016116947
MeanAbsoluteError value on hold-out data: 0.10852231085300446
Epoch: 201
Loss on hold-out set: 0.018791562289391692
MeanAbsoluteError value on hold-out data: 0.10818193852901459
Epoch: 202
Loss on hold-out set: 0.018794804296799396
MeanAbsoluteError value on hold-out data: 0.10837305337190628
Epoch: 203
```

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Loss on hold-out set: 0.018680709855336892
MeanAbsoluteError value on hold-out data: 0.10797148197889328
Epoch: 204
Loss on hold-out set: 0.01831601534381901
MeanAbsoluteError value on hold-out data: 0.10684337466955185
Epoch: 205
Loss on hold-out set: 0.01848246994134235
MeanAbsoluteError value on hold-out data: 0.1070624440908432
Epoch: 206
Loss on hold-out set: 0.018151238903795417
MeanAbsoluteError value on hold-out data: 0.10636742413043976
Epoch: 207
Loss on hold-out set: 0.018898849939241222
MeanAbsoluteError value on hold-out data: 0.10795409977436066
Epoch: 208
Loss on hold-out set: 0.018188779119794305
MeanAbsoluteError value on hold-out data: 0.1064424216747284
Epoch: 209
Loss on hold-out set: 0.018525854892734634
MeanAbsoluteError value on hold-out data: 0.10779225826263428
Epoch: 210
Loss on hold-out set: 0.0183330565127299
MeanAbsoluteError value on hold-out data: 0.1070449948310852
Epoch: 211
Loss on hold-out set: 0.018370906748857937
MeanAbsoluteError value on hold-out data: 0.10732687264680862
Epoch: 212
Loss on hold-out set: 0.017905267568207102
MeanAbsoluteError value on hold-out data: 0.10575823485851288
Epoch: 213
Loss on hold-out set: 0.017801041065372135
MeanAbsoluteError value on hold-out data: 0.1056157723069191
Epoch: 214
Loss on hold-out set: 0.01792539756647066
MeanAbsoluteError value on hold-out data: 0.10547392815351486
Epoch: 215

Loss on hold-out set: 0.017797857682269654
MeanAbsoluteError value on hold-out data: 0.10527236014604568
Epoch: 216
Loss on hold-out set: 0.017611378399459154
MeanAbsoluteError value on hold-out data: 0.10497079789638519
```

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Epoch: 217
Loss on hold-out set: 0.017552174738069113
MeanAbsoluteError value on hold-out data: 0.1048414558172226
Epoch: 218
Loss on hold-out set: 0.017549206833600214
MeanAbsoluteError value on hold-out data: 0.10449862480163574
Epoch: 219
Loss on hold-out set: 0.01843864729284848
MeanAbsoluteError value on hold-out data: 0.106554314494133
Epoch: 220
Loss on hold-out set: 0.01750968926047024
MeanAbsoluteError value on hold-out data: 0.10465012490749359
Epoch: 221
Loss on hold-out set: 0.017154831917172198
MeanAbsoluteError value on hold-out data: 0.10364329069852829
Epoch: 222
Loss on hold-out set: 0.017144633064928808
MeanAbsoluteError value on hold-out data: 0.10383941233158112
Epoch: 223
Loss on hold-out set: 0.01715003474811582
MeanAbsoluteError value on hold-out data: 0.10335065424442291
Epoch: 224
Loss on hold-out set: 0.017538932838330145
MeanAbsoluteError value on hold-out data: 0.10400862991809845
Epoch: 225
Loss on hold-out set: 0.016811363803418845
MeanAbsoluteError value on hold-out data: 0.10265810787677765
Epoch: 226
Loss on hold-out set: 0.016639234216295574
MeanAbsoluteError value on hold-out data: 0.10218437016010284
Epoch: 227

Loss on hold-out set: 0.01653419600456561
MeanAbsoluteError value on hold-out data: 0.10176951438188553
Epoch: 228
Loss on hold-out set: 0.01651018145984333
MeanAbsoluteError value on hold-out data: 0.10192359238862991
Epoch: 229
Loss on hold-out set: 0.016541494215887628
MeanAbsoluteError value on hold-out data: 0.10183876007795334
Epoch: 230
Loss on hold-out set: 0.017045061079491126
```

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MeanAbsoluteError value on hold-out data: 0.10256515443325043
Epoch: 231
Loss on hold-out set: 0.01611585484964675
MeanAbsoluteError value on hold-out data: 0.10049574077129364
Epoch: 232
Loss on hold-out set: 0.01723058418811936
MeanAbsoluteError value on hold-out data: 0.10236354917287827
Epoch: 233
Loss on hold-out set: 0.016418044921010733
MeanAbsoluteError value on hold-out data: 0.10135908424854279
Epoch: 234
Loss on hold-out set: 0.015875619125405426
MeanAbsoluteError value on hold-out data: 0.09950065612792969
Epoch: 235
Loss on hold-out set: 0.01593482207604929
MeanAbsoluteError value on hold-out data: 0.09977613389492035
Epoch: 236
Loss on hold-out set: 0.015722744669275063
MeanAbsoluteError value on hold-out data: 0.09926871955394745
Epoch: 237
Loss on hold-out set: 0.01561102938936337
MeanAbsoluteError value on hold-out data: 0.0988922119140625
Epoch: 238
Loss on hold-out set: 0.015587574410203257
MeanAbsoluteError value on hold-out data: 0.09894173592329025
Epoch: 239

Loss on hold-out set: 0.0155138821022487
MeanAbsoluteError value on hold-out data: 0.0988083928823471
Epoch: 240
Loss on hold-out set: 0.01583123259785536
MeanAbsoluteError value on hold-out data: 0.09931224584579468
Epoch: 241
Loss on hold-out set: 0.016371579583440172
MeanAbsoluteError value on hold-out data: 0.1002359613776207
Epoch: 242
Loss on hold-out set: 0.015095141728555686
MeanAbsoluteError value on hold-out data: 0.09738738089799881
Epoch: 243
Loss on hold-out set: 0.015121005487775332
MeanAbsoluteError value on hold-out data: 0.09749878197908401
Epoch: 244
```

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Loss on hold-out set: 0.01501142297332224
MeanAbsoluteError value on hold-out data: 0.09723982959985733
Epoch: 245
Loss on hold-out set: 0.01512931755400802
MeanAbsoluteError value on hold-out data: 0.09751014411449432
Epoch: 246
Loss on hold-out set: 0.015073393238708377
MeanAbsoluteError value on hold-out data: 0.09713176637887955
Epoch: 247
Loss on hold-out set: 0.015531412411579177
MeanAbsoluteError value on hold-out data: 0.09831395745277405
Epoch: 248
Loss on hold-out set: 0.014672747126927501
MeanAbsoluteError value on hold-out data: 0.09606106579303741
Epoch: 249
Loss on hold-out set: 0.014942506965445844
MeanAbsoluteError value on hold-out data: 0.09663927555084229
Epoch: 250


Loss on hold-out set: 0.014417544509725351
MeanAbsoluteError value on hold-out data: 0.09524711221456528
Epoch: 251
Loss on hold-out set: 0.014221242573847504
MeanAbsoluteError value on hold-out data: 0.09449361264705658
Epoch: 252
Loss on hold-out set: 0.014174263832453442
MeanAbsoluteError value on hold-out data: 0.09476542472839355
Epoch: 253
Loss on hold-out set: 0.014113735499497699
MeanAbsoluteError value on hold-out data: 0.09417657554149628
Epoch: 254
Loss on hold-out set: 0.013976256865517874
MeanAbsoluteError value on hold-out data: 0.09353960305452347
Epoch: 255
Loss on hold-out set: 0.01476578525341067
MeanAbsoluteError value on hold-out data: 0.09598888456821442
Epoch: 256
Loss on hold-out set: 0.013868556431445637
MeanAbsoluteError value on hold-out data: 0.09358832985162735
Epoch: 257
Loss on hold-out set: 0.013928520652514539
MeanAbsoluteError value on hold-out data: 0.09358058124780655
```

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Epoch: 258
Loss on hold-out set: 0.014523131717731686
MeanAbsoluteError value on hold-out data: 0.09456093609333038
Epoch: 259
Loss on hold-out set: 0.01407036378881649
MeanAbsoluteError value on hold-out data: 0.09420943260192871
Epoch: 260
Loss on hold-out set: 0.013556382821039542
MeanAbsoluteError value on hold-out data: 0.09284940361976624
Epoch: 261
```

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Loss on hold-out set: 0.013772094132084595
MeanAbsoluteError value on hold-out data: 0.09295887500047684
Epoch: 262
Loss on hold-out set: 0.013228543041470019
MeanAbsoluteError value on hold-out data: 0.09106487780809402
Epoch: 263
Loss on hold-out set: 0.01325282636466191
MeanAbsoluteError value on hold-out data: 0.09121712297201157
Epoch: 264
Loss on hold-out set: 0.013078157067004787
MeanAbsoluteError value on hold-out data: 0.09069923311471939
Epoch: 265
Loss on hold-out set: 0.013156838476118681
MeanAbsoluteError value on hold-out data: 0.09098505973815918
Epoch: 266
Loss on hold-out set: 0.012664623374707605
MeanAbsoluteError value on hold-out data: 0.08953144401311874
Epoch: 267
Loss on hold-out set: 0.013084286964792562
MeanAbsoluteError value on hold-out data: 0.09057478606700897
Epoch: 268
Loss on hold-out set: 0.012790032092628903
MeanAbsoluteError value on hold-out data: 0.09010933339595795
Epoch: 269
Loss on hold-out set: 0.012913738965596023
MeanAbsoluteError value on hold-out data: 0.08994783461093903
Epoch: 270
Loss on hold-out set: 0.013592863210329884
MeanAbsoluteError value on hold-out data: 0.09010741859674454
Epoch: 271
Loss on hold-out set: 0.012467049393116644
```

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MeanAbsoluteError value on hold-out data: 0.08890008926391602
Epoch: 272

Loss on hold-out set: 0.012349976379865487
MeanAbsoluteError value on hold-out data: 0.08820097148418427
Epoch: 273
Loss on hold-out set: 0.012258905843880615
MeanAbsoluteError value on hold-out data: 0.08787495642900467
Epoch: 274
Loss on hold-out set: 0.012165617062955311
MeanAbsoluteError value on hold-out data: 0.08727718889713287
Epoch: 275
Loss on hold-out set: 0.012041751442379072
MeanAbsoluteError value on hold-out data: 0.08723100274801254
Epoch: 276
Loss on hold-out set: 0.012022650065390687
MeanAbsoluteError value on hold-out data: 0.087256520986557
Epoch: 277
Loss on hold-out set: 0.01182659723379306
MeanAbsoluteError value on hold-out data: 0.08659619092941284
Epoch: 278
Loss on hold-out set: 0.01317785661299958
MeanAbsoluteError value on hold-out data: 0.08704650402069092
Epoch: 279
Loss on hold-out set: 0.012380996394265247
MeanAbsoluteError value on hold-out data: 0.08762799203395844
Epoch: 280
Loss on hold-out set: 0.012723700713219219
MeanAbsoluteError value on hold-out data: 0.086870476603508
Epoch: 281
Loss on hold-out set: 0.011461101325326845
MeanAbsoluteError value on hold-out data: 0.08529651910066605
Epoch: 282
Loss on hold-out set: 0.011371111662715282
MeanAbsoluteError value on hold-out data: 0.0848199725151062
Epoch: 283
Loss on hold-out set: 0.01148819319879342
MeanAbsoluteError value on hold-out data: 0.08555395156145096
Epoch: 284

Loss on hold-out set: 0.012045418371838567
MeanAbsoluteError value on hold-out data: 0.0858926996588707
```

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Epoch: 285
Loss on hold-out set: 0.011019533959609506
MeanAbsoluteError value on hold-out data: 0.08360833674669266
Epoch: 286
Loss on hold-out set: 0.011674451133187273
MeanAbsoluteError value on hold-out data: 0.08522060513496399
Epoch: 287
Loss on hold-out set: 0.011926101679962716
MeanAbsoluteError value on hold-out data: 0.08447889983654022
Epoch: 288
Loss on hold-out set: 0.011000964980523446
MeanAbsoluteError value on hold-out data: 0.0828862413764
Epoch: 289
Loss on hold-out set: 0.011081683051184212
MeanAbsoluteError value on hold-out data: 0.08345852792263031
Epoch: 290
Loss on hold-out set: 0.011482300175549952
MeanAbsoluteError value on hold-out data: 0.08441510051488876
Epoch: 291
Loss on hold-out set: 0.01063295640664077
MeanAbsoluteError value on hold-out data: 0.08214946836233139
Epoch: 292
Loss on hold-out set: 0.010593495319450372
MeanAbsoluteError value on hold-out data: 0.08200991153717041
Epoch: 293
Loss on hold-out set: 0.010749135840390073
MeanAbsoluteError value on hold-out data: 0.08238915354013443
Epoch: 294
Loss on hold-out set: 0.01039709397714193
MeanAbsoluteError value on hold-out data: 0.0812930092215538
Epoch: 295
Loss on hold-out set: 0.010436920020239134
MeanAbsoluteError value on hold-out data: 0.08104534447193146
Epoch: 296

Loss on hold-out set: 0.010393115342594683
MeanAbsoluteError value on hold-out data: 0.08056071400642395
Epoch: 297
Loss on hold-out set: 0.01058292317841398
MeanAbsoluteError value on hold-out data: 0.08185536414384842
Epoch: 298
Loss on hold-out set: 0.01111366898801766
```

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MeanAbsoluteError value on hold-out data: 0.08230647444725037
Epoch: 299
Loss on hold-out set: 0.00968531842686628
MeanAbsoluteError value on hold-out data: 0.07851683348417282
Epoch: 300
Loss on hold-out set: 0.010028578561583632
MeanAbsoluteError value on hold-out data: 0.07960429787635803
Epoch: 301
Loss on hold-out set: 0.009456746234239912
MeanAbsoluteError value on hold-out data: 0.0776200070977211
Epoch: 302
Loss on hold-out set: 0.00967082002592322
MeanAbsoluteError value on hold-out data: 0.07842865586280823
Epoch: 303
Loss on hold-out set: 0.00978735064180862
MeanAbsoluteError value on hold-out data: 0.07832492142915726
Epoch: 304
Loss on hold-out set: 0.009474753699338945
MeanAbsoluteError value on hold-out data: 0.0779242143034935
Epoch: 305
Loss on hold-out set: 0.009547592214259663
MeanAbsoluteError value on hold-out data: 0.07733172178268433
Epoch: 306
Loss on hold-out set: 0.009131042994436268
MeanAbsoluteError value on hold-out data: 0.0761641263961792
Epoch: 307
Loss on hold-out set: 0.009408445642819922
MeanAbsoluteError value on hold-out data: 0.07718942314386368
Epoch: 308

Loss on hold-out set: 0.008943852769382494
MeanAbsoluteError value on hold-out data: 0.07561268657445908
Epoch: 309
Loss on hold-out set: 0.009049545915331692
MeanAbsoluteError value on hold-out data: 0.07578058540821075
Epoch: 310
Loss on hold-out set: 0.008894311766581316
MeanAbsoluteError value on hold-out data: 0.07567360252141953
Epoch: 311
Loss on hold-out set: 0.008677626050101887
MeanAbsoluteError value on hold-out data: 0.074908547103405
Epoch: 312
```

```
Loss on hold-out set: 0.009143508413169337
MeanAbsoluteError value on hold-out data: 0.07421819865703583
Epoch: 313
Loss on hold-out set: 0.007406821691945784
MeanAbsoluteError value on hold-out data: 0.06943696737289429
Epoch: 314
Loss on hold-out set: 0.00724635832930768
MeanAbsoluteError value on hold-out data: 0.06852269172668457
Epoch: 315
Loss on hold-out set: 0.007198729481866681
MeanAbsoluteError value on hold-out data: 0.06829842180013657
Epoch: 316
Loss on hold-out set: 0.008186841674614698
MeanAbsoluteError value on hold-out data: 0.07018115371465683
Epoch: 317
Loss on hold-out set: 0.006848575446240015
MeanAbsoluteError value on hold-out data: 0.06700697541236877
Epoch: 318
Loss on hold-out set: 0.0067045604902025505
MeanAbsoluteError value on hold-out data: 0.0662500411272049
Epoch: 319
Loss on hold-out set: 0.006886950219172593
MeanAbsoluteError value on hold-out data: 0.06585253030061722
Epoch: 320

Loss on hold-out set: 0.00650021341310716
MeanAbsoluteError value on hold-out data: 0.06476552039384842
Epoch: 321
Loss on hold-out set: 0.006296339628629778
MeanAbsoluteError value on hold-out data: 0.06401921808719635
Epoch: 322
Loss on hold-out set: 0.006140050367991391
MeanAbsoluteError value on hold-out data: 0.06322938948869705
Epoch: 323
Loss on hold-out set: 0.0062189502580287425
MeanAbsoluteError value on hold-out data: 0.06302732974290848
Epoch: 324
Loss on hold-out set: 0.006631921459062907
MeanAbsoluteError value on hold-out data: 0.06461071968078613
Epoch: 325
Loss on hold-out set: 0.006216047478741721
MeanAbsoluteError value on hold-out data: 0.06313902139663696
```

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Epoch: 326
Loss on hold-out set: 0.006010337558109313
MeanAbsoluteError value on hold-out data: 0.0625510960817337
Epoch: 327
Loss on hold-out set: 0.00559731005494924
MeanAbsoluteError value on hold-out data: 0.060643527656793594
Epoch: 328
Loss on hold-out set: 0.006574166855946379
MeanAbsoluteError value on hold-out data: 0.062794528901577
Epoch: 329
Loss on hold-out set: 0.005810545812557011
MeanAbsoluteError value on hold-out data: 0.06154659390449524
Epoch: 330
Loss on hold-out set: 0.005559765635744522
MeanAbsoluteError value on hold-out data: 0.059952232986688614
Epoch: 331
Loss on hold-out set: 0.0054909270838834345
MeanAbsoluteError value on hold-out data: 0.05950763821601868
Epoch: 332

Loss on hold-out set: 0.0070338518646741776
MeanAbsoluteError value on hold-out data: 0.0614742711186409
Epoch: 333
Loss on hold-out set: 0.005534947497500597
MeanAbsoluteError value on hold-out data: 0.0593077577650547
Epoch: 334
Loss on hold-out set: 0.005569162003475388
MeanAbsoluteError value on hold-out data: 0.05897635221481323
Epoch: 335
Loss on hold-out set: 0.007037824944985148
MeanAbsoluteError value on hold-out data: 0.0614873506128788
Epoch: 336
Loss on hold-out set: 0.005442437884324279
MeanAbsoluteError value on hold-out data: 0.058563150465488434
Epoch: 337
Loss on hold-out set: 0.0050226373408038755
MeanAbsoluteError value on hold-out data: 0.05663497373461723
Epoch: 338
Loss on hold-out set: 0.005564242766826953
MeanAbsoluteError value on hold-out data: 0.0577348954975605
Epoch: 339
Loss on hold-out set: 0.004741094406007936
```

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MeanAbsoluteError value on hold-out data: 0.05558926984667778
Epoch: 340
Loss on hold-out set: 0.004692762480485008
MeanAbsoluteError value on hold-out data: 0.05528709292411804
Epoch: 341
Loss on hold-out set: 0.005238412815072623
MeanAbsoluteError value on hold-out data: 0.05677095428109169
Epoch: 342
Loss on hold-out set: 0.0048436824581585824
MeanAbsoluteError value on hold-out data: 0.05632227659225464
Epoch: 343
Loss on hold-out set: 0.00564109920340247
MeanAbsoluteError value on hold-out data: 0.05690006911754608
Epoch: 344
```

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Loss on hold-out set: 0.0043939210468364
MeanAbsoluteError value on hold-out data: 0.053590480238199234
Epoch: 345
Loss on hold-out set: 0.005403638216911962
MeanAbsoluteError value on hold-out data: 0.05460745468735695
Epoch: 346
Loss on hold-out set: 0.004481206975852777
MeanAbsoluteError value on hold-out data: 0.05399341508746147
Epoch: 347
Loss on hold-out set: 0.00812455520070599
MeanAbsoluteError value on hold-out data: 0.05833279341459274
Epoch: 348
Loss on hold-out set: 0.005019987862875783
MeanAbsoluteError value on hold-out data: 0.054505977779626846
Epoch: 349
Loss on hold-out set: 0.004270073213295913
MeanAbsoluteError value on hold-out data: 0.0518295094370842
Epoch: 350
Loss on hold-out set: 0.004355011366944956
MeanAbsoluteError value on hold-out data: 0.052401427179574966
Epoch: 351
Loss on hold-out set: 0.003993423974239512
MeanAbsoluteError value on hold-out data: 0.050963278859853745
Epoch: 352
Loss on hold-out set: 0.004383034082007055
MeanAbsoluteError value on hold-out data: 0.05167034640908241
Epoch: 353
```

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Loss on hold-out set: 0.0039040849905608126
MeanAbsoluteError value on hold-out data: 0.0501675046980381
Epoch: 354
Loss on hold-out set: 0.0038874355285722566
MeanAbsoluteError value on hold-out data: 0.050021737813949585
Epoch: 355
Loss on hold-out set: 0.0039059358425315863
MeanAbsoluteError value on hold-out data: 0.04978538677096367
Epoch: 356

Loss on hold-out set: 0.0048086563673630164
MeanAbsoluteError value on hold-out data: 0.05212489888072014
Epoch: 357
Loss on hold-out set: 0.004009886361401234
MeanAbsoluteError value on hold-out data: 0.04936303570866585
Epoch: 358
Loss on hold-out set: 0.0038240334573569463
MeanAbsoluteError value on hold-out data: 0.04941949248313904
Epoch: 359
Loss on hold-out set: 0.003615173534183812
MeanAbsoluteError value on hold-out data: 0.048097360879182816
Epoch: 360
Loss on hold-out set: 0.0033883331067811107
MeanAbsoluteError value on hold-out data: 0.04702981561422348
Epoch: 361
Loss on hold-out set: 0.0033538634230162166
MeanAbsoluteError value on hold-out data: 0.04680534824728966
Epoch: 362
Loss on hold-out set: 0.003439751822856794
MeanAbsoluteError value on hold-out data: 0.04712386429309845
Epoch: 363
Loss on hold-out set: 0.003564173524194446
MeanAbsoluteError value on hold-out data: 0.046935807913541794
Epoch: 364
Loss on hold-out set: 0.00325812826294599
MeanAbsoluteError value on hold-out data: 0.04606236517429352
Epoch: 365
Loss on hold-out set: 0.003350375128272725
MeanAbsoluteError value on hold-out data: 0.046358734369277954
Epoch: 366
Loss on hold-out set: 0.003044097915622651
MeanAbsoluteError value on hold-out data: 0.0445476770401001
```

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Epoch: 367
Loss on hold-out set: 0.0034435206999708164
MeanAbsoluteError value on hold-out data: 0.04572885110974312
Epoch: 368

Loss on hold-out set: 0.0031721656927593835
MeanAbsoluteError value on hold-out data: 0.0449834018945694
Epoch: 369
Loss on hold-out set: 0.0031527227578120993
MeanAbsoluteError value on hold-out data: 0.04469163715839386
Epoch: 370
Loss on hold-out set: 0.004355412872667473
MeanAbsoluteError value on hold-out data: 0.04643210023641586
Epoch: 371
Loss on hold-out set: 0.00342455170673355
MeanAbsoluteError value on hold-out data: 0.04479857161641121
Epoch: 372
Loss on hold-out set: 0.003621391581346918
MeanAbsoluteError value on hold-out data: 0.04520708695054054
Epoch: 373
Loss on hold-out set: 0.003357010498324311
MeanAbsoluteError value on hold-out data: 0.044390857219696045
Epoch: 374
Loss on hold-out set: 0.002991054426131182
MeanAbsoluteError value on hold-out data: 0.04259015992283821
Epoch: 375
Loss on hold-out set: 0.003639817202623051
MeanAbsoluteError value on hold-out data: 0.04377802088856697
Epoch: 376
Loss on hold-out set: 0.002517914684415844
MeanAbsoluteError value on hold-out data: 0.04056701064109802
Epoch: 377
Loss on hold-out set: 0.003945134123664741
MeanAbsoluteError value on hold-out data: 0.0435156486928463
Epoch: 378
Loss on hold-out set: 0.0037060973975856447
MeanAbsoluteError value on hold-out data: 0.04396042972803116
Epoch: 379
Loss on hold-out set: 0.00256635353741187
MeanAbsoluteError value on hold-out data: 0.0398501418530941
Epoch: 380

Loss on hold-out set: 0.0024128313617486703
```

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MeanAbsoluteError value on hold-out data: 0.03961200639605522
Epoch: 381
Loss on hold-out set: 0.0025458002438474643
MeanAbsoluteError value on hold-out data: 0.039755016565322876
Epoch: 382
Loss on hold-out set: 0.0035214965832174607
MeanAbsoluteError value on hold-out data: 0.04102525860071182
Epoch: 383
Loss on hold-out set: 0.002936185938061068
MeanAbsoluteError value on hold-out data: 0.04042985290288925
Epoch: 384
Loss on hold-out set: 0.002809902167523672
MeanAbsoluteError value on hold-out data: 0.039642371237277985
Epoch: 385
Loss on hold-out set: 0.002629184340261609
MeanAbsoluteError value on hold-out data: 0.03854414075613022
Epoch: 386
Loss on hold-out set: 0.002327290567336604
MeanAbsoluteError value on hold-out data: 0.03784326836466789
Epoch: 387
Loss on hold-out set: 0.0030743857802774167
MeanAbsoluteError value on hold-out data: 0.04014718905091286
Epoch: 388
Loss on hold-out set: 0.004468975247092251
MeanAbsoluteError value on hold-out data: 0.040339067578315735
Epoch: 389
Loss on hold-out set: 0.0022233230885927028
MeanAbsoluteError value on hold-out data: 0.03707429766654968
Epoch: 390
Loss on hold-out set: 0.002399773030590854
MeanAbsoluteError value on hold-out data: 0.03644128516316414
Epoch: 391
Loss on hold-out set: 0.0023456950515729227
MeanAbsoluteError value on hold-out data: 0.0364176481962204
Epoch: 392

Loss on hold-out set: 0.005730365955969319
MeanAbsoluteError value on hold-out data: 0.041633184999227524
Epoch: 393
Loss on hold-out set: 0.0022179192318090876
MeanAbsoluteError value on hold-out data: 0.0354059599339962
Epoch: 394
```

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Loss on hold-out set: 0.003250151884889132
MeanAbsoluteError value on hold-out data: 0.03583575412631035
Epoch: 395
Loss on hold-out set: 0.0018638650424116733
MeanAbsoluteError value on hold-out data: 0.03450913727283478
Epoch: 396
Loss on hold-out set: 0.0020289068036761725
MeanAbsoluteError value on hold-out data: 0.034197159111499786
Epoch: 397
Loss on hold-out set: 0.0023978886908336884
MeanAbsoluteError value on hold-out data: 0.035581108182668686
Epoch: 398
Loss on hold-out set: 0.0023235466046332334
MeanAbsoluteError value on hold-out data: 0.03487445041537285
Epoch: 399
Loss on hold-out set: 0.002192091253451317
MeanAbsoluteError value on hold-out data: 0.03374850004911423
Epoch: 400
Loss on hold-out set: 0.00159922827151604
MeanAbsoluteError value on hold-out data: 0.03198893368244171
Epoch: 401
Loss on hold-out set: 0.0016367980868763927
MeanAbsoluteError value on hold-out data: 0.032035235315561295
Epoch: 402
Loss on hold-out set: 0.0021368191442697458
MeanAbsoluteError value on hold-out data: 0.033244095742702484
Epoch: 403
Loss on hold-out set: 0.0020183470493832013
MeanAbsoluteError value on hold-out data: 0.03277793899178505
Epoch: 404

Loss on hold-out set: 0.0018637348188540752
MeanAbsoluteError value on hold-out data: 0.031258855015039444
Epoch: 405
Loss on hold-out set: 0.0016494327175774072
MeanAbsoluteError value on hold-out data: 0.03139146789908409
Epoch: 406
Loss on hold-out set: 0.0021355423224648754
MeanAbsoluteError value on hold-out data: 0.03248903155326843
Epoch: 407
Loss on hold-out set: 0.0016184093807456328
MeanAbsoluteError value on hold-out data: 0.030559372156858444
```

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Epoch: 408
Loss on hold-out set: 0.00138010978499599
MeanAbsoluteError value on hold-out data: 0.02940712869167328
Epoch: 409
Loss on hold-out set: 0.0018588095186523308
MeanAbsoluteError value on hold-out data: 0.030960047617554665
Epoch: 410
Loss on hold-out set: 0.0031501990222176047
MeanAbsoluteError value on hold-out data: 0.032854113727808
Epoch: 411
Loss on hold-out set: 0.0013963464060859558
MeanAbsoluteError value on hold-out data: 0.0287201888859272
Epoch: 412
Loss on hold-out set: 0.0018356388341329109
MeanAbsoluteError value on hold-out data: 0.02947746030986309
Epoch: 413
Loss on hold-out set: 0.0012109929145816224
MeanAbsoluteError value on hold-out data: 0.02746354416012764
Epoch: 414
Loss on hold-out set: 0.001119924822935565
MeanAbsoluteError value on hold-out data: 0.0267030056566
Epoch: 415
Loss on hold-out set: 0.003544050449578974
MeanAbsoluteError value on hold-out data: 0.03235873952507973
Epoch: 416

Loss on hold-out set: 0.00207661594552184
MeanAbsoluteError value on hold-out data: 0.028181593865156174
Epoch: 417
Loss on hold-out set: 0.0018316854509880375
MeanAbsoluteError value on hold-out data: 0.027598978951573372
Epoch: 418
Loss on hold-out set: 0.002870897086962175
MeanAbsoluteError value on hold-out data: 0.029765047132968903
Epoch: 419
Loss on hold-out set: 0.0016800934781234613
MeanAbsoluteError value on hold-out data: 0.027307618409395218
Epoch: 420
Loss on hold-out set: 0.0009480936193875479
MeanAbsoluteError value on hold-out data: 0.024546049535274506
Epoch: 421
Loss on hold-out set: 0.0011460747375263293
```

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MeanAbsoluteError value on hold-out data: 0.025613322854042053
Epoch: 422
Loss on hold-out set: 0.0010566231741043004
MeanAbsoluteError value on hold-out data: 0.024674730375409126
Epoch: 423
Loss on hold-out set: 0.0010600984747533833
MeanAbsoluteError value on hold-out data: 0.02490507997572422
Epoch: 424
Loss on hold-out set: 0.001962463108755305
MeanAbsoluteError value on hold-out data: 0.02610469050705433
Epoch: 425
Loss on hold-out set: 0.0009444281060591732
MeanAbsoluteError value on hold-out data: 0.02331778220832348
Epoch: 426
Loss on hold-out set: 0.0010426116427161584
MeanAbsoluteError value on hold-out data: 0.023669350892305374
Epoch: 427
Loss on hold-out set: 0.0008497563191524119
MeanAbsoluteError value on hold-out data: 0.02247169241309166
Epoch: 428

Loss on hold-out set: 0.0018509849078806216
MeanAbsoluteError value on hold-out data: 0.02571479044854641
Epoch: 429
Loss on hold-out set: 0.0011302869032461832
MeanAbsoluteError value on hold-out data: 0.022938407957553864
Epoch: 430
Loss on hold-out set: 0.00216474768852717
MeanAbsoluteError value on hold-out data: 0.024083776399493217
Epoch: 431
Loss on hold-out set: 0.0017871023435298795
MeanAbsoluteError value on hold-out data: 0.02366306073963642
Epoch: 432
Loss on hold-out set: 0.0010151130998948294
MeanAbsoluteError value on hold-out data: 0.022843357175588608
Epoch: 433
Loss on hold-out set: 0.0014685190954447822
MeanAbsoluteError value on hold-out data: 0.023224569857120514
Epoch: 434
Loss on hold-out set: 0.0010846371461459632
MeanAbsoluteError value on hold-out data: 0.02152407355606556
Epoch: 435
```

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Loss on hold-out set: 0.001785381944117896
MeanAbsoluteError value on hold-out data: 0.022927846759557724
Epoch: 436
Loss on hold-out set: 0.0014313396413375525
MeanAbsoluteError value on hold-out data: 0.022163916379213333
Epoch: 437
Loss on hold-out set: 0.000857638178307465
MeanAbsoluteError value on hold-out data: 0.020405776798725128
Epoch: 438
Loss on hold-out set: 0.0009266103914246502
MeanAbsoluteError value on hold-out data: 0.020170092582702637
Epoch: 439
Loss on hold-out set: 0.0012963123801072423
MeanAbsoluteError value on hold-out data: 0.020222404971718788
Epoch: 440


Loss on hold-out set: 0.0010153625576334122
MeanAbsoluteError value on hold-out data: 0.019934512674808502
Epoch: 441
Loss on hold-out set: 0.0005731258815534314
MeanAbsoluteError value on hold-out data: 0.01826510578393936
Epoch: 442
Loss on hold-out set: 0.0005173684464687923
MeanAbsoluteError value on hold-out data: 0.017831265926361084
Epoch: 443
Loss on hold-out set: 0.0043244973410190525
MeanAbsoluteError value on hold-out data: 0.02541729249060154
Epoch: 444
Loss on hold-out set: 0.0012672420190555339
MeanAbsoluteError value on hold-out data: 0.02180686593055725
Epoch: 445
Loss on hold-out set: 0.0005214676057221368
MeanAbsoluteError value on hold-out data: 0.017370207235217094
Epoch: 446
Loss on hold-out set: 0.0006167958237806728
MeanAbsoluteError value on hold-out data: 0.017408831045031548
Epoch: 447
Loss on hold-out set: 0.0009181712010008356
MeanAbsoluteError value on hold-out data: 0.018645763397216797
Epoch: 448
Loss on hold-out set: 0.0005235773701554679
MeanAbsoluteError value on hold-out data: 0.01631014794111252
```

```
Epoch: 449
Loss on hold-out set: 0.00042962801154843825
MeanAbsoluteError value on hold-out data: 0.0158933587372303
Epoch: 450
Loss on hold-out set: 0.0005812326468769338
MeanAbsoluteError value on hold-out data: 0.016757793724536896
Epoch: 451
Loss on hold-out set: 0.0010636585638597975
MeanAbsoluteError value on hold-out data: 0.017386583611369133
Epoch: 452

Loss on hold-out set: 0.0007198006820353361
MeanAbsoluteError value on hold-out data: 0.016344711184501648
Epoch: 453
Loss on hold-out set: 0.0011628287249646075
MeanAbsoluteError value on hold-out data: 0.016184518113732338
Epoch: 454
Loss on hold-out set: 0.0018463754114284377
MeanAbsoluteError value on hold-out data: 0.017566440626978874
Epoch: 455
Loss on hold-out set: 0.0010098031820426083
MeanAbsoluteError value on hold-out data: 0.01617281138896942
Epoch: 456
Loss on hold-out set: 0.000422299488395526
MeanAbsoluteError value on hold-out data: 0.014560316689312458
Epoch: 457
Loss on hold-out set: 0.0006739702653966992
MeanAbsoluteError value on hold-out data: 0.01568426750600338
Epoch: 458
Loss on hold-out set: 0.0009604494757934988
MeanAbsoluteError value on hold-out data: 0.015860693529248238
Epoch: 459
Loss on hold-out set: 0.0003101537438755929
MeanAbsoluteError value on hold-out data: 0.013202200643718243
Epoch: 460
Loss on hold-out set: 0.0004229859035771561
MeanAbsoluteError value on hold-out data: 0.013320228084921837
Epoch: 461
Loss on hold-out set: 0.0004899408926767615
MeanAbsoluteError value on hold-out data: 0.01366695761680603
Epoch: 462
Loss on hold-out set: 0.0002641877384265076
```

```
MeanAbsoluteError value on hold-out data: 0.012301875278353691
Epoch: 463
Loss on hold-out set: 0.0008694655577863543
MeanAbsoluteError value on hold-out data: 0.014560677111148834
Epoch: 464

Loss on hold-out set: 0.0006336345131306811
MeanAbsoluteError value on hold-out data: 0.013838430866599083
Epoch: 465
Loss on hold-out set: 0.0016065608477602883
MeanAbsoluteError value on hold-out data: 0.014911973848938942
Epoch: 466
Loss on hold-out set: 0.0007039026329852947
MeanAbsoluteError value on hold-out data: 0.013595843687653542
Epoch: 467
Loss on hold-out set: 0.0004082414898699713
MeanAbsoluteError value on hold-out data: 0.01386612094938755
Epoch: 468
Loss on hold-out set: 0.0003409776889288639
MeanAbsoluteError value on hold-out data: 0.01195351593196392
Epoch: 469
Loss on hold-out set: 0.0006902449090136399
MeanAbsoluteError value on hold-out data: 0.012710017152130604
Epoch: 470
Loss on hold-out set: 0.0010106860701949028
MeanAbsoluteError value on hold-out data: 0.013239141553640366
Epoch: 471
Loss on hold-out set: 0.00029585706416630845
MeanAbsoluteError value on hold-out data: 0.011495065875351429
Epoch: 472
Loss on hold-out set: 0.0008549765306701087
MeanAbsoluteError value on hold-out data: 0.012853328138589859
Epoch: 473
Loss on hold-out set: 0.0013506122651099424
MeanAbsoluteError value on hold-out data: 0.014025712385773659
Epoch: 474
Loss on hold-out set: 0.00045924872086432417
MeanAbsoluteError value on hold-out data: 0.01164537575095892
Epoch: 475
Loss on hold-out set: 0.0010416735988320923
MeanAbsoluteError value on hold-out data: 0.011578509584069252
Epoch: 476
```

```
Loss on hold-out set: 0.002665881544281116
MeanAbsoluteError value on hold-out data: 0.013985543511807919
Epoch: 477
Loss on hold-out set: 0.0010313741492465947
MeanAbsoluteError value on hold-out data: 0.013237101025879383
Epoch: 478
Loss on hold-out set: 0.0009769001970581532
MeanAbsoluteError value on hold-out data: 0.012231742963194847
Epoch: 479
Loss on hold-out set: 0.00017757292430599735
MeanAbsoluteError value on hold-out data: 0.009002278558909893
Epoch: 480
Loss on hold-out set: 0.0016442147928165994
MeanAbsoluteError value on hold-out data: 0.013704241253435612
Epoch: 481
Loss on hold-out set: 0.0007070019932335095
MeanAbsoluteError value on hold-out data: 0.011177456006407738
Epoch: 482
Loss on hold-out set: 0.0004255236433317278
MeanAbsoluteError value on hold-out data: 0.009650112129747868
Epoch: 483
Loss on hold-out set: 0.0005986928026686655
MeanAbsoluteError value on hold-out data: 0.010286077857017517
Epoch: 484
Loss on hold-out set: 0.0006200022788490108
MeanAbsoluteError value on hold-out data: 0.009467745199799538
Epoch: 485
Loss on hold-out set: 0.0007214035728171247
MeanAbsoluteError value on hold-out data: 0.010046619921922684
Epoch: 486
Loss on hold-out set: 0.000444268173994619
MeanAbsoluteError value on hold-out data: 0.009655172936618328
Epoch: 487
Loss on hold-out set: 0.0018907729465450086
MeanAbsoluteError value on hold-out data: 0.01064164750277996
Epoch: 488

Loss on hold-out set: 0.0008358817628600503
MeanAbsoluteError value on hold-out data: 0.010619590990245342
Epoch: 489
Loss on hold-out set: 0.0002802210749809762
MeanAbsoluteError value on hold-out data: 0.008571206592023373
```

```
Epoch: 490
Loss on hold-out set: 0.00032246595542586106
MeanAbsoluteError value on hold-out data: 0.008592499420046806
Epoch: 491
Loss on hold-out set: 0.0006777469682100147
MeanAbsoluteError value on hold-out data: 0.008777718991041183
Epoch: 492
Loss on hold-out set: 0.0022437359769977966
MeanAbsoluteError value on hold-out data: 0.012320950627326965
Epoch: 493
Loss on hold-out set: 0.00099604414785254
MeanAbsoluteError value on hold-out data: 0.010393313132226467
Epoch: 494
Loss on hold-out set: 0.000367161940582599
MeanAbsoluteError value on hold-out data: 0.008182466961443424
Epoch: 495
Loss on hold-out set: 0.0024859966370537508
MeanAbsoluteError value on hold-out data: 0.01233682595193386
Epoch: 496
Loss on hold-out set: 0.0002333748054872175
MeanAbsoluteError value on hold-out data: 0.007394938264042139
Epoch: 497
Loss on hold-out set: 0.000598443895437652
MeanAbsoluteError value on hold-out data: 0.01017621997743845
Epoch: 498
Loss on hold-out set: 0.00010778246037022512
MeanAbsoluteError value on hold-out data: 0.006679131183773279
Epoch: 499
Loss on hold-out set: 0.0007662878697852935
MeanAbsoluteError value on hold-out data: 0.011726436205208302
Epoch: 500

Loss on hold-out set: 0.0027282761852084627
MeanAbsoluteError value on hold-out data: 0.013687590137124062
Epoch: 501
Loss on hold-out set: 0.0007880161428578216
MeanAbsoluteError value on hold-out data: 0.010471004992723465
Epoch: 502
Loss on hold-out set: 0.0010085293099923308
MeanAbsoluteError value on hold-out data: 0.01149566937237978
Epoch: 503
Loss on hold-out set: 0.0016738354414835492
```

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MeanAbsoluteError value on hold-out data: 0.010981733910739422
Epoch: 504
Loss on hold-out set: 0.0018090026888833229
MeanAbsoluteError value on hold-out data: 0.0108635313808918
Epoch: 505
Loss on hold-out set: 0.002015853831572282
MeanAbsoluteError value on hold-out data: 0.010583148337900639
Epoch: 506
Loss on hold-out set: 0.0010301147695396427
MeanAbsoluteError value on hold-out data: 0.009146184660494328
Epoch: 507
Loss on hold-out set: 0.00035343212630323325
MeanAbsoluteError value on hold-out data: 0.0075922138057649136
Epoch: 508
Loss on hold-out set: 0.00010937166754095508
MeanAbsoluteError value on hold-out data: 0.006183498073369265
Epoch: 509
Loss on hold-out set: 0.002732724919640436
MeanAbsoluteError value on hold-out data: 0.012211617082357407
Epoch: 510
Loss on hold-out set: 0.00023590494780173206
MeanAbsoluteError value on hold-out data: 0.007525675930082798
Epoch: 511
Loss on hold-out set: 0.0010461008910887788
MeanAbsoluteError value on hold-out data: 0.009941624477505684
Epoch: 512

Loss on hold-out set: 0.0006810634216244102
MeanAbsoluteError value on hold-out data: 0.008720237761735916
Epoch: 513
Loss on hold-out set: 0.0007893860327289746
MeanAbsoluteError value on hold-out data: 0.008277512155473232
Epoch: 514
Loss on hold-out set: 0.0003520378574265985
MeanAbsoluteError value on hold-out data: 0.007628053892403841
Epoch: 515
Loss on hold-out set: 0.0007558907324269775
MeanAbsoluteError value on hold-out data: 0.008307664655148983
Epoch: 516
Loss on hold-out set: 0.0030667645069833703
MeanAbsoluteError value on hold-out data: 0.012613088823854923
Epoch: 517
```

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Loss on hold-out set: 0.0001256135365110822
MeanAbsoluteError value on hold-out data: 0.006017211824655533
Epoch: 518
Loss on hold-out set: 0.0014080853912242961
MeanAbsoluteError value on hold-out data: 0.00925402995198965
Epoch: 519
Loss on hold-out set: 0.0006008127502953261
MeanAbsoluteError value on hold-out data: 0.007831224240362644
Epoch: 520
Loss on hold-out set: 0.006152100395506989
MeanAbsoluteError value on hold-out data: 0.017862975597381592
Epoch: 521
Loss on hold-out set: 0.0017978816955220329
MeanAbsoluteError value on hold-out data: 0.009493675082921982
Epoch: 522
Loss on hold-out set: 0.00037273295013045226
MeanAbsoluteError value on hold-out data: 0.006546706426888704
Epoch: 523
Loss on hold-out set: 0.00258363873343258
MeanAbsoluteError value on hold-out data: 0.010543420910835266
Epoch: 524

Loss on hold-out set: 0.00023744817518060076
MeanAbsoluteError value on hold-out data: 0.0060460250824689865
Epoch: 525
Loss on hold-out set: 0.0005605401188763368
MeanAbsoluteError value on hold-out data: 0.007443140260875225
Epoch: 526
Loss on hold-out set: 0.0016594059548687686
MeanAbsoluteError value on hold-out data: 0.011665061116218567
Epoch: 527
Loss on hold-out set: 0.0006771486399776748
MeanAbsoluteError value on hold-out data: 0.007938249967992306
Epoch: 528
Loss on hold-out set: 0.0007728695783929364
MeanAbsoluteError value on hold-out data: 0.007438766770064831
Epoch: 529
Loss on hold-out set: 0.0002998776291358234
MeanAbsoluteError value on hold-out data: 0.006948966067284346
Epoch: 530
Loss on hold-out set: 0.00034487163475205307
MeanAbsoluteError value on hold-out data: 0.006817248649895191
```

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Epoch: 531
Loss on hold-out set: 0.001211613395119122
MeanAbsoluteError value on hold-out data: 0.008432652801275253
Epoch: 532
Loss on hold-out set: 0.0011518178450303726
MeanAbsoluteError value on hold-out data: 0.008012533187866211
Epoch: 533
Loss on hold-out set: 0.00018838623484378715
MeanAbsoluteError value on hold-out data: 0.006427890155464411
Epoch: 534
Loss on hold-out set: 0.0008669921627236027
MeanAbsoluteError value on hold-out data: 0.010111306793987751
Epoch: 535
Loss on hold-out set: 0.0003696686018321615
MeanAbsoluteError value on hold-out data: 0.0064856018871068954


Epoch: 536
Loss on hold-out set: 0.00038260200647911055
MeanAbsoluteError value on hold-out data: 0.007703965529799461
Epoch: 537
Loss on hold-out set: 0.00016133808912854875
MeanAbsoluteError value on hold-out data: 0.007848616689443588
Epoch: 538
Loss on hold-out set: 0.0001276179284080794
MeanAbsoluteError value on hold-out data: 0.005008282605558634
Epoch: 539
Loss on hold-out set: 0.0019025340998268803
MeanAbsoluteError value on hold-out data: 0.01155933365225792
Epoch: 540
Loss on hold-out set: 0.0009525668723965378
MeanAbsoluteError value on hold-out data: 0.009140456095337868
Epoch: 541
Loss on hold-out set: 0.00035153841422709916
MeanAbsoluteError value on hold-out data: 0.007262829225510359
Epoch: 542
Loss on hold-out set: 0.0008937535812468635
MeanAbsoluteError value on hold-out data: 0.008037962019443512
Epoch: 543
Loss on hold-out set: 0.0011299916686527325
MeanAbsoluteError value on hold-out data: 0.007668895646929741
Epoch: 544
Loss on hold-out set: 0.0003318459458916167
```

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MeanAbsoluteError value on hold-out data: 0.006236617919057608
Epoch: 545
Loss on hold-out set: 0.0022665591072358153
MeanAbsoluteError value on hold-out data: 0.011378367431461811
Epoch: 546
Loss on hold-out set: 0.000643088916675831
MeanAbsoluteError value on hold-out data: 0.011504745110869408
Epoch: 547

Loss on hold-out set: 0.0012330261251918273
MeanAbsoluteError value on hold-out data: 0.010465484112501144
Epoch: 548
Loss on hold-out set: 0.0002935761172490234
MeanAbsoluteError value on hold-out data: 0.005797748453915119
Epoch: 549
Loss on hold-out set: 0.002284049842357586
MeanAbsoluteError value on hold-out data: 0.012204629369080067
Epoch: 550
Loss on hold-out set: 0.0012760059200301935
MeanAbsoluteError value on hold-out data: 0.009485487826168537
Epoch: 551
Loss on hold-out set: 0.00020588104469329425
MeanAbsoluteError value on hold-out data: 0.008097061887383461
Epoch: 552
Loss on hold-out set: 0.000816446987157274
MeanAbsoluteError value on hold-out data: 0.011626819148659706
Epoch: 553
Loss on hold-out set: 0.0006392544918538222
MeanAbsoluteError value on hold-out data: 0.008177176117897034
Epoch: 554
Loss on hold-out set: 0.0022732836631276817
MeanAbsoluteError value on hold-out data: 0.0134514095261693
Epoch: 555
Loss on hold-out set: 0.0001770410977697841
MeanAbsoluteError value on hold-out data: 0.005729200784116983
Epoch: 556
Loss on hold-out set: 0.0010130766521869144
MeanAbsoluteError value on hold-out data: 0.008487250655889511
Epoch: 557
Loss on hold-out set: 0.0033023774476772048
MeanAbsoluteError value on hold-out data: 0.013060890138149261
Epoch: 558
```

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Loss on hold-out set: 0.001422483888317952
MeanAbsoluteError value on hold-out data: 0.009120716713368893
Epoch: 559

Loss on hold-out set: 0.0011112894589383646
MeanAbsoluteError value on hold-out data: 0.007608193438500166
Epoch: 560
Loss on hold-out set: 0.00020328787672951876
MeanAbsoluteError value on hold-out data: 0.00548491021618247
Epoch: 561
Loss on hold-out set: 0.0027549535970090226
MeanAbsoluteError value on hold-out data: 0.014594340696930885
Epoch: 562
Loss on hold-out set: 0.0002600979490299132
MeanAbsoluteError value on hold-out data: 0.0063681211322546005
Epoch: 563
Loss on hold-out set: 0.0006387673503569969
MeanAbsoluteError value on hold-out data: 0.006996834184974432
Epoch: 564
Loss on hold-out set: 0.0022359839510416256
MeanAbsoluteError value on hold-out data: 0.00832896213978529
Epoch: 565
Loss on hold-out set: 0.0008899090936199029
MeanAbsoluteError value on hold-out data: 0.008814847096800804
Epoch: 566
Loss on hold-out set: 0.0010114642337301024
MeanAbsoluteError value on hold-out data: 0.009131361730396748
Epoch: 567
Loss on hold-out set: 0.00013021098212855002
MeanAbsoluteError value on hold-out data: 0.005048446357250214
Epoch: 568
Loss on hold-out set: 0.0007610371230480508
MeanAbsoluteError value on hold-out data: 0.008758041076362133
Epoch: 569
Loss on hold-out set: 0.001043386703952963
MeanAbsoluteError value on hold-out data: 0.012379806488752365
Epoch: 570
Loss on hold-out set: 0.00263190215266724
MeanAbsoluteError value on hold-out data: 0.014103425666689873
Epoch: 571

Loss on hold-out set: 0.0009488909495931502
```

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MeanAbsoluteError value on hold-out data: 0.006875979248434305
Epoch: 572
Loss on hold-out set: 0.000664612546643184
MeanAbsoluteError value on hold-out data: 0.008894679136574268
Epoch: 573
Loss on hold-out set: 0.0023251329475897364
MeanAbsoluteError value on hold-out data: 0.010233340784907341
Epoch: 574
Loss on hold-out set: 0.0002131646499851501
MeanAbsoluteError value on hold-out data: 0.007300551515072584
Epoch: 575
Loss on hold-out set: 0.0005826567076885686
MeanAbsoluteError value on hold-out data: 0.008037659339606762
Epoch: 576
Loss on hold-out set: 0.0009764700955776405
MeanAbsoluteError value on hold-out data: 0.009254571981728077
Epoch: 577
Loss on hold-out set: 0.0009610427527820177
MeanAbsoluteError value on hold-out data: 0.007628255058079958
Epoch: 578
Loss on hold-out set: 0.00011495291489968382
MeanAbsoluteError value on hold-out data: 0.008461405523121357
Epoch: 579
Loss on hold-out set: 0.0005971306002864271
MeanAbsoluteError value on hold-out data: 0.007333038840442896
Epoch: 580
Loss on hold-out set: 0.0006580315340263615
MeanAbsoluteError value on hold-out data: 0.008251972496509552
Epoch: 581
Loss on hold-out set: 0.00028775941287724553
MeanAbsoluteError value on hold-out data: 0.006500041112303734
Epoch: 582
Loss on hold-out set: 0.00019008702016483432
MeanAbsoluteError value on hold-out data: 0.004899550229310989
Epoch: 583

Loss on hold-out set: 0.0007592452942557621
MeanAbsoluteError value on hold-out data: 0.010910337790846825
Epoch: 584
Loss on hold-out set: 0.00042013390653712694
MeanAbsoluteError value on hold-out data: 0.0074999104253947735
Epoch: 585
```

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Loss on hold-out set: 0.0030223883063208155
MeanAbsoluteError value on hold-out data: 0.012358760461211205
Epoch: 586
Loss on hold-out set: 0.0005098748965074743
MeanAbsoluteError value on hold-out data: 0.009567946195602417
Epoch: 587
Loss on hold-out set: 0.0005555858800370947
MeanAbsoluteError value on hold-out data: 0.007648818660527468
Epoch: 588
Loss on hold-out set: 0.0008999773324735303
MeanAbsoluteError value on hold-out data: 0.008085205219686031
Epoch: 589
Loss on hold-out set: 0.00041190136370890907
MeanAbsoluteError value on hold-out data: 0.008149277418851852
Epoch: 590
Loss on hold-out set: 0.0027821102312851793
MeanAbsoluteError value on hold-out data: 0.01699202135205269
Epoch: 591
Loss on hold-out set: 0.0005511773785512656
MeanAbsoluteError value on hold-out data: 0.009517504833638668
Epoch: 592
Loss on hold-out set: 0.0017864616377808392
MeanAbsoluteError value on hold-out data: 0.011470053344964981
Epoch: 593
Loss on hold-out set: 0.00039559204735664216
MeanAbsoluteError value on hold-out data: 0.006205889396369457
Epoch: 594
Loss on hold-out set: 0.0003579029513203798
MeanAbsoluteError value on hold-out data: 0.005858638323843479
Epoch: 595

Loss on hold-out set: 0.00035638249337472717
MeanAbsoluteError value on hold-out data: 0.0062966374680399895
Epoch: 596
Loss on hold-out set: 0.00037127082609793814
MeanAbsoluteError value on hold-out data: 0.005474887788295746
Epoch: 597
Loss on hold-out set: 0.0008054255871875763
MeanAbsoluteError value on hold-out data: 0.01319790817797184
Epoch: 598
Loss on hold-out set: 0.0018784831527706334
MeanAbsoluteError value on hold-out data: 0.02184775099158287
```

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Epoch: 599
Loss on hold-out set: 0.00028245059040368927
MeanAbsoluteError value on hold-out data: 0.008587797172367573
Epoch: 600
Loss on hold-out set: 0.0014417724340833765
MeanAbsoluteError value on hold-out data: 0.010912648402154446
Epoch: 601
Loss on hold-out set: 0.0006129274996917383
MeanAbsoluteError value on hold-out data: 0.009460673667490482
Epoch: 602
Loss on hold-out set: 0.0018895557637063718
MeanAbsoluteError value on hold-out data: 0.009964489378035069
Epoch: 603
Loss on hold-out set: 0.0007094604951769151
MeanAbsoluteError value on hold-out data: 0.01188866887241602
Epoch: 604
Loss on hold-out set: 0.0006008313978925703
MeanAbsoluteError value on hold-out data: 0.006295263301581144
Epoch: 605
Loss on hold-out set: 8.613518528028707e-05
MeanAbsoluteError value on hold-out data: 0.004418908152729273
Epoch: 606
Loss on hold-out set: 0.0007882692518646046
MeanAbsoluteError value on hold-out data: 0.007546835113316774
Epoch: 607
```

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Loss on hold-out set: 0.000756047324892662
MeanAbsoluteError value on hold-out data: 0.007853475399315357
Epoch: 608
Loss on hold-out set: 0.00039721957876425124
MeanAbsoluteError value on hold-out data: 0.0060641467571258545
Epoch: 609
Loss on hold-out set: 0.0001731815099698284
MeanAbsoluteError value on hold-out data: 0.0057158260606229305
Epoch: 610
Loss on hold-out set: 0.000256944288342933
MeanAbsoluteError value on hold-out data: 0.005702011752873659
Epoch: 611
Loss on hold-out set: 0.0010583272829224274
MeanAbsoluteError value on hold-out data: 0.007193075958639383
Epoch: 612
Loss on hold-out set: 0.00023333791393186307
```

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MeanAbsoluteError value on hold-out data: 0.005345104727894068
Epoch: 613
Loss on hold-out set: 0.001324884327579256
MeanAbsoluteError value on hold-out data: 0.007307696156203747
Epoch: 614
Loss on hold-out set: 0.0007421228306994683
MeanAbsoluteError value on hold-out data: 0.007374647539108992
Epoch: 615
Loss on hold-out set: 0.0006593735301976267
MeanAbsoluteError value on hold-out data: 0.008800985291600227
Epoch: 616
Loss on hold-out set: 0.0004646655640505359
MeanAbsoluteError value on hold-out data: 0.005862357094883919
Epoch: 617
Loss on hold-out set: 0.0007046280040568538
MeanAbsoluteError value on hold-out data: 0.007591322995722294
Epoch: 618
Loss on hold-out set: 0.0006824749939728223
MeanAbsoluteError value on hold-out data: 0.006719271186739206
Epoch: 619

Loss on hold-out set: 0.0004332832585843885
MeanAbsoluteError value on hold-out data: 0.006089725065976381
Epoch: 620
Loss on hold-out set: 0.000655660643546023
MeanAbsoluteError value on hold-out data: 0.006917482241988182
Epoch: 621
Loss on hold-out set: 0.0008294786755743045
MeanAbsoluteError value on hold-out data: 0.007125000935047865
Epoch: 622
Loss on hold-out set: 0.0012318113199638134
MeanAbsoluteError value on hold-out data: 0.008734548464417458
Epoch: 623
Loss on hold-out set: 0.0003816118806561893
MeanAbsoluteError value on hold-out data: 0.006540226750075817
Epoch: 624
Loss on hold-out set: 0.00038360279182675665
MeanAbsoluteError value on hold-out data: 0.005548881366848946
Epoch: 625
Loss on hold-out set: 0.0003810985354232942
MeanAbsoluteError value on hold-out data: 0.007227509748190641
Epoch: 626
```

```
Loss on hold-out set: 0.0023384031552076954
MeanAbsoluteError value on hold-out data: 0.01557124499231577
Epoch: 627
Loss on hold-out set: 0.00034150457204125477
MeanAbsoluteError value on hold-out data: 0.005441282410174608
Epoch: 628
Loss on hold-out set: 0.0014734512308223202
MeanAbsoluteError value on hold-out data: 0.007608066312968731
Epoch: 629
Loss on hold-out set: 0.00016660549618121112
MeanAbsoluteError value on hold-out data: 0.005559432320296764
Epoch: 630
Loss on hold-out set: 0.0012651888812193217
MeanAbsoluteError value on hold-out data: 0.007163417991250753
Epoch: 631


Loss on hold-out set: 0.00016009875616873614
MeanAbsoluteError value on hold-out data: 0.004947331268340349
Epoch: 632
Loss on hold-out set: 0.000997164882362181
MeanAbsoluteError value on hold-out data: 0.006558065302670002
Epoch: 633
Loss on hold-out set: 0.0009932212487671534
MeanAbsoluteError value on hold-out data: 0.010599881410598755
Epoch: 634
Loss on hold-out set: 0.00038715637444846306
MeanAbsoluteError value on hold-out data: 0.009253338910639286
Epoch: 635
Loss on hold-out set: 0.0005601194417743883
MeanAbsoluteError value on hold-out data: 0.006384608801454306
Epoch: 636
Loss on hold-out set: 0.0007099321919668
MeanAbsoluteError value on hold-out data: 0.01164994202554226
Epoch: 637
Loss on hold-out set: 0.0006701841085864066
MeanAbsoluteError value on hold-out data: 0.007309987675398588
Epoch: 638
Loss on hold-out set: 0.00038213892530261786
MeanAbsoluteError value on hold-out data: 0.005757347214967012
Epoch: 639
Loss on hold-out set: 0.0004779446798310298
MeanAbsoluteError value on hold-out data: 0.006758229807019234
```

```
Epoch: 640
Loss on hold-out set: 0.0007190675659641879
MeanAbsoluteError value on hold-out data: 0.007667848374694586
Epoch: 641
Loss on hold-out set: 0.0003347763021170785
MeanAbsoluteError value on hold-out data: 0.006631025578826666
Epoch: 642
Loss on hold-out set: 0.0009155785385485759
MeanAbsoluteError value on hold-out data: 0.0081059904769063
Epoch: 643

Loss on hold-out set: 0.0005939891185053774
MeanAbsoluteError value on hold-out data: 0.006801907438784838
Epoch: 644
Loss on hold-out set: 0.0007395306960533114
MeanAbsoluteError value on hold-out data: 0.00868386309593916
Epoch: 645
Loss on hold-out set: 0.00037999395030845716
MeanAbsoluteError value on hold-out data: 0.005785491317510605
Epoch: 646
Loss on hold-out set: 0.0006732082945889392
MeanAbsoluteError value on hold-out data: 0.006658282596617937
Epoch: 647
Loss on hold-out set: 0.0014791015143457212
MeanAbsoluteError value on hold-out data: 0.009316431358456612
Epoch: 648
Loss on hold-out set: 0.0009584059662960211
MeanAbsoluteError value on hold-out data: 0.008104034699499607
Epoch: 649
Loss on hold-out set: 0.0006543302665585017
MeanAbsoluteError value on hold-out data: 0.008320176973938942
Epoch: 650
Loss on hold-out set: 0.00034816634232763473
MeanAbsoluteError value on hold-out data: 0.005674282088875771
Epoch: 651
Loss on hold-out set: 0.0005119775378261693
MeanAbsoluteError value on hold-out data: 0.010825429111719131
Epoch: 652
Loss on hold-out set: 0.0003918613301242371
MeanAbsoluteError value on hold-out data: 0.008354507386684418
Epoch: 653
Loss on hold-out set: 0.0002557711512437029
```

```
MeanAbsoluteError value on hold-out data: 0.006764225196093321
Epoch: 654
Loss on hold-out set: 0.0022155373137114735
MeanAbsoluteError value on hold-out data: 0.008845877833664417
Epoch: 655

Loss on hold-out set: 0.0003099673945383218
MeanAbsoluteError value on hold-out data: 0.009290230460464954
Epoch: 656
Loss on hold-out set: 0.00045964037361189087
MeanAbsoluteError value on hold-out data: 0.006008022464811802
Epoch: 657
Loss on hold-out set: 0.00024063132241280982
MeanAbsoluteError value on hold-out data: 0.007781067863106728
Epoch: 658
Loss on hold-out set: 0.0005885914596499214
MeanAbsoluteError value on hold-out data: 0.0079822838306427
Epoch: 659
Loss on hold-out set: 0.0004334237523595986
MeanAbsoluteError value on hold-out data: 0.009384718723595142
Epoch: 660
Loss on hold-out set: 0.00048093541957577575
MeanAbsoluteError value on hold-out data: 0.006977810058742762
Epoch: 661
Loss on hold-out set: 0.00023430036197312707
MeanAbsoluteError value on hold-out data: 0.006438664626330137
Epoch: 662
Loss on hold-out set: 0.0003590431469583085
MeanAbsoluteError value on hold-out data: 0.005708519369363785
Epoch: 663
Loss on hold-out set: 0.0007734508686481652
MeanAbsoluteError value on hold-out data: 0.007648944854736328
Epoch: 664
Loss on hold-out set: 0.00035024309392228084
MeanAbsoluteError value on hold-out data: 0.008060436695814133
Epoch: 665
Loss on hold-out set: 0.0022778655991140496
MeanAbsoluteError value on hold-out data: 0.014609361067414284
Epoch: 666
Loss on hold-out set: 0.0005833717335630545
MeanAbsoluteError value on hold-out data: 0.010470641776919365
Epoch: 667
```

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Loss on hold-out set: 0.002088357838578017
MeanAbsoluteError value on hold-out data: 0.012592560611665249
Epoch: 668
Loss on hold-out set: 0.0001315541452832373
MeanAbsoluteError value on hold-out data: 0.007940810173749924
Epoch: 669
Loss on hold-out set: 0.0003961759319903841
MeanAbsoluteError value on hold-out data: 0.007794889621436596
Epoch: 670
Loss on hold-out set: 0.00043742334558996126
MeanAbsoluteError value on hold-out data: 0.0114379171282053
Epoch: 671
Loss on hold-out set: 0.0012670030221814063
MeanAbsoluteError value on hold-out data: 0.009487347677350044
Epoch: 672
Loss on hold-out set: 0.0006009919255982248
MeanAbsoluteError value on hold-out data: 0.009032496251165867
Epoch: 673
Loss on hold-out set: 0.0011261658101907894
MeanAbsoluteError value on hold-out data: 0.008295315317809582
Epoch: 674
Loss on hold-out set: 0.00048370484914752714
MeanAbsoluteError value on hold-out data: 0.005514911841601133
Epoch: 675
Loss on hold-out set: 0.00021992681581650686
MeanAbsoluteError value on hold-out data: 0.005012621637433767
Epoch: 676
Loss on hold-out set: 0.00037593370071638336
MeanAbsoluteError value on hold-out data: 0.007500792387872934
Epoch: 677
Loss on hold-out set: 6.949823527017878e-05
MeanAbsoluteError value on hold-out data: 0.004538900218904018
Epoch: 678
Loss on hold-out set: 0.0009379293469464756
MeanAbsoluteError value on hold-out data: 0.011369372718036175
Epoch: 679

Loss on hold-out set: 0.0004671794619011244
MeanAbsoluteError value on hold-out data: 0.005688984412699938
Epoch: 680
Loss on hold-out set: 0.00042980594930428965
MeanAbsoluteError value on hold-out data: 0.009361431933939457
```

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Epoch: 681
Loss on hold-out set: 0.0004474863539246
MeanAbsoluteError value on hold-out data: 0.005566123407334089
Epoch: 682
Loss on hold-out set: 0.00029317659978364406
MeanAbsoluteError value on hold-out data: 0.004886021837592125
Epoch: 683
Loss on hold-out set: 0.002272447230669322
MeanAbsoluteError value on hold-out data: 0.010329707525670528
Epoch: 684
Loss on hold-out set: 0.0023218027521531774
MeanAbsoluteError value on hold-out data: 0.011061378754675388
Epoch: 685
Loss on hold-out set: 0.00015164156618060302
MeanAbsoluteError value on hold-out data: 0.004221146460622549
Epoch: 686
Loss on hold-out set: 0.0002487783488229405
MeanAbsoluteError value on hold-out data: 0.004682318307459354
Epoch: 687
Loss on hold-out set: 0.00167728630750437
MeanAbsoluteError value on hold-out data: 0.007613492663949728
Epoch: 688
Loss on hold-out set: 0.0006020129090086955
MeanAbsoluteError value on hold-out data: 0.010067089460790157
Epoch: 689
Loss on hold-out set: 0.0003030345461219871
MeanAbsoluteError value on hold-out data: 0.004822711925953627
Epoch: 690
Loss on hold-out set: 0.0006504135849833179
MeanAbsoluteError value on hold-out data: 0.00750927347689867
Epoch: 691

Loss on hold-out set: 0.00029176188837410385
MeanAbsoluteError value on hold-out data: 0.005556139163672924
Epoch: 692
Loss on hold-out set: 0.00035902337726599257
MeanAbsoluteError value on hold-out data: 0.007571340538561344
Epoch: 693
Loss on hold-out set: 0.0014588596621874068
MeanAbsoluteError value on hold-out data: 0.008928458206355572
Epoch: 694
Loss on hold-out set: 0.002142963753182l897
```

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MeanAbsoluteError value on hold-out data: 0.015126891434192657
Epoch: 695
Loss on hold-out set: 0.00024299839745217948
MeanAbsoluteError value on hold-out data: 0.005267228931188583
Epoch: 696
Loss on hold-out set: 0.001547083264091797
MeanAbsoluteError value on hold-out data: 0.007846533320844173
Epoch: 697
Loss on hold-out set: 0.0012804234872754406
MeanAbsoluteError value on hold-out data: 0.009544054046273232
Epoch: 698
Loss on hold-out set: 0.00012257235371898308
MeanAbsoluteError value on hold-out data: 0.005423319060355425
Epoch: 699
Loss on hold-out set: 0.0002958490749973096
MeanAbsoluteError value on hold-out data: 0.006621989421546459
Epoch: 700
Loss on hold-out set: 0.0008880639960280908
MeanAbsoluteError value on hold-out data: 0.008562758564949036
Epoch: 701
Loss on hold-out set: 0.0001363451257188181
MeanAbsoluteError value on hold-out data: 0.004292565863579512
Epoch: 702
Loss on hold-out set: 0.00025012706526850756
MeanAbsoluteError value on hold-out data: 0.004836632404476404
Epoch: 703

Loss on hold-out set: 0.0001989589615109971
MeanAbsoluteError value on hold-out data: 0.006254958920180798
Epoch: 704
Loss on hold-out set: 0.0014141991062830896
MeanAbsoluteError value on hold-out data: 0.007274033036082983
Epoch: 705
Loss on hold-out set: 0.0003080279716174884
MeanAbsoluteError value on hold-out data: 0.006483470089733601
Epoch: 706
Loss on hold-out set: 0.002029822907526355
MeanAbsoluteError value on hold-out data: 0.008514143526554108
Epoch: 707
Loss on hold-out set: 0.0001898914812811295
MeanAbsoluteError value on hold-out data: 0.009433374740183353
Epoch: 708
```

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Loss on hold-out set: 0.0006134453668545049
MeanAbsoluteError value on hold-out data: 0.0060148476622998714
Epoch: 709
Loss on hold-out set: 0.0007291740134262095
MeanAbsoluteError value on hold-out data: 0.007589805871248245
Epoch: 710
Loss on hold-out set: 0.00035847546888889107
MeanAbsoluteError value on hold-out data: 0.008735123090445995
Epoch: 711
Loss on hold-out set: 6.358964687155764e-05
MeanAbsoluteError value on hold-out data: 0.003492431715130806
Epoch: 712
Loss on hold-out set: 0.0001475569065226074
MeanAbsoluteError value on hold-out data: 0.004241733346134424
Epoch: 713
Loss on hold-out set: 0.00011025673252094605
MeanAbsoluteError value on hold-out data: 0.005741286091506481
Epoch: 714
Loss on hold-out set: 0.00014796121809312304
MeanAbsoluteError value on hold-out data: 0.004307192750275135
Epoch: 715

Loss on hold-out set: 0.00017133565573825953
MeanAbsoluteError value on hold-out data: 0.0055903480388224125
Epoch: 716
Loss on hold-out set: 0.0018465293067157816
MeanAbsoluteError value on hold-out data: 0.00978761725127697
Epoch: 717
Loss on hold-out set: 0.0003891575379384449
MeanAbsoluteError value on hold-out data: 0.0046928743831813335
Epoch: 718
Loss on hold-out set: 0.00045563820245170543
MeanAbsoluteError value on hold-out data: 0.005543409381061792
Epoch: 719
Loss on hold-out set: 0.001596135028134277
MeanAbsoluteError value on hold-out data: 0.008642311207950115
Epoch: 720
Loss on hold-out set: 0.00044603629995483633
MeanAbsoluteError value on hold-out data: 0.0119462376460433
Epoch: 721
Loss on hold-out set: 0.00035155517415612277
MeanAbsoluteError value on hold-out data: 0.007955017499625683
```

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Epoch: 722
Loss on hold-out set: 0.00018811905260319786
MeanAbsoluteError value on hold-out data: 0.005162931978702545
Epoch: 723
Loss on hold-out set: 0.0006061094321454986
MeanAbsoluteError value on hold-out data: 0.00750218378379941
Epoch: 724
Loss on hold-out set: 0.0003995454658970151
MeanAbsoluteError value on hold-out data: 0.00946782249957323
Epoch: 725
Loss on hold-out set: 0.00037498494969823745
MeanAbsoluteError value on hold-out data: 0.005960552953183651
Epoch: 726
Loss on hold-out set: 0.00047189046651247306
MeanAbsoluteError value on hold-out data: 0.00642438093200326
Epoch: 727

Loss on hold-out set: 0.0005956765946010771
MeanAbsoluteError value on hold-out data: 0.00756965484470129
Epoch: 728
Loss on hold-out set: 0.0003895107935339806
MeanAbsoluteError value on hold-out data: 0.0050910236313939095
Epoch: 729
Loss on hold-out set: 0.0005118019429286697
MeanAbsoluteError value on hold-out data: 0.010503980331122875
Epoch: 730
Loss on hold-out set: 0.0008403577099120172
MeanAbsoluteError value on hold-out data: 0.0072881183587014675
Epoch: 731
Loss on hold-out set: 0.00025173100099987335
MeanAbsoluteError value on hold-out data: 0.005087653174996376
Epoch: 732
Loss on hold-out set: 0.0009759846036020367
MeanAbsoluteError value on hold-out data: 0.006929831579327583
Epoch: 733
Loss on hold-out set: 0.0007401807945221231
MeanAbsoluteError value on hold-out data: 0.005939609371125698
Epoch: 734
Loss on hold-out set: 0.0014356209432758317
MeanAbsoluteError value on hold-out data: 0.013354456052184105
Epoch: 735
Loss on hold-out set: 0.00010425547089940473
```

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MeanAbsoluteError value on hold-out data: 0.005908594001084566
Epoch: 736
Loss on hold-out set: 0.0002268339189090272
MeanAbsoluteError value on hold-out data: 0.005371060222387314
Epoch: 737
Loss on hold-out set: 0.00035115301383676094
MeanAbsoluteError value on hold-out data: 0.006738638039678335
Epoch: 738
Loss on hold-out set: 0.00021380843911270189
MeanAbsoluteError value on hold-out data: 0.004996495321393013
Epoch: 739

Loss on hold-out set: 0.0005000415028521992
MeanAbsoluteError value on hold-out data: 0.006178305484354496
Epoch: 740
Loss on hold-out set: 0.0006133078342324888
MeanAbsoluteError value on hold-out data: 0.006152932066470385
Epoch: 741
Loss on hold-out set: 0.0004580387616634222
MeanAbsoluteError value on hold-out data: 0.010062290355563164
Epoch: 742
Loss on hold-out set: 0.0003708001823174288
MeanAbsoluteError value on hold-out data: 0.006001479923725128
Epoch: 743
Loss on hold-out set: 0.000701415841453019
MeanAbsoluteError value on hold-out data: 0.006670424714684486
Epoch: 744
Loss on hold-out set: 9.191965001551388e-05
MeanAbsoluteError value on hold-out data: 0.005430926568806171
Epoch: 745
Loss on hold-out set: 0.00028193244416367013
MeanAbsoluteError value on hold-out data: 0.006976705510169268
Epoch: 746
Loss on hold-out set: 0.0005226626561747444
MeanAbsoluteError value on hold-out data: 0.006596271879971027
Epoch: 747
Loss on hold-out set: 0.0010315598548201802
MeanAbsoluteError value on hold-out data: 0.006985398009419441
Epoch: 748
Loss on hold-out set: 0.0002090641238891665
MeanAbsoluteError value on hold-out data: 0.004454633221030235
Epoch: 749
```

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Loss on hold-out set: 0.00017018491280396l2
MeanAbsoluteError value on hold-out data: 0.005849794950336218
Epoch: 750
Loss on hold-out set: 0.0015602337037092327
MeanAbsoluteError value on hold-out data: 0.008071658201515675
Epoch: 751

Loss on hold-out set: 0.00021408082655078057
MeanAbsoluteError value on hold-out data: 0.004505468066781759
Epoch: 752
Loss on hold-out set: 0.00037716504700830756
MeanAbsoluteError value on hold-out data: 0.007030079141259193
Epoch: 753
Loss on hold-out set: 0.0033407261565738928
MeanAbsoluteError value on hold-out data: 0.015415644273161888
Epoch: 754
Loss on hold-out set: 0.002131729367354302
MeanAbsoluteError value on hold-out data: 0.006738931406289339
Epoch: 755
Loss on hold-out set: 0.0005665713688837346
MeanAbsoluteError value on hold-out data: 0.006887075956910849
Epoch: 756
Loss on hold-out set: 0.00023582868379889987
MeanAbsoluteError value on hold-out data: 0.01048946101218462
Epoch: 757
Loss on hold-out set: 0.0006676088602830532
MeanAbsoluteError value on hold-out data: 0.006914608646184206
Epoch: 758
Loss on hold-out set: 0.0005415073678286239
MeanAbsoluteError value on hold-out data: 0.00603836216032505
Epoch: 759
Loss on hold-out set: 0.0003289088574906361
MeanAbsoluteError value on hold-out data: 0.005824036430567503
Epoch: 760
Loss on hold-out set: 0.00038454482769398774
MeanAbsoluteError value on hold-out data: 0.004857047460973263
Epoch: 761
Loss on hold-out set: 0.0005925784433226287
MeanAbsoluteError value on hold-out data: 0.006679937709122896
Epoch: 762
Loss on hold-out set: 0.00036247903598806666
MeanAbsoluteError value on hold-out data: 0.004627732560038567
Epoch: 763
```

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Loss on hold-out set: 0.00179311900100593
MeanAbsoluteError value on hold-out data: 0.007420160807669163
Epoch: 764
Loss on hold-out set: 0.000637055202787451
MeanAbsoluteError value on hold-out data: 0.008644074201583862
Epoch: 765
Loss on hold-out set: 0.0002198498275178233
MeanAbsoluteError value on hold-out data: 0.004152249079197645
Epoch: 766
Loss on hold-out set: 0.0005032714395943122
MeanAbsoluteError value on hold-out data: 0.004822432063519955
Epoch: 767
Loss on hold-out set: 0.001404177844612401
MeanAbsoluteError value on hold-out data: 0.0071569825522601604
Epoch: 768
Loss on hold-out set: 0.00028187218992427104
MeanAbsoluteError value on hold-out data: 0.0060898540541529655
Epoch: 769
Loss on hold-out set: 0.0007189549098352712
MeanAbsoluteError value on hold-out data: 0.007104986347258091
Epoch: 770
Loss on hold-out set: 0.00029731911718344187
MeanAbsoluteError value on hold-out data: 0.004793663043528795
Epoch: 771
Loss on hold-out set: 0.0007969282307840331
MeanAbsoluteError value on hold-out data: 0.007393963169306517
Epoch: 772
Loss on hold-out set: 6.318172873271148e-05
MeanAbsoluteError value on hold-out data: 0.0036106177140027285
Epoch: 773
Loss on hold-out set: 0.00018344093986773883
MeanAbsoluteError value on hold-out data: 0.00578764732927084
Epoch: 774
Loss on hold-out set: 0.0003494952507265369
MeanAbsoluteError value on hold-out data: 0.004831170663237572
Epoch: 775

Loss on hold-out set: 0.0006117154711031809
MeanAbsoluteError value on hold-out data: 0.008822374045848846
Epoch: 776
Loss on hold-out set: 0.000261018138644431
MeanAbsoluteError value on hold-out data: 0.006370716728270054
```

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Epoch: 777
Loss on hold-out set: 0.000310264962715672
MeanAbsoluteError value on hold-out data: 0.005705707240849733
Epoch: 778
Loss on hold-out set: 0.0016200519660168012
MeanAbsoluteError value on hold-out data: 0.00771168852224946
Epoch: 779
Loss on hold-out set: 0.0002540264087811968
MeanAbsoluteError value on hold-out data: 0.004706361331045628
Epoch: 780
Loss on hold-out set: 0.0004890841629653072
MeanAbsoluteError value on hold-out data: 0.004836706910282373
Epoch: 781
Loss on hold-out set: 0.001861141965392969
MeanAbsoluteError value on hold-out data: 0.007611947134137154
Epoch: 782
Loss on hold-out set: 9.470454833597997e-05
MeanAbsoluteError value on hold-out data: 0.0036913363728672266
Epoch: 783
Loss on hold-out set: 0.00017917430825850476
MeanAbsoluteError value on hold-out data: 0.005237209144979715
Epoch: 784
Loss on hold-out set: 0.0004690364034774431
MeanAbsoluteError value on hold-out data: 0.009040738455951214
Epoch: 785
Loss on hold-out set: 0.0007893543555401026
MeanAbsoluteError value on hold-out data: 0.006713644601404667
Epoch: 786
Loss on hold-out set: 0.00038155893851485177
MeanAbsoluteError value on hold-out data: 0.007164542563259602
Epoch: 787

Loss on hold-out set: 0.0007327826689004867
MeanAbsoluteError value on hold-out data: 0.007145140320062637
Epoch: 788
Loss on hold-out set: 0.00027057022871782753
MeanAbsoluteError value on hold-out data: 0.006349228788167238
Epoch: 789
Loss on hold-out set: 0.0022485408267025257
MeanAbsoluteError value on hold-out data: 0.006507921498268843
Epoch: 790
Loss on hold-out set: 0.001034284968538582
```

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MeanAbsoluteError value on hold-out data: 0.007639601826667786
Epoch: 791
Loss on hold-out set: 0.00019748837985987752
MeanAbsoluteError value on hold-out data: 0.004261576104909182
Epoch: 792
Loss on hold-out set: 0.0032022053695455774
MeanAbsoluteError value on hold-out data: 0.012742982245981693
Epoch: 793
Loss on hold-out set: 0.0013742911635230676
MeanAbsoluteError value on hold-out data: 0.0071471515111625195
Epoch: 794
Loss on hold-out set: 0.0005435693317753918
MeanAbsoluteError value on hold-out data: 0.008056605234742165
Epoch: 795
Loss on hold-out set: 0.00012571243415269046
MeanAbsoluteError value on hold-out data: 0.0035885258112102747
Epoch: 796
Loss on hold-out set: 0.0005603074883095504
MeanAbsoluteError value on hold-out data: 0.007006483152508736
Epoch: 797
Loss on hold-out set: 0.0005697067652267594
MeanAbsoluteError value on hold-out data: 0.007494286634027958
Epoch: 798
Loss on hold-out set: 0.0006237812014247586
MeanAbsoluteError value on hold-out data: 0.006115856114774942
Epoch: 799

Loss on hold-out set: 0.00032988656182983265
MeanAbsoluteError value on hold-out data: 0.006421132944524288
Epoch: 800
Loss on hold-out set: 0.00034795490946380953
MeanAbsoluteError value on hold-out data: 0.004425922408699989
Epoch: 801
Loss on hold-out set: 0.0003730917221554065
MeanAbsoluteError value on hold-out data: 0.005254663527011871
Epoch: 802
Loss on hold-out set: 0.0001292022955950463
MeanAbsoluteError value on hold-out data: 0.004355921875685453
Epoch: 803
Loss on hold-out set: 0.0014349198574181126
MeanAbsoluteError value on hold-out data: 0.00918896496295929
Epoch: 804
```

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Loss on hold-out set: 0.00017382171681914004
MeanAbsoluteError value on hold-out data: 0.005323646124452352 5
Epoch: 805
Loss on hold-out set: 0.00020135021594270305
MeanAbsoluteError value on hold-out data: 0.00821379944682121 3
Epoch: 806
Loss on hold-out set: 0.001466799218513571
MeanAbsoluteError value on hold-out data: 0.00927537027746439
Epoch: 807
Loss on hold-out set: 0.0006958983211045746
MeanAbsoluteError value on hold-out data: 0.006381119135767221 5
Epoch: 808
Loss on hold-out set: 0.0003104955884689269
MeanAbsoluteError value on hold-out data: 0.011727460660040379
Epoch: 809
Loss on hold-out set: 0.0018140695676840167
MeanAbsoluteError value on hold-out data: 0.010753813199698925
Epoch: 810
Loss on hold-out set: 0.0004890778276675471
MeanAbsoluteError value on hold-out data: 0.007305155508220196
Epoch: 811

Loss on hold-out set: 0.0016024516501745797
MeanAbsoluteError value on hold-out data: 0.00887287873774767
Epoch: 812
Loss on hold-out set: 0.0004397209690499662
MeanAbsoluteError value on hold-out data: 0.007052458357065916
Epoch: 813
Loss on hold-out set: 0.00029485655240454146
MeanAbsoluteError value on hold-out data: 0.006120500154793262 5
Epoch: 814
Loss on hold-out set: 0.00047940867754828344
MeanAbsoluteError value on hold-out data: 0.008907233364880085
Epoch: 815
Loss on hold-out set: 0.00017688199391398629
MeanAbsoluteError value on hold-out data: 0.007069777697324753
Epoch: 816
Loss on hold-out set: 5.8286389018672036e-05
MeanAbsoluteError value on hold-out data: 0.003794157411903143
Epoch: 817
Loss on hold-out set: 0.002479736068865254
MeanAbsoluteError value on hold-out data: 0.007949776947498322
```

```
Epoch: 818
Loss on hold-out set: 0.0004347016069106614
MeanAbsoluteError value on hold-out data: 0.005527614150196314
Epoch: 819
Loss on hold-out set: 0.0003882188866555225
MeanAbsoluteError value on hold-out data: 0.008398860692977905
Epoch: 820
Loss on hold-out set: 0.0009079494133025515
MeanAbsoluteError value on hold-out data: 0.007103196810930967
Epoch: 821
Loss on hold-out set: 0.0005509372540473123
MeanAbsoluteError value on hold-out data: 0.008586850017309189
Epoch: 822
Loss on hold-out set: 0.0005472442856468039
MeanAbsoluteError value on hold-out data: 0.006051115226000547
Epoch: 823

Loss on hold-out set: 0.0005021315741642914
MeanAbsoluteError value on hold-out data: 0.005863584112375975
Epoch: 824
Loss on hold-out set: 0.001513987251287649
MeanAbsoluteError value on hold-out data: 0.006810064427554607
Epoch: 825
Loss on hold-out set: 0.0019464991460872146
MeanAbsoluteError value on hold-out data: 0.012182822450995445
Epoch: 826
Loss on hold-out set: 0.00020428111852915638
MeanAbsoluteError value on hold-out data: 0.004828817211091518
Epoch: 827
Loss on hold-out set: 0.0002612240761460558
MeanAbsoluteError value on hold-out data: 0.004133149050176144
Epoch: 828
Loss on hold-out set: 0.0015061751534966262
MeanAbsoluteError value on hold-out data: 0.008728714659810066
Epoch: 829
Loss on hold-out set: 0.001247079492378888
MeanAbsoluteError value on hold-out data: 0.012686763890087605
Epoch: 830
Loss on hold-out set: 0.0010660557206009752
MeanAbsoluteError value on hold-out data: 0.009177055209875107
Epoch: 831
Loss on hold-out set: 0.0005741025214248159
```

```
MeanAbsoluteError value on hold-out data: 0.006128240376710892
Epoch: 832
Loss on hold-out set: 0.0012003332573756683
MeanAbsoluteError value on hold-out data: 0.00583643140271306
Epoch: 833
Loss on hold-out set: 0.001179916271882432
MeanAbsoluteError value on hold-out data: 0.008987369947135448
Epoch: 834
Loss on hold-out set: 0.00011497008994123654
MeanAbsoluteError value on hold-out data: 0.005865534767508507
Epoch: 835

Loss on hold-out set: 0.00044349597675663014
MeanAbsoluteError value on hold-out data: 0.008294308558106422
Epoch: 836
Loss on hold-out set: 0.00023314526942828562
MeanAbsoluteError value on hold-out data: 0.0051422445103526115
Epoch: 837
Loss on hold-out set: 0.0005574904796025006
MeanAbsoluteError value on hold-out data: 0.007436265237629414
Epoch: 838
Loss on hold-out set: 0.0016646552155036357
MeanAbsoluteError value on hold-out data: 0.010648621246218681
Epoch: 839
Loss on hold-out set: 0.0004612633137735668
MeanAbsoluteError value on hold-out data: 0.005025504156947136
Epoch: 840
Loss on hold-out set: 0.00027386755142350995
MeanAbsoluteError value on hold-out data: 0.004125975538045168
Epoch: 841
Loss on hold-out set: 0.0002662139222354055
MeanAbsoluteError value on hold-out data: 0.006543299648910761
Epoch: 842
Loss on hold-out set: 0.0006192345688439696
MeanAbsoluteError value on hold-out data: 0.005731938872486353
Epoch: 843
Loss on hold-out set: 0.0003948278661386882
MeanAbsoluteError value on hold-out data: 0.006083694286644459
Epoch: 844
Loss on hold-out set: 0.0003318237763898268
MeanAbsoluteError value on hold-out data: 0.005155637860298157
Epoch: 845
```

```
Loss on hold-out set: 0.0009660781403555886
MeanAbsoluteError value on hold-out data: 0.005639573559165001
Epoch: 846
Loss on hold-out set: 0.0015178548065498969
MeanAbsoluteError value on hold-out data: 0.006127491593360901
Epoch: 847

Loss on hold-out set: 0.00011524964343391873
MeanAbsoluteError value on hold-out data: 0.004975346382707357
Epoch: 848
Loss on hold-out set: 0.00031597586599511825
MeanAbsoluteError value on hold-out data: 0.004147558938711882
Epoch: 849
Loss on hold-out set: 0.0005901930714009339
MeanAbsoluteError value on hold-out data: 0.0069572641514241695
Epoch: 850
Loss on hold-out set: 0.00033342196951181044
MeanAbsoluteError value on hold-out data: 0.005010724533349276
Epoch: 851
Loss on hold-out set: 0.001236463886058166
MeanAbsoluteError value on hold-out data: 0.006122029852122068
Epoch: 852
Loss on hold-out set: 0.0007847533949978626
MeanAbsoluteError value on hold-out data: 0.007429562509059906
Epoch: 853
Loss on hold-out set: 0.00019812300621723758
MeanAbsoluteError value on hold-out data: 0.005041943863034248
Epoch: 854
Loss on hold-out set: 0.001474743023101454
MeanAbsoluteError value on hold-out data: 0.006349316798150539
Epoch: 855
Loss on hold-out set: 0.0003102677732158554
MeanAbsoluteError value on hold-out data: 0.005322516895830631
Epoch: 856
Loss on hold-out set: 0.00018579122625420782
MeanAbsoluteError value on hold-out data: 0.006237184628844261
Epoch: 857
Loss on hold-out set: 0.0006910942794021187
MeanAbsoluteError value on hold-out data: 0.007855916395783424
Epoch: 858
Loss on hold-out set: 0.00039277700136010124
MeanAbsoluteError value on hold-out data: 0.0066211591474711895
Epoch: 859
```

```
Loss on hold-out set: 0.0004282283096601029
MeanAbsoluteError value on hold-out data: 0.005558894481509924
Epoch: 860
Loss on hold-out set: 0.0008199277528433413
MeanAbsoluteError value on hold-out data: 0.00665871798992157
Epoch: 861
Loss on hold-out set: 0.0004997792023842569
MeanAbsoluteError value on hold-out data: 0.0076433890499174595
Epoch: 862
Loss on hold-out set: 0.00033259521950711993
MeanAbsoluteError value on hold-out data: 0.005582607816904783
Epoch: 863
Loss on hold-out set: 0.0006997151374195566
MeanAbsoluteError value on hold-out data: 0.008495215326547623
Epoch: 864
Loss on hold-out set: 0.0022731198317543252
MeanAbsoluteError value on hold-out data: 0.010563225485384464
Epoch: 865
Loss on hold-out set: 0.0003364318724236096
MeanAbsoluteError value on hold-out data: 0.008823012001812458
Epoch: 866
Loss on hold-out set: 0.0005849165760848432
MeanAbsoluteError value on hold-out data: 0.005922351032495499
Epoch: 867
Loss on hold-out set: 0.0008919900785114901
MeanAbsoluteError value on hold-out data: 0.0077645001001656055
Epoch: 868
Loss on hold-out set: 0.00043490429400088414
MeanAbsoluteError value on hold-out data: 0.006833918858319521
Epoch: 869
Loss on hold-out set: 0.0003846979711867286
MeanAbsoluteError value on hold-out data: 0.005271845497190952
Epoch: 870
Loss on hold-out set: 0.0005258466499236348
MeanAbsoluteError value on hold-out data: 0.005623467266559601
Epoch: 871

Loss on hold-out set: 0.00018650097074082863
MeanAbsoluteError value on hold-out data: 0.005617539864033461
Epoch: 872
Loss on hold-out set: 0.0004106564600701141
MeanAbsoluteError value on hold-out data: 0.007557016331702471
```

```
Epoch: 873
Loss on hold-out set: 0.001152551653422949
MeanAbsoluteError value on hold-out data: 0.006732459180057049
Epoch: 874
Loss on hold-out set: 0.0014273031963302617
MeanAbsoluteError value on hold-out data: 0.006723690778017044
Epoch: 875
Loss on hold-out set: 0.0002927287467556246
MeanAbsoluteError value on hold-out data: 0.004726245999336243
Epoch: 876
Loss on hold-out set: 0.0005300205740767476
MeanAbsoluteError value on hold-out data: 0.008704249747097492
Epoch: 877
Loss on hold-out set: 0.00021759261002635437
MeanAbsoluteError value on hold-out data: 0.008491461165249348
Epoch: 878
Loss on hold-out set: 0.00027308217804183617
MeanAbsoluteError value on hold-out data: 0.004928748123347759
Epoch: 879
Loss on hold-out set: 0.00014799767945748355
MeanAbsoluteError value on hold-out data: 0.005215576384216547
Epoch: 880
Loss on hold-out set: 0.0003331157803538525
MeanAbsoluteError value on hold-out data: 0.012088792398571968
Epoch: 881
Loss on hold-out set: 0.0003447394094684186
MeanAbsoluteError value on hold-out data: 0.009827177971601486
Epoch: 882
Loss on hold-out set: 0.0006356506402019141
MeanAbsoluteError value on hold-out data: 0.011546538211405277
Epoch: 883

Loss on hold-out set: 0.0012490628662243054
MeanAbsoluteError value on hold-out data: 0.006902391090989113
Epoch: 884
Loss on hold-out set: 0.00029411645730784874
MeanAbsoluteError value on hold-out data: 0.005374482367187738
Epoch: 885
Loss on hold-out set: 0.00023295181187533767
MeanAbsoluteError value on hold-out data: 0.005534400697797537
Epoch: 886
Loss on hold-out set: 0.0009609720106416381
```

```
MeanAbsoluteError value on hold-out data: 0.006021636072546244
Epoch: 887
Loss on hold-out set: 0.0003241629656019397
MeanAbsoluteError value on hold-out data: 0.005702234338968992
Epoch: 888
Loss on hold-out set: 0.0002936164163549237
MeanAbsoluteError value on hold-out data: 0.0053679742850363255
Epoch: 889
Loss on hold-out set: 0.0006665613868910058
MeanAbsoluteError value on hold-out data: 0.007261074613779783
Epoch: 890
Loss on hold-out set: 0.0005829308716113845
MeanAbsoluteError value on hold-out data: 0.009754205122590065
Epoch: 891
Loss on hold-out set: 0.00031709065557319454
MeanAbsoluteError value on hold-out data: 0.005613582208752632
Epoch: 892
Loss on hold-out set: 0.000268392373961409
MeanAbsoluteError value on hold-out data: 0.004845710005611181
Epoch: 893
Loss on hold-out set: 0.00046276553568627845
MeanAbsoluteError value on hold-out data: 0.008439009077847004
Epoch: 894
Loss on hold-out set: 0.00028895573988943637
MeanAbsoluteError value on hold-out data: 0.005557164084166288
Epoch: 895

Loss on hold-out set: 0.00019797728364330012
MeanAbsoluteError value on hold-out data: 0.00491351168602705
Epoch: 896
Loss on hold-out set: 0.0003639951798690115
MeanAbsoluteError value on hold-out data: 0.005720307119190693
Epoch: 897
Loss on hold-out set: 0.00010209219897953852
MeanAbsoluteError value on hold-out data: 0.003886011429131031
Epoch: 898
Loss on hold-out set: 0.000703880846805604
MeanAbsoluteError value on hold-out data: 0.009624983184039593
Epoch: 899
Loss on hold-out set: 0.0011832700127486437
MeanAbsoluteError value on hold-out data: 0.008639294654130936
Epoch: 900
```

```
Loss on hold-out set: 0.00047247946445407393
MeanAbsoluteError value on hold-out data: 0.006937573663890362
Epoch: 901
Loss on hold-out set: 0.0012159028377141112
MeanAbsoluteError value on hold-out data: 0.006778344977647066
Epoch: 902
Loss on hold-out set: 0.0009482245438245005
MeanAbsoluteError value on hold-out data: 0.006393224000930786
Epoch: 903
Loss on hold-out set: 0.0006607464100445787
MeanAbsoluteError value on hold-out data: 0.006727768573909998
Epoch: 904
Loss on hold-out set: 0.0001322320473790521
MeanAbsoluteError value on hold-out data: 0.004292851779609919
Epoch: 905
Loss on hold-out set: 0.0011519375920915752
MeanAbsoluteError value on hold-out data: 0.007209997158497572
Epoch: 906
Loss on hold-out set: 0.00034302983108677596
MeanAbsoluteError value on hold-out data: 0.005451631732285023
Epoch: 907

Loss on hold-out set: 0.00043626676203925135
MeanAbsoluteError value on hold-out data: 0.005905559286475182
Epoch: 908
Loss on hold-out set: 0.00012339751666589014
MeanAbsoluteError value on hold-out data: 0.0039001735858619213
Epoch: 909
Loss on hold-out set: 0.00022127980427237497
MeanAbsoluteError value on hold-out data: 0.004873132333159447
Epoch: 910
Loss on hold-out set: 0.0009601890234008399
MeanAbsoluteError value on hold-out data: 0.006949343718588352
Epoch: 911
Loss on hold-out set: 0.0011569652179805178
MeanAbsoluteError value on hold-out data: 0.006282619200646877
Epoch: 912
Loss on hold-out set: 0.00022948803394970846
MeanAbsoluteError value on hold-out data: 0.006141737103462219
Epoch: 913
Loss on hold-out set: 0.0008898065151051446
MeanAbsoluteError value on hold-out data: 0.00714455358684063
```

```
Epoch: 914
Loss on hold-out set: 0.0003610350521392703
MeanAbsoluteError value on hold-out data: 0.0050406986847519875
Epoch: 915
Loss on hold-out set: 0.0016744193588411498
MeanAbsoluteError value on hold-out data: 0.006784103810787201
Epoch: 916
Loss on hold-out set: 0.0004336913713431338
MeanAbsoluteError value on hold-out data: 0.007553595583885908
Epoch: 917
Loss on hold-out set: 0.00040660684473137784
MeanAbsoluteError value on hold-out data: 0.005112907849252224
Epoch: 918
Loss on hold-out set: 7.239383323490314e-05
MeanAbsoluteError value on hold-out data: 0.006587130017578602
Epoch: 919


Loss on hold-out set: 0.0002248943109598737
MeanAbsoluteError value on hold-out data: 0.006345826666802168
Epoch: 920
Loss on hold-out set: 0.00033588325558454066
MeanAbsoluteError value on hold-out data: 0.004987932741641998
Epoch: 921
Loss on hold-out set: 0.0008683295222549772
MeanAbsoluteError value on hold-out data: 0.0072085000574588776
Epoch: 922
Loss on hold-out set: 0.00017978170023381703
MeanAbsoluteError value on hold-out data: 0.006017597392201424
Epoch: 923
Loss on hold-out set: 0.0005387105847579445
MeanAbsoluteError value on hold-out data: 0.007300739176571369
Epoch: 924
Loss on hold-out set: 0.0004886610024461908
MeanAbsoluteError value on hold-out data: 0.00603595981374383
Epoch: 925
Loss on hold-out set: 0.0007039650886521318
MeanAbsoluteError value on hold-out data: 0.007461154367774725
Epoch: 926
Loss on hold-out set: 0.0003211208011060463
MeanAbsoluteError value on hold-out data: 0.005865081679075956
Epoch: 927
Loss on hold-out set: 0.0002594362076227921
```

```
MeanAbsoluteError value on hold-out data: 0.005927388556301594
Epoch: 928
Loss on hold-out set: 0.00012100546708001945
MeanAbsoluteError value on hold-out data: 0.005358011927455664
Epoch: 929
Loss on hold-out set: 0.0004420846954465225
MeanAbsoluteError value on hold-out data: 0.009182997979223728
Epoch: 930
Loss on hold-out set: 0.00029868474480041954
MeanAbsoluteError value on hold-out data: 0.006998472381383181
Epoch: 931

Loss on hold-out set: 0.00020274050466708248
MeanAbsoluteError value on hold-out data: 0.0038897052872925997
Epoch: 932
Loss on hold-out set: 0.0008514912169660324
MeanAbsoluteError value on hold-out data: 0.005441474728286266
Epoch: 933
Loss on hold-out set: 0.00036422694199101996
MeanAbsoluteError value on hold-out data: 0.007422807160764933
Epoch: 934
Loss on hold-out set: 0.00011481807848667813
MeanAbsoluteError value on hold-out data: 0.0038666026666760445
Epoch: 935
Loss on hold-out set: 0.000882441367492136
MeanAbsoluteError value on hold-out data: 0.006680510938167572
Epoch: 936
Loss on hold-out set: 0.0002348597661702905
MeanAbsoluteError value on hold-out data: 0.004336920566856861
Epoch: 937
Loss on hold-out set: 0.0004944198663475905
MeanAbsoluteError value on hold-out data: 0.008640159852802753
Epoch: 938
Loss on hold-out set: 0.0007473797743506637
MeanAbsoluteError value on hold-out data: 0.007821232080459595
Epoch: 939
Loss on hold-out set: 0.0002903537137483095
MeanAbsoluteError value on hold-out data: 0.005168846808373928
Epoch: 940
Loss on hold-out set: 0.00032563630079613705
MeanAbsoluteError value on hold-out data: 0.005247770342975855
Epoch: 941
```

```
Loss on hold-out set: 0.00030555975437538877
MeanAbsoluteError value on hold-out data: 0.004386599641293287
Epoch: 942
Loss on hold-out set: 0.00020991470023545844
MeanAbsoluteError value on hold-out data: 0.005081790499389172
Epoch: 943

Loss on hold-out set: 0.00031204216738363398
MeanAbsoluteError value on hold-out data: 0.00720458198338747
Epoch: 944
Loss on hold-out set: 0.00042404343694694323
MeanAbsoluteError value on hold-out data: 0.00627014460042119
Early stopping at epoch 943
Returned to Spot: Validation loss: 0.00042404343694694323
----------------------------------------------


spotPython tuning: 2.230668578225672e-06 [##########] 100.00% Done...

<spotPython.spot.spot.Spot at 0x2864df070>
```

25.13 Tensorboard

The textual output shown in the console (or code cell) can be visualized with Tensorboard as described in Section 20.13.

25.14 Results

After the hyperparameter tuning run is finished, the results can be analyzed as described in Section 20.14.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

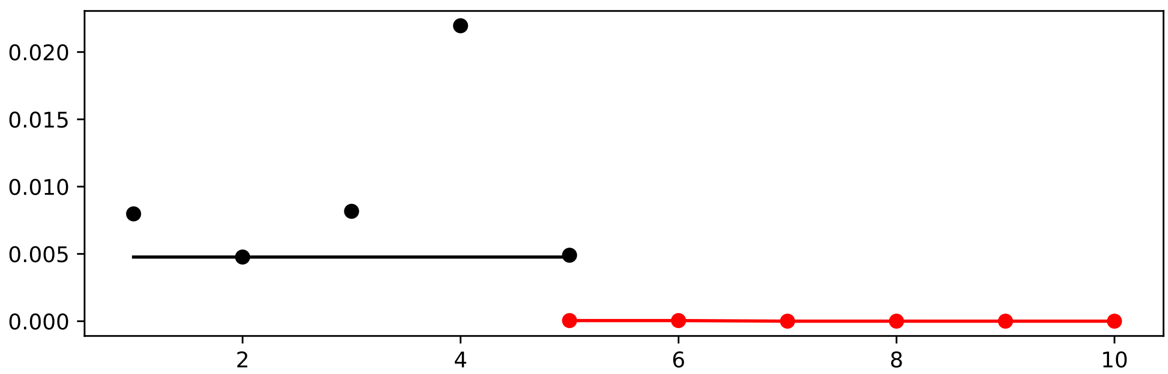

Figure 25.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

```
print(gen_design_table(fun_control=fun_control, spot=spot_tuner))
```

```
| name         | type   | default   |    lower |    upper |                    tuned | transform
|--------------|--------|-----------|----------|----------|--------------------------|-----------
| _L_in        | int    | 10        |     10.0 |     10.0 |                     10.0 | None
| _L_out       | int    | 1         |      1.0 |      1.0 |                      1.0 | None
| l1           | int    | 3         |      3.0 |      8.0 |                      3.0 | transform_
| dropout_prob | float  | 0.01      |      0.0 |      0.9 |  0.00015221963845657438 | None
| lr_mult      | float  | 1.0       |      0.1 |     10.0 |     0.10000114396238313 | None
| batch_size   | int    | 4         |      1.0 |      4.0 |                      3.0 | transform_
| epochs       | int    | 4         |      2.0 |     16.0 |                     10.0 | transform_
| k_folds      | int    | 1         |      1.0 |      1.0 |                      1.0 | None
| patience     | int    | 2         |      3.0 |      7.0 |                      7.0 | transform_
| optimizer    | factor | SGD       |      0.0 |      6.0 |                      2.0 | None
| sgd_momentum | float  | 0.0       |      0.0 |      1.0 |   0.0006997065831717553 | None
```

```
spot_tuner.plot_importance(threshold=0.025,
    filename="./figures/" + experiment_name+"_importance.png")
```

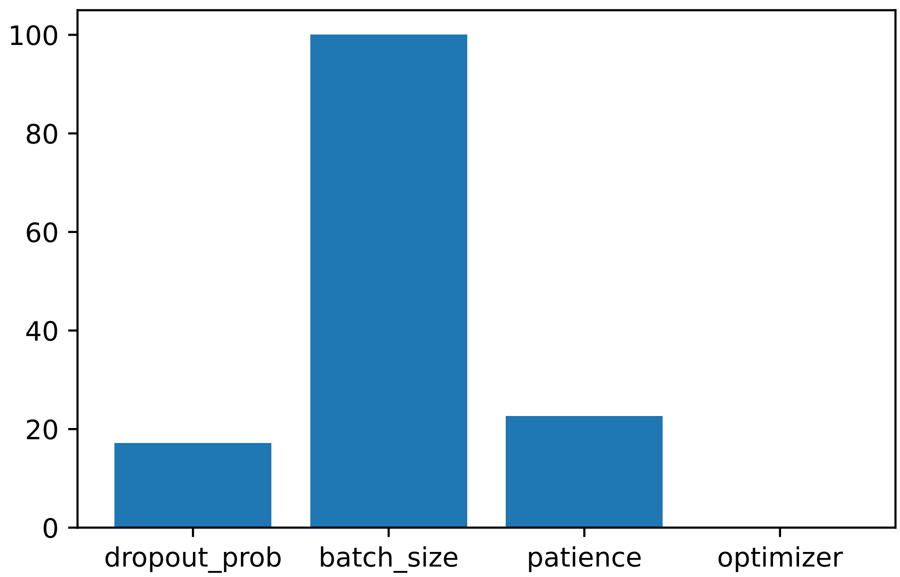

Figure 25.2: Variable importance plot, threshold 0.025.

25.15 Get the Tuned Architecture (SPOT Results)

```
from spotPython.hyperparameters.values import get_one_core_model_from_X
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
model_spot = get_one_core_model_from_X(X, fun_control)
model_spot
```

```
Net_lin_reg(
  (fc1): Linear(in_features=10, out_features=8, bias=True)
  (fc2): Linear(in_features=8, out_features=4, bias=True)
  (fc3): Linear(in_features=4, out_features=1, bias=True)
  (relu): ReLU()
  (softmax): Softmax(dim=1)
  (dropout1): Dropout(p=0.00015221963845657438, inplace=False)
  (dropout2): Dropout(p=7.610981922828719e-05, inplace=False)
)
```

25.16 Evaluation of the Tuned Architecture

```
from spotPython.torch.traintest import (
    train_tuned,
    test_tuned,
    )
```

```
train_tuned(net=model_spot, train_dataset=train,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
        shuffle=True,
        device = fun_control["device"],
        path=None,
        task=fun_control["task"],)
```

```
Epoch: 1
Loss on hold-out set: 0.07001589473925139
MeanAbsoluteError value on hold-out data: 0.21724970638751984
Epoch: 2
Loss on hold-out set: 0.06020361503684207
MeanAbsoluteError value on hold-out data: 0.2019364982843399
Epoch: 3

Loss on hold-out set: 0.053848143654728405
MeanAbsoluteError value on hold-out data: 0.18991972506046295
Epoch: 4
Loss on hold-out set: 0.048908020712827384
MeanAbsoluteError value on hold-out data: 0.17880721390247345
Epoch: 5
Loss on hold-out set: 0.043930474962843094
MeanAbsoluteError value on hold-out data: 0.16807261109352112
Epoch: 6
Loss on hold-out set: 0.04011133624436824
MeanAbsoluteError value on hold-out data: 0.15834765136241913
Epoch: 7
Loss on hold-out set: 0.03548612104924886
MeanAbsoluteError value on hold-out data: 0.15097184479236603
Epoch: 8
Loss on hold-out set: 0.03284217851040395
MeanAbsoluteError value on hold-out data: 0.14520542323589325
Epoch: 9
```

```
Loss on hold-out set: 0.031208371449457973
MeanAbsoluteError value on hold-out data: 0.14139969646930695
Epoch: 10
Loss on hold-out set: 0.03007565002496305
MeanAbsoluteError value on hold-out data: 0.1393551081418991
Epoch: 11
Loss on hold-out set: 0.02975446229653531
MeanAbsoluteError value on hold-out data: 0.13802330195903778
Epoch: 12

Loss on hold-out set: 0.0290682416556305
MeanAbsoluteError value on hold-out data: 0.13718019425868988
Epoch: 13
Loss on hold-out set: 0.029261650909718714
MeanAbsoluteError value on hold-out data: 0.13682356476783752
Epoch: 14
Loss on hold-out set: 0.028791081307357864
MeanAbsoluteError value on hold-out data: 0.13633714616298676
Epoch: 15

Loss on hold-out set: 0.028553941973338003
MeanAbsoluteError value on hold-out data: 0.1360315978527069
Epoch: 16
Loss on hold-out set: 0.028622761466785482
MeanAbsoluteError value on hold-out data: 0.13578416407108307
Epoch: 17
Loss on hold-out set: 0.02839061386246038
MeanAbsoluteError value on hold-out data: 0.13551843166351318
Epoch: 18
Loss on hold-out set: 0.029282534004826295
MeanAbsoluteError value on hold-out data: 0.1353159099817276
Epoch: 19
Loss on hold-out set: 0.028386387459345554
MeanAbsoluteError value on hold-out data: 0.13510717451572418
Epoch: 20
Loss on hold-out set: 0.028534089607235632
MeanAbsoluteError value on hold-out data: 0.13494232296943665
Epoch: 21
Loss on hold-out set: 0.028372254149105988
MeanAbsoluteError value on hold-out data: 0.1347459852695465
Epoch: 22
Loss on hold-out set: 0.0281102668837105
```

```
MeanAbsoluteError value on hold-out data: 0.1345331370830536
Epoch: 23
Loss on hold-out set: 0.027819932034043104
MeanAbsoluteError value on hold-out data: 0.13419438898563385
Epoch: 24

Loss on hold-out set: 0.0281258229852507
MeanAbsoluteError value on hold-out data: 0.1341298520565033
Epoch: 25
Loss on hold-out set: 0.028075226080162746
MeanAbsoluteError value on hold-out data: 0.13406148552894592
Epoch: 26
Loss on hold-out set: 0.0278374956871726
MeanAbsoluteError value on hold-out data: 0.13367129862308502
Epoch: 27

Loss on hold-out set: 0.028118828912020513
MeanAbsoluteError value on hold-out data: 0.13351868093013763
Epoch: 28
Loss on hold-out set: 0.027631634245871714
MeanAbsoluteError value on hold-out data: 0.1332530379295349
Epoch: 29
Loss on hold-out set: 0.027977442405627745
MeanAbsoluteError value on hold-out data: 0.13304178416728973
Epoch: 30
Loss on hold-out set: 0.027646212225877924
MeanAbsoluteError value on hold-out data: 0.13285265862941742
Epoch: 31
Loss on hold-out set: 0.02726275620884017
MeanAbsoluteError value on hold-out data: 0.13267390429973602
Epoch: 32
Loss on hold-out set: 0.027230405849159547
MeanAbsoluteError value on hold-out data: 0.13243305683135986
Epoch: 33
Loss on hold-out set: 0.02729718344237067
MeanAbsoluteError value on hold-out data: 0.13227465748786926
Epoch: 34
Loss on hold-out set: 0.027511261562865815
MeanAbsoluteError value on hold-out data: 0.13210661709308624
Epoch: 35
Loss on hold-out set: 0.027314123195154888
MeanAbsoluteError value on hold-out data: 0.1318829357624054
```

```
Epoch: 36

Loss on hold-out set: 0.027141385540170104
MeanAbsoluteError value on hold-out data: 0.13172547519207
Epoch: 37
Loss on hold-out set: 0.02693265063786193
MeanAbsoluteError value on hold-out data: 0.13154931366443634
Epoch: 38
Loss on hold-out set: 0.027032021420860763
MeanAbsoluteError value on hold-out data: 0.13144472241401672
Epoch: 39

Loss on hold-out set: 0.02694560641324834
MeanAbsoluteError value on hold-out data: 0.1312873512506485
Epoch: 40
Loss on hold-out set: 0.026708060409873724
MeanAbsoluteError value on hold-out data: 0.13108111917972565
Epoch: 41
Loss on hold-out set: 0.026749402554215568
MeanAbsoluteError value on hold-out data: 0.13094228506088257
Epoch: 42
Loss on hold-out set: 0.026742370431556514
MeanAbsoluteError value on hold-out data: 0.1307932734489441
Epoch: 43
Loss on hold-out set: 0.026647988351454075
MeanAbsoluteError value on hold-out data: 0.1306416392326355
Epoch: 44
Loss on hold-out set: 0.026795946539526706
MeanAbsoluteError value on hold-out data: 0.1304527372121811
Epoch: 45
Loss on hold-out set: 0.026533213848444193
MeanAbsoluteError value on hold-out data: 0.13030049204826355
Epoch: 46
Loss on hold-out set: 0.026563629042357206
MeanAbsoluteError value on hold-out data: 0.1301547735929489
Epoch: 47
Loss on hold-out set: 0.02701411844770375
MeanAbsoluteError value on hold-out data: 0.12997004389762878
Epoch: 48

Loss on hold-out set: 0.02624109139862029
MeanAbsoluteError value on hold-out data: 0.1298443078994751
```

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Epoch: 49
Loss on hold-out set: 0.026348216998341837
MeanAbsoluteError value on hold-out data: 0.12968780100345612
Epoch: 50
Loss on hold-out set: 0.026301107614448194
MeanAbsoluteError value on hold-out data: 0.1295841783285141
Epoch: 51

Loss on hold-out set: 0.025906153372488916
MeanAbsoluteError value on hold-out data: 0.12940089404582977
Epoch: 52
Loss on hold-out set: 0.026433154058299567
MeanAbsoluteError value on hold-out data: 0.1292327344417572
Epoch: 53
Loss on hold-out set: 0.026256737703653544
MeanAbsoluteError value on hold-out data: 0.12904760241508484
Epoch: 54
Loss on hold-out set: 0.025989399218049488
MeanAbsoluteError value on hold-out data: 0.12894561886787415
Epoch: 55
Loss on hold-out set: 0.026195827516187962
MeanAbsoluteError value on hold-out data: 0.12872543931007385
Epoch: 56
Loss on hold-out set: 0.02567533982035361
MeanAbsoluteError value on hold-out data: 0.12864071130752563
Epoch: 57
Loss on hold-out set: 0.02548717533385283
MeanAbsoluteError value on hold-out data: 0.12834790349006653
Epoch: 58
Loss on hold-out set: 0.02560471760501203
MeanAbsoluteError value on hold-out data: 0.1280268281698227
Epoch: 59
Loss on hold-out set: 0.025577055952070576
MeanAbsoluteError value on hold-out data: 0.12810121476650238
Epoch: 60

Loss on hold-out set: 0.026138791024047685
MeanAbsoluteError value on hold-out data: 0.12800434231758118
Epoch: 61
Loss on hold-out set: 0.02560937059062876
MeanAbsoluteError value on hold-out data: 0.1278320848941803
Epoch: 62
```

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Loss on hold-out set: 0.025499552206479405
MeanAbsoluteError value on hold-out data: 0.1276313215494156
Epoch: 63


Loss on hold-out set: 0.025599218071683458
MeanAbsoluteError value on hold-out data: 0.12747281789779663
Epoch: 64
Loss on hold-out set: 0.025183451398716944
MeanAbsoluteError value on hold-out data: 0.12730027735233307
Epoch: 65
Loss on hold-out set: 0.02527909305583882
MeanAbsoluteError value on hold-out data: 0.12695211172103882
Epoch: 66
Loss on hold-out set: 0.025082773663789817
MeanAbsoluteError value on hold-out data: 0.12696968019008636
Epoch: 67
Loss on hold-out set: 0.02530496930213351
MeanAbsoluteError value on hold-out data: 0.12679901719093323
Epoch: 68
Loss on hold-out set: 0.025038471126830893
MeanAbsoluteError value on hold-out data: 0.12663482129573822
Epoch: 69
Loss on hold-out set: 0.025079487430814066
MeanAbsoluteError value on hold-out data: 0.12648682296276093
Epoch: 70
Loss on hold-out set: 0.024757766458941132
MeanAbsoluteError value on hold-out data: 0.12632687389850616
Epoch: 71
Loss on hold-out set: 0.024700711003357644
MeanAbsoluteError value on hold-out data: 0.12615440785884857
Epoch: 72


Loss on hold-out set: 0.024978872302821593
MeanAbsoluteError value on hold-out data: 0.12602247297763824
Epoch: 73
Loss on hold-out set: 0.024740462460996288
MeanAbsoluteError value on hold-out data: 0.12583576142787933
Epoch: 74
Loss on hold-out set: 0.024778824091251744
MeanAbsoluteError value on hold-out data: 0.1256415694952011
Epoch: 75
```

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Loss on hold-out set: 0.02470172895118594
MeanAbsoluteError value on hold-out data: 0.12549945712089539
Epoch: 76
Loss on hold-out set: 0.024648509086354783
MeanAbsoluteError value on hold-out data: 0.12532354891300201
Epoch: 77
Loss on hold-out set: 0.024331767712474653
MeanAbsoluteError value on hold-out data: 0.12517598271369934
Epoch: 78
Loss on hold-out set: 0.02481598171748613
MeanAbsoluteError value on hold-out data: 0.12498103082180023
Epoch: 79
Loss on hold-out set: 0.024682543791928573
MeanAbsoluteError value on hold-out data: 0.12468743324279785
Epoch: 80
Loss on hold-out set: 0.024585426907594268
MeanAbsoluteError value on hold-out data: 0.12486963719129562
Epoch: 81
Loss on hold-out set: 0.024549938554532434
MeanAbsoluteError value on hold-out data: 0.1244463324546814
Epoch: 82
Loss on hold-out set: 0.024152118871968827
MeanAbsoluteError value on hold-out data: 0.12422565370798111
Epoch: 83
Loss on hold-out set: 0.023897774664587097
MeanAbsoluteError value on hold-out data: 0.12410138547420502
Epoch: 84

Loss on hold-out set: 0.024130363531998898
MeanAbsoluteError value on hold-out data: 0.12393136322498322
Epoch: 85
Loss on hold-out set: 0.0239818028088561
MeanAbsoluteError value on hold-out data: 0.12375174462795258
Epoch: 86
Loss on hold-out set: 0.02373309732463799
MeanAbsoluteError value on hold-out data: 0.12383680790662766
Epoch: 87

Loss on hold-out set: 0.023593875040349207
MeanAbsoluteError value on hold-out data: 0.12341003119945526
Epoch: 88
Loss on hold-out set: 0.023958279971817608
```

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MeanAbsoluteError value on hold-out data: 0.1232132688164711
Epoch: 89
Loss on hold-out set: 0.024033885387899846
MeanAbsoluteError value on hold-out data: 0.12299921363592148
Epoch: 90
Loss on hold-out set: 0.023540830668552143
MeanAbsoluteError value on hold-out data: 0.12290233373641968
Epoch: 91
Loss on hold-out set: 0.023591010426906377
MeanAbsoluteError value on hold-out data: 0.12268025428056717
Epoch: 92
Loss on hold-out set: 0.023318330965642082
MeanAbsoluteError value on hold-out data: 0.1224692314863205
Epoch: 93
Loss on hold-out set: 0.02398648979387393
MeanAbsoluteError value on hold-out data: 0.12233838438987732
Epoch: 94
Loss on hold-out set: 0.02410245104080164
MeanAbsoluteError value on hold-out data: 0.12218928337097168
Epoch: 95
Loss on hold-out set: 0.02330663900111655
MeanAbsoluteError value on hold-out data: 0.12193737179040909
Epoch: 96

Loss on hold-out set: 0.023262275015249065
MeanAbsoluteError value on hold-out data: 0.12187633663415909
Epoch: 97
Loss on hold-out set: 0.023682952110998724
MeanAbsoluteError value on hold-out data: 0.12156973779201508
Epoch: 98
Loss on hold-out set: 0.02284527371490472
MeanAbsoluteError value on hold-out data: 0.12132811546325684
Epoch: 99

Loss on hold-out set: 0.023549731097821342
MeanAbsoluteError value on hold-out data: 0.12114059180021286
Epoch: 100
Loss on hold-out set: 0.02290101868933753
MeanAbsoluteError value on hold-out data: 0.12093524634838104
Epoch: 101
Loss on hold-out set: 0.0226130635404077
MeanAbsoluteError value on hold-out data: 0.12073702365159988
```

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Epoch: 102
Loss on hold-out set: 0.022747472296223828
MeanAbsoluteError value on hold-out data: 0.12055285274982452
Epoch: 103
Loss on hold-out set: 0.022647173143923283
MeanAbsoluteError value on hold-out data: 0.12031290680170059
Epoch: 104
Loss on hold-out set: 0.022574222462839987
MeanAbsoluteError value on hold-out data: 0.12019718438386917
Epoch: 105
Loss on hold-out set: 0.022532813005933638
MeanAbsoluteError value on hold-out data: 0.11992631107568741
Epoch: 106
Loss on hold-out set: 0.022599327488263186
MeanAbsoluteError value on hold-out data: 0.11970622092485428
Epoch: 107
Loss on hold-out set: 0.022641721132554506
MeanAbsoluteError value on hold-out data: 0.1194968894124031
Epoch: 108

Loss on hold-out set: 0.022329359744234306
MeanAbsoluteError value on hold-out data: 0.11929728090763092
Epoch: 109
Loss on hold-out set: 0.022109372075647116
MeanAbsoluteError value on hold-out data: 0.1192525327205658
Epoch: 110
Loss on hold-out set: 0.021950509938362398
MeanAbsoluteError value on hold-out data: 0.11891830712556839
Epoch: 111

Loss on hold-out set: 0.02181299797896492
MeanAbsoluteError value on hold-out data: 0.1187036782503128
Epoch: 112
Loss on hold-out set: 0.02191872136226218
MeanAbsoluteError value on hold-out data: 0.11847143620252609
Epoch: 113
Loss on hold-out set: 0.021686336589290908
MeanAbsoluteError value on hold-out data: 0.11823465675115585
Epoch: 114
Loss on hold-out set: 0.021715863675222193
MeanAbsoluteError value on hold-out data: 0.11801876127719879
Epoch: 115
```

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Loss on hold-out set: 0.021739140545067034
MeanAbsoluteError value on hold-out data: 0.11782872676849365
Epoch: 116
Loss on hold-out set: 0.02180303265585711
MeanAbsoluteError value on hold-out data: 0.11758022010326385
Epoch: 117
Loss on hold-out set: 0.021555784697595396
MeanAbsoluteError value on hold-out data: 0.11735448241233826
Epoch: 118
Loss on hold-out set: 0.02174476581919742
MeanAbsoluteError value on hold-out data: 0.11708282679319382
Epoch: 119
Loss on hold-out set: 0.02134164495050515
MeanAbsoluteError value on hold-out data: 0.11690222471952438
Epoch: 120

Loss on hold-out set: 0.021234167071892636
MeanAbsoluteError value on hold-out data: 0.11667990684509277
Epoch: 121
Loss on hold-out set: 0.02136189674370383
MeanAbsoluteError value on hold-out data: 0.11643730103969574
Epoch: 122
Loss on hold-out set: 0.021518681823325
MeanAbsoluteError value on hold-out data: 0.11621028929948807
Epoch: 123

Loss on hold-out set: 0.020938298015512134
MeanAbsoluteError value on hold-out data: 0.11627567559480667
Epoch: 124
Loss on hold-out set: 0.020871493916370366
MeanAbsoluteError value on hold-out data: 0.11568310856819153
Epoch: 125
Loss on hold-out set: 0.020779550136802227
MeanAbsoluteError value on hold-out data: 0.11546770483255386
Epoch: 126
Loss on hold-out set: 0.02096392923818999
MeanAbsoluteError value on hold-out data: 0.11500227451324463
Epoch: 127
Loss on hold-out set: 0.020806309472965568
MeanAbsoluteError value on hold-out data: 0.11493619531393051
Epoch: 128
Loss on hold-out set: 0.020554326652353138
```

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MeanAbsoluteError value on hold-out data: 0.1152559295296669
Epoch: 129
Loss on hold-out set: 0.02026646076333954
MeanAbsoluteError value on hold-out data: 0.11444766819477081
Epoch: 130
Loss on hold-out set: 0.020591774649035773
MeanAbsoluteError value on hold-out data: 0.11417738348245621
Epoch: 131
Loss on hold-out set: 0.02068667020648718
MeanAbsoluteError value on hold-out data: 0.11448931694030762
Epoch: 132
```

```
Loss on hold-out set: 0.02005482495664374
MeanAbsoluteError value on hold-out data: 0.11365795135498047
Epoch: 133
Loss on hold-out set: 0.020392712940903085
MeanAbsoluteError value on hold-out data: 0.11335721611976624
Epoch: 134
Loss on hold-out set: 0.01998145569508013
MeanAbsoluteError value on hold-out data: 0.11311120539903641
Epoch: 135
```

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Loss on hold-out set: 0.020066004123930867
MeanAbsoluteError value on hold-out data: 0.11320082098245621
Epoch: 136
Loss on hold-out set: 0.019961921804535546
MeanAbsoluteError value on hold-out data: 0.11256633698940277
Epoch: 137
Loss on hold-out set: 0.019942529560802013
MeanAbsoluteError value on hold-out data: 0.11249187588691711
Epoch: 138
Loss on hold-out set: 0.019816554004424496
MeanAbsoluteError value on hold-out data: 0.11204414069652557
Epoch: 139
Loss on hold-out set: 0.01938594403480621
MeanAbsoluteError value on hold-out data: 0.11173694580793381
Epoch: 140
Loss on hold-out set: 0.019473686336392636
MeanAbsoluteError value on hold-out data: 0.11148057132959366
Epoch: 141
Loss on hold-out set: 0.019241984222868557
MeanAbsoluteError value on hold-out data: 0.11111248284578323
```

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Epoch: 142
Loss on hold-out set: 0.01906642636382266
MeanAbsoluteError value on hold-out data: 0.11091935634613037
Epoch: 143
Loss on hold-out set: 0.019243582286626884
MeanAbsoluteError value on hold-out data: 0.11063232272863388
Epoch: 144

Loss on hold-out set: 0.019172490304826123
MeanAbsoluteError value on hold-out data: 0.11032651364803314
Epoch: 145
Loss on hold-out set: 0.01909305906462434
MeanAbsoluteError value on hold-out data: 0.11001545190811157
Epoch: 146
Loss on hold-out set: 0.018669619065660396
MeanAbsoluteError value on hold-out data: 0.10971846431493759
Epoch: 147

Loss on hold-out set: 0.0186347643428139
MeanAbsoluteError value on hold-out data: 0.10940618813037872
Epoch: 148
Loss on hold-out set: 0.01848726331158296
MeanAbsoluteError value on hold-out data: 0.10911594331264496
Epoch: 149
Loss on hold-out set: 0.01843122808311723
MeanAbsoluteError value on hold-out data: 0.10884246975183487
Epoch: 150
Loss on hold-out set: 0.01839385750262361
MeanAbsoluteError value on hold-out data: 0.10853608697652817
Epoch: 151
Loss on hold-out set: 0.018618512414640895
MeanAbsoluteError value on hold-out data: 0.1081700250506401
Epoch: 152
Loss on hold-out set: 0.018120054388418794
MeanAbsoluteError value on hold-out data: 0.10787775367498398
Epoch: 153
Loss on hold-out set: 0.01823121482677954
MeanAbsoluteError value on hold-out data: 0.10793644934892654
Epoch: 154
Loss on hold-out set: 0.018211003858596087
MeanAbsoluteError value on hold-out data: 0.10722573846578598
Epoch: 155
```

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Loss on hold-out set: 0.017987757896710383
MeanAbsoluteError value on hold-out data: 0.10688520967960358
Epoch: 156

Loss on hold-out set: 0.017722976075387316
MeanAbsoluteError value on hold-out data: 0.10659806430339813
Epoch: 157
Loss on hold-out set: 0.017699321499094367
MeanAbsoluteError value on hold-out data: 0.10626756399869919
Epoch: 158
Loss on hold-out set: 0.017505877369426583
MeanAbsoluteError value on hold-out data: 0.1059345081448555
Epoch: 159

Loss on hold-out set: 0.01737876995282836
MeanAbsoluteError value on hold-out data: 0.1055934950709343
Epoch: 160
Loss on hold-out set: 0.017195255232141597
MeanAbsoluteError value on hold-out data: 0.10527124255895615
Epoch: 161
Loss on hold-out set: 0.01717593569896723
MeanAbsoluteError value on hold-out data: 0.1049439013004303
Epoch: 162
Loss on hold-out set: 0.016951858991217848
MeanAbsoluteError value on hold-out data: 0.1045936569571495
Epoch: 163
Loss on hold-out set: 0.01737115208647753
MeanAbsoluteError value on hold-out data: 0.10404124855995178
Epoch: 164
Loss on hold-out set: 0.016982867223161616
MeanAbsoluteError value on hold-out data: 0.10393040627241135
Epoch: 165
Loss on hold-out set: 0.017164383671785657
MeanAbsoluteError value on hold-out data: 0.10356393456459045
Epoch: 166
Loss on hold-out set: 0.016605223443261104
MeanAbsoluteError value on hold-out data: 0.10321934521198273
Epoch: 167
Loss on hold-out set: 0.016502745376017532
MeanAbsoluteError value on hold-out data: 0.10286068916320801
Epoch: 168
```

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Loss on hold-out set: 0.01625866600385818
MeanAbsoluteError value on hold-out data: 0.10254121571779251
Epoch: 169
Loss on hold-out set: 0.017065291636084255
MeanAbsoluteError value on hold-out data: 0.10289037227630615
Epoch: 170
Loss on hold-out set: 0.016752205773771397
MeanAbsoluteError value on hold-out data: 0.10286670923233032
Epoch: 171

Loss on hold-out set: 0.01608973549752447
MeanAbsoluteError value on hold-out data: 0.10142185539007187
Epoch: 172
Loss on hold-out set: 0.01606924637637444
MeanAbsoluteError value on hold-out data: 0.10135986655950546
Epoch: 173
Loss on hold-out set: 0.015664968075916955
MeanAbsoluteError value on hold-out data: 0.10070231556892395
Epoch: 174
Loss on hold-out set: 0.01565634877739572
MeanAbsoluteError value on hold-out data: 0.10029121488332748
Epoch: 175
Loss on hold-out set: 0.015449224061357151
MeanAbsoluteError value on hold-out data: 0.09995391964912415
Epoch: 176
Loss on hold-out set: 0.015708962786256483
MeanAbsoluteError value on hold-out data: 0.09961828589439392
Epoch: 177
Loss on hold-out set: 0.01521970941930225
MeanAbsoluteError value on hold-out data: 0.09922657161951065
Epoch: 178
Loss on hold-out set: 0.01506060630230135
MeanAbsoluteError value on hold-out data: 0.09879951179027557
Epoch: 179
Loss on hold-out set: 0.014920026897207686
MeanAbsoluteError value on hold-out data: 0.09810974448919296
Epoch: 180

Loss on hold-out set: 0.014910013169834488
MeanAbsoluteError value on hold-out data: 0.09802132099866867
Epoch: 181
Loss on hold-out set: 0.015032708289493856
```

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MeanAbsoluteError value on hold-out data: 0.09742375463247299
Epoch: 182
Loss on hold-out set: 0.014721427388538263
MeanAbsoluteError value on hold-out data: 0.09720245003700256
Epoch: 183

Loss on hold-out set: 0.014616260078343513
MeanAbsoluteError value on hold-out data: 0.09676757454872131
Epoch: 184
Loss on hold-out set: 0.01432303194030139
MeanAbsoluteError value on hold-out data: 0.09619944542646408
Epoch: 185
Loss on hold-out set: 0.014253577670866721
MeanAbsoluteError value on hold-out data: 0.09599501639604568
Epoch: 186
Loss on hold-out set: 0.014143149644185445
MeanAbsoluteError value on hold-out data: 0.0955677330493927
Epoch: 187
Loss on hold-out set: 0.014488510383096965
MeanAbsoluteError value on hold-out data: 0.09508416056632996
Epoch: 188
Loss on hold-out set: 0.013848718779627234
MeanAbsoluteError value on hold-out data: 0.09471061080694199
Epoch: 189
Loss on hold-out set: 0.01366033514741024
MeanAbsoluteError value on hold-out data: 0.09434199333190918
Epoch: 190
Loss on hold-out set: 0.013706413600103636
MeanAbsoluteError value on hold-out data: 0.09381535649299622
Epoch: 191
Loss on hold-out set: 0.01361281593256679
MeanAbsoluteError value on hold-out data: 0.0935135930776596
Epoch: 192

Loss on hold-out set: 0.013391523683247598
MeanAbsoluteError value on hold-out data: 0.09283328801393509
Epoch: 193
Loss on hold-out set: 0.013163051506700484
MeanAbsoluteError value on hold-out data: 0.09239313751459122
Epoch: 194
Loss on hold-out set: 0.013238227534058847
MeanAbsoluteError value on hold-out data: 0.09204260259866714
```

```
Epoch: 195

Loss on hold-out set: 0.012854206501383726
MeanAbsoluteError value on hold-out data: 0.0915234163403511
Epoch: 196
Loss on hold-out set: 0.012915943069138416
MeanAbsoluteError value on hold-out data: 0.0916854739189148
Epoch: 197
Loss on hold-out set: 0.012737678584495657
MeanAbsoluteError value on hold-out data: 0.09070099145174026
Epoch: 198
Loss on hold-out set: 0.012492550561498655
MeanAbsoluteError value on hold-out data: 0.09008793532848358
Epoch: 199
Loss on hold-out set: 0.01255999483462227
MeanAbsoluteError value on hold-out data: 0.08976836502552032
Epoch: 200
Loss on hold-out set: 0.012247667298652232
MeanAbsoluteError value on hold-out data: 0.08933186531066895
Epoch: 201
Loss on hold-out set: 0.01209118439644379
MeanAbsoluteError value on hold-out data: 0.08887667208909988
Epoch: 202
Loss on hold-out set: 0.012026162046056828
MeanAbsoluteError value on hold-out data: 0.08839646726846695
Epoch: 203
Loss on hold-out set: 0.011922342286102082
MeanAbsoluteError value on hold-out data: 0.08789008855819702
Epoch: 204

Loss on hold-out set: 0.011908917399858566
MeanAbsoluteError value on hold-out data: 0.0874127522110939
Epoch: 205
Loss on hold-out set: 0.011778860659289517
MeanAbsoluteError value on hold-out data: 0.08705934882164001
Epoch: 206
Loss on hold-out set: 0.011532742223751388
MeanAbsoluteError value on hold-out data: 0.08643541485071182
Epoch: 207

Loss on hold-out set: 0.011401721833910989
MeanAbsoluteError value on hold-out data: 0.08597028255462646
```

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Epoch: 208
Loss on hold-out set: 0.011300083960553533
MeanAbsoluteError value on hold-out data: 0.08549394458532333
Epoch: 209
Loss on hold-out set: 0.01135251810161495
MeanAbsoluteError value on hold-out data: 0.08493161201477051
Epoch: 210
Loss on hold-out set: 0.011151142681850806
MeanAbsoluteError value on hold-out data: 0.08499249070882797
Epoch: 211
Loss on hold-out set: 0.010809387325456268
MeanAbsoluteError value on hold-out data: 0.08397655189037323
Epoch: 212
Loss on hold-out set: 0.0107655423497291
MeanAbsoluteError value on hold-out data: 0.08353321999311447
Epoch: 213
Loss on hold-out set: 0.01058926998858193
MeanAbsoluteError value on hold-out data: 0.08297212421894073
Epoch: 214
Loss on hold-out set: 0.010605644355037887
MeanAbsoluteError value on hold-out data: 0.08245344460010529
Epoch: 215
Loss on hold-out set: 0.010300803421016195
MeanAbsoluteError value on hold-out data: 0.08193393051624298
Epoch: 216

Loss on hold-out set: 0.01040944050213224
MeanAbsoluteError value on hold-out data: 0.08143158257007599
Epoch: 217
Loss on hold-out set: 0.010109866773219485
MeanAbsoluteError value on hold-out data: 0.08091244101524353
Epoch: 218
Loss on hold-out set: 0.01002245763390276
MeanAbsoluteError value on hold-out data: 0.08039197325706482
Epoch: 219

Loss on hold-out set: 0.009981274721212685
MeanAbsoluteError value on hold-out data: 0.08029491454362869
Epoch: 220
Loss on hold-out set: 0.009652651766756256
MeanAbsoluteError value on hold-out data: 0.07938212156295776
Epoch: 221
```

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Loss on hold-out set: 0.009493834093997353
MeanAbsoluteError value on hold-out data: 0.07886140793561935
Epoch: 222
Loss on hold-out set: 0.009506357043344332
MeanAbsoluteError value on hold-out data: 0.07833781093358994
Epoch: 223
Loss on hold-out set: 0.009297929220146647
MeanAbsoluteError value on hold-out data: 0.07780131697654724
Epoch: 224
Loss on hold-out set: 0.009289743593207708
MeanAbsoluteError value on hold-out data: 0.07727857679128647
Epoch: 225
Loss on hold-out set: 0.00916800012591442
MeanAbsoluteError value on hold-out data: 0.07679478079080582
Epoch: 226
Loss on hold-out set: 0.008956947082065438
MeanAbsoluteError value on hold-out data: 0.07624585181474686
Epoch: 227
Loss on hold-out set: 0.008914594805039661
MeanAbsoluteError value on hold-out data: 0.07571589201688766
Epoch: 228

Loss on hold-out set: 0.008667653916697753
MeanAbsoluteError value on hold-out data: 0.07525564730167389
Epoch: 229
Loss on hold-out set: 0.008659819906920586
MeanAbsoluteError value on hold-out data: 0.07471645623445511
Epoch: 230
Loss on hold-out set: 0.008435887557233832
MeanAbsoluteError value on hold-out data: 0.07418979704380035
Epoch: 231

Loss on hold-out set: 0.008330353425423565
MeanAbsoluteError value on hold-out data: 0.0736633911728859
Epoch: 232
Loss on hold-out set: 0.008222068488401802
MeanAbsoluteError value on hold-out data: 0.07312512397766113
Epoch: 233
Loss on hold-out set: 0.00809222760634791
MeanAbsoluteError value on hold-out data: 0.07261932641267776
Epoch: 234
Loss on hold-out set: 0.008076274752200237
```

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MeanAbsoluteError value on hold-out data: 0.07208297401666641
Epoch: 235
Loss on hold-out set: 0.007891852316740704
MeanAbsoluteError value on hold-out data: 0.07139595597982407
Epoch: 236
Loss on hold-out set: 0.007745049838711948
MeanAbsoluteError value on hold-out data: 0.07104596495628357
Epoch: 237
Loss on hold-out set: 0.007636949493500747
MeanAbsoluteError value on hold-out data: 0.07053192704916
Epoch: 238
Loss on hold-out set: 0.007577943805556156
MeanAbsoluteError value on hold-out data: 0.06998930871486664
Epoch: 239
Loss on hold-out set: 0.007403608466694622
MeanAbsoluteError value on hold-out data: 0.06945252418518066
Epoch: 240

Loss on hold-out set: 0.007287694781553
MeanAbsoluteError value on hold-out data: 0.06892561912536621
Epoch: 241
Loss on hold-out set: 0.007224590002902244
MeanAbsoluteError value on hold-out data: 0.06840839236974716
Epoch: 242
Loss on hold-out set: 0.0071154170681869515
MeanAbsoluteError value on hold-out data: 0.0678938701748848
Epoch: 243

Loss on hold-out set: 0.007040511905583308
MeanAbsoluteError value on hold-out data: 0.06732629984617233
Epoch: 244
Loss on hold-out set: 0.006795691914464298
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Epoch: 245
Loss on hold-out set: 0.006714812412514891
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Epoch: 246
Loss on hold-out set: 0.0066110043584271085
MeanAbsoluteError value on hold-out data: 0.06604118645191193
Epoch: 247
Loss on hold-out set: 0.006476428575727991
MeanAbsoluteError value on hold-out data: 0.06528560817241669
```

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Epoch: 248
Loss on hold-out set: 0.006442093079002868
MeanAbsoluteError value on hold-out data: 0.06469962000846863
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Loss on hold-out set: 0.006271188784586756
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Loss on hold-out set: 0.006249697523583707
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Loss on hold-out set: 0.006145374665625002
MeanAbsoluteError value on hold-out data: 0.0630803033709526
Epoch: 252

Loss on hold-out set: 0.006006400018170672
MeanAbsoluteError value on hold-out data: 0.06263391673564911
Epoch: 253
Loss on hold-out set: 0.005875533921521549
MeanAbsoluteError value on hold-out data: 0.062136027961969376
Epoch: 254
Loss on hold-out set: 0.006248832459708578
MeanAbsoluteError value on hold-out data: 0.0622686892747879
Epoch: 255

Loss on hold-out set: 0.005768559447269102
MeanAbsoluteError value on hold-out data: 0.06094525754451752
Epoch: 256
Loss on hold-out set: 0.005576538611325975
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Loss on hold-out set: 0.005488299197933979
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Loss on hold-out set: 0.005448041465378513
MeanAbsoluteError value on hold-out data: 0.05951956287026405
Epoch: 259
Loss on hold-out set: 0.005281295679436114
MeanAbsoluteError value on hold-out data: 0.058792393654584885
Epoch: 260
Loss on hold-out set: 0.005249647337845282
MeanAbsoluteError value on hold-out data: 0.058137569576501846
Epoch: 261
```

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Loss on hold-out set: 0.00522616230821433
MeanAbsoluteError value on hold-out data: 0.05784903094172478
Epoch: 262
Loss on hold-out set: 0.0054559231625477735
MeanAbsoluteError value on hold-out data: 0.05839582532644272
Epoch: 263
Loss on hold-out set: 0.004865133679949825
MeanAbsoluteError value on hold-out data: 0.05657795071601868
Epoch: 264

Loss on hold-out set: 0.00484805740722406
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Epoch: 265
Loss on hold-out set: 0.004735414425866972
MeanAbsoluteError value on hold-out data: 0.05582219362258911
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Loss on hold-out set: 0.0045985271602771
MeanAbsoluteError value on hold-out data: 0.05510542541742325
Epoch: 267

Loss on hold-out set: 0.004577391636925505
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Epoch: 268
Loss on hold-out set: 0.004491504808691771
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Epoch: 269
Loss on hold-out set: 0.00449978826432734
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Loss on hold-out set: 0.004272434682781367
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Loss on hold-out set: 0.004324827631200223
MeanAbsoluteError value on hold-out data: 0.05286825820803642
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Loss on hold-out set: 0.004163197989232446
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Epoch: 273
Loss on hold-out set: 0.0040032143220550525
MeanAbsoluteError value on hold-out data: 0.05135466158390045
Epoch: 274
Loss on hold-out set: 0.0039475286275295444
```

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MeanAbsoluteError value on hold-out data: 0.05076075717806816
Epoch: 275
Loss on hold-out set: 0.0038945504562243037
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Epoch: 276

Loss on hold-out set: 0.0038345589235081875
MeanAbsoluteError value on hold-out data: 0.04986276477575302
Epoch: 277
Loss on hold-out set: 0.0037245174247992076
MeanAbsoluteError value on hold-out data: 0.04938310384750366
Epoch: 278
Loss on hold-out set: 0.003615929702247836
MeanAbsoluteError value on hold-out data: 0.04885910823941231
Epoch: 279

Loss on hold-out set: 0.003567042009978506
MeanAbsoluteError value on hold-out data: 0.0482843779027462
Epoch: 280
Loss on hold-out set: 0.0035059089423157275
MeanAbsoluteError value on hold-out data: 0.04783336818218231
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Loss on hold-out set: 0.0033862792035123626
MeanAbsoluteError value on hold-out data: 0.04729925096035004
Epoch: 282
Loss on hold-out set: 0.0033876908005607363
MeanAbsoluteError value on hold-out data: 0.04704219475388527
Epoch: 283
Loss on hold-out set: 0.0032856443002329846
MeanAbsoluteError value on hold-out data: 0.04624723270535469
Epoch: 284
Loss on hold-out set: 0.003398078504496401
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Epoch: 285
Loss on hold-out set: 0.003125347025496395
MeanAbsoluteError value on hold-out data: 0.04528861865401268
Epoch: 286
Loss on hold-out set: 0.003096558991513264
MeanAbsoluteError value on hold-out data: 0.044709332287311554
Epoch: 287
Loss on hold-out set: 0.0029605386585707925
MeanAbsoluteError value on hold-out data: 0.044187068939208984
```

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Epoch: 288

Loss on hold-out set: 0.002903534386668501
MeanAbsoluteError value on hold-out data: 0.043693799525499344
Epoch: 289
Loss on hold-out set: 0.0028824504590470737
MeanAbsoluteError value on hold-out data: 0.04322049766778946
Epoch: 290
Loss on hold-out set: 0.002827666176017374
MeanAbsoluteError value on hold-out data: 0.042850054800510406
Epoch: 291

Loss on hold-out set: 0.0027140989642296183
MeanAbsoluteError value on hold-out data: 0.04215596243739128
Epoch: 292
Loss on hold-out set: 0.002638102374284675
MeanAbsoluteError value on hold-out data: 0.04168936237692833
Epoch: 293
Loss on hold-out set: 0.002577840761085482
MeanAbsoluteError value on hold-out data: 0.04115049168467522
Epoch: 294
Loss on hold-out set: 0.0024946516756532027
MeanAbsoluteError value on hold-out data: 0.04065322503447533
Epoch: 295
Loss on hold-out set: 0.0024366742750556256
MeanAbsoluteError value on hold-out data: 0.04009507596492767
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Loss on hold-out set: 0.0023916331640640763
MeanAbsoluteError value on hold-out data: 0.03972143679857254
Epoch: 297
Loss on hold-out set: 0.0023191784199106656
MeanAbsoluteError value on hold-out data: 0.039194658398628235
Epoch: 298
Loss on hold-out set: 0.002254184266540075
MeanAbsoluteError value on hold-out data: 0.03865745663642883
Epoch: 299
Loss on hold-out set: 0.002240248084203095
MeanAbsoluteError value on hold-out data: 0.03810154274106026
Epoch: 300

Loss on hold-out set: 0.002153779554646462
MeanAbsoluteError value on hold-out data: 0.03759443759918213
```

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Epoch: 301
Loss on hold-out set: 0.0021133479182792237
MeanAbsoluteError value on hold-out data: 0.03705146908760071
Epoch: 302
Loss on hold-out set: 0.0020340517106600792
MeanAbsoluteError value on hold-out data: 0.036604128777980804
Epoch: 303

Loss on hold-out set: 0.001984888764318863
MeanAbsoluteError value on hold-out data: 0.03603493422269821
Epoch: 304
Loss on hold-out set: 0.0019363772329310642
MeanAbsoluteError value on hold-out data: 0.035615380853414536
Epoch: 305
Loss on hold-out set: 0.0018528906718864547
MeanAbsoluteError value on hold-out data: 0.03499514237046242
Epoch: 306
Loss on hold-out set: 0.0018273013338330202
MeanAbsoluteError value on hold-out data: 0.03446805104613304
Epoch: 307
Loss on hold-out set: 0.001759721264151219
MeanAbsoluteError value on hold-out data: 0.03396429866552353
Epoch: 308
Loss on hold-out set: 0.001703499923582728
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Epoch: 309
Loss on hold-out set: 0.0016380032822397833
MeanAbsoluteError value on hold-out data: 0.032932210713624954
Epoch: 310
Loss on hold-out set: 0.0016423792281114544
MeanAbsoluteError value on hold-out data: 0.032518643885850906
Epoch: 311
Loss on hold-out set: 0.0015560246339239377
MeanAbsoluteError value on hold-out data: 0.03186160698533058
Epoch: 312

Loss on hold-out set: 0.0015177854174429452
MeanAbsoluteError value on hold-out data: 0.03157699108123779
Epoch: 313
Loss on hold-out set: 0.0014504786001787963
MeanAbsoluteError value on hold-out data: 0.030891288071870804
Epoch: 314
```

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Loss on hold-out set: 0.0014079723868666118
MeanAbsoluteError value on hold-out data: 0.030315978452563286
Epoch: 315

Loss on hold-out set: 0.001351158990904591
MeanAbsoluteError value on hold-out data: 0.029864244163036346
Epoch: 316
Loss on hold-out set: 0.0013255935719873953
MeanAbsoluteError value on hold-out data: 0.02932373434305191
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Loss on hold-out set: 0.0012705730707813544
MeanAbsoluteError value on hold-out data: 0.029028113931417465
Epoch: 318
Loss on hold-out set: 0.0012188234173472186
MeanAbsoluteError value on hold-out data: 0.028431663289666176
Epoch: 319
Loss on hold-out set: 0.0011783540233553044
MeanAbsoluteError value on hold-out data: 0.027952756732702255
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Loss on hold-out set: 0.0011666308407592097
MeanAbsoluteError value on hold-out data: 0.02747192420065403
Epoch: 321
Loss on hold-out set: 0.0012133021871130424
MeanAbsoluteError value on hold-out data: 0.027350593358278275
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Loss on hold-out set: 0.001067115712334941
MeanAbsoluteError value on hold-out data: 0.026334639638662338
Epoch: 323
Loss on hold-out set: 0.0010176331546206615
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Epoch: 324

Loss on hold-out set: 0.0009743180271470919
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Epoch: 325
Loss on hold-out set: 0.0009638249773017474
MeanAbsoluteError value on hold-out data: 0.02497767098248005
Epoch: 326
Loss on hold-out set: 0.000895621690065845
MeanAbsoluteError value on hold-out data: 0.024337248876690865
Epoch: 327
```

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Loss on hold-out set: 0.0010532057138717438
MeanAbsoluteError value on hold-out data: 0.024650558829307556
Epoch: 328
Loss on hold-out set: 0.001248456612014898
MeanAbsoluteError value on hold-out data: 0.02481001242995262
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Loss on hold-out set: 0.0008128158611055513
MeanAbsoluteError value on hold-out data: 0.022964993491768837
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Loss on hold-out set: 0.0008018488239797175
MeanAbsoluteError value on hold-out data: 0.022359732538461685
Epoch: 331
Loss on hold-out set: 0.0007377433713899288
MeanAbsoluteError value on hold-out data: 0.02195705845952034
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Loss on hold-out set: 0.0006987039619401146
MeanAbsoluteError value on hold-out data: 0.021388912573456764
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Loss on hold-out set: 0.0006757650568799459
MeanAbsoluteError value on hold-out data: 0.02083178609609604
Epoch: 334
Loss on hold-out set: 0.0006453103265620916
MeanAbsoluteError value on hold-out data: 0.02049965225160122
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Loss on hold-out set: 0.000602123031919626
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Epoch: 336

Loss on hold-out set: 0.0005840417204461502
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Epoch: 337
Loss on hold-out set: 0.0005476218786115121
MeanAbsoluteError value on hold-out data: 0.018863936886191368
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Loss on hold-out set: 0.0005291276190148078
MeanAbsoluteError value on hold-out data: 0.01840182952582836
Epoch: 339

Loss on hold-out set: 0.0005024745194915388
MeanAbsoluteError value on hold-out data: 0.01794564723968506
Epoch: 340
Loss on hold-out set: 0.000475697498538801
```

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MeanAbsoluteError value on hold-out data: 0.01744559034705162
Epoch: 341
Loss on hold-out set: 0.00044930775689671894
MeanAbsoluteError value on hold-out data: 0.016980158165097237
Epoch: 342
Loss on hold-out set: 0.00042071210114763265
MeanAbsoluteError value on hold-out data: 0.01645486429333687
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Loss on hold-out set: 0.00040102845722637877
MeanAbsoluteError value on hold-out data: 0.015994880348443985
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Loss on hold-out set: 0.00037692765392038333
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Loss on hold-out set: 0.0003612240206597275
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Loss on hold-out set: 0.0003343067286263441
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Loss on hold-out set: 0.00032118067582288
MeanAbsoluteError value on hold-out data: 0.014204616658389568
Epoch: 348

Loss on hold-out set: 0.000312912718264239
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Epoch: 349
Loss on hold-out set: 0.0002860342910456606
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Loss on hold-out set: 0.00041401997307395123
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Epoch: 351

Loss on hold-out set: 0.0002512609127351377
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Loss on hold-out set: 0.00025335950493555223
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Epoch: 353
Loss on hold-out set: 0.00024814710636028873
MeanAbsoluteError value on hold-out data: 0.012133643962442875
```

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Epoch: 354
Loss on hold-out set: 0.00021078319887716442
MeanAbsoluteError value on hold-out data: 0.011434148997068405
Epoch: 355
Loss on hold-out set: 0.0005121696617846426
MeanAbsoluteError value on hold-out data: 0.012001863680779934
Epoch: 356
Loss on hold-out set: 0.00018578579558954132
MeanAbsoluteError value on hold-out data: 0.010545212775468826
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Loss on hold-out set: 0.00017370198800467494
MeanAbsoluteError value on hold-out data: 0.010231411084532738
Epoch: 358
Loss on hold-out set: 0.0001621567118586666
MeanAbsoluteError value on hold-out data: 0.009847723878920078
Epoch: 359
Loss on hold-out set: 0.00015186142589204552
MeanAbsoluteError value on hold-out data: 0.009465697221457958
Epoch: 360

Loss on hold-out set: 0.00014352087505118872
MeanAbsoluteError value on hold-out data: 0.009212052449584007
Epoch: 361
Loss on hold-out set: 0.00013359530892462077
MeanAbsoluteError value on hold-out data: 0.008831856772303581
Epoch: 362
Loss on hold-out set: 0.00012375698535929826
MeanAbsoluteError value on hold-out data: 0.008450483903288841
Epoch: 363

Loss on hold-out set: 0.0002435747489806473
MeanAbsoluteError value on hold-out data: 0.008833911269903183
Epoch: 364
Loss on hold-out set: 0.00011572858932739014
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Epoch: 365
Loss on hold-out set: 0.0001012663103545875
MeanAbsoluteError value on hold-out data: 0.007470663171261549
Epoch: 366
Loss on hold-out set: 9.529955636217462e-05
MeanAbsoluteError value on hold-out data: 0.007156994193792343
Epoch: 367
```

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Loss on hold-out set: 9.017392193000935e-05
MeanAbsoluteError value on hold-out data: 0.006891757715493441
Epoch: 368
Loss on hold-out set: 0.00010846045918362124
MeanAbsoluteError value on hold-out data: 0.006801420822739601
Epoch: 369
Loss on hold-out set: 7.665721269452326e-05
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Loss on hold-out set: 7.571921416552198e-05
MeanAbsoluteError value on hold-out data: 0.006261007860302925
Epoch: 371
Loss on hold-out set: 0.00015234843627503754
MeanAbsoluteError value on hold-out data: 0.00641176151111722
Epoch: 372

Loss on hold-out set: 0.0011185301910508745
MeanAbsoluteError value on hold-out data: 0.006788118742406368
Epoch: 373
Loss on hold-out set: 0.00029264925409446923
MeanAbsoluteError value on hold-out data: 0.006099347956478596
Epoch: 374
Loss on hold-out set: 5.4164589456425015e-05
MeanAbsoluteError value on hold-out data: 0.004928526934236288
Epoch: 375

Loss on hold-out set: 5.1198359612594924e-05
MeanAbsoluteError value on hold-out data: 0.00476361159235239
Epoch: 376
Loss on hold-out set: 4.738361516693227e-05
MeanAbsoluteError value on hold-out data: 0.004442534875124693
Epoch: 377
Loss on hold-out set: 0.00040093728777721705
MeanAbsoluteError value on hold-out data: 0.005284157581627369
Epoch: 378
Loss on hold-out set: 5.195734989253029e-05
MeanAbsoluteError value on hold-out data: 0.004166390281170607
Epoch: 379
Loss on hold-out set: 4.20102140220766e-05
MeanAbsoluteError value on hold-out data: 0.003829781198874116
Epoch: 380
Loss on hold-out set: 4.2553993065858343e-05
```

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MeanAbsoluteError value on hold-out data: 0.004277565982192755
Epoch: 381
Loss on hold-out set: 3.8862493277903064e-05
MeanAbsoluteError value on hold-out data: 0.003764599561691284
Epoch: 382
Loss on hold-out set: 3.4353519224264584e-05
MeanAbsoluteError value on hold-out data: 0.003365351352840662
Epoch: 383
Loss on hold-out set: 5.5240047081976006e-05
MeanAbsoluteError value on hold-out data: 0.00345878885127604
Epoch: 384

Loss on hold-out set: 3.097537231305499e-05
MeanAbsoluteError value on hold-out data: 0.0030198090244084597
Epoch: 385
Loss on hold-out set: 0.0001887896261941454
MeanAbsoluteError value on hold-out data: 0.0036234927829355
Epoch: 386
Loss on hold-out set: 5.508302346195131e-05
MeanAbsoluteError value on hold-out data: 0.006183478515595198
Epoch: 387

Loss on hold-out set: 2.780116033076602e-05
MeanAbsoluteError value on hold-out data: 0.002685203216969967
Epoch: 388
Loss on hold-out set: 2.7731091138680074e-05
MeanAbsoluteError value on hold-out data: 0.0026324980426579714
Epoch: 389
Loss on hold-out set: 2.6680777218165242e-05
MeanAbsoluteError value on hold-out data: 0.0025016418658196926
Epoch: 390
Loss on hold-out set: 2.5740300950354522e-05
MeanAbsoluteError value on hold-out data: 0.002380255376920104
Epoch: 391
Loss on hold-out set: 2.476483673550128e-05
MeanAbsoluteError value on hold-out data: 0.0022716913372278214
Epoch: 392
Loss on hold-out set: 2.3604206076972906e-05
MeanAbsoluteError value on hold-out data: 0.0021205898374319077
Epoch: 393
Loss on hold-out set: 2.891422099980302e-05
MeanAbsoluteError value on hold-out data: 0.002016614191234112
```

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Epoch: 394
Loss on hold-out set: 2.6202380067125457e-05
MeanAbsoluteError value on hold-out data: 0.0026831403374671936
Epoch: 395
Loss on hold-out set: 2.6131312243873445e-05
MeanAbsoluteError value on hold-out data: 0.002510657301172614
Epoch: 396

Loss on hold-out set: 2.6756150077744678e-05
MeanAbsoluteError value on hold-out data: 0.0029244888573884964
Epoch: 397
Loss on hold-out set: 2.379637554309068e-05
MeanAbsoluteError value on hold-out data: 0.0026493414770811796
Epoch: 398
Loss on hold-out set: 2.0930400469266812e-05
MeanAbsoluteError value on hold-out data: 0.0017846719129011035
Epoch: 399

Loss on hold-out set: 1.973844438988468e-05
MeanAbsoluteError value on hold-out data: 0.0016616295324638486
Epoch: 400
Loss on hold-out set: 1.9335872248180558e-05
MeanAbsoluteError value on hold-out data: 0.001589536084793508
Epoch: 401
Loss on hold-out set: 1.995258569078679e-05
MeanAbsoluteError value on hold-out data: 0.001731187105178833
Epoch: 402
Loss on hold-out set: 1.8480075502524367e-05
MeanAbsoluteError value on hold-out data: 0.0015486970078200102
Epoch: 403
Loss on hold-out set: 1.7587132206424366e-05
MeanAbsoluteError value on hold-out data: 0.0015673806192353368
Epoch: 404
Loss on hold-out set: 0.00025355973600002963
MeanAbsoluteError value on hold-out data: 0.0026645201724022627
Epoch: 405
Loss on hold-out set: 3.44321395363965e-05
MeanAbsoluteError value on hold-out data: 0.004918326623737812
Epoch: 406
Loss on hold-out set: 1.65521326950188e-05
MeanAbsoluteError value on hold-out data: 0.0013475847663357854
Epoch: 407
```

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Loss on hold-out set: 1.716413777929024e-05
MeanAbsoluteError value on hold-out data: 0.0015288025606423616
Epoch: 408

Loss on hold-out set: 1.6015567967399063e-05
MeanAbsoluteError value on hold-out data: 0.0013516671024262905
Epoch: 409
Loss on hold-out set: 1.577214390642056e-05
MeanAbsoluteError value on hold-out data: 0.0014959186082705855
Epoch: 410
Loss on hold-out set: 1.6197164283862787e-05
MeanAbsoluteError value on hold-out data: 0.0014423801330849528
Epoch: 411

Loss on hold-out set: 1.538323719224285e-05
MeanAbsoluteError value on hold-out data: 0.0012983916094526649
Epoch: 412
Loss on hold-out set: 1.4968509247718262e-05
MeanAbsoluteError value on hold-out data: 0.0012681649532169104
Epoch: 413
Loss on hold-out set: 1.4462082276622823e-05
MeanAbsoluteError value on hold-out data: 0.0012394544901326299
Epoch: 414
Loss on hold-out set: 6.974042238395764e-05
MeanAbsoluteError value on hold-out data: 0.00173162703868001 7
Epoch: 415
Loss on hold-out set: 3.025061568856221e-05
MeanAbsoluteError value on hold-out data: 0.0015006576431915164
Epoch: 416
Loss on hold-out set: 2.0477281216364262e-05
MeanAbsoluteError value on hold-out data: 0.0027927509509027004
Epoch: 417
Loss on hold-out set: 1.3891768730152427e-05
MeanAbsoluteError value on hold-out data: 0.0012767491862177849
Epoch: 418
Loss on hold-out set: 1.44907265474845e-05
MeanAbsoluteError value on hold-out data: 0.0014827375998720527
Epoch: 419
Loss on hold-out set: 3.0505021103378665e-05
MeanAbsoluteError value on hold-out data: 0.0017290787072852254
Epoch: 420
```

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Loss on hold-out set: 2.729390538852864e-05
MeanAbsoluteError value on hold-out data: 0.0017739069880917668
Epoch: 421
Loss on hold-out set: 6.724019235439614e-05
MeanAbsoluteError value on hold-out data: 0.001665789633989334
Epoch: 422
Loss on hold-out set: 1.3271381979058405e-05
MeanAbsoluteError value on hold-out data: 0.0011963536962866783
Epoch: 423

Loss on hold-out set: 1.3496167912457599e-05
MeanAbsoluteError value on hold-out data: 0.0012384118745103478
Epoch: 424
Loss on hold-out set: 0.00010423429553370289
MeanAbsoluteError value on hold-out data: 0.0018004445591941476
Epoch: 425
Loss on hold-out set: 1.2721817798789839e-05
MeanAbsoluteError value on hold-out data: 0.0011985714081674814
Epoch: 426
Loss on hold-out set: 1.2593787637626974e-05
MeanAbsoluteError value on hold-out data: 0.001163459732197225
Epoch: 427
Loss on hold-out set: 1.2143599513561149e-05
MeanAbsoluteError value on hold-out data: 0.0011533339275047183
Epoch: 428
Loss on hold-out set: 0.00014611181559587294
MeanAbsoluteError value on hold-out data: 0.0018592310370877385
Epoch: 429
Loss on hold-out set: 1.1793714254643442e-05
MeanAbsoluteError value on hold-out data: 0.001123339869081974
Epoch: 430
Loss on hold-out set: 0.00023841301290199106
MeanAbsoluteError value on hold-out data: 0.0019860793836414814
Epoch: 431
Loss on hold-out set: 1.1833698104324916e-05
MeanAbsoluteError value on hold-out data: 0.0014277789741754532
Epoch: 432

Loss on hold-out set: 1.1301703337021776e-05
MeanAbsoluteError value on hold-out data: 0.0011684728087857366
Epoch: 433
Loss on hold-out set: 3.626917221385826e-05
```

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MeanAbsoluteError value on hold-out data: 0.0053856875747442245
Epoch: 434
Loss on hold-out set: 7.476697383785635e-05
MeanAbsoluteError value on hold-out data: 0.0016997500788420439
Epoch: 435

Loss on hold-out set: 1.223571105338363e-05
MeanAbsoluteError value on hold-out data: 0.0012459371937438846
Epoch: 436
Loss on hold-out set: 3.707687501954943e-05
MeanAbsoluteError value on hold-out data: 0.0014271921245381236
Epoch: 437
Loss on hold-out set: 1.0854388566814888e-05
MeanAbsoluteError value on hold-out data: 0.0012129396200180054
Epoch: 438
Loss on hold-out set: 3.318882419546897e-05
MeanAbsoluteError value on hold-out data: 0.0014447923749685287
Epoch: 439
Loss on hold-out set: 1.072128974642869e-05
MeanAbsoluteError value on hold-out data: 0.0011766623938456178
Epoch: 440
Loss on hold-out set: 1.042822990963319e-05
MeanAbsoluteError value on hold-out data: 0.0011268937960267067
Epoch: 441
Loss on hold-out set: 1.0708248964126716e-05
MeanAbsoluteError value on hold-out data: 0.0011976545210927725
Epoch: 442
Loss on hold-out set: 1.111257793433807e-05
MeanAbsoluteError value on hold-out data: 0.0013385617639869452
Epoch: 443
Loss on hold-out set: 1.9907755394773342e-05
MeanAbsoluteError value on hold-out data: 0.0031672779005020857
Epoch: 444

Loss on hold-out set: 1.1071194790782843e-05
MeanAbsoluteError value on hold-out data: 0.001151963253505528
Epoch: 445
Loss on hold-out set: 1.0824633142865542e-05
MeanAbsoluteError value on hold-out data: 0.0011173131642863154
Epoch: 446
Loss on hold-out set: 1.1164872367729864e-05
MeanAbsoluteError value on hold-out data: 0.001154331723228097
```

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Epoch: 447

Loss on hold-out set: 1.4714086516601368e-05
MeanAbsoluteError value on hold-out data: 0.002384946681559086
Epoch: 448
Loss on hold-out set: 1.1518229680075964e-05
MeanAbsoluteError value on hold-out data: 0.001220362144522369
Epoch: 449
Loss on hold-out set: 1.3249631631663905e-05
MeanAbsoluteError value on hold-out data: 0.0012051766971126199
Epoch: 450
Loss on hold-out set: 0.00017253357554268764
MeanAbsoluteError value on hold-out data: 0.0021120188757777214
Epoch: 451
Loss on hold-out set: 1.5330541923743257e-05
MeanAbsoluteError value on hold-out data: 0.0027106106281280518
Epoch: 452
Loss on hold-out set: 0.00014967298414310455
MeanAbsoluteError value on hold-out data: 0.0018550098175182939
Epoch: 453
Loss on hold-out set: 1.2025780382361373e-05
MeanAbsoluteError value on hold-out data: 0.0016915812157094479
Epoch: 454
Loss on hold-out set: 1.1344897245635366e-05
MeanAbsoluteError value on hold-out data: 0.0012166124070063233
Epoch: 455
Loss on hold-out set: 1.1427209377763192e-05
MeanAbsoluteError value on hold-out data: 0.0012406929163262248
Epoch: 456

Loss on hold-out set: 1.1017218047240213e-05
MeanAbsoluteError value on hold-out data: 0.0013425410725176334
Epoch: 457
Loss on hold-out set: 1.0409654484832523e-05
MeanAbsoluteError value on hold-out data: 0.001075275707989931
Epoch: 458
Loss on hold-out set: 1.0343946565913747e-05
MeanAbsoluteError value on hold-out data: 0.001216908567585051
Epoch: 459

Loss on hold-out set: 0.00014399309481511206
MeanAbsoluteError value on hold-out data: 0.002103416481986642
```

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Epoch: 460
Loss on hold-out set: 9.813772718072605e-06
MeanAbsoluteError value on hold-out data: 0.0010976666817441583
Epoch: 461
Loss on hold-out set: 7.057155675445421e-05
MeanAbsoluteError value on hold-out data: 0.0015316683566197753
Epoch: 462
Loss on hold-out set: 4.8373065265955596e-05
MeanAbsoluteError value on hold-out data: 0.0014109942130744457
Epoch: 463
Loss on hold-out set: 9.71214652915813e-06
MeanAbsoluteError value on hold-out data: 0.0010707750916481018
Epoch: 464
Loss on hold-out set: 9.704506021609846e-06
MeanAbsoluteError value on hold-out data: 0.0011101460549980402
Epoch: 465
Loss on hold-out set: 7.692661211416108e-05
MeanAbsoluteError value on hold-out data: 0.0015200028428807855
Epoch: 466
Loss on hold-out set: 9.066072427618552e-06
MeanAbsoluteError value on hold-out data: 0.0010284429881721735
Epoch: 467
Loss on hold-out set: 0.0003456577777749197
MeanAbsoluteError value on hold-out data: 0.008530404418706894
Epoch: 468

Loss on hold-out set: 1.0429597954211395e-05
MeanAbsoluteError value on hold-out data: 0.0013254259247332811
Epoch: 469
Loss on hold-out set: 0.0010995697980972277
MeanAbsoluteError value on hold-out data: 0.0039873505011200905
Epoch: 470
Loss on hold-out set: 0.00012327478970438447
MeanAbsoluteError value on hold-out data: 0.0020900042727589607
Epoch: 471

Loss on hold-out set: 1.2040385796970105e-05
MeanAbsoluteError value on hold-out data: 0.0012228734558448195
Epoch: 472
Loss on hold-out set: 9.530354458170701e-06
MeanAbsoluteError value on hold-out data: 0.0012144853826612234
Epoch: 473
```

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Loss on hold-out set: 9.757659694885565e-06
MeanAbsoluteError value on hold-out data: 0.0013979388168081641
Epoch: 474
Loss on hold-out set: 8.641884624326299e-06
MeanAbsoluteError value on hold-out data: 0.001051724306307733
Epoch: 475
Loss on hold-out set: 8.455478808817935e-06
MeanAbsoluteError value on hold-out data: 0.001025396166369319
Epoch: 476
Loss on hold-out set: 8.719805993519602e-06
MeanAbsoluteError value on hold-out data: 0.001058626570738852
Epoch: 477
Loss on hold-out set: 8.933517692430302e-06
MeanAbsoluteError value on hold-out data: 0.0010995186166837811
Epoch: 478
Loss on hold-out set: 0.000325282024511571
MeanAbsoluteError value on hold-out data: 0.002419666387140751
Epoch: 479
Loss on hold-out set: 0.00020127065444267158
MeanAbsoluteError value on hold-out data: 0.002098645782098174
Epoch: 480

Loss on hold-out set: 5.13534319311834e-05
MeanAbsoluteError value on hold-out data: 0.0015804999275133014
Epoch: 481
Loss on hold-out set: 3.297641208183976e-05
MeanAbsoluteError value on hold-out data: 0.0052962214685976505
Epoch: 482
Loss on hold-out set: 6.59326563954054e-05
MeanAbsoluteError value on hold-out data: 0.0018292946042492986
Epoch: 483

Loss on hold-out set: 1.0382201916052891e-05
MeanAbsoluteError value on hold-out data: 0.0013368705986067653
Epoch: 484
Loss on hold-out set: 1.0407664562780825e-05
MeanAbsoluteError value on hold-out data: 0.0013182335533201694
Epoch: 485
Loss on hold-out set: 1.0129609440181603e-05
MeanAbsoluteError value on hold-out data: 0.0012479230063036084
Epoch: 486
Loss on hold-out set: 0.000402127905951189
```

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MeanAbsoluteError value on hold-out data: 0.0023231152445077896
Epoch: 487
Loss on hold-out set: 1.0047630768377458e-05
MeanAbsoluteError value on hold-out data: 0.0012048851931467652
Epoch: 488
Loss on hold-out set: 0.0001724967885889471
MeanAbsoluteError value on hold-out data: 0.0018644031370058656
Epoch: 489
Loss on hold-out set: 9.57091715560553e-06
MeanAbsoluteError value on hold-out data: 0.001114205690100789
Epoch: 490
Loss on hold-out set: 9.409546562647178e-06
MeanAbsoluteError value on hold-out data: 0.0010852273553609848
Epoch: 491
Loss on hold-out set: 9.926122848768452e-06
MeanAbsoluteError value on hold-out data: 0.0012386218877509236
Epoch: 492

Loss on hold-out set: 9.29931913088024e-06
MeanAbsoluteError value on hold-out data: 0.0010549381840974092
Epoch: 493
Loss on hold-out set: 9.19014134126428e-06
MeanAbsoluteError value on hold-out data: 0.0010477430187165737
Epoch: 494
Loss on hold-out set: 2.2956854153514877e-05
MeanAbsoluteError value on hold-out data: 0.004160949029028416
Epoch: 495

Loss on hold-out set: 9.924687950346148e-06
MeanAbsoluteError value on hold-out data: 0.0011279686586931348
Epoch: 496
Loss on hold-out set: 9.551054801598388e-06
MeanAbsoluteError value on hold-out data: 0.0010955770267173648
Epoch: 497
Loss on hold-out set: 0.0006845993336421424
MeanAbsoluteError value on hold-out data: 0.003603518009185791
Epoch: 498
Loss on hold-out set: 9.24134472244843e-06
MeanAbsoluteError value on hold-out data: 0.0010654354700818658
Epoch: 499
Loss on hold-out set: 9.094471627990012e-06
MeanAbsoluteError value on hold-out data: 0.0011261970503255725
```

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Epoch: 500
Loss on hold-out set: 2.254453015905854e-05
MeanAbsoluteError value on hold-out data: 0.0013286209432408214
Epoch: 501
Loss on hold-out set: 4.5941371455246315e-05
MeanAbsoluteError value on hold-out data: 0.0013900500489398837
Epoch: 502
Loss on hold-out set: 8.694476630024072e-06
MeanAbsoluteError value on hold-out data: 0.0010251509957015514
Epoch: 503
Loss on hold-out set: 0.0006689391872057334
MeanAbsoluteError value on hold-out data: 0.0025100598577409983
Epoch: 504

Loss on hold-out set: 8.975820055399564e-06
MeanAbsoluteError value on hold-out data: 0.0011729176621884108
Epoch: 505
Loss on hold-out set: 8.777140733609725e-06
MeanAbsoluteError value on hold-out data: 0.0010675160447135568
Epoch: 506
Loss on hold-out set: 8.575718587840248e-06
MeanAbsoluteError value on hold-out data: 0.0010455294977873564
Epoch: 507

Loss on hold-out set: 8.55145414765215e-06
MeanAbsoluteError value on hold-out data: 0.0010542431846261024
Epoch: 508
Loss on hold-out set: 8.399858056556672e-06
MeanAbsoluteError value on hold-out data: 0.0010392138501629233
Epoch: 509
Loss on hold-out set: 0.00033010062755179986
MeanAbsoluteError value on hold-out data: 0.00208917330019176
Epoch: 510
Loss on hold-out set: 1.2584658263317818e-05
MeanAbsoluteError value on hold-out data: 0.002564432332292199
Epoch: 511
Loss on hold-out set: 8.310065845463263e-06
MeanAbsoluteError value on hold-out data: 0.0010396076831966639
Epoch: 512
Loss on hold-out set: 8.173477649925668e-06
MeanAbsoluteError value on hold-out data: 0.0010260207345709205
Epoch: 513
```

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Loss on hold-out set: 8.05944307894666e-06
MeanAbsoluteError value on hold-out data: 0.0010132662719115615
Epoch: 514
Loss on hold-out set: 8.107614165902233e-06
MeanAbsoluteError value on hold-out data: 0.0010997885838150978
Epoch: 515
Loss on hold-out set: 7.929345819571895e-06
MeanAbsoluteError value on hold-out data: 0.001028990838676691
Epoch: 516

Loss on hold-out set: 0.00023762480216012256
MeanAbsoluteError value on hold-out data: 0.0018897366244345903
Epoch: 517
Loss on hold-out set: 0.0005197173397988308
MeanAbsoluteError value on hold-out data: 0.0029050461016595364
Epoch: 518
Loss on hold-out set: 7.623959061070788e-06
MeanAbsoluteError value on hold-out data: 0.000993369147181511
Epoch: 519

Loss on hold-out set: 0.00023705263293182175
MeanAbsoluteError value on hold-out data: 0.0022527447436004877
Epoch: 520
Loss on hold-out set: 7.529478941810459e-06
MeanAbsoluteError value on hold-out data: 0.0009851377690210938
Epoch: 521
Loss on hold-out set: 0.00012945544303059813
MeanAbsoluteError value on hold-out data: 0.0018860447453334928
Epoch: 522
Loss on hold-out set: 7.569554771623045e-06
MeanAbsoluteError value on hold-out data: 0.0010406962828710675
Epoch: 523
Loss on hold-out set: 7.3162307239427766e-06
MeanAbsoluteError value on hold-out data: 0.0009832698851823807
Epoch: 524
Loss on hold-out set: 0.0003384093100719024
MeanAbsoluteError value on hold-out data: 0.002139362506568432
Epoch: 525
Loss on hold-out set: 9.258962091065002e-05
MeanAbsoluteError value on hold-out data: 0.0014918019296601415
Epoch: 526
Loss on hold-out set: 7.011999164325588e-06
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MeanAbsoluteError value on hold-out data: 0.0009803185239434242
Epoch: 527
Loss on hold-out set: 1.3542878132523728e-05
MeanAbsoluteError value on hold-out data: 0.001118353451602161
Epoch: 528

Loss on hold-out set: 0.00010323737411591825
MeanAbsoluteError value on hold-out data: 0.0022065467201173306
Epoch: 529
Loss on hold-out set: 7.390527815088813e-06
MeanAbsoluteError value on hold-out data: 0.0010116930352523923
Epoch: 530
Loss on hold-out set: 7.257541963518203e-06
MeanAbsoluteError value on hold-out data: 0.0009916548151522875
Epoch: 531

Loss on hold-out set: 6.98164907107998e-06
MeanAbsoluteError value on hold-out data: 0.0009835944510996342
Epoch: 532
Loss on hold-out set: 6.895705641864568e-06
MeanAbsoluteError value on hold-out data: 0.0009669680148363113
Epoch: 533
Loss on hold-out set: 0.00014385009237378497
MeanAbsoluteError value on hold-out data: 0.0016544223763048649
Epoch: 534
Loss on hold-out set: 0.00010418001487266793
MeanAbsoluteError value on hold-out data: 0.0017070466419681907
Epoch: 535
Loss on hold-out set: 7.314825942809253e-06
MeanAbsoluteError value on hold-out data: 0.0010564274853095412
Epoch: 536
Loss on hold-out set: 7.112728868949752e-06
MeanAbsoluteError value on hold-out data: 0.0010102665983140469
Epoch: 537
Loss on hold-out set: 6.826847352595235e-06
MeanAbsoluteError value on hold-out data: 0.0010005810763686895
Epoch: 538
Loss on hold-out set: 6.623434842367715e-06
MeanAbsoluteError value on hold-out data: 0.0009573873830959201
Epoch: 539
Loss on hold-out set: 7.023591099129446e-06
MeanAbsoluteError value on hold-out data: 0.0009866467444226146
```

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Epoch: 540

Loss on hold-out set: 0.0002674563117866425
MeanAbsoluteError value on hold-out data: 0.00193535047583282
Epoch: 541
Loss on hold-out set: 6.616347444171904e-05
MeanAbsoluteError value on hold-out data: 0.0014771324349567294
Epoch: 542
Loss on hold-out set: 7.648082616565501e-05
MeanAbsoluteError value on hold-out data: 0.0014365152455866337
Epoch: 543

Loss on hold-out set: 6.531703481240775e-06
MeanAbsoluteError value on hold-out data: 0.0009362655691802502
Epoch: 544
Loss on hold-out set: 6.76946559907103e-06
MeanAbsoluteError value on hold-out data: 0.000973195827100426
Epoch: 545
Loss on hold-out set: 7.011530688541107e-06
MeanAbsoluteError value on hold-out data: 0.001045162440277636
Epoch: 546
Loss on hold-out set: 6.65407156182147e-06
MeanAbsoluteError value on hold-out data: 0.0009521609754301608
Epoch: 547
Loss on hold-out set: 7.81142912019636e-06
MeanAbsoluteError value on hold-out data: 0.0009572664857842028
Epoch: 548
Loss on hold-out set: 5.4874632616319054e-05
MeanAbsoluteError value on hold-out data: 0.007179544772952795
Epoch: 549
Loss on hold-out set: 7.816320439545913e-06
MeanAbsoluteError value on hold-out data: 0.001206666580401361
Epoch: 550
Loss on hold-out set: 7.1601548822884885e-06
MeanAbsoluteError value on hold-out data: 0.001054667984135449
Epoch: 551
Loss on hold-out set: 7.496818462390078e-06
MeanAbsoluteError value on hold-out data: 0.0011336212046444416
Epoch: 552

Loss on hold-out set: 0.0003012934592163674
MeanAbsoluteError value on hold-out data: 0.0021433548536151648
```

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Epoch: 553
Loss on hold-out set: 7.592540561362464e-06
MeanAbsoluteError value on hold-out data: 0.0010715096723288298
Epoch: 554
Loss on hold-out set: 8.087110828862359e-06
MeanAbsoluteError value on hold-out data: 0.0012500699376687407
Epoch: 555
Loss on hold-out set: 9.852465202704097e-06
MeanAbsoluteError value on hold-out data: 0.0015821816632524133
Epoch: 556
Loss on hold-out set: 0.000330187478130926
MeanAbsoluteError value on hold-out data: 0.0021669832058250904
Epoch: 557
Loss on hold-out set: 7.716449723123955e-06
MeanAbsoluteError value on hold-out data: 0.001068917685188353
Epoch: 558
Loss on hold-out set: 7.502335297939872e-06
MeanAbsoluteError value on hold-out data: 0.001031004125252366
Epoch: 559
Loss on hold-out set: 0.00019843543647069558
MeanAbsoluteError value on hold-out data: 0.0018070610240101814
Epoch: 560
Loss on hold-out set: 7.287712977556207e-06
MeanAbsoluteError value on hold-out data: 0.0009953259723260999
Epoch: 561
Loss on hold-out set: 7.20474984056433e-06
MeanAbsoluteError value on hold-out data: 0.0009752005571499467
Epoch: 562
Loss on hold-out set: 3.856698463260656e-05
MeanAbsoluteError value on hold-out data: 0.001393485814332962
Epoch: 563
Loss on hold-out set: 8.14206871445914e-05
MeanAbsoluteError value on hold-out data: 0.001513263676315546
Epoch: 564
Loss on hold-out set: 0.00030710719641777623
MeanAbsoluteError value on hold-out data: 0.00197670329362154
Epoch: 565
Loss on hold-out set: 6.841073720702178e-06
MeanAbsoluteError value on hold-out data: 0.0009467008640058339
Epoch: 566
```

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Loss on hold-out set: 2.4958573871309025e-05
MeanAbsoluteError value on hold-out data: 0.0045304554514586926
Epoch: 567


Loss on hold-out set: 1.6459980198952078e-05
MeanAbsoluteError value on hold-out data: 0.0014644494513049722
Epoch: 568
Loss on hold-out set: 7.221229958606488e-06
MeanAbsoluteError value on hold-out data: 0.000998428207822144
Epoch: 569
Loss on hold-out set: 8.337672968880988e-06
MeanAbsoluteError value on hold-out data: 0.0009800012921914458
Epoch: 570
Loss on hold-out set: 0.00011455239004326838
MeanAbsoluteError value on hold-out data: 0.010544370859861374
Epoch: 571
Loss on hold-out set: 0.00017187442404663575
MeanAbsoluteError value on hold-out data: 0.002394062466919422
Epoch: 572
Loss on hold-out set: 7.705598315211367e-06
MeanAbsoluteError value on hold-out data: 0.0010930807329714298
Epoch: 573
Loss on hold-out set: 8.546947496693305e-06
MeanAbsoluteError value on hold-out data: 0.0012959224404767156
Epoch: 574
Loss on hold-out set: 7.516102275112165e-06
MeanAbsoluteError value on hold-out data: 0.0010541138472035527
Epoch: 575
Loss on hold-out set: 8.180113061715282e-05
MeanAbsoluteError value on hold-out data: 0.0014889712911099195
Epoch: 576


Loss on hold-out set: 8.114229006881296e-06
MeanAbsoluteError value on hold-out data: 0.0011255746940150857
Epoch: 577
Loss on hold-out set: 7.830410122790598e-06
MeanAbsoluteError value on hold-out data: 0.0010488226544111967
Epoch: 578
Loss on hold-out set: 7.529151034939212e-06
MeanAbsoluteError value on hold-out data: 0.0010149938752874732
Epoch: 579
```

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Loss on hold-out set: 7.621631270712657e-06
MeanAbsoluteError value on hold-out data: 0.001040202216245234
Epoch: 580
Loss on hold-out set: 0.0002829057312662317
MeanAbsoluteError value on hold-out data: 0.0019636075012385845
Epoch: 581
Loss on hold-out set: 0.00010207187611250017
MeanAbsoluteError value on hold-out data: 0.0019603080581873655
Epoch: 582
Loss on hold-out set: 1.2409132146355037e-05
MeanAbsoluteError value on hold-out data: 0.0027169405948370695
Epoch: 583
Loss on hold-out set: 8.645632488567476e-06
MeanAbsoluteError value on hold-out data: 0.0013082538498565555
Epoch: 584
Loss on hold-out set: 7.609867024807739e-06
MeanAbsoluteError value on hold-out data: 0.0011013203766196966
Epoch: 585
Loss on hold-out set: 5.288761841888189e-05
MeanAbsoluteError value on hold-out data: 0.001455524004995823
Epoch: 586
Loss on hold-out set: 0.0001430736854064357
MeanAbsoluteError value on hold-out data: 0.0016852682456374168
Epoch: 587
Loss on hold-out set: 7.398237072882359e-06
MeanAbsoluteError value on hold-out data: 0.001111428951844573
Epoch: 588

Loss on hold-out set: 8.692617384260876e-06
MeanAbsoluteError value on hold-out data: 0.0014727236703038216
Epoch: 589
Loss on hold-out set: 9.082686539248866e-06
MeanAbsoluteError value on hold-out data: 0.0010438361205160618
Epoch: 590
Loss on hold-out set: 7.452967075868114e-06
MeanAbsoluteError value on hold-out data: 0.0011282627237960696
Epoch: 591

Loss on hold-out set: 3.1200281467279544e-05
MeanAbsoluteError value on hold-out data: 0.0052452245727181435
Epoch: 592
Loss on hold-out set: 8.2720983743313e-06
```

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MeanAbsoluteError value on hold-out data: 0.0012111261021345854
Epoch: 593
Loss on hold-out set: 7.282950136300315e-06
MeanAbsoluteError value on hold-out data: 0.0009869611822068691
Epoch: 594
Loss on hold-out set: 0.00035132955444404639
MeanAbsoluteError value on hold-out data: 0.002211550483480096
Epoch: 595
Loss on hold-out set: 0.0005104060113401493
MeanAbsoluteError value on hold-out data: 0.00478703947737813
Epoch: 596
Loss on hold-out set: 8.433274385161463e-06
MeanAbsoluteError value on hold-out data: 0.001243462204001844
Epoch: 597
Loss on hold-out set: 2.235583444512725e-05
MeanAbsoluteError value on hold-out data: 0.004255779553204775
Epoch: 598
Loss on hold-out set: 7.474870827756401e-06
MeanAbsoluteError value on hold-out data: 0.0010693245567381382
Epoch: 599
Loss on hold-out set: 7.219333445250772e-06
MeanAbsoluteError value on hold-out data: 0.0010091597214341164
Epoch: 600

Loss on hold-out set: 1.771747472383523e-05
MeanAbsoluteError value on hold-out data: 0.0036711604334414005
Epoch: 601
Loss on hold-out set: 5.560636395635538e-05
MeanAbsoluteError value on hold-out data: 0.0013723409501835704
Epoch: 602
Loss on hold-out set: 7.261326367980521e-06
MeanAbsoluteError value on hold-out data: 0.0010253681102767587
Epoch: 603

Loss on hold-out set: 5.495513596991642e-05
MeanAbsoluteError value on hold-out data: 0.0016771757509559393
Epoch: 604
Loss on hold-out set: 6.786135339840066e-06
MeanAbsoluteError value on hold-out data: 0.0009614552836865187
Epoch: 605
Loss on hold-out set: 0.00038162785648110096
MeanAbsoluteError value on hold-out data: 0.005578479263931513
```

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Epoch: 606
Loss on hold-out set: 5.038141468329932e-05
MeanAbsoluteError value on hold-out data: 0.001426653703674674
Epoch: 607
Loss on hold-out set: 7.32389500026748e-06
MeanAbsoluteError value on hold-out data: 0.0010452416026964784
Epoch: 608
Loss on hold-out set: 6.941269155528349e-06
MeanAbsoluteError value on hold-out data: 0.000981086166575551
Epoch: 609
Loss on hold-out set: 6.7850741091110406e-06
MeanAbsoluteError value on hold-out data: 0.0009581730701029301
Epoch: 610
Loss on hold-out set: 6.729261466743633e-06
MeanAbsoluteError value on hold-out data: 0.0009457924752496183
Epoch: 611
Loss on hold-out set: 6.677285102945892e-06
MeanAbsoluteError value on hold-out data: 0.0009662559605203569
Epoch: 612

Loss on hold-out set: 8.003224618697028e-06
MeanAbsoluteError value on hold-out data: 0.0016615849453955889
Epoch: 613
Loss on hold-out set: 0.00010368286567534979
MeanAbsoluteError value on hold-out data: 0.0015503070317208767
Epoch: 614
Loss on hold-out set: 0.00013478030039499643
MeanAbsoluteError value on hold-out data: 0.0016132285818457603
Epoch: 615

Loss on hold-out set: 6.466136755764901e-06
MeanAbsoluteError value on hold-out data: 0.0009430261561647058
Epoch: 616
Loss on hold-out set: 6.345204134748285e-06
MeanAbsoluteError value on hold-out data: 0.0009281864622607827
Epoch: 617
Loss on hold-out set: 8.253848019840485e-06
MeanAbsoluteError value on hold-out data: 0.001432921621017158
Epoch: 618
Loss on hold-out set: 6.662792022525896e-06
MeanAbsoluteError value on hold-out data: 0.000989630469121039
Epoch: 619
```

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Loss on hold-out set: 6.684874369517801e-06
MeanAbsoluteError value on hold-out data: 0.0009642874356359243
Epoch: 620
Loss on hold-out set: 6.810361325455305e-06
MeanAbsoluteError value on hold-out data: 0.0010624176356941462
Epoch: 621
Loss on hold-out set: 6.225903724262145e-06
MeanAbsoluteError value on hold-out data: 0.0009674853063188493
Epoch: 622
Loss on hold-out set: 0.00027743773352377997
MeanAbsoluteError value on hold-out data: 0.002292849123477936
Epoch: 623
Loss on hold-out set: 0.00019108968305584097
MeanAbsoluteError value on hold-out data: 0.0017520043766126037
Epoch: 624

Loss on hold-out set: 5.896229650210516e-06
MeanAbsoluteError value on hold-out data: 0.0009231514995917678
Epoch: 625
Loss on hold-out set: 5.7757418452141745e-06
MeanAbsoluteError value on hold-out data: 0.0009112553671002388
Epoch: 626
Loss on hold-out set: 4.9063971298317866e-05
MeanAbsoluteError value on hold-out data: 0.0067945425398647785
Epoch: 627

Loss on hold-out set: 0.00026318907316187125
MeanAbsoluteError value on hold-out data: 0.001848085317760706
Epoch: 628
Loss on hold-out set: 6.207773967198112e-06
MeanAbsoluteError value on hold-out data: 0.0009768783347681165
Epoch: 629
Loss on hold-out set: 0.00021288302391541056
MeanAbsoluteError value on hold-out data: 0.0017408374696969986
Epoch: 630
Loss on hold-out set: 5.715988802840481e-06
MeanAbsoluteError value on hold-out data: 0.0010064997477456927
Epoch: 631
Loss on hold-out set: 5.401881769497968e-06
MeanAbsoluteError value on hold-out data: 0.0008830880979076028
Epoch: 632
Loss on hold-out set: 0.00032952988912994313
```

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MeanAbsoluteError value on hold-out data: 0.0019316633697599173
Epoch: 633
Loss on hold-out set: 7.685777320961948e-06
MeanAbsoluteError value on hold-out data: 0.0016797985881567001
Epoch: 634
Loss on hold-out set: 6.147477368793823e-06
MeanAbsoluteError value on hold-out data: 0.0010341880843043327
Epoch: 635
Loss on hold-out set: 9.678124345818536e-06
MeanAbsoluteError value on hold-out data: 0.0020753880962729454
Epoch: 636

Loss on hold-out set: 6.385131451218895e-06
MeanAbsoluteError value on hold-out data: 0.0011742589995265007
Epoch: 637
Loss on hold-out set: 5.884753238810366e-06
MeanAbsoluteError value on hold-out data: 0.001008043298497796
Epoch: 638
Loss on hold-out set: 6.1067609190732395e-06
MeanAbsoluteError value on hold-out data: 0.001004847465083003
Epoch: 639

Loss on hold-out set: 6.846423306533804e-05
MeanAbsoluteError value on hold-out data: 0.003540098201483488
Epoch: 640
Loss on hold-out set: 7.755662402262798e-06
MeanAbsoluteError value on hold-out data: 0.0010056018363684416
Epoch: 641
Loss on hold-out set: 7.1178432661829565e-06
MeanAbsoluteError value on hold-out data: 0.0012490323279052973
Epoch: 642
Loss on hold-out set: 6.338894628754588e-06
MeanAbsoluteError value on hold-out data: 0.001060951384715736
Epoch: 643
Loss on hold-out set: 3.959379167863936e-05
MeanAbsoluteError value on hold-out data: 0.0013072489527985454
Epoch: 644
Loss on hold-out set: 5.90439757381115e-06
MeanAbsoluteError value on hold-out data: 0.0009420106653124094
Epoch: 645
Loss on hold-out set: 0.00026081281006371996
MeanAbsoluteError value on hold-out data: 0.0019451415864750743
```

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Epoch: 646
Loss on hold-out set: 1.1994796571008537e-05
MeanAbsoluteError value on hold-out data: 0.002894238568842411
Epoch: 647
Loss on hold-out set: 6.344709449847055e-06
MeanAbsoluteError value on hold-out data: 0.0012003214797005057
Epoch: 648

Loss on hold-out set: 6.064277326195703e-06
MeanAbsoluteError value on hold-out data: 0.0009940984891727567
Epoch: 649
Loss on hold-out set: 9.499103501447711e-06
MeanAbsoluteError value on hold-out data: 0.0018784292042255402
Epoch: 650
Loss on hold-out set: 8.34252995517952e-06
MeanAbsoluteError value on hold-out data: 0.0018077914137393236
Epoch: 651

Loss on hold-out set: 7.279234906539052e-06
MeanAbsoluteError value on hold-out data: 0.0012469964567571878
Epoch: 652
Loss on hold-out set: 2.9266613588830343e-05
MeanAbsoluteError value on hold-out data: 0.0012577392626553774
Epoch: 653
Loss on hold-out set: 6.345519801398998e-06
MeanAbsoluteError value on hold-out data: 0.0011627880157902837
Epoch: 654
Loss on hold-out set: 1.531530407000422e-05
MeanAbsoluteError value on hold-out data: 0.003065296681597829
Epoch: 655
Loss on hold-out set: 6.26896739301006e-06
MeanAbsoluteError value on hold-out data: 0.0009817708050832152
Epoch: 656
Loss on hold-out set: 6.113106941540991e-06
MeanAbsoluteError value on hold-out data: 0.0009653091547079384
Epoch: 657
Loss on hold-out set: 5.9280297962591005e-06
MeanAbsoluteError value on hold-out data: 0.0009351673652417958
Epoch: 658
Loss on hold-out set: 5.858831202643662e-06
MeanAbsoluteError value on hold-out data: 0.0009342113044112921
Epoch: 659
```

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Loss on hold-out set: 0.00022213456143940915
MeanAbsoluteError value on hold-out data: 0.0018751841271296144
Epoch: 660

Loss on hold-out set: 7.664612211717787e-06
MeanAbsoluteError value on hold-out data: 0.0011398295173421502
Epoch: 661
Loss on hold-out set: 6.3081755719825815e-06
MeanAbsoluteError value on hold-out data: 0.0010855472646653652
Epoch: 662
Loss on hold-out set: 0.00019433300577537991
MeanAbsoluteError value on hold-out data: 0.001912860432639718
Epoch: 663

Loss on hold-out set: 6.065394169982746e-06
MeanAbsoluteError value on hold-out data: 0.0010094199096783996
Epoch: 664
Loss on hold-out set: 5.819455993398486e-06
MeanAbsoluteError value on hold-out data: 0.0010351096279919147
Epoch: 665
Loss on hold-out set: 0.0003679656156693131
MeanAbsoluteError value on hold-out data: 0.002282471163198352
Epoch: 666
Loss on hold-out set: 7.940485470738312e-06
MeanAbsoluteError value on hold-out data: 0.0011118506081402302
Epoch: 667
Loss on hold-out set: 8.370463276426227e-06
MeanAbsoluteError value on hold-out data: 0.0013024579966440797
Epoch: 668
Loss on hold-out set: 5.8281162400936935e-06
MeanAbsoluteError value on hold-out data: 0.0010390712413936853
Epoch: 669
Loss on hold-out set: 6.240107891648294e-06
MeanAbsoluteError value on hold-out data: 0.0010985065018758178
Epoch: 670
Loss on hold-out set: 6.0994765187154756e-06
MeanAbsoluteError value on hold-out data: 0.0010326766641810536
Epoch: 671
Loss on hold-out set: 5.949272562588703e-06
MeanAbsoluteError value on hold-out data: 0.0010141580132767558
Epoch: 672
```

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Loss on hold-out set: 7.2910152338959294e-06
MeanAbsoluteError value on hold-out data: 0.0015053405659273267
Epoch: 673
Loss on hold-out set: 1.3256239053828866e-05
MeanAbsoluteError value on hold-out data: 0.0026811587158590555
Epoch: 674
Loss on hold-out set: 5.969722617524703e-06
MeanAbsoluteError value on hold-out data: 0.0011400020448490977
Epoch: 675

Loss on hold-out set: 6.22513396807353e-05
MeanAbsoluteError value on hold-out data: 0.0015707833226770163
Epoch: 676
Loss on hold-out set: 5.3070490501364765e-06
MeanAbsoluteError value on hold-out data: 0.0009123075287789106
Epoch: 677
Loss on hold-out set: 0.0001168054944608792
MeanAbsoluteError value on hold-out data: 0.0014969134936109185
Epoch: 678
Loss on hold-out set: 5.836954063385603e-06
MeanAbsoluteError value on hold-out data: 0.0011515364749357104
Epoch: 679
Loss on hold-out set: 2.9418477424769662e-05
MeanAbsoluteError value on hold-out data: 0.001758535741828382
Epoch: 680
Loss on hold-out set: 0.00044028886590820069
MeanAbsoluteError value on hold-out data: 0.0026659199502319098
Epoch: 681
Loss on hold-out set: 6.001357209733645e-06
MeanAbsoluteError value on hold-out data: 0.0010149921290576458
Epoch: 682
Loss on hold-out set: 5.8278117772995364e-06
MeanAbsoluteError value on hold-out data: 0.0010108561255037785
Epoch: 683
Loss on hold-out set: 5.730268871897543e-06
MeanAbsoluteError value on hold-out data: 0.0009574246359989047
Epoch: 684

Loss on hold-out set: 5.7540818253779725e-06
MeanAbsoluteError value on hold-out data: 0.0009809565963223577
Epoch: 685
Loss on hold-out set: 5.85947531767398e-06
```

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MeanAbsoluteError value on hold-out data: 0.0009631771827116609
Epoch: 686
Loss on hold-out set: 0.0004687321554377221
MeanAbsoluteError value on hold-out data: 0.0021657056640833616
Epoch: 687

Loss on hold-out set: 7.030242342708741e-06
MeanAbsoluteError value on hold-out data: 0.0009356471127830446
Epoch: 688
Loss on hold-out set: 5.384246286529273e-06
MeanAbsoluteError value on hold-out data: 0.0009066176135092974
Epoch: 689
Loss on hold-out set: 1.8053211174686256e-05
MeanAbsoluteError value on hold-out data: 0.003859366523101926
Epoch: 690
Loss on hold-out set: 5.630747787377961e-06
MeanAbsoluteError value on hold-out data: 0.0010141179664060473
Epoch: 691
Loss on hold-out set: 4.475594584363307e-05
MeanAbsoluteError value on hold-out data: 0.0012873995583504438
Epoch: 692
Loss on hold-out set: 6.254255160642012e-06
MeanAbsoluteError value on hold-out data: 0.0009555913275107741
Epoch: 693
Loss on hold-out set: 0.0003292978790483403
MeanAbsoluteError value on hold-out data: 0.0020545045845210552
Epoch: 694
Loss on hold-out set: 6.915928965979315e-06
MeanAbsoluteError value on hold-out data: 0.0010495820315554738
Epoch: 695
Loss on hold-out set: 6.502387014886847e-06
MeanAbsoluteError value on hold-out data: 0.0009890419896692038
Epoch: 696

Loss on hold-out set: 0.0004724461477663729
MeanAbsoluteError value on hold-out data: 0.0022732852958142757
Epoch: 697
Loss on hold-out set: 0.0003981952595734727
MeanAbsoluteError value on hold-out data: 0.004544503055512905
Epoch: 698
Loss on hold-out set: 7.127801465033276e-06
MeanAbsoluteError value on hold-out data: 0.0010447765234857798
```

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Epoch: 699

Loss on hold-out set: 8.407722422089736e-06
MeanAbsoluteError value on hold-out data: 0.0010038232430815697
Epoch: 700
Loss on hold-out set: 3.533350525829423e-05
MeanAbsoluteError value on hold-out data: 0.002744155004620552
Epoch: 701
Loss on hold-out set: 6.6175611774916e-06
MeanAbsoluteError value on hold-out data: 0.0010988388676196337
Epoch: 702
Loss on hold-out set: 7.289779038749682e-05
MeanAbsoluteError value on hold-out data: 0.001439571031369269
Epoch: 703
Loss on hold-out set: 0.0004472819619199922
MeanAbsoluteError value on hold-out data: 0.002245548879727721
Epoch: 704
Loss on hold-out set: 6.845547909207246e-06
MeanAbsoluteError value on hold-out data: 0.0011935703223571181
Epoch: 705
Loss on hold-out set: 1.308454281905525e-05
MeanAbsoluteError value on hold-out data: 0.002406654180958867
Epoch: 706
Loss on hold-out set: 7.808395535771764e-06
MeanAbsoluteError value on hold-out data: 0.0012220190837979317
Epoch: 707
Loss on hold-out set: 6.94152337126453e-06
MeanAbsoluteError value on hold-out data: 0.0010289079509675503
Epoch: 708

Loss on hold-out set: 6.662159036651653e-06
MeanAbsoluteError value on hold-out data: 0.001000101212412119
Epoch: 709
Loss on hold-out set: 6.403335616692187e-06
MeanAbsoluteError value on hold-out data: 0.0009629273554310203
Epoch: 710
Loss on hold-out set: 7.560604377232494e-06
MeanAbsoluteError value on hold-out data: 0.0009689502185210586
Epoch: 711

Loss on hold-out set: 0.0002975040198332647
MeanAbsoluteError value on hold-out data: 0.001949181198142469
```

```
Epoch: 712
Loss on hold-out set: 6.064346123187199e-06
MeanAbsoluteError value on hold-out data: 0.0009524434572085738
Epoch: 713
Loss on hold-out set: 6.169054802434833e-06
MeanAbsoluteError value on hold-out data: 0.0009867771295830607
Epoch: 714
Loss on hold-out set: 6.4488650762864625e-06
MeanAbsoluteError value on hold-out data: 0.0010525390971451998
Epoch: 715
Loss on hold-out set: 6.258768344480359e-06
MeanAbsoluteError value on hold-out data: 0.0009943742770701647
Epoch: 716
Loss on hold-out set: 6.659639972302725e-06
MeanAbsoluteError value on hold-out data: 0.001024283585138619
Epoch: 717
Loss on hold-out set: 0.0001781451350950647
MeanAbsoluteError value on hold-out data: 0.0024079580325633287
Epoch: 718
Loss on hold-out set: 0.00029793831034914166
MeanAbsoluteError value on hold-out data: 0.002409802284091711
Epoch: 719
Loss on hold-out set: 6.5753918973068965e-06
MeanAbsoluteError value on hold-out data: 0.0010730954818427563
Epoch: 720

Loss on hold-out set: 0.0006586748135578988
MeanAbsoluteError value on hold-out data: 0.0024844070430845022
Epoch: 721
Loss on hold-out set: 6.281674548945734e-06
MeanAbsoluteError value on hold-out data: 0.0009502103785052896
Epoch: 722
Loss on hold-out set: 6.171118242847522e-06
MeanAbsoluteError value on hold-out data: 0.0009389470797032118
Epoch: 723

Loss on hold-out set: 1.4795467189281608e-05
MeanAbsoluteError value on hold-out data: 0.0012751807225868106
Epoch: 724
Loss on hold-out set: 6.464944416812183e-06
MeanAbsoluteError value on hold-out data: 0.0010450535919517279
Epoch: 725
```

```
Loss on hold-out set: 6.622834268461319e-06
MeanAbsoluteError value on hold-out data: 0.0010511926375329494
Epoch: 726
Loss on hold-out set: 6.308288594275861e-06
MeanAbsoluteError value on hold-out data: 0.0009939285228028893
Epoch: 727
Loss on hold-out set: 6.015558312436784e-06
MeanAbsoluteError value on hold-out data: 0.0010017253225669265
Epoch: 728
Loss on hold-out set: 5.902723682843795e-06
MeanAbsoluteError value on hold-out data: 0.0009256523917429149
Epoch: 729
Loss on hold-out set: 9.989509352318524e-05
MeanAbsoluteError value on hold-out data: 0.0014948209282010794
Epoch: 730
Loss on hold-out set: 6.1052018140410265e-06
MeanAbsoluteError value on hold-out data: 0.0009791165357455611
Epoch: 731
Loss on hold-out set: 7.405559279349243e-06
MeanAbsoluteError value on hold-out data: 0.0009368417668156326
Epoch: 732

Loss on hold-out set: 5.954375084782944e-06
MeanAbsoluteError value on hold-out data: 0.0009372631902806461
Epoch: 733
Loss on hold-out set: 6.119384255648104e-06
MeanAbsoluteError value on hold-out data: 0.0010258910479024053
Epoch: 734
Loss on hold-out set: 6.087702384673464e-06
MeanAbsoluteError value on hold-out data: 0.001050476566888392
Epoch: 735

Loss on hold-out set: 5.561615191589609e-06
MeanAbsoluteError value on hold-out data: 0.0008989034104160964
Epoch: 736
Loss on hold-out set: 0.00015276530674824293
MeanAbsoluteError value on hold-out data: 0.0022239824756979942
Epoch: 737
Loss on hold-out set: 5.695969207595765e-06
MeanAbsoluteError value on hold-out data: 0.000926374108530581
Epoch: 738
Loss on hold-out set: 5.768265127489701e-06
```

```
MeanAbsoluteError value on hold-out data: 0.0011116425739601254
Epoch: 739
Loss on hold-out set: 7.0284225436604465e-06
MeanAbsoluteError value on hold-out data: 0.0010267429752275348
Epoch: 740
Loss on hold-out set: 6.928575916133109e-06
MeanAbsoluteError value on hold-out data: 0.0010140397353097796
Epoch: 741
Loss on hold-out set: 0.0003743265681949101
MeanAbsoluteError value on hold-out data: 0.008923103101551533
Epoch: 742
Loss on hold-out set: 8.052295611767141e-06
MeanAbsoluteError value on hold-out data: 0.0011852786410599947
Epoch: 743
Loss on hold-out set: 7.954990419839783e-06
MeanAbsoluteError value on hold-out data: 0.0012131797848269343
Epoch: 744

Loss on hold-out set: 2.798059109920814e-05
MeanAbsoluteError value on hold-out data: 0.001301713171415031
Epoch: 745
Loss on hold-out set: 6.953064283677397e-06
MeanAbsoluteError value on hold-out data: 0.0009828538168221712
Epoch: 746
Loss on hold-out set: 0.00023405688599391277
MeanAbsoluteError value on hold-out data: 0.0018256930634379387
Epoch: 747

Loss on hold-out set: 6.6007228569057925e-06
MeanAbsoluteError value on hold-out data: 0.0009684756514616311
Epoch: 748
Loss on hold-out set: 6.473115549448194e-06
MeanAbsoluteError value on hold-out data: 0.0009327837033197284
Epoch: 749
Loss on hold-out set: 2.05278201256557e-05
MeanAbsoluteError value on hold-out data: 0.004081602673977613
Epoch: 750
Loss on hold-out set: 7.5112933158930234e-06
MeanAbsoluteError value on hold-out data: 0.0010865916265174747
Epoch: 751
Loss on hold-out set: 0.0004980753611838239
MeanAbsoluteError value on hold-out data: 0.002943685743957758
```

```
Epoch: 752
Loss on hold-out set: 7.4820891036982794e-06
MeanAbsoluteError value on hold-out data: 0.0011110384948551655
Epoch: 753
Loss on hold-out set: 0.0003262664203170492
MeanAbsoluteError value on hold-out data: 0.0021523754112422466
Epoch: 754
Loss on hold-out set: 0.0002957370441026198
MeanAbsoluteError value on hold-out data: 0.002053485019132495
Epoch: 755
Loss on hold-out set: 6.940562423545471e-06
MeanAbsoluteError value on hold-out data: 0.0011378828203305602
Epoch: 756

Loss on hold-out set: 8.122453260440173e-06
MeanAbsoluteError value on hold-out data: 0.0017390541033819318
Epoch: 757
Loss on hold-out set: 6.58689744544685e-06
MeanAbsoluteError value on hold-out data: 0.0011068833991885185
Epoch: 758
Loss on hold-out set: 6.366904012105279e-06
MeanAbsoluteError value on hold-out data: 0.0010569925652816892
Epoch: 759

Loss on hold-out set: 8.008400310712349e-06
MeanAbsoluteError value on hold-out data: 0.0013499398482963443
Epoch: 760
Loss on hold-out set: 7.225785356910676e-06
MeanAbsoluteError value on hold-out data: 0.0010902481153607368
Epoch: 761
Loss on hold-out set: 6.894222529377944e-06
MeanAbsoluteError value on hold-out data: 0.0010441800113767385
Epoch: 762
Loss on hold-out set: 6.765939895178451e-06
MeanAbsoluteError value on hold-out data: 0.0010162382386624813
Epoch: 763
Loss on hold-out set: 6.58528246763455e-06
MeanAbsoluteError value on hold-out data: 0.0009986265795305371
Epoch: 764
Loss on hold-out set: 6.36993938709757e-06
MeanAbsoluteError value on hold-out data: 0.0009608734399080276
Epoch: 765
```

```
Loss on hold-out set: 6.2136535980154185e-06
MeanAbsoluteError value on hold-out data: 0.0009424753952771425
Epoch: 766
Loss on hold-out set: 6.112790635214831e-06
MeanAbsoluteError value on hold-out data: 0.0009395978995598853
Epoch: 767
Loss on hold-out set: 9.131002311815301e-05
MeanAbsoluteError value on hold-out data: 0.0014510223409160972
Epoch: 768

Loss on hold-out set: 5.7945767074921895e-06
MeanAbsoluteError value on hold-out data: 0.0009200687054544687
Epoch: 769
Loss on hold-out set: 6.30273891781479e-06
MeanAbsoluteError value on hold-out data: 0.0011189104989171028
Epoch: 770
Loss on hold-out set: 5.68486605831858e-06
MeanAbsoluteError value on hold-out data: 0.0009157651802524924
Epoch: 771

Loss on hold-out set: 6.264035144155107e-06
MeanAbsoluteError value on hold-out data: 0.0009666107944212854
Epoch: 772
Loss on hold-out set: 6.094015168699977e-06
MeanAbsoluteError value on hold-out data: 0.000928132445551455
Epoch: 773
Loss on hold-out set: 0.00012316794244482984
MeanAbsoluteError value on hold-out data: 0.0015772997867316008
Epoch: 774
Loss on hold-out set: 6.848781991963231e-06
MeanAbsoluteError value on hold-out data: 0.0010670294286683202
Epoch: 775
Loss on hold-out set: 3.458943846405753e-05
MeanAbsoluteError value on hold-out data: 0.005598096642643213
Epoch: 776
Loss on hold-out set: 5.7233020297767955e-05
MeanAbsoluteError value on hold-out data: 0.0015643634833395481
Epoch: 777
Loss on hold-out set: 7.586359063943267e-06
MeanAbsoluteError value on hold-out data: 0.0010948943672701716
Epoch: 778
Loss on hold-out set: 7.2213092241363005e-06
```

```
MeanAbsoluteError value on hold-out data: 0.001036608824506402
Epoch: 779
Loss on hold-out set: 8.690084537252723e-06
MeanAbsoluteError value on hold-out data: 0.0013599023222923279
Epoch: 780

Loss on hold-out set: 9.443333655817218e-06
MeanAbsoluteError value on hold-out data: 0.001382449991069734
Epoch: 781
Loss on hold-out set: 8.224451673150293e-06
MeanAbsoluteError value on hold-out data: 0.001148227252997458
Epoch: 782
Loss on hold-out set: 7.81162989470449e-06
MeanAbsoluteError value on hold-out data: 0.001084494637325406
Epoch: 783

Loss on hold-out set: 8.261213632241188e-06
MeanAbsoluteError value on hold-out data: 0.0011231752578169107
Epoch: 784
Loss on hold-out set: 0.00033054782758842736
MeanAbsoluteError value on hold-out data: 0.0021578106097877026
Epoch: 785
Loss on hold-out set: 7.753892504069881e-06
MeanAbsoluteError value on hold-out data: 0.0010733997914940119
Epoch: 786
Loss on hold-out set: 1.8072616608390634e-05
MeanAbsoluteError value on hold-out data: 0.003264630911871791
Epoch: 787
Loss on hold-out set: 8.001198268989116e-06
MeanAbsoluteError value on hold-out data: 0.0012574649881571531
Epoch: 788
Loss on hold-out set: 7.363011572704779e-06
MeanAbsoluteError value on hold-out data: 0.0010318373097106814
Epoch: 789
Loss on hold-out set: 7.970701614711192e-06
MeanAbsoluteError value on hold-out data: 0.0014114395016804338
Epoch: 790
Loss on hold-out set: 7.662892195681755e-06
MeanAbsoluteError value on hold-out data: 0.0011054851347580552
Epoch: 791
Loss on hold-out set: 7.407771340994211e-06
MeanAbsoluteError value on hold-out data: 0.0010129157453775406
```

```
Epoch: 792

Loss on hold-out set: 9.009732527575029e-06
MeanAbsoluteError value on hold-out data: 0.00184192496817559
Epoch: 793
Loss on hold-out set: 0.0003829373806133755
MeanAbsoluteError value on hold-out data: 0.0030300773214548826
Epoch: 794
Loss on hold-out set: 7.326557928578088e-06
MeanAbsoluteError value on hold-out data: 0.0011067939922213554
Epoch: 795

Loss on hold-out set: 0.00029516006408713516
MeanAbsoluteError value on hold-out data: 0.001962677575647831
Epoch: 796
Loss on hold-out set: 6.929426808261796e-06
MeanAbsoluteError value on hold-out data: 0.0009798182873055339
Epoch: 797
Loss on hold-out set: 9.057234595538352e-06
MeanAbsoluteError value on hold-out data: 0.0015873538795858622
Epoch: 798
Loss on hold-out set: 6.8923757480302145e-06
MeanAbsoluteError value on hold-out data: 0.0010297771077603102
Epoch: 799
Loss on hold-out set: 6.97840857848058e-06
MeanAbsoluteError value on hold-out data: 0.0010473806178197265
Epoch: 800
Loss on hold-out set: 6.600986483219554e-06
MeanAbsoluteError value on hold-out data: 0.0009583315113559365
Epoch: 801
Loss on hold-out set: 6.506662362120981e-06
MeanAbsoluteError value on hold-out data: 0.0009457283304072917
Epoch: 802
Loss on hold-out set: 6.308545417329912e-06
MeanAbsoluteError value on hold-out data: 0.000924948079045862
Epoch: 803
Loss on hold-out set: 0.0002749667153388576
MeanAbsoluteError value on hold-out data: 0.002106817439198494
Epoch: 804

Loss on hold-out set: 6.144706429947028e-06
MeanAbsoluteError value on hold-out data: 0.0009207808179780841
```

```
Early stopping at epoch 803
Returned to Spot: Validation loss: 6.144706429947028e-06
----------------------------------------------
```

If `path` is set to a filename, e.g., `path = "model_spot_trained.pt"`, the weights of the trained model will be loaded from this file.

```
test_tuned(net=model_spot, test_dataset=test,
            shuffle=False,
            loss_function=fun_control["loss_function"],
            metric=fun_control["metric_torch"],
            device = fun_control["device"],
            task=fun_control["task"],)
```

```
Loss on hold-out set: 1.5340190220314298e-06
MeanAbsoluteError value on hold-out data: 0.0007534134783782065
Final evaluation: Validation loss: 1.5340190220314298e-06
Final evaluation: Validation metric: 0.0007534134783782065
----------------------------------------------
```

```
(1.5340190220314298e-06, nan, tensor(0.0008))
```

25.17 Cross-validated Evaluations

- This is the evaluation that will be used in the comparison (evaluatecv has to be updated before, to get metric vlaues!):

```
from spotPython.torch.traintest import evaluate_cv
# modify k-kolds:
setattr(model_spot, "k_folds",  10)
df_eval, df_preds, df_metrics = evaluate_cv(net=model_spot,
            dataset=fun_control["data"],
            loss_function=fun_control["loss_function"],
            metric=fun_control["metric_torch"],
            task=fun_control["task"],
            writer=fun_control["writer"],
            writerId="model_spot_cv",
            device = fun_control["device"])
```

```
Fold: 1
Epoch: 1

Loss on hold-out set: 0.0957127557351039
MeanAbsoluteError value on hold-out data: 0.26347172260284424
Epoch: 2
Loss on hold-out set: 0.06425470400315064
MeanAbsoluteError value on hold-out data: 0.20990997552871704
Epoch: 3
Loss on hold-out set: 0.04585300994893679
MeanAbsoluteError value on hold-out data: 0.17775171995162964
Epoch: 4
Loss on hold-out set: 0.03821444998566921
MeanAbsoluteError value on hold-out data: 0.15906724333763123
Epoch: 5
Loss on hold-out set: 0.03318567925061171
MeanAbsoluteError value on hold-out data: 0.1513856053352356
Epoch: 6
Loss on hold-out set: 0.03142024719944367
MeanAbsoluteError value on hold-out data: 0.14800335466861725
Epoch: 7

Loss on hold-out set: 0.030217633869212408
MeanAbsoluteError value on hold-out data: 0.14537598192691803
Epoch: 8

Loss on hold-out set: 0.02946180900415549
MeanAbsoluteError value on hold-out data: 0.14377373456954956
Epoch: 9
Loss on hold-out set: 0.029839327845435876
MeanAbsoluteError value on hold-out data: 0.14230552315711975
Epoch: 10
Loss on hold-out set: 0.029960188943033036
MeanAbsoluteError value on hold-out data: 0.14217129349708557
Epoch: 11
Loss on hold-out set: 0.028358745102125864
MeanAbsoluteError value on hold-out data: 0.13976074755191803
Epoch: 12
Loss on hold-out set: 0.02784837818203064
MeanAbsoluteError value on hold-out data: 0.13852378726005554
Epoch: 13
Loss on hold-out set: 0.02788380103615614
```

```
MeanAbsoluteError value on hold-out data: 0.13764487206935883
Epoch: 14

Loss on hold-out set: 0.027397984280609168
MeanAbsoluteError value on hold-out data: 0.13678181171417236
Epoch: 15

Loss on hold-out set: 0.027601479552686214
MeanAbsoluteError value on hold-out data: 0.13557761907577515
Epoch: 16
Loss on hold-out set: 0.026293635368347168
MeanAbsoluteError value on hold-out data: 0.13474510610103607
Epoch: 17
Loss on hold-out set: 0.02594766257187495
MeanAbsoluteError value on hold-out data: 0.13370651006698608
Epoch: 18
Loss on hold-out set: 0.025629257281812336
MeanAbsoluteError value on hold-out data: 0.13273851573467255
Epoch: 19
Loss on hold-out set: 0.026230456880651988
MeanAbsoluteError value on hold-out data: 0.13179726898670197
Epoch: 20
Loss on hold-out set: 0.027077525818290617
MeanAbsoluteError value on hold-out data: 0.1309555172920227
Epoch: 21

Loss on hold-out set: 0.02469282292832549
MeanAbsoluteError value on hold-out data: 0.13013432919979095
Epoch: 22

Loss on hold-out set: 0.02594389021396637
MeanAbsoluteError value on hold-out data: 0.12904061377048492
Epoch: 23
Loss on hold-out set: 0.02492654760583089
MeanAbsoluteError value on hold-out data: 0.1285826712846756
Epoch: 24
Loss on hold-out set: 0.023774396556501206
MeanAbsoluteError value on hold-out data: 0.1277652531862259
Epoch: 25
Loss on hold-out set: 0.023881979931432467
MeanAbsoluteError value on hold-out data: 0.1269274801015854
```

```
Epoch: 26
Loss on hold-out set: 0.024846836566351928
MeanAbsoluteError value on hold-out data: 0.12581311166286469
Epoch: 27
Loss on hold-out set: 0.02300680256806887
MeanAbsoluteError value on hold-out data: 0.12436894327402115
Epoch: 28

Loss on hold-out set: 0.022557669390852634
MeanAbsoluteError value on hold-out data: 0.12273605167865753
Epoch: 29

Loss on hold-out set: 0.022037813905626535
MeanAbsoluteError value on hold-out data: 0.12161512672901154
Epoch: 30
Loss on hold-out set: 0.021789058541449215
MeanAbsoluteError value on hold-out data: 0.12006925791501999
Epoch: 31
Loss on hold-out set: 0.021415081340819597
MeanAbsoluteError value on hold-out data: 0.11887155473232269
Epoch: 32
Loss on hold-out set: 0.021093921592602365
MeanAbsoluteError value on hold-out data: 0.1176164373755455
Epoch: 33
Loss on hold-out set: 0.020645720812563714
MeanAbsoluteError value on hold-out data: 0.11636350303888321
Epoch: 34
Loss on hold-out set: 0.020018809797385566
MeanAbsoluteError value on hold-out data: 0.11485806107521057
Epoch: 35

Loss on hold-out set: 0.02039514471275302
MeanAbsoluteError value on hold-out data: 0.11365482956171036
Epoch: 36

Loss on hold-out set: 0.01892503570371236
MeanAbsoluteError value on hold-out data: 0.11221129447221756
Epoch: 37
Loss on hold-out set: 0.01910681026772811
MeanAbsoluteError value on hold-out data: 0.11051815748214722
Epoch: 38
```

```
Loss on hold-out set: 0.018365071441691656
MeanAbsoluteError value on hold-out data: 0.10937139391899109
Epoch: 39
Loss on hold-out set: 0.01919524769227092
MeanAbsoluteError value on hold-out data: 0.10834864526987076
Epoch: 40
Loss on hold-out set: 0.017800500688071434
MeanAbsoluteError value on hold-out data: 0.10687793046236038
Epoch: 41
Loss on hold-out set: 0.01752090146048711
MeanAbsoluteError value on hold-out data: 0.10561325401067734
Epoch: 42

Loss on hold-out set: 0.01674504717811942
MeanAbsoluteError value on hold-out data: 0.10435213148593903
Epoch: 43

Loss on hold-out set: 0.017789947227216683
MeanAbsoluteError value on hold-out data: 0.10232734680175781
Epoch: 44
Loss on hold-out set: 0.017162188708495636
MeanAbsoluteError value on hold-out data: 0.10085074603557587
Epoch: 45
Loss on hold-out set: 0.01539943739771843
MeanAbsoluteError value on hold-out data: 0.10093280673027039
Epoch: 46
Loss on hold-out set: 0.015712835181217927
MeanAbsoluteError value on hold-out data: 0.0976647287607193
Epoch: 47
Loss on hold-out set: 0.014274800017189521
MeanAbsoluteError value on hold-out data: 0.0959000363945961
Epoch: 48
Loss on hold-out set: 0.014146852127921123
MeanAbsoluteError value on hold-out data: 0.0951240137219429
Epoch: 49

Loss on hold-out set: 0.013688513292716099
MeanAbsoluteError value on hold-out data: 0.09288778901100159
Epoch: 50

Loss on hold-out set: 0.012906890040120253
```

```
MeanAbsoluteError value on hold-out data: 0.0915551483631134
Epoch: 51
Loss on hold-out set: 0.013018081358705576
MeanAbsoluteError value on hold-out data: 0.08949565887451172
Epoch: 52
Loss on hold-out set: 0.012176136235491587
MeanAbsoluteError value on hold-out data: 0.08783692121505737
Epoch: 53
Loss on hold-out set: 0.011659748816432862
MeanAbsoluteError value on hold-out data: 0.0859600082039833
Epoch: 54
Loss on hold-out set: 0.011504575645980926
MeanAbsoluteError value on hold-out data: 0.0840337947010994
Epoch: 55
Loss on hold-out set: 0.011327058757440401
MeanAbsoluteError value on hold-out data: 0.08251693844795227
Epoch: 56

Loss on hold-out set: 0.010816963819357065
MeanAbsoluteError value on hold-out data: 0.08039071410894394
Epoch: 57

Loss on hold-out set: 0.010297177046035918
MeanAbsoluteError value on hold-out data: 0.07845998555421829
Epoch: 58
Loss on hold-out set: 0.009894413909373375
MeanAbsoluteError value on hold-out data: 0.07650671154260635
Epoch: 59
Loss on hold-out set: 0.009375113205840955
MeanAbsoluteError value on hold-out data: 0.07460083067417145
Epoch: 60
Loss on hold-out set: 0.008979370083230047
MeanAbsoluteError value on hold-out data: 0.07270314544439316
Epoch: 61
Loss on hold-out set: 0.008432122932460446
MeanAbsoluteError value on hold-out data: 0.07142002880573273
Epoch: 62
Loss on hold-out set: 0.008082479131049834
MeanAbsoluteError value on hold-out data: 0.06972936540842056
Epoch: 63

Loss on hold-out set: 0.007803889027295204
```

```
MeanAbsoluteError value on hold-out data: 0.06708591431379318
Epoch: 64

Loss on hold-out set: 0.007645072719941919
MeanAbsoluteError value on hold-out data: 0.06516192108392715
Epoch: 65
Loss on hold-out set: 0.007101766639747298
MeanAbsoluteError value on hold-out data: 0.06452284753322601
Epoch: 66
Loss on hold-out set: 0.006758311812658436
MeanAbsoluteError value on hold-out data: 0.06143724545836449
Epoch: 67
Loss on hold-out set: 0.006313732699849284
MeanAbsoluteError value on hold-out data: 0.05981384217739105
Epoch: 68
Loss on hold-out set: 0.0062382740389484055
MeanAbsoluteError value on hold-out data: 0.057754624634981155
Epoch: 69
Loss on hold-out set: 0.005669133733205784
MeanAbsoluteError value on hold-out data: 0.05563807860016823
Epoch: 70

Loss on hold-out set: 0.006161279568914324
MeanAbsoluteError value on hold-out data: 0.0552336610853672
Epoch: 71

Loss on hold-out set: 0.005088918434921652
MeanAbsoluteError value on hold-out data: 0.051912590861320496
Epoch: 72
Loss on hold-out set: 0.005059576091858057
MeanAbsoluteError value on hold-out data: 0.050653114914894104
Epoch: 73
Loss on hold-out set: 0.004999533931438167
MeanAbsoluteError value on hold-out data: 0.04865130037069321
Epoch: 74
Loss on hold-out set: 0.0043915475790317245
MeanAbsoluteError value on hold-out data: 0.04629955813288689
Epoch: 75
Loss on hold-out set: 0.004505526014746955
MeanAbsoluteError value on hold-out data: 0.046213679015636444
Epoch: 76
Loss on hold-out set: 0.003988978365669027
```

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MeanAbsoluteError value on hold-out data: 0.042633675038814545
Epoch: 77

Loss on hold-out set: 0.003723909532149824
MeanAbsoluteError value on hold-out data: 0.04090777412056923
Epoch: 78

Loss on hold-out set: 0.003600112337153405
MeanAbsoluteError value on hold-out data: 0.039546046406030655
Epoch: 79
Loss on hold-out set: 0.0032899396632833835
MeanAbsoluteError value on hold-out data: 0.03728180751204491
Epoch: 80
Loss on hold-out set: 0.003057565067697746
MeanAbsoluteError value on hold-out data: 0.035643547773361206
Epoch: 81
Loss on hold-out set: 0.0029008554052919722
MeanAbsoluteError value on hold-out data: 0.03396422788500786
Epoch: 82
Loss on hold-out set: 0.0027470284190852768
MeanAbsoluteError value on hold-out data: 0.032980166375637054
Epoch: 83
Loss on hold-out set: 0.0025352196445545326
MeanAbsoluteError value on hold-out data: 0.03127985820174217
Epoch: 84

Loss on hold-out set: 0.0024235148784310487
MeanAbsoluteError value on hold-out data: 0.030081504955887794
Epoch: 85

Loss on hold-out set: 0.002218812448868098
MeanAbsoluteError value on hold-out data: 0.027713827788829803
Epoch: 86
Loss on hold-out set: 0.0020915000439764788
MeanAbsoluteError value on hold-out data: 0.02642601914703846
Epoch: 87
Loss on hold-out set: 0.001957699907227204
MeanAbsoluteError value on hold-out data: 0.024572128430008888
Epoch: 88
Loss on hold-out set: 0.0018563226370203595
MeanAbsoluteError value on hold-out data: 0.02413640171289444
```

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Epoch: 89
Loss on hold-out set: 0.0017234094848390669
MeanAbsoluteError value on hold-out data: 0.02205057442188263
Epoch: 90
Loss on hold-out set: 0.0016348685944999137
MeanAbsoluteError value on hold-out data: 0.02091670036315918
Epoch: 91

Loss on hold-out set: 0.001526311721066192
MeanAbsoluteError value on hold-out data: 0.019552089273929596
Epoch: 92

Loss on hold-out set: 0.0018379598884796277
MeanAbsoluteError value on hold-out data: 0.018263662233948708
Epoch: 93
Loss on hold-out set: 0.0013450975501865076
MeanAbsoluteError value on hold-out data: 0.017358601093292236
Epoch: 94
Loss on hold-out set: 0.001291027341861851
MeanAbsoluteError value on hold-out data: 0.01626702770590782
Epoch: 95
Loss on hold-out set: 0.0011960246119997464
MeanAbsoluteError value on hold-out data: 0.014859862625598907
Epoch: 96
Loss on hold-out set: 0.0015222020763478493
MeanAbsoluteError value on hold-out data: 0.015632836148142815
Epoch: 97
Loss on hold-out set: 0.001078379295974558
MeanAbsoluteError value on hold-out data: 0.014234447851777077
Epoch: 98

Loss on hold-out set: 0.0010699821832531597
MeanAbsoluteError value on hold-out data: 0.014178738929331303
Epoch: 99

Loss on hold-out set: 0.0009552944163190729
MeanAbsoluteError value on hold-out data: 0.011540352366864681
Epoch: 100
Loss on hold-out set: 0.0009075995300848333
MeanAbsoluteError value on hold-out data: 0.010936255566775799
Epoch: 101
```

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Loss on hold-out set: 0.0009139616843010747
MeanAbsoluteError value on hold-out data: 0.01015168335288763
Epoch: 102
Loss on hold-out set: 0.0008180498216111468
MeanAbsoluteError value on hold-out data: 0.009606858715415001
Epoch: 103
Loss on hold-out set: 0.0011880475476923143
MeanAbsoluteError value on hold-out data: 0.00993590708822012
Epoch: 104
Loss on hold-out set: 0.0007392983881380552
MeanAbsoluteError value on hold-out data: 0.009708492085337639
Epoch: 105

Loss on hold-out set: 0.0007006981199293267
MeanAbsoluteError value on hold-out data: 0.008874774910509586
Epoch: 106

Loss on hold-out set: 0.0006622419662982373
MeanAbsoluteError value on hold-out data: 0.00827738270163536
Epoch: 107
Loss on hold-out set: 0.0018313374447153853
MeanAbsoluteError value on hold-out data: 0.011009803041815758
Epoch: 108
Loss on hold-out set: 0.0006011905632546516
MeanAbsoluteError value on hold-out data: 0.0077175865881145
Epoch: 109
Loss on hold-out set: 0.0005752559682150604
MeanAbsoluteError value on hold-out data: 0.008606499060988426
Epoch: 110
Loss on hold-out set: 0.000563072065443311
MeanAbsoluteError value on hold-out data: 0.010237045586109161
Epoch: 111
Loss on hold-out set: 0.0005198719708494956
MeanAbsoluteError value on hold-out data: 0.006702848710119724
Epoch: 112

Loss on hold-out set: 0.0006767612702648106
MeanAbsoluteError value on hold-out data: 0.006747986190021038
Epoch: 113

Loss on hold-out set: 0.000667681068493336
```

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MeanAbsoluteError value on hold-out data: 0.006159230601042509
Epoch: 114
Loss on hold-out set: 0.00044922690183022074
MeanAbsoluteError value on hold-out data: 0.005857891868799925
Epoch: 115
Loss on hold-out set: 0.0004536780247340525
MeanAbsoluteError value on hold-out data: 0.006591743789613247
Epoch: 116
Loss on hold-out set: 0.00041466013573636493
MeanAbsoluteError value on hold-out data: 0.006202235352247953
Epoch: 117
Loss on hold-out set: 0.00040936642576875433
MeanAbsoluteError value on hold-out data: 0.00782759115099907
Epoch: 118
Loss on hold-out set: 0.0005124261526641651
MeanAbsoluteError value on hold-out data: 0.008599684573709965
Epoch: 119

Loss on hold-out set: 0.0003485414580032179
MeanAbsoluteError value on hold-out data: 0.005159558728337288
Epoch: 120

Loss on hold-out set: 0.0003316023564558726
MeanAbsoluteError value on hold-out data: 0.005018211435526609
Epoch: 121
Loss on hold-out set: 0.00032079604807659754
MeanAbsoluteError value on hold-out data: 0.004821013193577528
Epoch: 122
Loss on hold-out set: 0.0003146975444853804
MeanAbsoluteError value on hold-out data: 0.004684919025748968
Epoch: 123
Loss on hold-out set: 0.0003092158424701316
MeanAbsoluteError value on hold-out data: 0.005032783839851618
Epoch: 124
Loss on hold-out set: 0.00027412611099136413
MeanAbsoluteError value on hold-out data: 0.004323940258473158
Epoch: 125
Loss on hold-out set: 0.0003654109596748885
MeanAbsoluteError value on hold-out data: 0.004375927150249481
Epoch: 126

Loss on hold-out set: 0.0002478536161207173
```

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MeanAbsoluteError value on hold-out data: 0.004090022295713425
Epoch: 127

Loss on hold-out set: 0.0004888767113190904
MeanAbsoluteError value on hold-out data: 0.005974699277430773
Epoch: 128
Loss on hold-out set: 0.00022336877394151926
MeanAbsoluteError value on hold-out data: 0.0042075905948877335
Epoch: 129
Loss on hold-out set: 0.00021161706551818218
MeanAbsoluteError value on hold-out data: 0.003968422766774893
Epoch: 130
Loss on hold-out set: 0.0002025250494564436
MeanAbsoluteError value on hold-out data: 0.0044609177857637405
Epoch: 131
Loss on hold-out set: 0.00019206979011152306
MeanAbsoluteError value on hold-out data: 0.0035503781400620937
Epoch: 132
Loss on hold-out set: 0.00018349880389223472
MeanAbsoluteError value on hold-out data: 0.0034675265196710825
Epoch: 133

Loss on hold-out set: 0.00017476556619901482
MeanAbsoluteError value on hold-out data: 0.0033638374879956245
Epoch: 134

Loss on hold-out set: 0.00016594154378970835
MeanAbsoluteError value on hold-out data: 0.0032805835362523794
Epoch: 135
Loss on hold-out set: 0.00016009786200863976
MeanAbsoluteError value on hold-out data: 0.003287261351943016
Epoch: 136
Loss on hold-out set: 0.0001510974863116679
MeanAbsoluteError value on hold-out data: 0.003481563413515687
Epoch: 137
Loss on hold-out set: 0.0001441877092444289
MeanAbsoluteError value on hold-out data: 0.0030157456640154123
Epoch: 138
Loss on hold-out set: 0.00013950761256007984
MeanAbsoluteError value on hold-out data: 0.004079090431332588
Epoch: 139
Loss on hold-out set: 0.0001307772981511754
```

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MeanAbsoluteError value on hold-out data: 0.0029333424754440784
Epoch: 140

Loss on hold-out set: 0.00012496110983962493
MeanAbsoluteError value on hold-out data: 0.0035007456317543983
Epoch: 141

Loss on hold-out set: 0.00011773212105481434
MeanAbsoluteError value on hold-out data: 0.002697225194424391
Epoch: 142
Loss on hold-out set: 0.00011255651448585432
MeanAbsoluteError value on hold-out data: 0.002698859665542841
Epoch: 143
Loss on hold-out set: 0.00010687469003082348
MeanAbsoluteError value on hold-out data: 0.002926622051745653
Epoch: 144
Loss on hold-out set: 0.00010208994180953386
MeanAbsoluteError value on hold-out data: 0.002861360553652048
Epoch: 145
Loss on hold-out set: 0.0003182269317151692
MeanAbsoluteError value on hold-out data: 0.01465524174273014
Epoch: 146
Loss on hold-out set: 9.191708437583657e-05
MeanAbsoluteError value on hold-out data: 0.0025433236733078957
Epoch: 147

Loss on hold-out set: 8.734002908174541e-05
MeanAbsoluteError value on hold-out data: 0.002570624928921461
Epoch: 148

Loss on hold-out set: 8.304929617854493e-05
MeanAbsoluteError value on hold-out data: 0.0025683750864118338
Epoch: 149
Loss on hold-out set: 8.280602245437106e-05
MeanAbsoluteError value on hold-out data: 0.0031483545899391174
Epoch: 150
Loss on hold-out set: 7.817988036479689e-05
MeanAbsoluteError value on hold-out data: 0.0032331652473658323
Epoch: 151
Loss on hold-out set: 0.0009307824041990478
MeanAbsoluteError value on hold-out data: 0.0051475525833666325
```

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Epoch: 152
Loss on hold-out set: 6.938522925390946e-05
MeanAbsoluteError value on hold-out data: 0.0024634809233248234
Epoch: 153
Loss on hold-out set: 7.327342753062391e-05
MeanAbsoluteError value on hold-out data: 0.003514794632792473
Epoch: 154

Loss on hold-out set: 9.088883933827674e-05
MeanAbsoluteError value on hold-out data: 0.0022426587529480457
Epoch: 155

Loss on hold-out set: 6.162274683254928e-05
MeanAbsoluteError value on hold-out data: 0.0022860721219331026
Epoch: 156
Loss on hold-out set: 6.20463604438835e-05
MeanAbsoluteError value on hold-out data: 0.002686907071620226
Epoch: 157
Loss on hold-out set: 6.066548784334512e-05
MeanAbsoluteError value on hold-out data: 0.002852558856830001
Epoch: 158
Loss on hold-out set: 5.4813661961361504e-05
MeanAbsoluteError value on hold-out data: 0.002314105397090316
Epoch: 159
Loss on hold-out set: 9.096648360495098e-05
MeanAbsoluteError value on hold-out data: 0.007066895253956318
Epoch: 160
Loss on hold-out set: 5.0278495378436746e-05
MeanAbsoluteError value on hold-out data: 0.0021561328321695328
Epoch: 161

Loss on hold-out set: 4.8201631705943815e-05
MeanAbsoluteError value on hold-out data: 0.0018483602907508612
Epoch: 162

Loss on hold-out set: 4.768732359340132e-05
MeanAbsoluteError value on hold-out data: 0.0024554512929171324
Epoch: 163
Loss on hold-out set: 4.520016521452747e-05
MeanAbsoluteError value on hold-out data: 0.0020021414384245872
Epoch: 164
```

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Loss on hold-out set: 6.051486334312218e-05
MeanAbsoluteError value on hold-out data: 0.0018793982453644276
Epoch: 165
Loss on hold-out set: 5.953018094609993e-05
MeanAbsoluteError value on hold-out data: 0.005282791331410408
Epoch: 166
Loss on hold-out set: 4.077461570134871e-05
MeanAbsoluteError value on hold-out data: 0.0018119359156116843
Epoch: 167
Loss on hold-out set: 3.937432208763662e-05
MeanAbsoluteError value on hold-out data: 0.0020258906297385693
Epoch: 168

Loss on hold-out set: 3.7208703010203586e-05
MeanAbsoluteError value on hold-out data: 0.0017691239481791854
Epoch: 169

Loss on hold-out set: 3.621838415203736e-05
MeanAbsoluteError value on hold-out data: 0.0019262362038716674
Epoch: 170
Loss on hold-out set: 0.0003511372098133646
MeanAbsoluteError value on hold-out data: 0.003539882367476821
Epoch: 171
Loss on hold-out set: 3.2781661965067054e-05
MeanAbsoluteError value on hold-out data: 0.0015794229693710804
Epoch: 172
Loss on hold-out set: 3.664465727454696e-05
MeanAbsoluteError value on hold-out data: 0.003227469976991415
Epoch: 173
Loss on hold-out set: 3.72220741925188e-05
MeanAbsoluteError value on hold-out data: 0.0034957302268594503
Epoch: 174
Loss on hold-out set: 2.9541103952641817e-05
MeanAbsoluteError value on hold-out data: 0.0015773072373121977
Epoch: 175

Loss on hold-out set: 2.871678036233159e-05
MeanAbsoluteError value on hold-out data: 0.0016822912730276585
Epoch: 176

Loss on hold-out set: 2.8137928531726593e-05
```

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MeanAbsoluteError value on hold-out data: 0.001720584579743445
Epoch: 177
Loss on hold-out set: 0.0008966201374195092
MeanAbsoluteError value on hold-out data: 0.0044942740350961685
Epoch: 178
Loss on hold-out set: 0.00023794904144726667
MeanAbsoluteError value on hold-out data: 0.0037575168535113335
Epoch: 179
Loss on hold-out set: 2.586505062778927e-05
MeanAbsoluteError value on hold-out data: 0.0016958480700850487
Epoch: 180
Loss on hold-out set: 0.00016430396592480835
MeanAbsoluteError value on hold-out data: 0.0028235504869371653
Epoch: 181
Loss on hold-out set: 2.4524982017318016e-05
MeanAbsoluteError value on hold-out data: 0.0015407466562464833
Epoch: 182

Loss on hold-out set: 4.0886210417039154e-05
MeanAbsoluteError value on hold-out data: 0.004544973373413086
Epoch: 183

Loss on hold-out set: 2.283810981505387e-05
MeanAbsoluteError value on hold-out data: 0.0019578305073082447
Epoch: 184
Loss on hold-out set: 2.7137087622227577e-05
MeanAbsoluteError value on hold-out data: 0.0032129306346178055
Epoch: 185
Loss on hold-out set: 0.00043184073441492586
MeanAbsoluteError value on hold-out data: 0.003522320417687297
Epoch: 186
Loss on hold-out set: 1.9511621111143122e-05
MeanAbsoluteError value on hold-out data: 0.0015053466195240617
Epoch: 187
Loss on hold-out set: 1.9736091264104078e-05
MeanAbsoluteError value on hold-out data: 0.001583693316206336
Epoch: 188
Loss on hold-out set: 1.842323034067634e-05
MeanAbsoluteError value on hold-out data: 0.0015934637049213052
Epoch: 189

Loss on hold-out set: 2.428960797173064e-05
```

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MeanAbsoluteError value on hold-out data: 0.0016436255536973476
Epoch: 190

Loss on hold-out set: 1.6745613871412737e-05
MeanAbsoluteError value on hold-out data: 0.0013270446797832847
Epoch: 191
Loss on hold-out set: 1.6103933872430458e-05
MeanAbsoluteError value on hold-out data: 0.0012849727645516396
Epoch: 192
Loss on hold-out set: 1.678075919314254e-05
MeanAbsoluteError value on hold-out data: 0.0017209819052368402
Epoch: 193
Loss on hold-out set: 1.4729011094407095e-05
MeanAbsoluteError value on hold-out data: 0.0012336805230006576
Epoch: 194
Loss on hold-out set: 1.3934263751462613e-05
MeanAbsoluteError value on hold-out data: 0.001210046117193997
Epoch: 195
Loss on hold-out set: 1.3525154604219726e-05
MeanAbsoluteError value on hold-out data: 0.0012507268693298101
Epoch: 196

Loss on hold-out set: 1.368866892247612e-05
MeanAbsoluteError value on hold-out data: 0.001529492437839508
Epoch: 197

Loss on hold-out set: 1.4451455600605046e-05
MeanAbsoluteError value on hold-out data: 0.001974515849724412
Epoch: 198
Loss on hold-out set: 6.380505566574776e-05
MeanAbsoluteError value on hold-out data: 0.007276320364326239
Epoch: 199
Loss on hold-out set: 1.1465603117463055e-05
MeanAbsoluteError value on hold-out data: 0.0014039170928299427
Epoch: 200
Loss on hold-out set: 4.200056803081399e-05
MeanAbsoluteError value on hold-out data: 0.0056494008749723434
Epoch: 201
Loss on hold-out set: 1.0351045668462924e-05
MeanAbsoluteError value on hold-out data: 0.001202849787659943
Epoch: 202
Loss on hold-out set: 1.1099910378876442e-05
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MeanAbsoluteError value on hold-out data: 0.0016414013225585222
Epoch: 203

Loss on hold-out set: 9.511583538841687e-06
MeanAbsoluteError value on hold-out data: 0.0011372214648872614
Epoch: 204

Loss on hold-out set: 0.001002064104402332
MeanAbsoluteError value on hold-out data: 0.004501827526837587
Epoch: 205
Loss on hold-out set: 1.4079142335259139e-05
MeanAbsoluteError value on hold-out data: 0.001119135064072907
Epoch: 206
Loss on hold-out set: 1.1455199035900967e-05
MeanAbsoluteError value on hold-out data: 0.002169703133404255
Epoch: 207
Loss on hold-out set: 9.09156962227196e-06
MeanAbsoluteError value on hold-out data: 0.0015874216333031654
Epoch: 208
Loss on hold-out set: 8.436607950775746e-06
MeanAbsoluteError value on hold-out data: 0.0011010020971298218
Epoch: 209
Loss on hold-out set: 8.15008999447505e-06
MeanAbsoluteError value on hold-out data: 0.0010748717468231916
Epoch: 210

Loss on hold-out set: 8.912657353203731e-06
MeanAbsoluteError value on hold-out data: 0.0014516809023916721
Epoch: 211

Loss on hold-out set: 7.92131584148592e-06
MeanAbsoluteError value on hold-out data: 0.0013551139272749424
Epoch: 212
Loss on hold-out set: 7.538494982712179e-06
MeanAbsoluteError value on hold-out data: 0.0012377328239381313
Epoch: 213
Loss on hold-out set: 7.3795460917398696e-06
MeanAbsoluteError value on hold-out data: 0.0012831783387809992
Epoch: 214
Loss on hold-out set: 6.984181077576488e-06
MeanAbsoluteError value on hold-out data: 0.0012039229040965438
```

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Epoch: 215
Loss on hold-out set: 0.00011994901683028029
MeanAbsoluteError value on hold-out data: 0.0017604363383725286
Epoch: 216
Loss on hold-out set: 6.168371820299749e-06
MeanAbsoluteError value on hold-out data: 0.0009677031775936484
Epoch: 217

Loss on hold-out set: 5.61965313312822e-06
MeanAbsoluteError value on hold-out data: 0.0009812607895582914
Epoch: 218

Loss on hold-out set: 6.866289656780002e-06
MeanAbsoluteError value on hold-out data: 0.0015938509022817016
Epoch: 219
Loss on hold-out set: 7.48926140221766e-06
MeanAbsoluteError value on hold-out data: 0.0010048729600384831
Epoch: 220
Loss on hold-out set: 5.716221992840404e-06
MeanAbsoluteError value on hold-out data: 0.0010482472134754062
Epoch: 221
Loss on hold-out set: 0.00021120235813371508
MeanAbsoluteError value on hold-out data: 0.002554908161982894
Epoch: 222
Loss on hold-out set: 6.098770318028703e-06
MeanAbsoluteError value on hold-out data: 0.001359446905553341
Epoch: 223
Loss on hold-out set: 5.216510636238616e-06
MeanAbsoluteError value on hold-out data: 0.0012659585336223245
Epoch: 224

Loss on hold-out set: 6.00849039773703e-06
MeanAbsoluteError value on hold-out data: 0.001476030913181603
Epoch: 225

Loss on hold-out set: 6.038108394407643e-06
MeanAbsoluteError value on hold-out data: 0.0012056499253958464
Epoch: 226
Loss on hold-out set: 7.778055585451792e-06
MeanAbsoluteError value on hold-out data: 0.0019640279933810234
Epoch: 227
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Loss on hold-out set: 4.961465422708828e-06
MeanAbsoluteError value on hold-out data: 0.0009565192740410566
Epoch: 228
Loss on hold-out set: 4.926163928058276e-06
MeanAbsoluteError value on hold-out data: 0.001010667416267097
Epoch: 229
Loss on hold-out set: 5.423416596910941e-06
MeanAbsoluteError value on hold-out data: 0.0015784540446475148
Epoch: 230
Loss on hold-out set: 4.776688578763592e-06
MeanAbsoluteError value on hold-out data: 0.0011387538397684693
Epoch: 231

Loss on hold-out set: 0.00059025118978385
MeanAbsoluteError value on hold-out data: 0.0033887505996972322
Epoch: 232

Loss on hold-out set: 4.7115364814395925e-06
MeanAbsoluteError value on hold-out data: 0.0009717259090393782
Epoch: 233
Loss on hold-out set: 4.681061918395594e-06
MeanAbsoluteError value on hold-out data: 0.0009835499804466963
Epoch: 234
Loss on hold-out set: 4.314205367651224e-06
MeanAbsoluteError value on hold-out data: 0.0009267982677556574
Epoch: 235
Loss on hold-out set: 3.7104690296001327e-06
MeanAbsoluteError value on hold-out data: 0.0008713725255802274
Epoch: 236
Loss on hold-out set: 5.083690946496343e-06
MeanAbsoluteError value on hold-out data: 0.0015664026141166687
Epoch: 237
Loss on hold-out set: 5.397789257480886e-06
MeanAbsoluteError value on hold-out data: 0.0016001000767573714
Epoch: 238

Loss on hold-out set: 3.187680914169715e-06
MeanAbsoluteError value on hold-out data: 0.000950960791669786
Epoch: 239

Loss on hold-out set: 3.4272807301231996e-06
```

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MeanAbsoluteError value on hold-out data: 0.001242858823388815
Epoch: 240
Loss on hold-out set: 0.000385898639793735
MeanAbsoluteError value on hold-out data: 0.004055963829159737
Epoch: 241
Loss on hold-out set: 2.43261232176687e-06
MeanAbsoluteError value on hold-out data: 0.000956175324972719
Epoch: 242
Loss on hold-out set: 3.228185230105177e-06
MeanAbsoluteError value on hold-out data: 0.0011224958579987288
Epoch: 243
Loss on hold-out set: 5.203499182033948e-06
MeanAbsoluteError value on hold-out data: 0.0018023261800408363
Epoch: 244
Loss on hold-out set: 7.541218600146329e-06
MeanAbsoluteError value on hold-out data: 0.0024455254897475243
Epoch: 245

Loss on hold-out set: 3.60845959991051e-06
MeanAbsoluteError value on hold-out data: 0.001257044728845358
Epoch: 246

Loss on hold-out set: 2.9518037059425787e-06
MeanAbsoluteError value on hold-out data: 0.0009374299552291632
Epoch: 247
Loss on hold-out set: 2.705056092421588e-06
MeanAbsoluteError value on hold-out data: 0.0008751577115617692
Epoch: 248
Loss on hold-out set: 6.829411719221613e-06
MeanAbsoluteError value on hold-out data: 0.0022910914849489927
Epoch: 249
Loss on hold-out set: 3.0568448088694404e-06
MeanAbsoluteError value on hold-out data: 0.000875355617608875
Epoch: 250
Loss on hold-out set: 3.9669593241761995e-06
MeanAbsoluteError value on hold-out data: 0.0015238085761666298
Epoch: 251
Loss on hold-out set: 1.998871471624415e-06
MeanAbsoluteError value on hold-out data: 0.0008587342454120517
Epoch: 252

Loss on hold-out set: 3.972594124836458e-06
```

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MeanAbsoluteError value on hold-out data: 0.001487795147113502
Epoch: 253

Loss on hold-out set: 2.3591956838012825e-06
MeanAbsoluteError value on hold-out data: 0.0009280738304369152
Epoch: 254
Loss on hold-out set: 1.2121694453526288e-05
MeanAbsoluteError value on hold-out data: 0.003129742108285427
Epoch: 255
Loss on hold-out set: 1.893678114146706e-06
MeanAbsoluteError value on hold-out data: 0.0008694094140082598
Epoch: 256
Loss on hold-out set: 5.988109303591325e-06
MeanAbsoluteError value on hold-out data: 0.002055330201983452
Epoch: 257
Loss on hold-out set: 2.136436185432663e-06
MeanAbsoluteError value on hold-out data: 0.0009863609448075294
Epoch: 258
Loss on hold-out set: 4.2857508245875715e-06
MeanAbsoluteError value on hold-out data: 0.001781387603841722
Epoch: 259

Loss on hold-out set: 3.3691711372249792e-06
MeanAbsoluteError value on hold-out data: 0.0011933058267459273
Epoch: 260

Loss on hold-out set: 1.7354562811096212e-06
MeanAbsoluteError value on hold-out data: 0.0007967668934725225
Epoch: 261
Loss on hold-out set: 1.0915709935943596e-05
MeanAbsoluteError value on hold-out data: 0.003165669972077012
Epoch: 262
Loss on hold-out set: 1.9641327814777187e-06
MeanAbsoluteError value on hold-out data: 0.0009542584302835166
Epoch: 263
Loss on hold-out set: 2.590259491888411e-06
MeanAbsoluteError value on hold-out data: 0.0011773884762078524
Epoch: 264
Loss on hold-out set: 0.0002770542269427796
MeanAbsoluteError value on hold-out data: 0.003105679526925087
Epoch: 265
Loss on hold-out set: 3.849461567229949e-05
```

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MeanAbsoluteError value on hold-out data: 0.006103107705712318
Epoch: 266

Loss on hold-out set: 2.5250798654059718e-06
MeanAbsoluteError value on hold-out data: 0.0011195603292435408
Epoch: 267

Loss on hold-out set: 1.7789460593156457e-06
MeanAbsoluteError value on hold-out data: 0.0008087557507678866
Epoch: 268
Loss on hold-out set: 1.6679253790768528e-06
MeanAbsoluteError value on hold-out data: 0.0007812061812728643
Epoch: 269
Loss on hold-out set: 1.709106589723538e-06
MeanAbsoluteError value on hold-out data: 0.0007906371611170471
Epoch: 270
Loss on hold-out set: 1.64482507723453e-06
MeanAbsoluteError value on hold-out data: 0.0007768308860249817
Epoch: 271
Loss on hold-out set: 2.9775277076064062e-06
MeanAbsoluteError value on hold-out data: 0.0013064751401543617
Epoch: 272
Loss on hold-out set: 1.6432550620055945e-06
MeanAbsoluteError value on hold-out data: 0.0008710205438546836
Epoch: 273

Loss on hold-out set: 1.834045419330393e-06
MeanAbsoluteError value on hold-out data: 0.0009637635666877031
Epoch: 274

Loss on hold-out set: 1.2563287550794764e-06
MeanAbsoluteError value on hold-out data: 0.0007360369199886918
Epoch: 275
Loss on hold-out set: 1.3505227667127865e-06
MeanAbsoluteError value on hold-out data: 0.0007685983437113464
Epoch: 276
Loss on hold-out set: 4.604124394693197e-06
MeanAbsoluteError value on hold-out data: 0.0018290462903678417
Epoch: 277
Loss on hold-out set: 3.461928799179777e-05
MeanAbsoluteError value on hold-out data: 0.005753321573138237
```

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Epoch: 278
Loss on hold-out set: 2.8668438814677825e-06
MeanAbsoluteError value on hold-out data: 0.0013885381631553173
Epoch: 279
Loss on hold-out set: 7.81254420172235e-06
MeanAbsoluteError value on hold-out data: 0.0026560332626104355
Epoch: 280

Loss on hold-out set: 1.5211061325387093e-06
MeanAbsoluteError value on hold-out data: 0.0009427678305655718
Epoch: 281

Loss on hold-out set: 2.7025207513221317e-06
MeanAbsoluteError value on hold-out data: 0.0014398458879441023
Epoch: 282
Loss on hold-out set: 1.0617206975474312e-06
MeanAbsoluteError value on hold-out data: 0.0007313293172046542
Epoch: 283
Loss on hold-out set: 1.2463693880048454e-06
MeanAbsoluteError value on hold-out data: 0.0007510143332183361
Epoch: 284
Loss on hold-out set: 1.7396222696893697e-06
MeanAbsoluteError value on hold-out data: 0.0010707536712288857
Epoch: 285
Loss on hold-out set: 1.1571518056231212e-06
MeanAbsoluteError value on hold-out data: 0.0008572065853513777
Epoch: 286
Loss on hold-out set: 2.048623999738853e-06
MeanAbsoluteError value on hold-out data: 0.0011512646451592445
Epoch: 287

Loss on hold-out set: 1.0242297212069109e-06
MeanAbsoluteError value on hold-out data: 0.0007716334075666964
Epoch: 288

Loss on hold-out set: 1.3822429598174215e-06
MeanAbsoluteError value on hold-out data: 0.0009450933430343866
Epoch: 289
Loss on hold-out set: 1.209917943338741e-06
MeanAbsoluteError value on hold-out data: 0.0008289185352623463
Epoch: 290
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Loss on hold-out set: 5.348304739527521e-06
MeanAbsoluteError value on hold-out data: 0.001993176992982626
Epoch: 291
Loss on hold-out set: 1.0096908121900365e-06
MeanAbsoluteError value on hold-out data: 0.0007466963143087924
Epoch: 292
Loss on hold-out set: 5.095980143848395e-06
MeanAbsoluteError value on hold-out data: 0.0020124062430113554
Epoch: 293
Loss on hold-out set: 1.1190870666793602e-05
MeanAbsoluteError value on hold-out data: 0.003237795550376177
Epoch: 294

Loss on hold-out set: 1.4505447985322041e-06
MeanAbsoluteError value on hold-out data: 0.000847647781483829
Epoch: 295

Loss on hold-out set: 1.5469576689716073e-06
MeanAbsoluteError value on hold-out data: 0.0009326660656370223
Epoch: 296
Loss on hold-out set: 1.206764938370515e-06
MeanAbsoluteError value on hold-out data: 0.0007968246936798096
Epoch: 297
Loss on hold-out set: 2.0152366372573083e-06
MeanAbsoluteError value on hold-out data: 0.001061116112396121
Epoch: 298
Loss on hold-out set: 2.2858315123113034e-06
MeanAbsoluteError value on hold-out data: 0.0012333857594057918
Epoch: 299
Loss on hold-out set: 1.208191533281094e-06
MeanAbsoluteError value on hold-out data: 0.000886446563526988
Epoch: 300
Loss on hold-out set: 1.0685325761983222e-06
MeanAbsoluteError value on hold-out data: 0.000713374640326947
Epoch: 301

Loss on hold-out set: 1.2235022108615549e-06
MeanAbsoluteError value on hold-out data: 0.0007676995010115206
Epoch: 302

Loss on hold-out set: 0.00015279166894270718
```

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MeanAbsoluteError value on hold-out data: 0.002314210869371891
Epoch: 303
Loss on hold-out set: 4.7587941511896865e-05
MeanAbsoluteError value on hold-out data: 0.001467967638745904
Epoch: 304
Loss on hold-out set: 1.2137059505116317e-06
MeanAbsoluteError value on hold-out data: 0.0007327159983105958
Epoch: 305
Loss on hold-out set: 3.2992378202414748e-06
MeanAbsoluteError value on hold-out data: 0.0015944089973345399
Epoch: 306
Loss on hold-out set: 9.975975321524926e-05
MeanAbsoluteError value on hold-out data: 0.0023254030384123325
Epoch: 307
Loss on hold-out set: 2.5200303683120113e-05
MeanAbsoluteError value on hold-out data: 0.004910659044981003
Epoch: 308

Loss on hold-out set: 1.135179515516099e-06
MeanAbsoluteError value on hold-out data: 0.0007809179951436818
Epoch: 309

Loss on hold-out set: 9.880759163339603e-07
MeanAbsoluteError value on hold-out data: 0.0007278930861502886
Epoch: 310
Loss on hold-out set: 9.621163325863772e-07
MeanAbsoluteError value on hold-out data: 0.000714493973646313
Epoch: 311
Loss on hold-out set: 8.347280807076738e-07
MeanAbsoluteError value on hold-out data: 0.0006733223563060164
Epoch: 312
Loss on hold-out set: 1.4459236253445013e-06
MeanAbsoluteError value on hold-out data: 0.0008838411886245012
Epoch: 313
Loss on hold-out set: 1.1279129050916044e-06
MeanAbsoluteError value on hold-out data: 0.0007815453573130071
Epoch: 314
Loss on hold-out set: 1.4309163549779232e-06
MeanAbsoluteError value on hold-out data: 0.0008288449025712907
Epoch: 315

Loss on hold-out set: 3.4263562418765596e-06
```

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MeanAbsoluteError value on hold-out data: 0.0015886389883235097
Epoch: 316

Loss on hold-out set: 1.6496719581482466e-06
MeanAbsoluteError value on hold-out data: 0.000970256922300905
Epoch: 317
Loss on hold-out set: 1.4345427005607164e-06
MeanAbsoluteError value on hold-out data: 0.0008295217412523925
Epoch: 318
Loss on hold-out set: 1.3097440282413468e-06
MeanAbsoluteError value on hold-out data: 0.000787308206781745
Epoch: 319
Loss on hold-out set: 2.8286059519954365e-06
MeanAbsoluteError value on hold-out data: 0.0014352456200867891
Epoch: 320
Loss on hold-out set: 1.116020277217663e-06
MeanAbsoluteError value on hold-out data: 0.0006971901748329401
Epoch: 321
Loss on hold-out set: 2.077463519229311e-06
MeanAbsoluteError value on hold-out data: 0.0010856634471565485
Epoch: 322

Loss on hold-out set: 1.308774290447008e-06
MeanAbsoluteError value on hold-out data: 0.0007342237513512373
Epoch: 323

Loss on hold-out set: 0.0005215340445899458
MeanAbsoluteError value on hold-out data: 0.004234718158841133
Epoch: 324
Loss on hold-out set: 1.5322400311281224e-06
MeanAbsoluteError value on hold-out data: 0.0009032675880007446
Epoch: 325
Loss on hold-out set: 1.8820313742323308e-06
MeanAbsoluteError value on hold-out data: 0.0010022068163380027
Epoch: 326
Loss on hold-out set: 1.2470244821717922e-06
MeanAbsoluteError value on hold-out data: 0.0007507330155931413
Epoch: 327
Loss on hold-out set: 1.0549370465731465e-06
MeanAbsoluteError value on hold-out data: 0.0007128342986106873
Epoch: 328
Loss on hold-out set: 1.1910359883306508e-06
```

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MeanAbsoluteError value on hold-out data: 0.0007799685117788613
Epoch: 329

Loss on hold-out set: 1.1338934830116788e-05
MeanAbsoluteError value on hold-out data: 0.003200545674189925
Epoch: 330

Loss on hold-out set: 4.0988433004083796e-05
MeanAbsoluteError value on hold-out data: 0.0029550311155617237
Epoch: 331
Loss on hold-out set: 2.589464171565991e-06
MeanAbsoluteError value on hold-out data: 0.001374593935906887
Epoch: 332
Loss on hold-out set: 1.1153383037655938e-06
MeanAbsoluteError value on hold-out data: 0.0007720431894995272
Epoch: 333
Loss on hold-out set: 1.3319873696323507e-06
MeanAbsoluteError value on hold-out data: 0.0009007903863675892
Epoch: 334
Loss on hold-out set: 9.540907059274034e-07
MeanAbsoluteError value on hold-out data: 0.0006884893518872559
Epoch: 335
Loss on hold-out set: 1.076984303311362e-06
MeanAbsoluteError value on hold-out data: 0.0008002325776033103
Epoch: 336

Loss on hold-out set: 3.09307428271775e-06
MeanAbsoluteError value on hold-out data: 0.0014020660892128944
Epoch: 337

Loss on hold-out set: 9.279624863394859e-07
MeanAbsoluteError value on hold-out data: 0.0007397332810796797
Epoch: 338
Loss on hold-out set: 9.457386526561934e-07
MeanAbsoluteError value on hold-out data: 0.0007318690186366439
Epoch: 339
Loss on hold-out set: 3.0138674298121678e-06
MeanAbsoluteError value on hold-out data: 0.001353992847725749
Epoch: 340
Loss on hold-out set: 2.2048060985141023e-06
MeanAbsoluteError value on hold-out data: 0.0012309083249419928
```

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Epoch: 341
Loss on hold-out set: 9.425235036202978e-07
MeanAbsoluteError value on hold-out data: 0.0007094466709531844
Epoch: 342
Loss on hold-out set: 1.58662964027966e-05
MeanAbsoluteError value on hold-out data: 0.003833447117358446
Epoch: 343

Loss on hold-out set: 9.414771627601882e-07
MeanAbsoluteError value on hold-out data: 0.0007575288182124496
Epoch: 344

Loss on hold-out set: 8.184936680558726e-07
MeanAbsoluteError value on hold-out data: 0.0007140261004678905
Epoch: 345
Loss on hold-out set: 2.049385868583788e-05
MeanAbsoluteError value on hold-out data: 0.004440742544829845
Epoch: 346
Loss on hold-out set: 0.00015012131300933944
MeanAbsoluteError value on hold-out data: 0.012177454307675362
Epoch: 347
Loss on hold-out set: 2.0552144781924235e-06
MeanAbsoluteError value on hold-out data: 0.001195073127746582
Epoch: 348
Loss on hold-out set: 6.85204907383125e-05
MeanAbsoluteError value on hold-out data: 0.008217650465667248
Epoch: 349
Loss on hold-out set: 0.00032544615322868036
MeanAbsoluteError value on hold-out data: 0.002730037784203887
Epoch: 350

Loss on hold-out set: 8.069219046109748e-07
MeanAbsoluteError value on hold-out data: 0.0007271462818607688
Epoch: 351

Loss on hold-out set: 7.229267391896708e-07
MeanAbsoluteError value on hold-out data: 0.0006900304579176009
Epoch: 352
Loss on hold-out set: 9.936060354658157e-07
MeanAbsoluteError value on hold-out data: 0.0007916534086689353
Epoch: 353
```

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Loss on hold-out set: 5.2435814914439594e-05
MeanAbsoluteError value on hold-out data: 0.0016973427264019847
Epoch: 354
Loss on hold-out set: 8.445355840299621e-07
MeanAbsoluteError value on hold-out data: 0.0007427537348121405
Epoch: 355
Loss on hold-out set: 0.00020976021943397427
MeanAbsoluteError value on hold-out data: 0.002307160524651408
Epoch: 356
Loss on hold-out set: 8.991695781792084e-07
MeanAbsoluteError value on hold-out data: 0.0007073390297591686
Epoch: 357

Loss on hold-out set: 4.088788605608547e-06
MeanAbsoluteError value on hold-out data: 0.0018470004433766007
Epoch: 358

Loss on hold-out set: 0.00012725563640768857
MeanAbsoluteError value on hold-out data: 0.0019432478584349155
Epoch: 359
Loss on hold-out set: 3.1968464694588106e-06
MeanAbsoluteError value on hold-out data: 0.0015683319652453065
Epoch: 360
Loss on hold-out set: 8.690698747998865e-07
MeanAbsoluteError value on hold-out data: 0.0006794839864596725
Epoch: 361
Loss on hold-out set: 7.279601749570037e-06
MeanAbsoluteError value on hold-out data: 0.002564332215115428
Epoch: 362
Loss on hold-out set: 9.412520092575086e-07
MeanAbsoluteError value on hold-out data: 0.0007444974617101252
Epoch: 363
Loss on hold-out set: 1.0624520668373477e-06
MeanAbsoluteError value on hold-out data: 0.0007821503095328808
Epoch: 364

Loss on hold-out set: 0.0002479577582291243
MeanAbsoluteError value on hold-out data: 0.0025098014157265425
Epoch: 365

Loss on hold-out set: 2.3714423841388802e-06
```

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MeanAbsoluteError value on hold-out data: 0.0012887322809547186
Epoch: 366
Loss on hold-out set: 8.539055307629986e-07
MeanAbsoluteError value on hold-out data: 0.0007551556918770075
Epoch: 367
Loss on hold-out set: 1.3954713591164573e-06
MeanAbsoluteError value on hold-out data: 0.000947164895478636
Epoch: 368
Loss on hold-out set: 7.735724370132419e-07
MeanAbsoluteError value on hold-out data: 0.0006938755395822227
Epoch: 369
Loss on hold-out set: 1.0093513607828825e-06
MeanAbsoluteError value on hold-out data: 0.0008415851043537259
Epoch: 370
Loss on hold-out set: 3.5966865145662896e-06
MeanAbsoluteError value on hold-out data: 0.0016554028261452913
Epoch: 371

Loss on hold-out set: 9.117944422052041e-07
MeanAbsoluteError value on hold-out data: 0.0007631888729520142
Epoch: 372

Loss on hold-out set: 1.1665119009544119e-06
MeanAbsoluteError value on hold-out data: 0.0008745291852392256
Epoch: 373
Loss on hold-out set: 1.3359111440317624e-06
MeanAbsoluteError value on hold-out data: 0.0009283700492233038
Epoch: 374
Loss on hold-out set: 6.767788031188852e-07
MeanAbsoluteError value on hold-out data: 0.0006594553706236184
Epoch: 375
Loss on hold-out set: 2.7668414059707384e-06
MeanAbsoluteError value on hold-out data: 0.0013898187316954136
Epoch: 376
Loss on hold-out set: 7.987778889610826e-07
MeanAbsoluteError value on hold-out data: 0.0006876992993056774
Epoch: 377
Loss on hold-out set: 1.1902097845415062e-06
MeanAbsoluteError value on hold-out data: 0.0008803606033325195
Epoch: 378

Loss on hold-out set: 1.3843633024197725e-06
```

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MeanAbsoluteError value on hold-out data: 0.0009095197892747819
Epoch: 379

Loss on hold-out set: 1.4973869523461103e-06
MeanAbsoluteError value on hold-out data: 0.0009918161667883396
Epoch: 380
Loss on hold-out set: 8.208519112975829e-07
MeanAbsoluteError value on hold-out data: 0.0007435792940668762
Epoch: 381
Loss on hold-out set: 1.7403249549156149e-06
MeanAbsoluteError value on hold-out data: 0.0011091935448348522
Epoch: 382
Loss on hold-out set: 7.422414158169815e-07
MeanAbsoluteError value on hold-out data: 0.000677600794006139
Epoch: 383
Loss on hold-out set: 8.480249282281595e-07
MeanAbsoluteError value on hold-out data: 0.000675604329444468
Epoch: 384
Loss on hold-out set: 8.811691189363886e-06
MeanAbsoluteError value on hold-out data: 0.002733753062784672
Epoch: 385

Loss on hold-out set: 7.340103521231028e-07
MeanAbsoluteError value on hold-out data: 0.0006793603533878922
Epoch: 386

Loss on hold-out set: 5.290862110139362e-06
MeanAbsoluteError value on hold-out data: 0.0009143123170360923
Epoch: 387
Loss on hold-out set: 1.210457307584315e-06
MeanAbsoluteError value on hold-out data: 0.00088769436115399
Epoch: 388
Loss on hold-out set: 1.107822631988361e-06
MeanAbsoluteError value on hold-out data: 0.0008286601514555514
Epoch: 389
Loss on hold-out set: 2.005135120096104e-06
MeanAbsoluteError value on hold-out data: 0.00118435884360224
Epoch: 390
Loss on hold-out set: 1.0945601375694353e-06
MeanAbsoluteError value on hold-out data: 0.0008449560264125466
Epoch: 391
Loss on hold-out set: 1.2281939912274818e-06
```

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MeanAbsoluteError value on hold-out data: 0.0008749475819058716
Epoch: 392

Loss on hold-out set: 6.634789254069171e-07
MeanAbsoluteError value on hold-out data: 0.0006736275390721858
Epoch: 393

Loss on hold-out set: 9.400128292851989e-07
MeanAbsoluteError value on hold-out data: 0.0008136311080306768
Epoch: 394
Loss on hold-out set: 2.938019599915046e-06
MeanAbsoluteError value on hold-out data: 0.0009561249753460288
Epoch: 395
Loss on hold-out set: 9.000847175964457e-07
MeanAbsoluteError value on hold-out data: 0.0007794001721777022
Epoch: 396
Loss on hold-out set: 2.193617586516876e-06
MeanAbsoluteError value on hold-out data: 0.0011677858419716358
Epoch: 397
Loss on hold-out set: 2.4035521514283923e-06
MeanAbsoluteError value on hold-out data: 0.0013323649764060974
Epoch: 398
Loss on hold-out set: 2.3840053332745672e-05
MeanAbsoluteError value on hold-out data: 0.0037702119443565607
Epoch: 399

Loss on hold-out set: 3.2812420193714876e-05
MeanAbsoluteError value on hold-out data: 0.005616064183413982
Epoch: 400

Loss on hold-out set: 2.3266654544875983e-06
MeanAbsoluteError value on hold-out data: 0.0012832111679017544
Epoch: 401
Loss on hold-out set: 1.4340465143574804e-06
MeanAbsoluteError value on hold-out data: 0.000967580359429121
Epoch: 402
Loss on hold-out set: 9.95505383973348e-07
MeanAbsoluteError value on hold-out data: 0.0007565122796222568
Epoch: 403
Loss on hold-out set: 2.2040620706320624e-06
MeanAbsoluteError value on hold-out data: 0.0011982264695689082
```

```
Epoch: 404
Loss on hold-out set: 1.8753717872991379e-06
MeanAbsoluteError value on hold-out data: 0.0011346113169565797
Epoch: 405
Loss on hold-out set: 2.265137009789424e-06
MeanAbsoluteError value on hold-out data: 0.0012638989137485623
Epoch: 406

Loss on hold-out set: 2.403155052049372e-06
MeanAbsoluteError value on hold-out data: 0.0012985053472220898
Epoch: 407

Loss on hold-out set: 0.00056617361638717 95
MeanAbsoluteError value on hold-out data: 0.004491807427257299
Epoch: 408
Loss on hold-out set: 2.230022958498851e-06
MeanAbsoluteError value on hold-out data: 0.001253614667803049
Epoch: 409
Loss on hold-out set: 3.697513434767293e-05
MeanAbsoluteError value on hold-out data: 0.006023370660841465
Epoch: 410
Loss on hold-out set: 3.74196322923126e-05
MeanAbsoluteError value on hold-out data: 0.001452714204788208
Epoch: 411
Loss on hold-out set: 0.0002011593789658351
MeanAbsoluteError value on hold-out data: 0.002144350903108716
Epoch: 412
Loss on hold-out set: 1.5791553498554724e-05
MeanAbsoluteError value on hold-out data: 0.0038796691223978996
Epoch: 413

Loss on hold-out set: 1.2182303762004337e-06
MeanAbsoluteError value on hold-out data: 0.000911443552467972
Epoch: 414

Loss on hold-out set: 8.748974675672099e-07
MeanAbsoluteError value on hold-out data: 0.0007570752641186118
Epoch: 415
Loss on hold-out set: 8.134616306366437e-07
MeanAbsoluteError value on hold-out data: 0.0007213798235170543
Epoch: 416
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Loss on hold-out set: 8.302532028035505e-07
MeanAbsoluteError value on hold-out data: 0.0007462686044164002
Epoch: 417
Loss on hold-out set: 7.720171813966422e-07
MeanAbsoluteError value on hold-out data: 0.0006997668533585966
Epoch: 418
Loss on hold-out set: 1.5673240647209661e-06
MeanAbsoluteError value on hold-out data: 0.0009908947395160794
Epoch: 419
Loss on hold-out set: 0.00039206597380406005
MeanAbsoluteError value on hold-out data: 0.0028716973029077053
Epoch: 420

Loss on hold-out set: 8.319682255939999e-07
MeanAbsoluteError value on hold-out data: 0.0007071375730447471
Epoch: 421

Loss on hold-out set: 7.227867775747235e-07
MeanAbsoluteError value on hold-out data: 0.0006823968724347651
Epoch: 422
Loss on hold-out set: 7.447946888288033e-07
MeanAbsoluteError value on hold-out data: 0.0006712907343171537
Epoch: 423
Loss on hold-out set: 7.442254347831924e-07
MeanAbsoluteError value on hold-out data: 0.0006452884990721941
Epoch: 424
Loss on hold-out set: 3.207591047472446e-06
MeanAbsoluteError value on hold-out data: 0.0015700325602665544
Epoch: 425
Loss on hold-out set: 1.3122338994155423e-05
MeanAbsoluteError value on hold-out data: 0.003491015173494816
Epoch: 426
Loss on hold-out set: 4.152935015064521e-05
MeanAbsoluteError value on hold-out data: 0.0063660722225904465
Epoch: 427

Loss on hold-out set: 1.2394966907217727e-06
MeanAbsoluteError value on hold-out data: 0.0008610758231952786
Epoch: 428

Loss on hold-out set: 1.0709136426192765e-06
```

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MeanAbsoluteError value on hold-out data: 0.0008425944834016263
Epoch: 429
Loss on hold-out set: 1.2887504703065554e-06
MeanAbsoluteError value on hold-out data: 0.0008386304834857583
Epoch: 430
Loss on hold-out set: 1.8933120818823786e-06
MeanAbsoluteError value on hold-out data: 0.0010896105086430907
Epoch: 431
Loss on hold-out set: 9.328381950651349e-07
MeanAbsoluteError value on hold-out data: 0.0007616141228936613
Epoch: 432
Loss on hold-out set: 1.4846339345590072e-06
MeanAbsoluteError value on hold-out data: 0.0009783479617908597
Epoch: 433
Loss on hold-out set: 1.0473864226521703e-06
MeanAbsoluteError value on hold-out data: 0.0008044082205742598
Epoch: 434

Loss on hold-out set: 1.3906679459278866e-06
MeanAbsoluteError value on hold-out data: 0.0009685129043646157
Epoch: 435

Loss on hold-out set: 7.734124861914237e-07
MeanAbsoluteError value on hold-out data: 0.000663663144223392
Epoch: 436
Loss on hold-out set: 0.0001825881265456421
MeanAbsoluteError value on hold-out data: 0.003575695212930441
Epoch: 437
Loss on hold-out set: 8.195444815092183e-07
MeanAbsoluteError value on hold-out data: 0.0007187279989011586
Epoch: 438
Loss on hold-out set: 8.018686886456495e-07
MeanAbsoluteError value on hold-out data: 0.0007194870850071311
Epoch: 439
Loss on hold-out set: 7.263115811348633e-07
MeanAbsoluteError value on hold-out data: 0.0006803015130572021
Epoch: 440
Loss on hold-out set: 0.00027480148384466494
MeanAbsoluteError value on hold-out data: 0.003078745910897851
Epoch: 441

Loss on hold-out set: 1.0315236479003104e-06
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MeanAbsoluteError value on hold-out data: 0.0008095965022221208
Epoch: 442

Loss on hold-out set: 8.806849791653804e-07
MeanAbsoluteError value on hold-out data: 0.0007132348255254328
Epoch: 443
Loss on hold-out set: 1.5889163565729036e-06
MeanAbsoluteError value on hold-out data: 0.001036167494021356
Epoch: 444
Loss on hold-out set: 7.297589246053786e-07
MeanAbsoluteError value on hold-out data: 0.0006525036878883839
Epoch: 445
Loss on hold-out set: 1.5938067664277555e-06
MeanAbsoluteError value on hold-out data: 0.0010487702675163746
Epoch: 446
Loss on hold-out set: 2.0186398439993636e-06
MeanAbsoluteError value on hold-out data: 0.001156823942437768
Epoch: 447
Loss on hold-out set: 1.052370917110378e-06
MeanAbsoluteError value on hold-out data: 0.000780874805059284
Epoch: 448

Loss on hold-out set: 7.271488584592589e-07
MeanAbsoluteError value on hold-out data: 0.000658315431792289
Epoch: 449

Loss on hold-out set: 1.1438147938546395e-06
MeanAbsoluteError value on hold-out data: 0.0008338397601619363
Epoch: 450
Loss on hold-out set: 6.982705717571382e-07
MeanAbsoluteError value on hold-out data: 0.0006851718062534928
Epoch: 451
Loss on hold-out set: 3.3943747701834163e-06
MeanAbsoluteError value on hold-out data: 0.0016194918425753713
Epoch: 452
Loss on hold-out set: 1.5176752168162448e-06
MeanAbsoluteError value on hold-out data: 0.0009564259671606123
Epoch: 453
Loss on hold-out set: 0.00039555520409351175
MeanAbsoluteError value on hold-out data: 0.0026755218859761953
Epoch: 454
Loss on hold-out set: 2.0074614326404117e-06
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MeanAbsoluteError value on hold-out data: 0.0011415225453674793
Epoch: 455

Loss on hold-out set: 9.173518483643979e-07
MeanAbsoluteError value on hold-out data: 0.0008148029446601868
Epoch: 456

Loss on hold-out set: 1.7063555770409248e-06
MeanAbsoluteError value on hold-out data: 0.0010448074899613857
Epoch: 457
Loss on hold-out set: 1.0464263591704646e-06
MeanAbsoluteError value on hold-out data: 0.000835350772831589
Epoch: 458
Loss on hold-out set: 2.102244798152242e-05
MeanAbsoluteError value on hold-out data: 0.004502266179770231
Epoch: 459
Loss on hold-out set: 1.4908324076784013e-06
MeanAbsoluteError value on hold-out data: 0.0009961286559700966
Epoch: 460
Loss on hold-out set: 1.0692303707042602e-06
MeanAbsoluteError value on hold-out data: 0.0007755595725029707
Epoch: 461
Loss on hold-out set: 6.076993801028808e-06
MeanAbsoluteError value on hold-out data: 0.002271021716296673
Epoch: 462

Loss on hold-out set: 7.177962500621177e-07
MeanAbsoluteError value on hold-out data: 0.0006570163532160223
Epoch: 463

Loss on hold-out set: 9.088096992225194e-07
MeanAbsoluteError value on hold-out data: 0.0007973050815053284
Epoch: 464
Loss on hold-out set: 0.0008556233493970047
MeanAbsoluteError value on hold-out data: 0.003808550303801894
Epoch: 465
Loss on hold-out set: 8.050770612901313e-07
MeanAbsoluteError value on hold-out data: 0.0006836706306785345
Epoch: 466
Loss on hold-out set: 7.847449869411951e-07
MeanAbsoluteError value on hold-out data: 0.0006717938231304288
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Epoch: 467
Loss on hold-out set: 8.633218835886789e-07
MeanAbsoluteError value on hold-out data: 0.0007686069584451616
Epoch: 468
Loss on hold-out set: 2.6597491831545576e-06
MeanAbsoluteError value on hold-out data: 0.0014288570964708924
Epoch: 469

Loss on hold-out set: 4.190913244446374e-05
MeanAbsoluteError value on hold-out data: 0.0014117419486865401
Epoch: 470

Loss on hold-out set: 7.174803526000827e-07
MeanAbsoluteError value on hold-out data: 0.0007054537418298423
Epoch: 471
Loss on hold-out set: 1.3721655486383847e-06
MeanAbsoluteError value on hold-out data: 0.0009438336128368974
Epoch: 472
Loss on hold-out set: 1.5081328814840863e-06
MeanAbsoluteError value on hold-out data: 0.0009781825356185436
Epoch: 473
Loss on hold-out set: 9.167115116235017e-07
MeanAbsoluteError value on hold-out data: 0.0007203263230621815
Epoch: 474
Loss on hold-out set: 8.549476892592513e-07
MeanAbsoluteError value on hold-out data: 0.0006951433606445789
Epoch: 475
Loss on hold-out set: 1.0600237006796165e-06
MeanAbsoluteError value on hold-out data: 0.0008073044009506702
Epoch: 476

Loss on hold-out set: 8.071278811117876e-07
MeanAbsoluteError value on hold-out data: 0.0007109549478627741
Epoch: 477

Loss on hold-out set: 6.338688452755238e-07
MeanAbsoluteError value on hold-out data: 0.0006342959241010249
Epoch: 478
Loss on hold-out set: 4.200610436992764e-06
MeanAbsoluteError value on hold-out data: 0.0016974302707239985
Epoch: 479
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Loss on hold-out set: 9.277842160862257e-07
MeanAbsoluteError value on hold-out data: 0.0007900905329734087
Epoch: 480
Loss on hold-out set: 8.007554124735459e-07
MeanAbsoluteError value on hold-out data: 0.0007250335766002536
Epoch: 481
Loss on hold-out set: 7.357141516177552e-07
MeanAbsoluteError value on hold-out data: 0.0006603902438655496
Epoch: 482
Loss on hold-out set: 7.365955700431816e-07
MeanAbsoluteError value on hold-out data: 0.0006713622715324163
Epoch: 483

Loss on hold-out set: 1.0310538917005592e-06
MeanAbsoluteError value on hold-out data: 0.0007951059960760176
Epoch: 484

Loss on hold-out set: 1.2821991154291586e-06
MeanAbsoluteError value on hold-out data: 0.0008644676418043673
Epoch: 485
Loss on hold-out set: 7.359718643748728e-07
MeanAbsoluteError value on hold-out data: 0.0006613123696297407
Epoch: 486
Loss on hold-out set: 1.2190029963221605e-06
MeanAbsoluteError value on hold-out data: 0.0008703327039256692
Epoch: 487
Loss on hold-out set: 7.089655495152468e-07
MeanAbsoluteError value on hold-out data: 0.0006959203165024519
Epoch: 488
Loss on hold-out set: 1.0400255322250673e-06
MeanAbsoluteError value on hold-out data: 0.0008369520073756576
Epoch: 489
Loss on hold-out set: 2.1804695349531427e-05
MeanAbsoluteError value on hold-out data: 0.004554932937026024
Epoch: 490

Loss on hold-out set: 1.0657292779552126e-06
MeanAbsoluteError value on hold-out data: 0.000845813425257802
Epoch: 491

Loss on hold-out set: 2.8609167307317525e-06
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MeanAbsoluteError value on hold-out data: 0.0014698291197419167
Epoch: 492
Loss on hold-out set: 0.0001766245826589651
MeanAbsoluteError value on hold-out data: 0.004287627059966326
Epoch: 493
Loss on hold-out set: 8.192793315559427e-07
MeanAbsoluteError value on hold-out data: 0.0007113629835657775
Epoch: 494
Loss on hold-out set: 1.0005145134947759e-06
MeanAbsoluteError value on hold-out data: 0.0008095020311884582
Epoch: 495
Loss on hold-out set: 9.80597882552012e-07
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Epoch: 496
Loss on hold-out set: 1.4419080947356213e-06
MeanAbsoluteError value on hold-out data: 0.0009521424653939903
Epoch: 497

Loss on hold-out set: 6.849065427489292e-06
MeanAbsoluteError value on hold-out data: 0.0024194088764488697
Epoch: 498

Loss on hold-out set: 7.318355185449176e-07
MeanAbsoluteError value on hold-out data: 0.0006987258675508201
Epoch: 499
Loss on hold-out set: 7.246195344543174e-06
MeanAbsoluteError value on hold-out data: 0.0025667801965028048
Epoch: 500
Loss on hold-out set: 1.4262997183323023e-06
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Epoch: 501
Loss on hold-out set: 7.457933424330594e-07
MeanAbsoluteError value on hold-out data: 0.0006701159290969372
Epoch: 502
Loss on hold-out set: 1.9736995463622757e-06
MeanAbsoluteError value on hold-out data: 0.0011543608270585537
Epoch: 503
Loss on hold-out set: 9.120198810181207e-07
MeanAbsoluteError value on hold-out data: 0.0007460620836354792
Epoch: 504

Loss on hold-out set: 0.0003175725097905185
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MeanAbsoluteError value on hold-out data: 0.002527987351641059
Epoch: 505

Loss on hold-out set: 9.101256068788643e-07
MeanAbsoluteError value on hold-out data: 0.0007445600349456072
Epoch: 506
Loss on hold-out set: 0.0005384697298598422
MeanAbsoluteError value on hold-out data: 0.0030075418762862682
Epoch: 507
Loss on hold-out set: 8.270642520248937e-07
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Epoch: 508
Loss on hold-out set: 1.5130865766475556e-06
MeanAbsoluteError value on hold-out data: 0.0009654456516727805
Epoch: 509
Loss on hold-out set: 8.167139115427674e-07
MeanAbsoluteError value on hold-out data: 0.0007274383096955717
Epoch: 510
Loss on hold-out set: 4.787003210647246e-06
MeanAbsoluteError value on hold-out data: 0.0020073410123586655
Epoch: 511

Loss on hold-out set: 8.819203825483923e-06
MeanAbsoluteError value on hold-out data: 0.0027967796195298433
Epoch: 512

Loss on hold-out set: 1.3677442959411005e-06
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Epoch: 513
Loss on hold-out set: 2.0072387551058805e-06
MeanAbsoluteError value on hold-out data: 0.0011719107860699296
Epoch: 514
Loss on hold-out set: 1.498209937923233e-06
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Epoch: 515
Loss on hold-out set: 7.815443854479571e-07
MeanAbsoluteError value on hold-out data: 0.0007036301540210843
Epoch: 516
Loss on hold-out set: 7.422664487841338e-07
MeanAbsoluteError value on hold-out data: 0.0007060319185256958
Epoch: 517
Loss on hold-out set: 3.0231384034078264e-06
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MeanAbsoluteError value on hold-out data: 0.0014057201333343983
Epoch: 518

Loss on hold-out set: 1.0388168356292647e-06
MeanAbsoluteError value on hold-out data: 0.0008013647748157382
Epoch: 519

Loss on hold-out set: 1.1009822720517639e-06
MeanAbsoluteError value on hold-out data: 0.0008299493929371238
Epoch: 520
Loss on hold-out set: 9.966551558066455e-07
MeanAbsoluteError value on hold-out data: 0.0008111086208373308
Epoch: 521
Loss on hold-out set: 0.0004051660187393771
MeanAbsoluteError value on hold-out data: 0.0035555106587707996
Epoch: 522
Loss on hold-out set: 2.5960314360418124e-06
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Epoch: 523
Loss on hold-out set: 9.023731549335096e-07
MeanAbsoluteError value on hold-out data: 0.0007557386416010559
Epoch: 524
Loss on hold-out set: 9.810739027653444e-05
MeanAbsoluteError value on hold-out data: 0.0017871218733489513
Epoch: 525

Loss on hold-out set: 1.657779954747149e-06
MeanAbsoluteError value on hold-out data: 0.0010590633610263467
Epoch: 526

Loss on hold-out set: 7.210360757006548e-07
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Epoch: 527
Loss on hold-out set: 1.0896849202114167e-06
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Epoch: 528
Loss on hold-out set: 0.0003355627252272615
MeanAbsoluteError value on hold-out data: 0.00298997457139194
Epoch: 529
Loss on hold-out set: 1.4390612713773758e-06
MeanAbsoluteError value on hold-out data: 0.0009766441071406007

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Epoch: 530
Loss on hold-out set: 1.1857375651603575e-06
MeanAbsoluteError value on hold-out data: 0.0008691337425261736
Epoch: 531
Loss on hold-out set: 7.679828618515435e-07
MeanAbsoluteError value on hold-out data: 0.0006920605665072799
Epoch: 532

Loss on hold-out set: 8.06102351501837e-07
MeanAbsoluteError value on hold-out data: 0.0007402473711408675
Epoch: 533

Loss on hold-out set: 2.4750792083348362e-05
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Epoch: 534
Loss on hold-out set: 8.921714315699949e-07
MeanAbsoluteError value on hold-out data: 0.0006778320530429482
Epoch: 535
Loss on hold-out set: 5.3953838932312256e-06
MeanAbsoluteError value on hold-out data: 0.002104681683704257
Epoch: 536
Loss on hold-out set: 2.3650817061374814e-06
MeanAbsoluteError value on hold-out data: 0.001316939597018063
Epoch: 537
Loss on hold-out set: 6.411602380642132e-07
MeanAbsoluteError value on hold-out data: 0.0006638088962063193
Epoch: 538
Loss on hold-out set: 8.757614317836179e-07
MeanAbsoluteError value on hold-out data: 0.0007567370194010437
Epoch: 539

Loss on hold-out set: 8.514112021902503e-07
MeanAbsoluteError value on hold-out data: 0.0007907053804956377
Epoch: 540

Loss on hold-out set: 9.65989605980702e-07
MeanAbsoluteError value on hold-out data: 0.0007597905350849032
Epoch: 541
Loss on hold-out set: 1.5492252854388564e-05
MeanAbsoluteError value on hold-out data: 0.0038302848115563393
Epoch: 542
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Loss on hold-out set: 1.3951314354716697e-06
MeanAbsoluteError value on hold-out data: 0.0009470772929489613
Epoch: 543
Loss on hold-out set: 1.0089374007713138e-06
MeanAbsoluteError value on hold-out data: 0.0007908648112788796
Epoch: 544
Loss on hold-out set: 1.2940908264296852e-06
MeanAbsoluteError value on hold-out data: 0.0009134748834185302
Epoch: 545
Loss on hold-out set: 9.023387034491092e-07
MeanAbsoluteError value on hold-out data: 0.0007735806866548955
Epoch: 546

Loss on hold-out set: 1.262253990192291e-05
MeanAbsoluteError value on hold-out data: 0.0012873489176854491
Epoch: 547

Loss on hold-out set: 1.2492785084707346e-06
MeanAbsoluteError value on hold-out data: 0.0008310854318551719
Epoch: 548
Loss on hold-out set: 4.243393802356038e-06
MeanAbsoluteError value on hold-out data: 0.0019056525779888034
Epoch: 549
Loss on hold-out set: 8.466342168188791e-07
MeanAbsoluteError value on hold-out data: 0.0007444357615895569
Epoch: 550
Loss on hold-out set: 0.000514309969330585
MeanAbsoluteError value on hold-out data: 0.003103358205407858
Epoch: 551
Loss on hold-out set: 2.2882291895817057e-06
MeanAbsoluteError value on hold-out data: 0.0013064548838883638
Epoch: 552
Loss on hold-out set: 9.179755146795707e-07
MeanAbsoluteError value on hold-out data: 0.000737536873202771
Epoch: 553

Loss on hold-out set: 9.101424412759885e-07
MeanAbsoluteError value on hold-out data: 0.0008090698975138366
Epoch: 554

Loss on hold-out set: 1.0599972094601421e-06
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MeanAbsoluteError value on hold-out data: 0.0008642569300718606
Epoch: 555
Loss on hold-out set: 8.474767281103806e-07
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Epoch: 556
Loss on hold-out set: 0.0006027005630543797
MeanAbsoluteError value on hold-out data: 0.003134778467938304
Epoch: 557
Loss on hold-out set: 5.6434277422130645e-06
MeanAbsoluteError value on hold-out data: 0.0021871139761060476
Epoch: 558
Loss on hold-out set: 9.336647901993554e-07
MeanAbsoluteError value on hold-out data: 0.0007781591848470271
Epoch: 559
Loss on hold-out set: 0.0008523277472249902
MeanAbsoluteError value on hold-out data: 0.004329799208790064
Epoch: 560

Loss on hold-out set: 1.0905767103744997e-06
MeanAbsoluteError value on hold-out data: 0.0008074897341430187
Epoch: 561

Loss on hold-out set: 0.0009867537921938773
MeanAbsoluteError value on hold-out data: 0.004125410225242376
Epoch: 562
Loss on hold-out set: 1.402197072436068e-06
MeanAbsoluteError value on hold-out data: 0.0009356108494102955
Epoch: 563
Loss on hold-out set: 7.451355503900021e-07
MeanAbsoluteError value on hold-out data: 0.0006964313797652721
Epoch: 564
Loss on hold-out set: 6.611581102770987e-07
MeanAbsoluteError value on hold-out data: 0.0006390053313225508
Epoch: 565
Loss on hold-out set: 5.221095629027471e-05
MeanAbsoluteError value on hold-out data: 0.0071658180095255375
Epoch: 566
Loss on hold-out set: 0.0001756955360336248
MeanAbsoluteError value on hold-out data: 0.0023058841470628977
Epoch: 567

Loss on hold-out set: 1.1303635705399547e-06
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MeanAbsoluteError value on hold-out data: 0.0008760658092796803
Epoch: 568

Loss on hold-out set: 9.665087711360125e-07
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Epoch: 569
Loss on hold-out set: 2.605619748954688e-06
MeanAbsoluteError value on hold-out data: 0.0013850810937583447
Epoch: 570
Loss on hold-out set: 8.827397244623661e-07
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Epoch: 571
Loss on hold-out set: 7.62716795704294e-07
MeanAbsoluteError value on hold-out data: 0.0006954509299248457
Epoch: 572
Loss on hold-out set: 9.409550767276625e-07
MeanAbsoluteError value on hold-out data: 0.0007536247139796615
Epoch: 573
Loss on hold-out set: 8.168777058542148e-07
MeanAbsoluteError value on hold-out data: 0.0007302159210667014
Epoch: 574

Loss on hold-out set: 7.865860180362897e-06
MeanAbsoluteError value on hold-out data: 0.0026520402170717716
Epoch: 575

Loss on hold-out set: 7.63358804953476e-07
MeanAbsoluteError value on hold-out data: 0.000714190595317632
Epoch: 576
Loss on hold-out set: 7.093905699443544e-07
MeanAbsoluteError value on hold-out data: 0.0006988575914874673
Epoch: 577
Loss on hold-out set: 1.0805238380621281e-06
MeanAbsoluteError value on hold-out data: 0.0008242467301897705
Epoch: 578
Loss on hold-out set: 7.804402479485781e-07
MeanAbsoluteError value on hold-out data: 0.0007406816002912819
Epoch: 579
Loss on hold-out set: 7.388023496227665e-07
MeanAbsoluteError value on hold-out data: 0.0006460488075390458
Epoch: 580
Loss on hold-out set: 6.15315133682788e-07
```

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MeanAbsoluteError value on hold-out data: 0.0006418144912458956
Epoch: 581

Loss on hold-out set: 1.4431336213559775e-06
MeanAbsoluteError value on hold-out data: 0.001015059999190271
Epoch: 582

Loss on hold-out set: 1.3176909655717631e-05
MeanAbsoluteError value on hold-out data: 0.0035351491533219814
Epoch: 583
Loss on hold-out set: 1.0532358793660444e-05
MeanAbsoluteError value on hold-out data: 0.0031463601626455784
Epoch: 584
Loss on hold-out set: 1.5080829696828985e-06
MeanAbsoluteError value on hold-out data: 0.0010017934255301952
Epoch: 585
Loss on hold-out set: 1.1207650258116841e-06
MeanAbsoluteError value on hold-out data: 0.0008509141043759882
Epoch: 586
Loss on hold-out set: 4.252437358987803e-05
MeanAbsoluteError value on hold-out data: 0.001496287528425455
Epoch: 587
Loss on hold-out set: 1.2603720978614338e-05
MeanAbsoluteError value on hold-out data: 0.0018878793343901634
Epoch: 588

Loss on hold-out set: 1.1715619752277025e-06
MeanAbsoluteError value on hold-out data: 0.0008882060647010803
Epoch: 589

Loss on hold-out set: 1.132422980276715e-06
MeanAbsoluteError value on hold-out data: 0.0008742550271563232
Epoch: 590
Loss on hold-out set: 7.165444453851076e-07
MeanAbsoluteError value on hold-out data: 0.0006815537926740944
Epoch: 591
Loss on hold-out set: 6.0706846187923265e-06
MeanAbsoluteError value on hold-out data: 0.0022808508947491646
Epoch: 592
Loss on hold-out set: 6.629632637738653e-07
MeanAbsoluteError value on hold-out data: 0.000640654587186873
```

```
Epoch: 593
Loss on hold-out set: 6.332600238378151e-07
MeanAbsoluteError value on hold-out data: 0.0006548571400344372
Epoch: 594
Loss on hold-out set: 1.3759709313140215e-06
MeanAbsoluteError value on hold-out data: 0.0009813648648560047
Epoch: 595

Loss on hold-out set: 1.7755993046473752e-06
MeanAbsoluteError value on hold-out data: 0.001138710998930037
Epoch: 596

Loss on hold-out set: 7.67481463544055e-07
MeanAbsoluteError value on hold-out data: 0.0007193913916125894
Epoch: 597
Loss on hold-out set: 8.40236162083294e-07
MeanAbsoluteError value on hold-out data: 0.0007367542129941285
Epoch: 598
Loss on hold-out set: 5.445338082119213e-06
MeanAbsoluteError value on hold-out data: 0.002100499579682946
Epoch: 599
Loss on hold-out set: 2.3868716775373637e-06
MeanAbsoluteError value on hold-out data: 0.0012411108473315835
Epoch: 600
Loss on hold-out set: 9.019216039317913e-07
MeanAbsoluteError value on hold-out data: 0.000730598287191242
Epoch: 601
Loss on hold-out set: 7.407772395359084e-06
MeanAbsoluteError value on hold-out data: 0.0024888443294912577
Epoch: 602

Loss on hold-out set: 1.5382189006301744e-06
MeanAbsoluteError value on hold-out data: 0.000983974663540721
Epoch: 603

Loss on hold-out set: 5.535376644379889e-05
MeanAbsoluteError value on hold-out data: 0.004145415034145117
Epoch: 604
Loss on hold-out set: 7.844471536617885e-07
MeanAbsoluteError value on hold-out data: 0.0006762361736036837
Epoch: 605
```

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Loss on hold-out set: 8.205587326196669e-07
MeanAbsoluteError value on hold-out data: 0.0007024306105449796
Epoch: 606
Loss on hold-out set: 8.986927403279528e-07
MeanAbsoluteError value on hold-out data: 0.0007334923720918596
Epoch: 607
Loss on hold-out set: 7.927306466644251e-07
MeanAbsoluteError value on hold-out data: 0.0007419189787469804
Epoch: 608
Loss on hold-out set: 1.6774119138482581e-06
MeanAbsoluteError value on hold-out data: 0.001060634502209723
Epoch: 609

Loss on hold-out set: 0.00015024051139588525
MeanAbsoluteError value on hold-out data: 0.001907592173665762
Epoch: 610

Loss on hold-out set: 6.2941753640188836e-06
MeanAbsoluteError value on hold-out data: 0.0023606899194419384
Epoch: 611
Loss on hold-out set: 9.658248223751377e-07
MeanAbsoluteError value on hold-out data: 0.0006958955782465637
Epoch: 612
Loss on hold-out set: 1.3844472207962938e-06
MeanAbsoluteError value on hold-out data: 0.000938015291467309
Epoch: 613
Loss on hold-out set: 2.757859577356542e-06
MeanAbsoluteError value on hold-out data: 0.0014116945676505566
Epoch: 614
Loss on hold-out set: 7.912340239412375e-07
MeanAbsoluteError value on hold-out data: 0.0006970805115997791
Epoch: 615
Loss on hold-out set: 6.963196061458523e-07
MeanAbsoluteError value on hold-out data: 0.000685929087921977
Epoch: 616

Loss on hold-out set: 8.101959171933861e-07
MeanAbsoluteError value on hold-out data: 0.0007392889237962663
Epoch: 617

Loss on hold-out set: 6.685875921273412e-07
```

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MeanAbsoluteError value on hold-out data: 0.0006517416331917048
Epoch: 618
Loss on hold-out set: 6.89486785614253e-07
MeanAbsoluteError value on hold-out data: 0.000662462436594069
Epoch: 619
Loss on hold-out set: 1.2271809190714032e-06
MeanAbsoluteError value on hold-out data: 0.0008993333321996033
Epoch: 620
Loss on hold-out set: 7.382138147267352e-07
MeanAbsoluteError value on hold-out data: 0.0006591129349544644
Epoch: 621
Loss on hold-out set: 7.404493220956982e-07
MeanAbsoluteError value on hold-out data: 0.000660986581351608
Epoch: 622
Loss on hold-out set: 7.674925174027381e-07
MeanAbsoluteError value on hold-out data: 0.0006718173390254378
Epoch: 623

Loss on hold-out set: 7.27925752768827e-07
MeanAbsoluteError value on hold-out data: 0.0006357851671054959
Epoch: 624

Loss on hold-out set: 6.852234390154221e-07
MeanAbsoluteError value on hold-out data: 0.0006431955262087286
Epoch: 625
Loss on hold-out set: 3.0634950707490834e-06
MeanAbsoluteError value on hold-out data: 0.0015486642951145768
Epoch: 626
Loss on hold-out set: 7.447597487096293e-07
MeanAbsoluteError value on hold-out data: 0.0006835263920947909
Epoch: 627
Loss on hold-out set: 0.0003070209067853004
MeanAbsoluteError value on hold-out data: 0.0025254548527300358
Epoch: 628
Loss on hold-out set: 1.0417886607263847e-05
MeanAbsoluteError value on hold-out data: 0.0030585932545363903
Epoch: 629
Loss on hold-out set: 1.0714428504762998e-06
MeanAbsoluteError value on hold-out data: 0.0008344376110471785
Epoch: 630

Loss on hold-out set: 1.3199524897362817e-06
```

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MeanAbsoluteError value on hold-out data: 0.0009476843406446278
Epoch: 631

Loss on hold-out set: 6.883600058507419e-07
MeanAbsoluteError value on hold-out data: 0.0006458890275098383
Epoch: 632
Loss on hold-out set: 9.744111235494738e-07
MeanAbsoluteError value on hold-out data: 0.0008303308277390897
Epoch: 633
Loss on hold-out set: 1.2712172248869208e-06
MeanAbsoluteError value on hold-out data: 0.0009291294263675809
Epoch: 634
Loss on hold-out set: 1.9425499999670137e-06
MeanAbsoluteError value on hold-out data: 0.0011358058545738459
Epoch: 635
Loss on hold-out set: 6.49539035617426e-07
MeanAbsoluteError value on hold-out data: 0.000651878712233156
Epoch: 636
Loss on hold-out set: 7.326379005689887e-07
MeanAbsoluteError value on hold-out data: 0.0006312808254733682
Epoch: 637

Loss on hold-out set: 2.0539689593043968e-05
MeanAbsoluteError value on hold-out data: 0.0043908096849918365
Epoch: 638

Loss on hold-out set: 0.00022207395013887994
MeanAbsoluteError value on hold-out data: 0.002255108440294862
Epoch: 639
Loss on hold-out set: 0.00018759921004866205
MeanAbsoluteError value on hold-out data: 0.0021671149879693985
Epoch: 640
Loss on hold-out set: 0.001480339783668136
MeanAbsoluteError value on hold-out data: 0.004652958828955889
Epoch: 641
Loss on hold-out set: 7.719579711052715e-06
MeanAbsoluteError value on hold-out data: 0.002605306450277567
Epoch: 642
Loss on hold-out set: 5.442050018718174e-05
MeanAbsoluteError value on hold-out data: 0.0017453720793128014
Epoch: 643
Loss on hold-out set: 8.972310642827954e-07
```

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MeanAbsoluteError value on hold-out data: 0.0007134583429433405
Epoch: 644

Loss on hold-out set: 2.7463737086901137e-06
MeanAbsoluteError value on hold-out data: 0.001377840293571353
Epoch: 645

Loss on hold-out set: 1.0095079609037874e-05
MeanAbsoluteError value on hold-out data: 0.0014833899913355708
Epoch: 646
Loss on hold-out set: 1.7805608026632258e-06
MeanAbsoluteError value on hold-out data: 0.000989165622740984
Epoch: 647
Loss on hold-out set: 1.1345402172607394e-06
MeanAbsoluteError value on hold-out data: 0.00076138018630445
Epoch: 648
Loss on hold-out set: 1.0434709725341936e-06
MeanAbsoluteError value on hold-out data: 0.0007407820085063577
Epoch: 649
Loss on hold-out set: 1.2083713465052335e-06
MeanAbsoluteError value on hold-out data: 0.0009163016220554709
Epoch: 650
Loss on hold-out set: 9.264194394868005e-07
MeanAbsoluteError value on hold-out data: 0.0006944656488485634
Epoch: 651

Loss on hold-out set: 1.0150370166264531e-06
MeanAbsoluteError value on hold-out data: 0.0007478824118152261
Epoch: 652

Loss on hold-out set: 1.0546827464434746e-05
MeanAbsoluteError value on hold-out data: 0.0010263801086694002
Epoch: 653
Loss on hold-out set: 7.750832388900072e-07
MeanAbsoluteError value on hold-out data: 0.0006926089408807456
Epoch: 654
Loss on hold-out set: 8.30726506251267e-07
MeanAbsoluteError value on hold-out data: 0.000674178299959749
Epoch: 655
Loss on hold-out set: 1.1436568194347694e-06
MeanAbsoluteError value on hold-out data: 0.0008940243860706687
```

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Epoch: 656
Loss on hold-out set: 5.855118808120516e-06
MeanAbsoluteError value on hold-out data: 0.00215267576277256
Epoch: 657
Loss on hold-out set: 1.0961254249563212e-06
MeanAbsoluteError value on hold-out data: 0.0008248934173025191
Epoch: 658

Loss on hold-out set: 5.9066790072392905e-06
MeanAbsoluteError value on hold-out data: 0.002240561880171299
Epoch: 659

Loss on hold-out set: 1.8001776075274952e-06
MeanAbsoluteError value on hold-out data: 0.001132426899857819
Epoch: 660
Loss on hold-out set: 1.4769273312035343e-06
MeanAbsoluteError value on hold-out data: 0.0009026590269058943
Epoch: 661
Loss on hold-out set: 1.0678943913087726e-06
MeanAbsoluteError value on hold-out data: 0.0007134667248465121
Epoch: 662
Loss on hold-out set: 9.938120294569112e-07
MeanAbsoluteError value on hold-out data: 0.0006932371761649847
Epoch: 663
Loss on hold-out set: 8.48820785283631e-07
MeanAbsoluteError value on hold-out data: 0.0006951972609385848
Epoch: 664
Loss on hold-out set: 0.00021769653550598797
MeanAbsoluteError value on hold-out data: 0.00405622785910964
Epoch: 665

Loss on hold-out set: 6.7574192493898754e-06
MeanAbsoluteError value on hold-out data: 0.002329746726900339
Epoch: 666

Loss on hold-out set: 0.00019316636889225963
MeanAbsoluteError value on hold-out data: 0.00494766840711236
Epoch: 667
Loss on hold-out set: 7.68901412147198e-07
MeanAbsoluteError value on hold-out data: 0.0006836742395535111
Epoch: 668
```

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Loss on hold-out set: 1.063807294835547e-06
MeanAbsoluteError value on hold-out data: 0.0007634559297002852
Epoch: 669
Loss on hold-out set: 1.4511765125637164e-06
MeanAbsoluteError value on hold-out data: 0.0009641352226026356
Epoch: 670
Loss on hold-out set: 3.829181038711865e-06
MeanAbsoluteError value on hold-out data: 0.0016871211118996143
Epoch: 671
Loss on hold-out set: 2.0531966461371317e-06
MeanAbsoluteError value on hold-out data: 0.0012176904128864408
Epoch: 672

Loss on hold-out set: 9.255497078496634e-07
MeanAbsoluteError value on hold-out data: 0.0007569000008516014
Epoch: 673

Loss on hold-out set: 0.00020167695671401676
MeanAbsoluteError value on hold-out data: 0.002272852463647723
Epoch: 674
Loss on hold-out set: 1.3794308940235238e-05
MeanAbsoluteError value on hold-out data: 0.003574905451387167
Epoch: 675
Loss on hold-out set: 1.3834318661583193e-05
MeanAbsoluteError value on hold-out data: 0.0034945246297866106
Epoch: 676
Loss on hold-out set: 1.7311991462940148e-06
MeanAbsoluteError value on hold-out data: 0.0009968072408810258
Epoch: 677
Loss on hold-out set: 1.50462567752094e-06
MeanAbsoluteError value on hold-out data: 0.000852116965688765
Epoch: 678
Loss on hold-out set: 1.8972140120118079e-06
MeanAbsoluteError value on hold-out data: 0.0010090291034430265
Epoch: 679

Loss on hold-out set: 1.2922563586724978e-06
MeanAbsoluteError value on hold-out data: 0.0007583725382573903
Epoch: 680

Loss on hold-out set: 1.8743351085084632e-05
```

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MeanAbsoluteError value on hold-out data: 0.0041512418538331985
Epoch: 681
Loss on hold-out set: 1.237655031725528e-06
MeanAbsoluteError value on hold-out data: 0.0008058989187702537
Epoch: 682
Loss on hold-out set: 4.889717746874129e-06
MeanAbsoluteError value on hold-out data: 0.0019378319848328829
Epoch: 683
Loss on hold-out set: 1.2386827394222494e-06
MeanAbsoluteError value on hold-out data: 0.000828794261906296
Epoch: 684
Loss on hold-out set: 1.1994783269878658e-06
MeanAbsoluteError value on hold-out data: 0.0007929271669127047
Epoch: 685
Loss on hold-out set: 3.0114137014327123e-05
MeanAbsoluteError value on hold-out data: 0.002793232211843133
Epoch: 686

Loss on hold-out set: 0.00011635216736749499
MeanAbsoluteError value on hold-out data: 0.001961719011887908
Epoch: 687

Loss on hold-out set: 0.0005805577064804241
MeanAbsoluteError value on hold-out data: 0.003209246788173914
Epoch: 688
Loss on hold-out set: 1.14311378933525e-06
MeanAbsoluteError value on hold-out data: 0.000727097678463906
Epoch: 689
Loss on hold-out set: 1.8396168089706266e-06
MeanAbsoluteError value on hold-out data: 0.0010775146074593067
Epoch: 690
Loss on hold-out set: 1.0916989284536471e-06
MeanAbsoluteError value on hold-out data: 0.0007865491788834333
Epoch: 691
Loss on hold-out set: 8.276714687291623e-07
MeanAbsoluteError value on hold-out data: 0.0006699448567815125
Epoch: 692
Loss on hold-out set: 1.2971465734013832e-06
MeanAbsoluteError value on hold-out data: 0.0008447608561255038
Epoch: 693

Loss on hold-out set: 1.6392985567283456e-06
```

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MeanAbsoluteError value on hold-out data: 0.0010255036177113652
Epoch: 694

Loss on hold-out set: 1.1170731594435124e-06
MeanAbsoluteError value on hold-out data: 0.0007415014551952481
Epoch: 695
Loss on hold-out set: 1.077602553104603e-06
MeanAbsoluteError value on hold-out data: 0.0007185408612713218
Epoch: 696
Loss on hold-out set: 9.230584580039319e-05
MeanAbsoluteError value on hold-out data: 0.009551366791129112
Epoch: 697
Loss on hold-out set: 0.00030669874387111084
MeanAbsoluteError value on hold-out data: 0.0026481174863874912
Epoch: 698
Loss on hold-out set: 1.300017563957786e-06
MeanAbsoluteError value on hold-out data: 0.0007992875762283802
Epoch: 699
Loss on hold-out set: 0.0001987929081355315
MeanAbsoluteError value on hold-out data: 0.002288880990818143
Epoch: 700

Loss on hold-out set: 1.217058669366312e-06
MeanAbsoluteError value on hold-out data: 0.0008134257514029741
Epoch: 701

Loss on hold-out set: 1.3563263420424987e-06
MeanAbsoluteError value on hold-out data: 0.0008219170849770308
Epoch: 702
Loss on hold-out set: 1.3283265507023036e-06
MeanAbsoluteError value on hold-out data: 0.0007546171545982361
Epoch: 703
Loss on hold-out set: 2.5518803550557306e-05
MeanAbsoluteError value on hold-out data: 0.004889992997050285
Epoch: 704
Loss on hold-out set: 2.1868532415352934e-06
MeanAbsoluteError value on hold-out data: 0.001033029519021511
Epoch: 705
Loss on hold-out set: 1.8848312755345921e-06
MeanAbsoluteError value on hold-out data: 0.0010135701159015298
Epoch: 706
Loss on hold-out set: 1.5553178688885685e-06
```

```
MeanAbsoluteError value on hold-out data: 0.0007709988858550787
Epoch: 707

Loss on hold-out set: 2.3236736410581216e-06
MeanAbsoluteError value on hold-out data: 0.0009608289692550898
Epoch: 708

Loss on hold-out set: 1.5961942927753205e-06
MeanAbsoluteError value on hold-out data: 0.0007883515791036189
Early stopping at epoch 707
Fold: 2
Epoch: 1
Loss on hold-out set: 0.48089800431178165
MeanAbsoluteError value on hold-out data: 0.6768458485603333
Epoch: 2
Loss on hold-out set: 0.2729788411122102
MeanAbsoluteError value on hold-out data: 0.5040225386619568
Epoch: 3
Loss on hold-out set: 0.1338590016731849
MeanAbsoluteError value on hold-out data: 0.3456019163131714
Epoch: 4
Loss on hold-out set: 0.05220478830429224
MeanAbsoluteError value on hold-out data: 0.20001418888568878
Epoch: 5
Loss on hold-out set: 0.021230400432474338
MeanAbsoluteError value on hold-out data: 0.11704164743423462
Epoch: 6

Loss on hold-out set: 0.014299159188969778
MeanAbsoluteError value on hold-out data: 0.09798163175582886
Epoch: 7

Loss on hold-out set: 0.013366446257210694
MeanAbsoluteError value on hold-out data: 0.09379708021879196
Epoch: 8
Loss on hold-out set: 0.013095624315050932
MeanAbsoluteError value on hold-out data: 0.09249260276556015
Epoch: 9
Loss on hold-out set: 0.013330733905044885
MeanAbsoluteError value on hold-out data: 0.0919770896434784
Epoch: 10
```

```
Loss on hold-out set: 0.012795270850452093
MeanAbsoluteError value on hold-out data: 0.09164375066757202
Epoch: 11
Loss on hold-out set: 0.013017626801648965
MeanAbsoluteError value on hold-out data: 0.09134530276060104
Epoch: 12
Loss on hold-out set: 0.012858210812107874
MeanAbsoluteError value on hold-out data: 0.09106254577636719
Epoch: 13

Loss on hold-out set: 0.013207406414529452
MeanAbsoluteError value on hold-out data: 0.09069392085075378
Epoch: 14

Loss on hold-out set: 0.012530622287438465
MeanAbsoluteError value on hold-out data: 0.09046226739883423
Epoch: 15
Loss on hold-out set: 0.012694994453340769
MeanAbsoluteError value on hold-out data: 0.09013649076223373
Epoch: 16
Loss on hold-out set: 0.012346686293872504
MeanAbsoluteError value on hold-out data: 0.08985792100429535
Epoch: 17
Loss on hold-out set: 0.012292257653406033
MeanAbsoluteError value on hold-out data: 0.08946473896503448
Epoch: 18
Loss on hold-out set: 0.012359350418242125
MeanAbsoluteError value on hold-out data: 0.08930173516273499
Epoch: 19
Loss on hold-out set: 0.012223283688609417
MeanAbsoluteError value on hold-out data: 0.0888572409749031
Epoch: 20

Loss on hold-out set: 0.012067201833885450
MeanAbsoluteError value on hold-out data: 0.08840721845626831
Epoch: 21

Loss on hold-out set: 0.011743563478096174
MeanAbsoluteError value on hold-out data: 0.08815556764602661
Epoch: 22
Loss on hold-out set: 0.01199856006468718
```

```
MeanAbsoluteError value on hold-out data: 0.08790997415781021
Epoch: 23
Loss on hold-out set: 0.012015825782257777
MeanAbsoluteError value on hold-out data: 0.08740033954381943
Epoch: 24
Loss on hold-out set: 0.01194110202889603
MeanAbsoluteError value on hold-out data: 0.08720187097787857
Epoch: 25

Loss on hold-out set: 0.011749905319168018
MeanAbsoluteError value on hold-out data: 0.08669576793909073
Epoch: 26

Loss on hold-out set: 0.011411882757854003
MeanAbsoluteError value on hold-out data: 0.08710582554340363
Epoch: 27
Loss on hold-out set: 0.011462971711388001
MeanAbsoluteError value on hold-out data: 0.08623361587524414
Epoch: 28
Loss on hold-out set: 0.01119758253200696
MeanAbsoluteError value on hold-out data: 0.08587340265512466
Epoch: 29
Loss on hold-out set: 0.01122348615899682
MeanAbsoluteError value on hold-out data: 0.08505178242921829
Epoch: 30
Loss on hold-out set: 0.011219443860822
MeanAbsoluteError value on hold-out data: 0.0849202424287796
Epoch: 31
Loss on hold-out set: 0.01088542860144606
MeanAbsoluteError value on hold-out data: 0.08484183251857758
Epoch: 32

Loss on hold-out set: 0.010709480310861882
MeanAbsoluteError value on hold-out data: 0.08426530659198761
Epoch: 33

Loss on hold-out set: 0.011579803871707274
MeanAbsoluteError value on hold-out data: 0.08360669016838074
Epoch: 34
Loss on hold-out set: 0.010967066153310813
MeanAbsoluteError value on hold-out data: 0.08307456225156784
```

```
Epoch: 35
Loss on hold-out set: 0.010598977472489843
MeanAbsoluteError value on hold-out data: 0.08310297876596451
Epoch: 36
Loss on hold-out set: 0.010978156378349433
MeanAbsoluteError value on hold-out data: 0.0821908563375473
Epoch: 37
Loss on hold-out set: 0.010474070906639099
MeanAbsoluteError value on hold-out data: 0.08177904039621353
Epoch: 38
Loss on hold-out set: 0.01055913857327631
MeanAbsoluteError value on hold-out data: 0.0816844254732132
Epoch: 39

Loss on hold-out set: 0.010069563877410613
MeanAbsoluteError value on hold-out data: 0.0811368003487587
Epoch: 40

Loss on hold-out set: 0.010587653503395043
MeanAbsoluteError value on hold-out data: 0.08058562874794006
Epoch: 41
Loss on hold-out set: 0.010240508995663661
MeanAbsoluteError value on hold-out data: 0.08012838661670685
Epoch: 42
Loss on hold-out set: 0.009658174463905968
MeanAbsoluteError value on hold-out data: 0.07961888611316681
Epoch: 43
Loss on hold-out set: 0.012060168593262251
MeanAbsoluteError value on hold-out data: 0.08285506069660187
Epoch: 44
Loss on hold-out set: 0.009341445626117863
MeanAbsoluteError value on hold-out data: 0.07875639200210571
Epoch: 45
Loss on hold-out set: 0.009564528277573677
MeanAbsoluteError value on hold-out data: 0.07829418778419495
Epoch: 46

Loss on hold-out set: 0.009222062304615974
MeanAbsoluteError value on hold-out data: 0.0778663158416748
Epoch: 47
```

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Loss on hold-out set: 0.00918949988240806
MeanAbsoluteError value on hold-out data: 0.07573112100362778
Epoch: 48
Loss on hold-out set: 0.009815766368634425
MeanAbsoluteError value on hold-out data: 0.07677052915096283
Epoch: 49
Loss on hold-out set: 0.008830264049510542
MeanAbsoluteError value on hold-out data: 0.07641876488924026
Epoch: 50
Loss on hold-out set: 0.00886221096600191
MeanAbsoluteError value on hold-out data: 0.07615961879491806
Epoch: 51
Loss on hold-out set: 0.00920321316852306
MeanAbsoluteError value on hold-out data: 0.07546946406364441
Epoch: 52
Loss on hold-out set: 0.008912964347893229
MeanAbsoluteError value on hold-out data: 0.07491032034158707
Epoch: 53

Loss on hold-out set: 0.008852780832407566
MeanAbsoluteError value on hold-out data: 0.07553204149007797
Epoch: 54

Loss on hold-out set: 0.008206973121000024
MeanAbsoluteError value on hold-out data: 0.07393701374530792
Epoch: 55
Loss on hold-out set: 0.00826974782662896
MeanAbsoluteError value on hold-out data: 0.07366793602705002
Epoch: 56
Loss on hold-out set: 0.008045641436743049
MeanAbsoluteError value on hold-out data: 0.07330740243196487
Epoch: 57
Loss on hold-out set: 0.00849883768779154
MeanAbsoluteError value on hold-out data: 0.07283826172351837
Epoch: 58
Loss on hold-out set: 0.00828180000042686
MeanAbsoluteError value on hold-out data: 0.0722367912530899
Epoch: 59
Loss on hold-out set: 0.007906073776002113
MeanAbsoluteError value on hold-out data: 0.0715891644358635
Epoch: 60
```

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Loss on hold-out set: 0.007666753390087531
MeanAbsoluteError value on hold-out data: 0.0710829570889473
Epoch: 61

Loss on hold-out set: 0.007730253900472934
MeanAbsoluteError value on hold-out data: 0.07058941572904587
Epoch: 62
Loss on hold-out set: 0.007660357012914924
MeanAbsoluteError value on hold-out data: 0.0701579749584198
Epoch: 63
Loss on hold-out set: 0.007452558582791915
MeanAbsoluteError value on hold-out data: 0.06983374059200287
Epoch: 64
Loss on hold-out set: 0.007433339339701029
MeanAbsoluteError value on hold-out data: 0.06916157901287079
Epoch: 65
Loss on hold-out set: 0.007661678040256867
MeanAbsoluteError value on hold-out data: 0.0688382163643837
Epoch: 66
Loss on hold-out set: 0.007086659745814709
MeanAbsoluteError value on hold-out data: 0.06819465756416321
Epoch: 67

Loss on hold-out set: 0.006843695666778724
MeanAbsoluteError value on hold-out data: 0.06775577366352081
Epoch: 68

Loss on hold-out set: 0.007224914456664603
MeanAbsoluteError value on hold-out data: 0.0674770176410675
Epoch: 69
Loss on hold-out set: 0.006927350088823757
MeanAbsoluteError value on hold-out data: 0.06696334481239319
Epoch: 70
Loss on hold-out set: 0.007603412422423179
MeanAbsoluteError value on hold-out data: 0.0683172270655632
Epoch: 71
Loss on hold-out set: 0.006690811522555753
MeanAbsoluteError value on hold-out data: 0.06570933014154434
Epoch: 72
Loss on hold-out set: 0.006882904106392884
MeanAbsoluteError value on hold-out data: 0.0661717876791954
Epoch: 73
```

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Loss on hold-out set: 0.006716555862042766
MeanAbsoluteError value on hold-out data: 0.06469205021858215
Epoch: 74

Loss on hold-out set: 0.0063429479487240314
MeanAbsoluteError value on hold-out data: 0.0640869140625
Epoch: 75

Loss on hold-out set: 0.007924225342531618
MeanAbsoluteError value on hold-out data: 0.06761431694030762
Epoch: 76
Loss on hold-out set: 0.006116453737307053
MeanAbsoluteError value on hold-out data: 0.06325498223304749
Epoch: 77
Loss on hold-out set: 0.0061817219516692255
MeanAbsoluteError value on hold-out data: 0.06265797466039658
Epoch: 78
Loss on hold-out set: 0.005854646084257043
MeanAbsoluteError value on hold-out data: 0.062155164778232574
Epoch: 79
Loss on hold-out set: 0.0057295989872028046
MeanAbsoluteError value on hold-out data: 0.06174791231751442
Epoch: 80
Loss on hold-out set: 0.005962887546047568
MeanAbsoluteError value on hold-out data: 0.061208225786685944
Epoch: 81

Loss on hold-out set: 0.005626792338891671
MeanAbsoluteError value on hold-out data: 0.06084812059998512
Epoch: 82

Loss on hold-out set: 0.005562322178425698
MeanAbsoluteError value on hold-out data: 0.06030622497200966
Epoch: 83
Loss on hold-out set: 0.005421976048427706
MeanAbsoluteError value on hold-out data: 0.05976680666208267
Epoch: 84
Loss on hold-out set: 0.005421681687808954
MeanAbsoluteError value on hold-out data: 0.059290237724781036
Epoch: 85
Loss on hold-out set: 0.005469467687922029
```

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MeanAbsoluteError value on hold-out data: 0.05878660827875137
Epoch: 86
Loss on hold-out set: 0.005446155054064898
MeanAbsoluteError value on hold-out data: 0.05828780680894852
Epoch: 87
Loss on hold-out set: 0.005204204237088561
MeanAbsoluteError value on hold-out data: 0.05792013183236122
Epoch: 88

Loss on hold-out set: 0.005156193510629237
MeanAbsoluteError value on hold-out data: 0.05745090916752815
Epoch: 89

Loss on hold-out set: 0.004952231502661912
MeanAbsoluteError value on hold-out data: 0.05688568577170372
Epoch: 90
Loss on hold-out set: 0.005291682873995831
MeanAbsoluteError value on hold-out data: 0.05640179291367531
Epoch: 91
Loss on hold-out set: 0.0052795736029600865
MeanAbsoluteError value on hold-out data: 0.055896125733852386
Epoch: 92
Loss on hold-out set: 0.004725129773410467
MeanAbsoluteError value on hold-out data: 0.05541016533970833
Epoch: 93
Loss on hold-out set: 0.004673432218484008
MeanAbsoluteError value on hold-out data: 0.05522111803293228
Epoch: 94
Loss on hold-out set: 0.004674920471958243
MeanAbsoluteError value on hold-out data: 0.0545952171087265
Epoch: 95

Loss on hold-out set: 0.004550408133162329
MeanAbsoluteError value on hold-out data: 0.05393233895301819
Epoch: 96

Loss on hold-out set: 0.014054271356704144
MeanAbsoluteError value on hold-out data: 0.06333528459072113
Epoch: 97
Loss on hold-out set: 0.00430889676611584
MeanAbsoluteError value on hold-out data: 0.05297904834151268
```

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Epoch: 98
Loss on hold-out set: 0.004311565685873995
MeanAbsoluteError value on hold-out data: 0.05247812718153
Epoch: 99
Loss on hold-out set: 0.004233709491717701
MeanAbsoluteError value on hold-out data: 0.05181951820850372
Epoch: 100
Loss on hold-out set: 0.004106730695079582
MeanAbsoluteError value on hold-out data: 0.05130009725689888
Epoch: 101
Loss on hold-out set: 0.004156673031572539
MeanAbsoluteError value on hold-out data: 0.051192279905080795
Epoch: 102

Loss on hold-out set: 0.004042894830210851
MeanAbsoluteError value on hold-out data: 0.050255537033081055
Epoch: 103

Loss on hold-out set: 0.004016427162031715
MeanAbsoluteError value on hold-out data: 0.050271376967430115
Epoch: 104
Loss on hold-out set: 0.003882875504831855
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Epoch: 105
Loss on hold-out set: 0.003751001929721007
MeanAbsoluteError value on hold-out data: 0.04879167675971985
Epoch: 106
Loss on hold-out set: 0.0037043495641018334
MeanAbsoluteError value on hold-out data: 0.048305388540029526
Epoch: 107
Loss on hold-out set: 0.0036564159851807812
MeanAbsoluteError value on hold-out data: 0.04837166145443916
Epoch: 108
Loss on hold-out set: 0.0035849060379685117
MeanAbsoluteError value on hold-out data: 0.047287896275520325
Epoch: 109

Loss on hold-out set: 0.0036413285146968868
MeanAbsoluteError value on hold-out data: 0.04710400104522705
Epoch: 110
```

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Loss on hold-out set: 0.003474272377878571
MeanAbsoluteError value on hold-out data: 0.04644059017300606
Epoch: 111
Loss on hold-out set: 0.003481612675106869
MeanAbsoluteError value on hold-out data: 0.04596753418445587
Epoch: 112
Loss on hold-out set: 0.0032601017469110396
MeanAbsoluteError value on hold-out data: 0.045888274908065796
Epoch: 113
Loss on hold-out set: 0.0032011706185025666
MeanAbsoluteError value on hold-out data: 0.045079123228788376
Epoch: 114
Loss on hold-out set: 0.003105119484154364
MeanAbsoluteError value on hold-out data: 0.044520970433950424
Epoch: 115
Loss on hold-out set: 0.0031469587836629497
MeanAbsoluteError value on hold-out data: 0.04453633353114128
Epoch: 116

Loss on hold-out set: 0.0029788562410081234
MeanAbsoluteError value on hold-out data: 0.04357083886861801
Epoch: 117

Loss on hold-out set: 0.0031213297580297175
MeanAbsoluteError value on hold-out data: 0.04399211332201958
Epoch: 118
Loss on hold-out set: 0.0029521708134919978
MeanAbsoluteError value on hold-out data: 0.042901407927274704
Epoch: 119
Loss on hold-out set: 0.0029279803678106805
MeanAbsoluteError value on hold-out data: 0.04220738261938095
Epoch: 120
Loss on hold-out set: 0.0029868087373100794
MeanAbsoluteError value on hold-out data: 0.04176194220781326
Epoch: 121
Loss on hold-out set: 0.002885142439761414
MeanAbsoluteError value on hold-out data: 0.04139403998851776
Epoch: 122
Loss on hold-out set: 0.002685657993424684
MeanAbsoluteError value on hold-out data: 0.04098516330122948
Epoch: 123
```

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Loss on hold-out set: 0.002659165416844189
MeanAbsoluteError value on hold-out data: 0.040466852486133575
Epoch: 124

Loss on hold-out set: 0.003108913329644845
MeanAbsoluteError value on hold-out data: 0.04249108210206032
Epoch: 125
Loss on hold-out set: 0.0033894019255128046
MeanAbsoluteError value on hold-out data: 0.04233918339014053
Epoch: 126
Loss on hold-out set: 0.0026005785912275314
MeanAbsoluteError value on hold-out data: 0.04044059291481972
Epoch: 127
Loss on hold-out set: 0.002463198934072772
MeanAbsoluteError value on hold-out data: 0.03870614618062973
Epoch: 128
Loss on hold-out set: 0.0023514721900797808
MeanAbsoluteError value on hold-out data: 0.03836960718035698
Epoch: 129
Loss on hold-out set: 0.00238570277668679
MeanAbsoluteError value on hold-out data: 0.03796141967177391
Epoch: 130

Loss on hold-out set: 0.0023790958892697324
MeanAbsoluteError value on hold-out data: 0.037892505526542664
Epoch: 131

Loss on hold-out set: 0.002242844748812226
MeanAbsoluteError value on hold-out data: 0.03711908683180809
Epoch: 132
Loss on hold-out set: 0.002226169830044875
MeanAbsoluteError value on hold-out data: 0.03680618852376938
Epoch: 133
Loss on hold-out set: 0.0020897158694704277
MeanAbsoluteError value on hold-out data: 0.036139730364084244
Epoch: 134
Loss on hold-out set: 0.002056904741598723
MeanAbsoluteError value on hold-out data: 0.036033209413290024
Epoch: 135
Loss on hold-out set: 0.0019948899862356484
MeanAbsoluteError value on hold-out data: 0.035444650799036026
Epoch: 136
```

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Loss on hold-out set: 0.002137538909804649
MeanAbsoluteError value on hold-out data: 0.03555243834853172
Epoch: 137

Loss on hold-out set: 0.0019063836393448024
MeanAbsoluteError value on hold-out data: 0.034481633454561234
Epoch: 138

Loss on hold-out set: 0.001914002605749724
MeanAbsoluteError value on hold-out data: 0.03520604223012924
Epoch: 139
Loss on hold-out set: 0.0019391412004971732
MeanAbsoluteError value on hold-out data: 0.033891431987285614
Epoch: 140
Loss on hold-out set: 0.0017648786172055854
MeanAbsoluteError value on hold-out data: 0.033269573003053665
Epoch: 141
Loss on hold-out set: 0.0017837016896989483
MeanAbsoluteError value on hold-out data: 0.033047646284103394
Epoch: 142
Loss on hold-out set: 0.0018553859375130672
MeanAbsoluteError value on hold-out data: 0.03270260617136955
Epoch: 143
Loss on hold-out set: 0.0024245800629544715
MeanAbsoluteError value on hold-out data: 0.034628283232450485
Epoch: 144

Loss on hold-out set: 0.0016680677385570912
MeanAbsoluteError value on hold-out data: 0.031608592718839645
Epoch: 145

Loss on hold-out set: 0.001568836137616577
MeanAbsoluteError value on hold-out data: 0.031077241525053978
Epoch: 146
Loss on hold-out set: 0.0015847922298305023
MeanAbsoluteError value on hold-out data: 0.03114929609000683
Epoch: 147
Loss on hold-out set: 0.0015180982165754987
MeanAbsoluteError value on hold-out data: 0.030878745019435883
Epoch: 148
Loss on hold-out set: 0.0014340199682360084
```

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MeanAbsoluteError value on hold-out data: 0.02987806871533394
Epoch: 149
Loss on hold-out set: 0.0014241256218296117
MeanAbsoluteError value on hold-out data: 0.029404859989881516
Epoch: 150
Loss on hold-out set: 0.0013386942849207956
MeanAbsoluteError value on hold-out data: 0.028988542035222054
Epoch: 151

Loss on hold-out set: 0.0013334213469464045
MeanAbsoluteError value on hold-out data: 0.029034819453954697
Epoch: 152

Loss on hold-out set: 0.0012876041672335793
MeanAbsoluteError value on hold-out data: 0.028374534100294113
Epoch: 153
Loss on hold-out set: 0.0012336218854985558
MeanAbsoluteError value on hold-out data: 0.027882475405931473
Epoch: 154
Loss on hold-out set: 0.0012414639775390523
MeanAbsoluteError value on hold-out data: 0.02742600440979004
Epoch: 155
Loss on hold-out set: 0.0011502403448013445
MeanAbsoluteError value on hold-out data: 0.026820743456482887
Epoch: 156
Loss on hold-out set: 0.0011829747057233292
MeanAbsoluteError value on hold-out data: 0.02699214406311512
Epoch: 157
Loss on hold-out set: 0.001153945168390727
MeanAbsoluteError value on hold-out data: 0.02634296379983425
Epoch: 158

Loss on hold-out set: 0.0010879125643091707
MeanAbsoluteError value on hold-out data: 0.025582144036889076
Epoch: 159

Loss on hold-out set: 0.001044698160302897
MeanAbsoluteError value on hold-out data: 0.02519342489540577
Epoch: 160
Loss on hold-out set: 0.0010043363951039142
MeanAbsoluteError value on hold-out data: 0.02480778656899929
```

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Epoch: 161
Loss on hold-out set: 0.0009423952187017466
MeanAbsoluteError value on hold-out data: 0.02444668859243393
Epoch: 162
Loss on hold-out set: 0.0009133005313252887
MeanAbsoluteError value on hold-out data: 0.023896990343928337
Epoch: 163
Loss on hold-out set: 0.0008949298644438386
MeanAbsoluteError value on hold-out data: 0.023453984409570694
Epoch: 164
Loss on hold-out set: 0.0008753189456631214
MeanAbsoluteError value on hold-out data: 0.023272376507520676
Epoch: 165

Loss on hold-out set: 0.0008192716844720193
MeanAbsoluteError value on hold-out data: 0.02285359613597393
Epoch: 166

Loss on hold-out set: 0.0008275941553830097
MeanAbsoluteError value on hold-out data: 0.02213374152779579
Epoch: 167
Loss on hold-out set: 0.0007741751435857553
MeanAbsoluteError value on hold-out data: 0.021875329315662384
Epoch: 168
Loss on hold-out set: 0.0007290469231800392
MeanAbsoluteError value on hold-out data: 0.021266290917992592
Epoch: 169
Loss on hold-out set: 0.0012985979724012746
MeanAbsoluteError value on hold-out data: 0.023262806236743927
Epoch: 170
Loss on hold-out set: 0.0007131492854498972
MeanAbsoluteError value on hold-out data: 0.020395925268530846
Epoch: 171
Loss on hold-out set: 0.0006428530256156451
MeanAbsoluteError value on hold-out data: 0.01996695250272751
Epoch: 172

Loss on hold-out set: 0.0006525951578693751
MeanAbsoluteError value on hold-out data: 0.019556963816285133
Epoch: 173
```

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Loss on hold-out set: 0.0005951617982086296
MeanAbsoluteError value on hold-out data: 0.019217627122998238
Epoch: 174
Loss on hold-out set: 0.0005766160891373426
MeanAbsoluteError value on hold-out data: 0.018854446709156036
Epoch: 175
Loss on hold-out set: 0.0005635067959351895
MeanAbsoluteError value on hold-out data: 0.01872177980840206
Epoch: 176
Loss on hold-out set: 0.0005160757383027186
MeanAbsoluteError value on hold-out data: 0.017889074981212616
Epoch: 177
Loss on hold-out set: 0.0005895038708471335
MeanAbsoluteError value on hold-out data: 0.01839336007833481
Epoch: 178
Loss on hold-out set: 0.0004608191044938464
MeanAbsoluteError value on hold-out data: 0.01703508384525776
Epoch: 179

Loss on hold-out set: 0.0005050937907071784
MeanAbsoluteError value on hold-out data: 0.017575470730662346
Epoch: 180

Loss on hold-out set: 0.009924840135052083
MeanAbsoluteError value on hold-out data: 0.02610151469707489
Epoch: 181
Loss on hold-out set: 0.00041382950159738987
MeanAbsoluteError value on hold-out data: 0.01601763814687729
Epoch: 182
Loss on hold-out set: 0.0003772214146850344
MeanAbsoluteError value on hold-out data: 0.015374668873846531
Epoch: 183
Loss on hold-out set: 0.0003611802497359279
MeanAbsoluteError value on hold-out data: 0.014936735853552818
Epoch: 184
Loss on hold-out set: 0.0003409405371013026
MeanAbsoluteError value on hold-out data: 0.014517405070364475
Epoch: 185
Loss on hold-out set: 0.0003383541647613478
MeanAbsoluteError value on hold-out data: 0.014263086020946503
Epoch: 186
```

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Loss on hold-out set: 0.0003091785480277255
MeanAbsoluteError value on hold-out data: 0.013828396797180176
Epoch: 187

Loss on hold-out set: 0.0002805239150452857
MeanAbsoluteError value on hold-out data: 0.01331359427422285
Epoch: 188
Loss on hold-out set: 0.0002906658908334346
MeanAbsoluteError value on hold-out data: 0.01282120868563652
Epoch: 189
Loss on hold-out set: 0.0002470798577773027
MeanAbsoluteError value on hold-out data: 0.012446671724319458
Epoch: 190
Loss on hold-out set: 0.00023790363159675436
MeanAbsoluteError value on hold-out data: 0.012032996863126755
Epoch: 191
Loss on hold-out set: 0.00021432132388536746
MeanAbsoluteError value on hold-out data: 0.011635934934020042
Epoch: 192
Loss on hold-out set: 0.00020484472882414522
MeanAbsoluteError value on hold-out data: 0.01141049899160862
Epoch: 193

Loss on hold-out set: 0.0002072437754787433
MeanAbsoluteError value on hold-out data: 0.010884216986596584
Epoch: 194

Loss on hold-out set: 0.00017142634925011618
MeanAbsoluteError value on hold-out data: 0.010440489277243614
Epoch: 195
Loss on hold-out set: 0.0001693896282141885
MeanAbsoluteError value on hold-out data: 0.01014502253383398
Epoch: 196
Loss on hold-out set: 0.0008320684335978093
MeanAbsoluteError value on hold-out data: 0.012135080993175507
Epoch: 197
Loss on hold-out set: 0.00013461322837079375
MeanAbsoluteError value on hold-out data: 0.009205713868141174
Epoch: 198
Loss on hold-out set: 0.00028187885058846755
MeanAbsoluteError value on hold-out data: 0.01001446321606636
Epoch: 199
```

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Loss on hold-out set: 0.0001223347311539468
MeanAbsoluteError value on hold-out data: 0.008530543185770512
Epoch: 200

Loss on hold-out set: 0.00011540142377970579
MeanAbsoluteError value on hold-out data: 0.00829827319830656
Epoch: 201

Loss on hold-out set: 0.00010055114566617143
MeanAbsoluteError value on hold-out data: 0.00789195392280817
Epoch: 202
Loss on hold-out set: 0.00010408658482237325
MeanAbsoluteError value on hold-out data: 0.008178390562534332
Epoch: 203
Loss on hold-out set: 7.862100098394036e-05
MeanAbsoluteError value on hold-out data: 0.007111493498086929
Epoch: 204
Loss on hold-out set: 7.814156239104565e-05
MeanAbsoluteError value on hold-out data: 0.006876624189317226
Epoch: 205
Loss on hold-out set: 6.568535907438042e-05
MeanAbsoluteError value on hold-out data: 0.006442994344979525
Epoch: 206
Loss on hold-out set: 6.557853899161833e-05
MeanAbsoluteError value on hold-out data: 0.006444161757826805
Epoch: 207

Loss on hold-out set: 5.52499892504644e-05
MeanAbsoluteError value on hold-out data: 0.0058446056209504604
Epoch: 208

Loss on hold-out set: 4.811187640230995e-05
MeanAbsoluteError value on hold-out data: 0.0055388035252690315
Epoch: 209
Loss on hold-out set: 4.269921282684663e-05
MeanAbsoluteError value on hold-out data: 0.005281229503452778
Epoch: 210
Loss on hold-out set: 4.0888869569663744e-05
MeanAbsoluteError value on hold-out data: 0.004949769005179405
Epoch: 211
Loss on hold-out set: 3.961865023974007e-05
```

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MeanAbsoluteError value on hold-out data: 0.004984727595001459
Epoch: 212
Loss on hold-out set: 3.154497104473054e-05
MeanAbsoluteError value on hold-out data: 0.0044730836525559425
Epoch: 213
Loss on hold-out set: 3.0510093613254587e-05
MeanAbsoluteError value on hold-out data: 0.004404598847031593
Epoch: 214

Loss on hold-out set: 2.328312740036591e-05
MeanAbsoluteError value on hold-out data: 0.003914854489266872
Epoch: 215

Loss on hold-out set: 2.17863432156334e-05
MeanAbsoluteError value on hold-out data: 0.003767577465623617
Epoch: 216
Loss on hold-out set: 1.7840506783473895e-05
MeanAbsoluteError value on hold-out data: 0.003423182060942054
Epoch: 217
Loss on hold-out set: 0.0004029153216763986
MeanAbsoluteError value on hold-out data: 0.005193439777940512
Epoch: 218
Loss on hold-out set: 2.4973333123713157e-05
MeanAbsoluteError value on hold-out data: 0.003983679227530956
Epoch: 219
Loss on hold-out set: 1.1319328642947277e-05
MeanAbsoluteError value on hold-out data: 0.002751233521848917
Epoch: 220
Loss on hold-out set: 9.424217558681938e-06
MeanAbsoluteError value on hold-out data: 0.002532902406528592
Epoch: 221

Loss on hold-out set: 7.947988828723632e-06
MeanAbsoluteError value on hold-out data: 0.002323705470189452
Epoch: 222

Loss on hold-out set: 7.83538623111851e-06
MeanAbsoluteError value on hold-out data: 0.0022275494411587715
Epoch: 223
Loss on hold-out set: 5.811509761490295e-06
MeanAbsoluteError value on hold-out data: 0.001985739218071103
```

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Epoch: 224
Loss on hold-out set: 8.570202121168572e-06
MeanAbsoluteError value on hold-out data: 0.0023375593591481447
Epoch: 225
Loss on hold-out set: 4.052536015618758e-06
MeanAbsoluteError value on hold-out data: 0.001684086862951517
Epoch: 226
Loss on hold-out set: 3.895768232863562e-06
MeanAbsoluteError value on hold-out data: 0.0016326826298609376
Epoch: 227
Loss on hold-out set: 5.673821935768221e-06
MeanAbsoluteError value on hold-out data: 0.0019408835796639323
Epoch: 228

Loss on hold-out set: 2.787740378642831e-06
MeanAbsoluteError value on hold-out data: 0.0013337306445464492
Epoch: 229

Loss on hold-out set: 2.4698623519725516e-06
MeanAbsoluteError value on hold-out data: 0.0012651811121031642
Epoch: 230
Loss on hold-out set: 2.6733502566527863e-06
MeanAbsoluteError value on hold-out data: 0.001320726121775806
Epoch: 231
Loss on hold-out set: 8.67862175150199e-06
MeanAbsoluteError value on hold-out data: 0.0026337774470448494
Epoch: 232
Loss on hold-out set: 4.493021789970114e-06
MeanAbsoluteError value on hold-out data: 0.0018094460247084498
Epoch: 233
Loss on hold-out set: 1.6121166656655707e-06
MeanAbsoluteError value on hold-out data: 0.001021075644530356
Epoch: 234
Loss on hold-out set: 1.6495437849838568e-06
MeanAbsoluteError value on hold-out data: 0.0010304163442924619
Epoch: 235

Loss on hold-out set: 3.727579190546329e-06
MeanAbsoluteError value on hold-out data: 0.0016523684607818723
Epoch: 236
```

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Loss on hold-out set: 1.2663304409863065e-06
MeanAbsoluteError value on hold-out data: 0.0009300594101659954
Epoch: 237
Loss on hold-out set: 1.1947208083011692e-06
MeanAbsoluteError value on hold-out data: 0.0009092388791032135
Epoch: 238
Loss on hold-out set: 1.8030858174055397e-06
MeanAbsoluteError value on hold-out data: 0.0011192683596163988
Epoch: 239
Loss on hold-out set: 1.036070451312718e-06
MeanAbsoluteError value on hold-out data: 0.0008360730134882033
Epoch: 240
Loss on hold-out set: 4.5716360196260775e-06
MeanAbsoluteError value on hold-out data: 0.0018855518428608775
Epoch: 241
Loss on hold-out set: 9.586418277999305e-07
MeanAbsoluteError value on hold-out data: 0.0007856862503103912
Epoch: 242


Loss on hold-out set: 1.886044922754921e-05
MeanAbsoluteError value on hold-out data: 0.004260508343577385
Epoch: 243


Loss on hold-out set: 1.1543669153560097e-06
MeanAbsoluteError value on hold-out data: 0.0008635178091935813
Epoch: 244
Loss on hold-out set: 1.0639303477196686e-06
MeanAbsoluteError value on hold-out data: 0.0008324768859893084
Epoch: 245
Loss on hold-out set: 7.924866823626731e-07
MeanAbsoluteError value on hold-out data: 0.0007383874035440385
Epoch: 246
Loss on hold-out set: 7.913749562668762e-07
MeanAbsoluteError value on hold-out data: 0.000732586660888046
Epoch: 247
Loss on hold-out set: 7.73636350878895e-07
MeanAbsoluteError value on hold-out data: 0.0007275638054125011
Epoch: 248
Loss on hold-out set: 0.0009645247064119425
MeanAbsoluteError value on hold-out data: 0.0038316131103783846
Epoch: 249
```

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Loss on hold-out set: 6.898047294393668e-07
MeanAbsoluteError value on hold-out data: 0.000663262908346951
Epoch: 250

Loss on hold-out set: 6.841854142381775e-07
MeanAbsoluteError value on hold-out data: 0.0006560930050909519
Epoch: 251
Loss on hold-out set: 7.124435457993828e-07
MeanAbsoluteError value on hold-out data: 0.0006555989384651184
Epoch: 252
Loss on hold-out set: 1.0354188956485955e-06
MeanAbsoluteError value on hold-out data: 0.000844066496938467
Epoch: 253
Loss on hold-out set: 1.006868776934985e-06
MeanAbsoluteError value on hold-out data: 0.000783913885243237
Epoch: 254
Loss on hold-out set: 1.560974392479973e-06
MeanAbsoluteError value on hold-out data: 0.0010303119197487831
Epoch: 255
Loss on hold-out set: 3.818668871575098e-06
MeanAbsoluteError value on hold-out data: 0.0017260791501030326
Epoch: 256

Loss on hold-out set: 9.797327825603693e-07
MeanAbsoluteError value on hold-out data: 0.0007913073641248047
Epoch: 257

Loss on hold-out set: 1.100082362024925e-06
MeanAbsoluteError value on hold-out data: 0.0008758697076700628
Epoch: 258
Loss on hold-out set: 9.035458980668828e-07
MeanAbsoluteError value on hold-out data: 0.0007689133053645492
Epoch: 259
Loss on hold-out set: 8.139835352074862e-07
MeanAbsoluteError value on hold-out data: 0.0007128116558305919
Epoch: 260
Loss on hold-out set: 9.426774017111501e-07
MeanAbsoluteError value on hold-out data: 0.000810713623650372
Epoch: 261
Loss on hold-out set: 8.054866432653048e-07
MeanAbsoluteError value on hold-out data: 0.0007364396587945521
Epoch: 262
```

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Loss on hold-out set: 7.932036527773352e-07
MeanAbsoluteError value on hold-out data: 0.0007417878368869424
Epoch: 263

Loss on hold-out set: 7.674445196943662e-07
MeanAbsoluteError value on hold-out data: 0.0006918534636497498
Epoch: 264

Loss on hold-out set: 7.004721610953241e-07
MeanAbsoluteError value on hold-out data: 0.0006720945239067078
Epoch: 265
Loss on hold-out set: 7.285885339150319e-07
MeanAbsoluteError value on hold-out data: 0.0006999735487625003
Epoch: 266
Loss on hold-out set: 4.6781177003979865e-06
MeanAbsoluteError value on hold-out data: 0.0019883483182638884
Epoch: 267
Loss on hold-out set: 1.6804293243065051e-06
MeanAbsoluteError value on hold-out data: 0.0010413608979433775
Epoch: 268
Loss on hold-out set: 1.7040543586797587e-06
MeanAbsoluteError value on hold-out data: 0.001046789693646133
Epoch: 269
Loss on hold-out set: 8.049428091593514e-07
MeanAbsoluteError value on hold-out data: 0.0007220993866212666
Epoch: 270

Loss on hold-out set: 7.883346116754043e-07
MeanAbsoluteError value on hold-out data: 0.0007206473965197802
Epoch: 271

Loss on hold-out set: 8.08029712883441e-07
MeanAbsoluteError value on hold-out data: 0.0007438383181579411
Epoch: 272
Loss on hold-out set: 8.091677902764507e-07
MeanAbsoluteError value on hold-out data: 0.0007281337748281658
Epoch: 273
Loss on hold-out set: 7.245208101162111e-07
MeanAbsoluteError value on hold-out data: 0.0006788300233893096
Epoch: 274
Loss on hold-out set: 7.692002369070067e-07
```

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MeanAbsoluteError value on hold-out data: 0.0007079025963321328
Epoch: 275
Loss on hold-out set: 9.829856734401032e-07
MeanAbsoluteError value on hold-out data: 0.0007868316606618464
Epoch: 276
Loss on hold-out set: 9.733460899497004e-07
MeanAbsoluteError value on hold-out data: 0.0007871807902120054
Epoch: 277

Loss on hold-out set: 0.0007238441949150106
MeanAbsoluteError value on hold-out data: 0.003564909799024462
Epoch: 278

Loss on hold-out set: 8.369967059269794e-07
MeanAbsoluteError value on hold-out data: 0.0007411576807498932
Epoch: 279
Loss on hold-out set: 9.432906219549645e-07
MeanAbsoluteError value on hold-out data: 0.0007975688786245883
Epoch: 280
Loss on hold-out set: 0.00025937720921940757
MeanAbsoluteError value on hold-out data: 0.0023550447076559067
Epoch: 281
Loss on hold-out set: 7.378368357317063e-07
MeanAbsoluteError value on hold-out data: 0.0006938811857253313
Epoch: 282
Loss on hold-out set: 1.2923859993809226e-06
MeanAbsoluteError value on hold-out data: 0.0009275637567043304
Epoch: 283
Loss on hold-out set: 1.0634560178109846e-06
MeanAbsoluteError value on hold-out data: 0.0008467392763122916
Epoch: 284

Loss on hold-out set: 9.533083541030535e-07
MeanAbsoluteError value on hold-out data: 0.0008024679264053702
Epoch: 285

Loss on hold-out set: 8.60007762508548e-07
MeanAbsoluteError value on hold-out data: 0.0007576309144496918
Epoch: 286
Loss on hold-out set: 3.2205751687377833e-06
MeanAbsoluteError value on hold-out data: 0.001580305048264563
```

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Epoch: 287
Loss on hold-out set: 8.34554719211575e-07
MeanAbsoluteError value on hold-out data: 0.0007521483348682523
Epoch: 288
Loss on hold-out set: 1.2309294666360634e-05
MeanAbsoluteError value on hold-out data: 0.0034286347217857838
Epoch: 289
Loss on hold-out set: 8.34243578013299e-07
MeanAbsoluteError value on hold-out data: 0.0007258187397383153
Epoch: 290
Loss on hold-out set: 1.017494297500959e-06
MeanAbsoluteError value on hold-out data: 0.0008324495865963399
Epoch: 291

Loss on hold-out set: 7.581486464949613e-07
MeanAbsoluteError value on hold-out data: 0.0006862115697003901
Epoch: 292

Loss on hold-out set: 7.649768878519143e-07
MeanAbsoluteError value on hold-out data: 0.0006783977150917053
Epoch: 293
Loss on hold-out set: 7.571997702353445e-07
MeanAbsoluteError value on hold-out data: 0.0006781116244383156
Epoch: 294
Loss on hold-out set: 8.587606627175913e-07
MeanAbsoluteError value on hold-out data: 0.0007612036424688995
Epoch: 295
Loss on hold-out set: 9.400298057908702e-07
MeanAbsoluteError value on hold-out data: 0.000797563639935106
Epoch: 296
Loss on hold-out set: 3.1646909956879636e-06
MeanAbsoluteError value on hold-out data: 0.0015761852264404297
Epoch: 297
Loss on hold-out set: 7.378043322275446e-07
MeanAbsoluteError value on hold-out data: 0.0007001635385677218
Epoch: 298

Loss on hold-out set: 7.136858663705845e-07
MeanAbsoluteError value on hold-out data: 0.0006739488453604281
Epoch: 299
```

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Loss on hold-out set: 1.3097965935370527e-05
MeanAbsoluteError value on hold-out data: 0.0035319870803505182
Epoch: 300
Loss on hold-out set: 7.764294286752935e-05
MeanAbsoluteError value on hold-out data: 0.0016554989852011204
Epoch: 301
Loss on hold-out set: 1.010327333863013e-06
MeanAbsoluteError value on hold-out data: 0.0008407048298977315
Epoch: 302
Loss on hold-out set: 1.0305144498418556e-06
MeanAbsoluteError value on hold-out data: 0.0008493416244164109
Epoch: 303
Loss on hold-out set: 1.066003368175818e-06
MeanAbsoluteError value on hold-out data: 0.0008146718028001487
Epoch: 304
Loss on hold-out set: 7.301906809796212e-07
MeanAbsoluteError value on hold-out data: 0.0006919209845364094
Epoch: 305


Loss on hold-out set: 7.611481796979765e-07
MeanAbsoluteError value on hold-out data: 0.0007024817168712616
Epoch: 306


Loss on hold-out set: 0.002482702356989928
MeanAbsoluteError value on hold-out data: 0.005719712004065514
Epoch: 307
Loss on hold-out set: 7.589649595292241e-07
MeanAbsoluteError value on hold-out data: 0.0007188431336544454
Epoch: 308
Loss on hold-out set: 7.065884440967588e-07
MeanAbsoluteError value on hold-out data: 0.0006576185114681721
Epoch: 309
Loss on hold-out set: 7.348208638492137e-07
MeanAbsoluteError value on hold-out data: 0.000665514322463423
Epoch: 310
Loss on hold-out set: 0.000772778508567521
MeanAbsoluteError value on hold-out data: 0.002781782764941454
Epoch: 311
Loss on hold-out set: 1.2017670594734507e-06
MeanAbsoluteError value on hold-out data: 0.0008587530464865267
Epoch: 312
```

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Loss on hold-out set: 1.4484567355583959e-05
MeanAbsoluteError value on hold-out data: 0.003709857352077961
Epoch: 313

Loss on hold-out set: 6.989913747300027e-07
MeanAbsoluteError value on hold-out data: 0.0006579540786333382
Epoch: 314
Loss on hold-out set: 8.34419217618723e-07
MeanAbsoluteError value on hold-out data: 0.0007522646919824183
Epoch: 315
Loss on hold-out set: 1.9774972508037954e-06
MeanAbsoluteError value on hold-out data: 0.0011962215648964047
Epoch: 316
Loss on hold-out set: 1.77131401484915e-06
MeanAbsoluteError value on hold-out data: 0.0011067130835726857
Epoch: 317
Loss on hold-out set: 1.7831828682364385e-06
MeanAbsoluteError value on hold-out data: 0.0011287928791716695
Epoch: 318
Loss on hold-out set: 1.025772508000955e-05
MeanAbsoluteError value on hold-out data: 0.0030240071937441826
Epoch: 319

Loss on hold-out set: 8.022050071059101e-07
MeanAbsoluteError value on hold-out data: 0.0007326349732466042
Epoch: 320

Loss on hold-out set: 1.015981106014316e-06
MeanAbsoluteError value on hold-out data: 0.0008047637529671192
Epoch: 321
Loss on hold-out set: 7.525677924254874e-07
MeanAbsoluteError value on hold-out data: 0.0006964948843233287
Epoch: 322
Loss on hold-out set: 1.5098078471545216e-06
MeanAbsoluteError value on hold-out data: 0.0009919842705130577
Epoch: 323
Loss on hold-out set: 9.715452532733393e-07
MeanAbsoluteError value on hold-out data: 0.0007870218250900507
Epoch: 324
Loss on hold-out set: 7.294306232534626e-07
MeanAbsoluteError value on hold-out data: 0.000673137023113668
Epoch: 325
```

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Loss on hold-out set: 8.021821473063867e-07
MeanAbsoluteError value on hold-out data: 0.0007384309428744018
Epoch: 326

Loss on hold-out set: 0.00037826894163117686
MeanAbsoluteError value on hold-out data: 0.003368979087099433
Epoch: 327

Loss on hold-out set: 8.124178980149456e-07
MeanAbsoluteError value on hold-out data: 0.0007304075406864285
Epoch: 328
Loss on hold-out set: 0.0007809521915727549
MeanAbsoluteError value on hold-out data: 0.003615156514570117
Epoch: 329
Loss on hold-out set: 7.730341473269128e-07
MeanAbsoluteError value on hold-out data: 0.0006731781177222729
Epoch: 330
Loss on hold-out set: 0.000699063968810903
MeanAbsoluteError value on hold-out data: 0.003449820913374424
Epoch: 331
Loss on hold-out set: 8.550741461896486e-07
MeanAbsoluteError value on hold-out data: 0.0007742363959550858
Epoch: 332
Loss on hold-out set: 1.0138367897000605e-06
MeanAbsoluteError value on hold-out data: 0.0007940450450405478
Epoch: 333

Loss on hold-out set: 7.706091371171799e-07
MeanAbsoluteError value on hold-out data: 0.0007236058008857071
Epoch: 334

Loss on hold-out set: 4.8747173982869404e-05
MeanAbsoluteError value on hold-out data: 0.006900527514517307
Epoch: 335
Loss on hold-out set: 1.9386341705285304e-06
MeanAbsoluteError value on hold-out data: 0.0011164955794811249
Epoch: 336
Loss on hold-out set: 9.349369896391671e-07
MeanAbsoluteError value on hold-out data: 0.000794957741163671
Epoch: 337
Loss on hold-out set: 0.0002715929150532212
```

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MeanAbsoluteError value on hold-out data: 0.0024459257256239653
Epoch: 338
Loss on hold-out set: 9.03926176166491e-07
MeanAbsoluteError value on hold-out data: 0.0007651693886145949
Epoch: 339
Loss on hold-out set: 8.354727775930279e-07
MeanAbsoluteError value on hold-out data: 0.0007491406868211925
Epoch: 340

Loss on hold-out set: 1.084869139206673e-06
MeanAbsoluteError value on hold-out data: 0.0008280471083708107
Epoch: 341

Loss on hold-out set: 9.182863651018963e-07
MeanAbsoluteError value on hold-out data: 0.0007497888873331249
Epoch: 342
Loss on hold-out set: 7.614983067364497e-07
MeanAbsoluteError value on hold-out data: 0.0007106736302375793
Epoch: 343
Loss on hold-out set: 0.00035127482374920106
MeanAbsoluteError value on hold-out data: 0.0026283643674105406
Epoch: 344
Loss on hold-out set: 8.0810768237755e-07
MeanAbsoluteError value on hold-out data: 0.0007190614705905318
Epoch: 345
Loss on hold-out set: 7.084299577050283e-07
MeanAbsoluteError value on hold-out data: 0.0006778505630791187
Epoch: 346
Loss on hold-out set: 9.733208449128701e-07
MeanAbsoluteError value on hold-out data: 0.0008268795791082084
Epoch: 347

Loss on hold-out set: 9.33889054977044e-07
MeanAbsoluteError value on hold-out data: 0.0008149282657541335
Epoch: 348

Loss on hold-out set: 7.116848971341265e-07
MeanAbsoluteError value on hold-out data: 0.0006675818585790694
Epoch: 349
Loss on hold-out set: 1.0685527342957357e-06
MeanAbsoluteError value on hold-out data: 0.0008173188543878496
```

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Epoch: 350
Loss on hold-out set: 6.637289839790566e-07
MeanAbsoluteError value on hold-out data: 0.0006595167797058821
Epoch: 351
Loss on hold-out set: 8.498763096353147e-07
MeanAbsoluteError value on hold-out data: 0.0007484445231966674
Epoch: 352
Loss on hold-out set: 6.551766642377726e-07
MeanAbsoluteError value on hold-out data: 0.0006584814400412142
Epoch: 353
Loss on hold-out set: 6.935993851059791e-07
MeanAbsoluteError value on hold-out data: 0.0006667503621429205
Epoch: 354

Loss on hold-out set: 6.657276947827576e-07
MeanAbsoluteError value on hold-out data: 0.0006503406330011785
Epoch: 355

Loss on hold-out set: 1.0681353746104623e-06
MeanAbsoluteError value on hold-out data: 0.0008418459910899401
Epoch: 356
Loss on hold-out set: 3.95687689328602e-06
MeanAbsoluteError value on hold-out data: 0.0017885447014123201
Epoch: 357
Loss on hold-out set: 7.326488527654035e-07
MeanAbsoluteError value on hold-out data: 0.0006842621951363981
Epoch: 358
Loss on hold-out set: 1.9128375732599616e-06
MeanAbsoluteError value on hold-out data: 0.0011904133716598153
Epoch: 359
Loss on hold-out set: 7.091309201384249e-07
MeanAbsoluteError value on hold-out data: 0.0006689527654089034
Epoch: 360
Loss on hold-out set: 6.777037810934416e-07
MeanAbsoluteError value on hold-out data: 0.0006589743425138295
Epoch: 361

Loss on hold-out set: 1.560266250285517e-05
MeanAbsoluteError value on hold-out data: 0.0038302093744277954
Epoch: 362
```

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Loss on hold-out set: 0.000340543560403498
MeanAbsoluteError value on hold-out data: 0.0026111886836588383
Epoch: 363
Loss on hold-out set: 1.0794360146239621e-06
MeanAbsoluteError value on hold-out data: 0.0008677897858433425
Epoch: 364
Loss on hold-out set: 8.65393611950192e-07
MeanAbsoluteError value on hold-out data: 0.0007562433020211756
Epoch: 365
Loss on hold-out set: 8.025758032859952e-07
MeanAbsoluteError value on hold-out data: 0.0007431587437167764
Epoch: 366
Loss on hold-out set: 7.359441532081781e-07
MeanAbsoluteError value on hold-out data: 0.0007126799318939447
Epoch: 367
Loss on hold-out set: 7.150162909615924e-07
MeanAbsoluteError value on hold-out data: 0.0006824276060797274
Epoch: 368

Loss on hold-out set: 7.199838001689876e-07
MeanAbsoluteError value on hold-out data: 0.0006782713462598622
Epoch: 369

Loss on hold-out set: 7.799908099916418e-07
MeanAbsoluteError value on hold-out data: 0.000738562666811049
Epoch: 370
Loss on hold-out set: 6.845311654265411e-07
MeanAbsoluteError value on hold-out data: 0.00065813452238217
Epoch: 371
Loss on hold-out set: 1.003099664733152e-06
MeanAbsoluteError value on hold-out data: 0.000825669034384191
Epoch: 372
Loss on hold-out set: 9.214550839960094e-07
MeanAbsoluteError value on hold-out data: 0.0007577601354569197
Epoch: 373
Loss on hold-out set: 0.00028665302967895585
MeanAbsoluteError value on hold-out data: 0.0032603812869638205
Epoch: 374
Loss on hold-out set: 7.224585603947932e-07
MeanAbsoluteError value on hold-out data: 0.0006815532105974853
Epoch: 375
```

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Loss on hold-out set: 1.1925914691346406e-06
MeanAbsoluteError value on hold-out data: 0.000879875267855823
Epoch: 376

Loss on hold-out set: 6.989232325885006e-07
MeanAbsoluteError value on hold-out data: 0.0006574949366040528
Epoch: 377
Loss on hold-out set: 2.91631866170624e-06
MeanAbsoluteError value on hold-out data: 0.0015211073914542794
Epoch: 378
Loss on hold-out set: 1.0703575368937052e-06
MeanAbsoluteError value on hold-out data: 0.0008649521041661501
Epoch: 379
Loss on hold-out set: 9.188036074192496e-07
MeanAbsoluteError value on hold-out data: 0.0008006064454093575
Epoch: 380
Loss on hold-out set: 0.0002965663269334912
MeanAbsoluteError value on hold-out data: 0.0024963102769106627
Epoch: 381
Loss on hold-out set: 9.675644539933833e-07
MeanAbsoluteError value on hold-out data: 0.0008049601456150413
Epoch: 382

Loss on hold-out set: 9.438535215622323e-07
MeanAbsoluteError value on hold-out data: 0.0007894234149716794
Epoch: 383

Loss on hold-out set: 1.3254258069886978e-06
MeanAbsoluteError value on hold-out data: 0.0009433770319446921
Epoch: 384
Loss on hold-out set: 1.8213497237586405e-06
MeanAbsoluteError value on hold-out data: 0.0010771476663649082
Epoch: 385
Loss on hold-out set: 7.429097829222324e-07
MeanAbsoluteError value on hold-out data: 0.0007033312576822937
Epoch: 386
Loss on hold-out set: 8.758327691811456e-07
MeanAbsoluteError value on hold-out data: 0.0007522013620473444
Epoch: 387
Loss on hold-out set: 7.802095226977074e-07
MeanAbsoluteError value on hold-out data: 0.000714690366294235
Epoch: 388
```

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Loss on hold-out set: 1.1053996856319898e-06
MeanAbsoluteError value on hold-out data: 0.0008438652148470283
Epoch: 389

Loss on hold-out set: 9.232605468521517e-07
MeanAbsoluteError value on hold-out data: 0.0007929109851829708
Epoch: 390

Loss on hold-out set: 1.2155906705839488e-06
MeanAbsoluteError value on hold-out data: 0.0008949219482019544
Epoch: 391
Loss on hold-out set: 9.714374606608965e-07
MeanAbsoluteError value on hold-out data: 0.0008073060889728367
Epoch: 392
Loss on hold-out set: 8.60057643701741e-07
MeanAbsoluteError value on hold-out data: 0.0007710719364695251
Epoch: 393
Loss on hold-out set: 8.40826439448742e-07
MeanAbsoluteError value on hold-out data: 0.0007587805157527328
Epoch: 394
Loss on hold-out set: 8.07859512755945e-07
MeanAbsoluteError value on hold-out data: 0.0007534088799729943
Epoch: 395
Loss on hold-out set: 2.3691416826155684e-05
MeanAbsoluteError value on hold-out data: 0.0012414738303050399
Epoch: 396

Loss on hold-out set: 7.937751914911272e-07
MeanAbsoluteError value on hold-out data: 0.0007390585378743708
Epoch: 397

Loss on hold-out set: 8.188100465006826e-07
MeanAbsoluteError value on hold-out data: 0.0006962314364500344
Epoch: 398
Loss on hold-out set: 0.0001075383031886846
MeanAbsoluteError value on hold-out data: 0.0017818865599110723
Epoch: 399
Loss on hold-out set: 0.0003865160869852301
MeanAbsoluteError value on hold-out data: 0.0027057614643126726
Epoch: 400
Loss on hold-out set: 7.139475242795995e-07
```

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MeanAbsoluteError value on hold-out data: 0.0006904790061526
Epoch: 401
Loss on hold-out set: 2.368102610279703e-06
MeanAbsoluteError value on hold-out data: 0.0013291100040078163
Epoch: 402
Loss on hold-out set: 1.0054980700365727e-06
MeanAbsoluteError value on hold-out data: 0.00081325025530532
Epoch: 403

Loss on hold-out set: 8.773290727066734e-07
MeanAbsoluteError value on hold-out data: 0.0007690667407587171
Epoch: 404

Loss on hold-out set: 9.474197847444325e-07
MeanAbsoluteError value on hold-out data: 0.0008095787488855422
Epoch: 405
Loss on hold-out set: 7.477226889617529e-07
MeanAbsoluteError value on hold-out data: 0.0006714620976708829
Epoch: 406
Loss on hold-out set: 1.1687241812279144e-06
MeanAbsoluteError value on hold-out data: 0.0008120464044623077
Epoch: 407
Loss on hold-out set: 6.986046383434979e-07
MeanAbsoluteError value on hold-out data: 0.0006513705593533814
Epoch: 408
Loss on hold-out set: 0.01044554637693715
MeanAbsoluteError value on hold-out data: 0.014018138870596886
Epoch: 409
Loss on hold-out set: 0.00035867274916129716
MeanAbsoluteError value on hold-out data: 0.0026057728100568056
Epoch: 410

Loss on hold-out set: 9.046790104058836e-07
MeanAbsoluteError value on hold-out data: 0.0008013497572392225
Epoch: 411

Loss on hold-out set: 2.9733134747052995e-05
MeanAbsoluteError value on hold-out data: 0.005358859430998564
Epoch: 412
Loss on hold-out set: 1.1125392050486811e-05
MeanAbsoluteError value on hold-out data: 0.0031877821311354637
```

```
Epoch: 413
Loss on hold-out set: 1.724819530688994e-06
MeanAbsoluteError value on hold-out data: 0.0010996938217431307
Epoch: 414
Loss on hold-out set: 7.862373015891185e-07
MeanAbsoluteError value on hold-out data: 0.000701775832567364
Epoch: 415
Loss on hold-out set: 1.2453757335606497e-05
MeanAbsoluteError value on hold-out data: 0.0034233792684972286
Epoch: 416
Loss on hold-out set: 1.0778014340163422e-06
MeanAbsoluteError value on hold-out data: 0.0008443400147370994
Epoch: 417

Loss on hold-out set: 1.4010063645960495e-06
MeanAbsoluteError value on hold-out data: 0.0009268574649468064
Epoch: 418

Loss on hold-out set: 8.397865656206704e-07
MeanAbsoluteError value on hold-out data: 0.0007343646720983088
Epoch: 419
Loss on hold-out set: 8.707345299486545e-07
MeanAbsoluteError value on hold-out data: 0.000761308940127492
Epoch: 420
Loss on hold-out set: 1.2272144326393923e-06
MeanAbsoluteError value on hold-out data: 0.0008875976782292128
Epoch: 421
Loss on hold-out set: 9.035434527067292e-07
MeanAbsoluteError value on hold-out data: 0.0007456378662027419
Epoch: 422
Loss on hold-out set: 8.526692738541897e-07
MeanAbsoluteError value on hold-out data: 0.0007240979466587305
Epoch: 423
Loss on hold-out set: 8.152324408701344e-07
MeanAbsoluteError value on hold-out data: 0.00070715113542974
Epoch: 424

Loss on hold-out set: 8.188961937951087e-07
MeanAbsoluteError value on hold-out data: 0.0007355567649938166
Epoch: 425
```

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Loss on hold-out set: 7.648759098908788e-07
MeanAbsoluteError value on hold-out data: 0.0006939420127309859
Epoch: 426
Loss on hold-out set: 5.158415328528813e-06
MeanAbsoluteError value on hold-out data: 0.0020763373468071222
Epoch: 427
Loss on hold-out set: 0.00080154483532624
MeanAbsoluteError value on hold-out data: 0.004575972445309162
Epoch: 428
Loss on hold-out set: 0.00030807101548082125
MeanAbsoluteError value on hold-out data: 0.0024997261352837086
Epoch: 429
Loss on hold-out set: 0.00038263441431879
MeanAbsoluteError value on hold-out data: 0.0031106071546673775
Epoch: 430
Loss on hold-out set: 7.421945637221282e-07
MeanAbsoluteError value on hold-out data: 0.0006861898582428694
Epoch: 431

Loss on hold-out set: 0.00024043556733160514
MeanAbsoluteError value on hold-out data: 0.0022881338372826576
Epoch: 432

Loss on hold-out set: 9.198211745779889e-07
MeanAbsoluteError value on hold-out data: 0.0007912203436717391
Epoch: 433
Loss on hold-out set: 1.2158627909614622e-06
MeanAbsoluteError value on hold-out data: 0.0009236046462319791
Epoch: 434
Loss on hold-out set: 8.822344870378191e-07
MeanAbsoluteError value on hold-out data: 0.0007742819143459201
Epoch: 435
Loss on hold-out set: 7.431952811797461e-07
MeanAbsoluteError value on hold-out data: 0.0006888565258122981
Epoch: 436
Loss on hold-out set: 1.7350848509067873e-06
MeanAbsoluteError value on hold-out data: 0.0011216930579394102
Epoch: 437
Loss on hold-out set: 2.5455838856312485e-06
MeanAbsoluteError value on hold-out data: 0.0013996027410030365
Epoch: 438
```

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Loss on hold-out set: 9.103535970867737e-07
MeanAbsoluteError value on hold-out data: 0.0007711246726103127
Epoch: 439

Loss on hold-out set: 7.427868830780845e-07
MeanAbsoluteError value on hold-out data: 0.0007086452678777277
Epoch: 440
Loss on hold-out set: 8.17801302096436e-07
MeanAbsoluteError value on hold-out data: 0.0007514660246670246
Epoch: 441
Loss on hold-out set: 8.610442814817641e-07
MeanAbsoluteError value on hold-out data: 0.0007820735336281359
Epoch: 442
Loss on hold-out set: 8.312920315872291e-07
MeanAbsoluteError value on hold-out data: 0.0007561044185422361
Epoch: 443
Loss on hold-out set: 6.978491652576989e-07
MeanAbsoluteError value on hold-out data: 0.0006668756832368672
Epoch: 444
Loss on hold-out set: 8.340580738884175e-07
MeanAbsoluteError value on hold-out data: 0.0007724373135715723
Epoch: 445

Loss on hold-out set: 7.216448085938072e-07
MeanAbsoluteError value on hold-out data: 0.0007001875201240182
Epoch: 446

Loss on hold-out set: 8.785938715706064e-07
MeanAbsoluteError value on hold-out data: 0.0007264422019943595
Epoch: 447
Loss on hold-out set: 7.667672150546423e-07
MeanAbsoluteError value on hold-out data: 0.000690108397975564
Epoch: 448
Loss on hold-out set: 8.466702424287248e-07
MeanAbsoluteError value on hold-out data: 0.0007560875965282321
Epoch: 449
Loss on hold-out set: 6.84119099437689e-05
MeanAbsoluteError value on hold-out data: 0.008229164406657219
Epoch: 450
Loss on hold-out set: 8.289659179948873e-07
MeanAbsoluteError value on hold-out data: 0.0007421949412673712
Epoch: 451
```

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Loss on hold-out set: 3.722135974944999e-05
MeanAbsoluteError value on hold-out data: 0.006042690947651863
Epoch: 452

Loss on hold-out set: 9.601246342929069e-07
MeanAbsoluteError value on hold-out data: 0.0008031284087337554
Epoch: 453

Loss on hold-out set: 3.369390259859546e-06
MeanAbsoluteError value on hold-out data: 0.0016090101562440395
Epoch: 454
Loss on hold-out set: 0.00018162772066541668
MeanAbsoluteError value on hold-out data: 0.0021466559264808893
Epoch: 455
Loss on hold-out set: 1.1412149070530666e-06
MeanAbsoluteError value on hold-out data: 0.0008637817809358239
Epoch: 456
Loss on hold-out set: 8.253371806159311e-07
MeanAbsoluteError value on hold-out data: 0.0007504531531594694
Epoch: 457
Loss on hold-out set: 7.537288564225702e-07
MeanAbsoluteError value on hold-out data: 0.000697562238201499
Epoch: 458
Loss on hold-out set: 0.00031563737132518535
MeanAbsoluteError value on hold-out data: 0.0029981143306940794
Epoch: 459

Loss on hold-out set: 7.508902906640567e-07
MeanAbsoluteError value on hold-out data: 0.0006881430745124817
Epoch: 460

Loss on hold-out set: 1.1058151498078728e-06
MeanAbsoluteError value on hold-out data: 0.0008471976034343243
Epoch: 461
Loss on hold-out set: 1.3637249349603035e-06
MeanAbsoluteError value on hold-out data: 0.000949238077737391
Epoch: 462
Loss on hold-out set: 1.3398390854910338e-06
MeanAbsoluteError value on hold-out data: 0.0009596736636012793
Epoch: 463
Loss on hold-out set: 9.191212233015624e-07
```

```
MeanAbsoluteError value on hold-out data: 0.0007876424351707101
Epoch: 464
Loss on hold-out set: 7.804866627863632e-07
MeanAbsoluteError value on hold-out data: 0.0007352986722253263
Epoch: 465
Loss on hold-out set: 7.842044060278288e-07
MeanAbsoluteError value on hold-out data: 0.0007177391671575606
Epoch: 466

Loss on hold-out set: 9.239014421889526e-07
MeanAbsoluteError value on hold-out data: 0.0007788410875946283
Epoch: 467

Loss on hold-out set: 1.0158004827714578e-06
MeanAbsoluteError value on hold-out data: 0.0008227964281104505
Epoch: 468
Loss on hold-out set: 6.016707997192638e-06
MeanAbsoluteError value on hold-out data: 0.0020008718129247427
Epoch: 469
Loss on hold-out set: 1.0329925561773753e-06
MeanAbsoluteError value on hold-out data: 0.0007913890294730663
Epoch: 470
Loss on hold-out set: 1.303251884529835e-06
MeanAbsoluteError value on hold-out data: 0.0008812205633148551
Epoch: 471
Loss on hold-out set: 8.542081268650201e-07
MeanAbsoluteError value on hold-out data: 0.0007572339382022619
Epoch: 472
Loss on hold-out set: 7.867408468288116e-07
MeanAbsoluteError value on hold-out data: 0.000715623376891017
Epoch: 473

Loss on hold-out set: 8.026409808245752e-07
MeanAbsoluteError value on hold-out data: 0.0007287964108400047
Epoch: 474

Loss on hold-out set: 0.00020330895109037345
MeanAbsoluteError value on hold-out data: 0.0022251131013035774
Epoch: 475
Loss on hold-out set: 1.4218487605760927e-06
MeanAbsoluteError value on hold-out data: 0.0009306840365752578
```

```
Epoch: 476
Loss on hold-out set: 0.00014983487455730519
MeanAbsoluteError value on hold-out data: 0.0019887115340679884
Epoch: 477
Loss on hold-out set: 9.396798514689391e-07
MeanAbsoluteError value on hold-out data: 0.0007567426655441523
Epoch: 478
Loss on hold-out set: 8.288754188994901e-07
MeanAbsoluteError value on hold-out data: 0.0007292547961696982
Epoch: 479
Loss on hold-out set: 8.736318040274244e-07
MeanAbsoluteError value on hold-out data: 0.0007754234247840941
Epoch: 480

Loss on hold-out set: 3.692971474195544e-06
MeanAbsoluteError value on hold-out data: 0.001680795568972826
Early stopping at epoch 479
Fold: 3
Epoch: 1

Loss on hold-out set: 0.023147662098591145
MeanAbsoluteError value on hold-out data: 0.12105317413806915
Epoch: 2
Loss on hold-out set: 0.022219104898305468
MeanAbsoluteError value on hold-out data: 0.12043218314647675
Epoch: 3
Loss on hold-out set: 0.022145008525023095
MeanAbsoluteError value on hold-out data: 0.12024133652448654
Epoch: 4
Loss on hold-out set: 0.022413055340831097
MeanAbsoluteError value on hold-out data: 0.11969315260648727
Epoch: 5
Loss on hold-out set: 0.024177483641184293
MeanAbsoluteError value on hold-out data: 0.11925803124904633
Epoch: 6
Loss on hold-out set: 0.023082148785201404
MeanAbsoluteError value on hold-out data: 0.11875530332326889
Epoch: 7

Loss on hold-out set: 0.02317363156292301
MeanAbsoluteError value on hold-out data: 0.1181684285402298
Epoch: 8
```

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Loss on hold-out set: 0.0217435761856345
MeanAbsoluteError value on hold-out data: 0.11781645566225052
Epoch: 9
Loss on hold-out set: 0.02212148503615306
MeanAbsoluteError value on hold-out data: 0.11736951768398285
Epoch: 10
Loss on hold-out set: 0.020988762557793122
MeanAbsoluteError value on hold-out data: 0.11737681180238724
Epoch: 11
Loss on hold-out set: 0.021374669928963367
MeanAbsoluteError value on hold-out data: 0.11670612543821335
Epoch: 12
Loss on hold-out set: 0.022587559741133682
MeanAbsoluteError value on hold-out data: 0.11630409955978394
Epoch: 13
Loss on hold-out set: 0.020932519414390508
MeanAbsoluteError value on hold-out data: 0.11586921662092209
Epoch: 14


Loss on hold-out set: 0.02161829463707713
MeanAbsoluteError value on hold-out data: 0.11548049747943878
Epoch: 15


Loss on hold-out set: 0.020711456389667895
MeanAbsoluteError value on hold-out data: 0.11544494330883026
Epoch: 16
Loss on hold-out set: 0.02008743551917947
MeanAbsoluteError value on hold-out data: 0.11481564491987228
Epoch: 17
Loss on hold-out set: 0.02126506257515687
MeanAbsoluteError value on hold-out data: 0.11434663087129593
Epoch: 18
Loss on hold-out set: 0.021931090893653724
MeanAbsoluteError value on hold-out data: 0.11401292681694031
Epoch: 19
Loss on hold-out set: 0.019964563552863322
MeanAbsoluteError value on hold-out data: 0.11329139024019241
Epoch: 20
Loss on hold-out set: 0.019962201145692512
MeanAbsoluteError value on hold-out data: 0.11316452920436859
Epoch: 21
```

```
Loss on hold-out set: 0.019371242978825018
MeanAbsoluteError value on hold-out data: 0.11277145147323608
Epoch: 22

Loss on hold-out set: 0.0202973006436458
MeanAbsoluteError value on hold-out data: 0.11237024515867233
Epoch: 23
Loss on hold-out set: 0.018862950543944653
MeanAbsoluteError value on hold-out data: 0.11186323314905167
Epoch: 24
Loss on hold-out set: 0.018958646159332532
MeanAbsoluteError value on hold-out data: 0.11142351478338242
Epoch: 25
Loss on hold-out set: 0.019010306837467048
MeanAbsoluteError value on hold-out data: 0.11094829440116882
Epoch: 26
Loss on hold-out set: 0.01903916598082735
MeanAbsoluteError value on hold-out data: 0.11052985489368439
Epoch: 27
Loss on hold-out set: 0.01838335835446532
MeanAbsoluteError value on hold-out data: 0.11002692580223083
Epoch: 28

Loss on hold-out set: 0.019357785045240935
MeanAbsoluteError value on hold-out data: 0.1094965934753418
Epoch: 29

Loss on hold-out set: 0.01822722452477767
MeanAbsoluteError value on hold-out data: 0.10903432965278625
Epoch: 30
Loss on hold-out set: 0.017694098910746667
MeanAbsoluteError value on hold-out data: 0.10863642394542694
Epoch: 31
Loss on hold-out set: 0.018226327302937325
MeanAbsoluteError value on hold-out data: 0.10806599259376526
Epoch: 32
Loss on hold-out set: 0.017615636255448826
MeanAbsoluteError value on hold-out data: 0.10759858787059784
Epoch: 33
Loss on hold-out set: 0.01826531090773642
MeanAbsoluteError value on hold-out data: 0.10703232139348984
Epoch: 34
```

```
Loss on hold-out set: 0.017319737324634425
MeanAbsoluteError value on hold-out data: 0.10644162446260452
Epoch: 35

Loss on hold-out set: 0.01714170781465677
MeanAbsoluteError value on hold-out data: 0.10590916872024536
Epoch: 36

Loss on hold-out set: 0.01689928648276971
MeanAbsoluteError value on hold-out data: 0.10543128848075867
Epoch: 37
Loss on hold-out set: 0.016695981057217486
MeanAbsoluteError value on hold-out data: 0.10487301647663116
Epoch: 38
Loss on hold-out set: 0.016659982395000182
MeanAbsoluteError value on hold-out data: 0.10429508984088898
Epoch: 39
Loss on hold-out set: 0.018208919773594692
MeanAbsoluteError value on hold-out data: 0.1035793200135231
Epoch: 40
Loss on hold-out set: 0.017079792630213957
MeanAbsoluteError value on hold-out data: 0.10307673364877701
Epoch: 41
Loss on hold-out set: 0.016182355851364825
MeanAbsoluteError value on hold-out data: 0.10250847041606903
Epoch: 42

Loss on hold-out set: 0.015736987026265033
MeanAbsoluteError value on hold-out data: 0.10189595073461533
Epoch: 43

Loss on hold-out set: 0.017721008097466368
MeanAbsoluteError value on hold-out data: 0.10125230997800827
Epoch: 44
Loss on hold-out set: 0.017196233205210704
MeanAbsoluteError value on hold-out data: 0.10093364864587784
Epoch: 45
Loss on hold-out set: 0.01554824522911356
MeanAbsoluteError value on hold-out data: 0.09992749243974686
Epoch: 46
Loss on hold-out set: 0.0164021709933877
```

```
MeanAbsoluteError value on hold-out data: 0.09971775859594345
Epoch: 47
Loss on hold-out set: 0.014811924193054438
MeanAbsoluteError value on hold-out data: 0.09867990761995316
Epoch: 48
Loss on hold-out set: 0.014649071748583363
MeanAbsoluteError value on hold-out data: 0.09816664457321167
Epoch: 49

Loss on hold-out set: 0.01530372928111599
MeanAbsoluteError value on hold-out data: 0.09791475534439087
Epoch: 50

Loss on hold-out set: 0.015786927515784137
MeanAbsoluteError value on hold-out data: 0.09735602140426636
Epoch: 51
Loss on hold-out set: 0.014365089699052848
MeanAbsoluteError value on hold-out data: 0.09594324976205826
Epoch: 52
Loss on hold-out set: 0.014059318337016381
MeanAbsoluteError value on hold-out data: 0.09551295638084412
Epoch: 53
Loss on hold-out set: 0.014057954021084767
MeanAbsoluteError value on hold-out data: 0.09497341513633728
Epoch: 54
Loss on hold-out set: 0.013376821369792406
MeanAbsoluteError value on hold-out data: 0.09395905584096909
Epoch: 55
Loss on hold-out set: 0.013413552660495043
MeanAbsoluteError value on hold-out data: 0.09339629858732224
Epoch: 56

Loss on hold-out set: 0.01307578757405281
MeanAbsoluteError value on hold-out data: 0.09283825755119324
Epoch: 57

Loss on hold-out set: 0.014027600606473593
MeanAbsoluteError value on hold-out data: 0.09206923842430115
Epoch: 58
Loss on hold-out set: 0.012696861217801388
MeanAbsoluteError value on hold-out data: 0.09134627133607864
```

```
Epoch: 59
Loss on hold-out set: 0.01241704083692569
MeanAbsoluteError value on hold-out data: 0.09082495421171188
Epoch: 60
Loss on hold-out set: 0.012285008739966612
MeanAbsoluteError value on hold-out data: 0.0903434082865715
Epoch: 61
Loss on hold-out set: 0.012160382484300779
MeanAbsoluteError value on hold-out data: 0.08909682184457779
Epoch: 62
Loss on hold-out set: 0.011796484164033946
MeanAbsoluteError value on hold-out data: 0.08749110251665115
Epoch: 63

Loss on hold-out set: 0.011975437904206606
MeanAbsoluteError value on hold-out data: 0.08780727535486221
Epoch: 64

Loss on hold-out set: 0.012459474938133588
MeanAbsoluteError value on hold-out data: 0.08890450745820999
Epoch: 65
Loss on hold-out set: 0.011775898603865733
MeanAbsoluteError value on hold-out data: 0.08634188026189804
Epoch: 66
Loss on hold-out set: 0.011693736359190483
MeanAbsoluteError value on hold-out data: 0.08596345037221909
Epoch: 67
Loss on hold-out set: 0.011436198694774738
MeanAbsoluteError value on hold-out data: 0.08490323275327682
Epoch: 68
Loss on hold-out set: 0.011300881697724644
MeanAbsoluteError value on hold-out data: 0.08457998931407928
Epoch: 69
Loss on hold-out set: 0.010775120678142859
MeanAbsoluteError value on hold-out data: 0.08333015441894531
Epoch: 70

Loss on hold-out set: 0.010330770809489947
MeanAbsoluteError value on hold-out data: 0.08220499753952026
Epoch: 71
```

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Loss on hold-out set: 0.010513143309463676
MeanAbsoluteError value on hold-out data: 0.081989586353302
Epoch: 72
Loss on hold-out set: 0.01029156857671646
MeanAbsoluteError value on hold-out data: 0.08121489733457565
Epoch: 73
Loss on hold-out set: 0.009841585307955168
MeanAbsoluteError value on hold-out data: 0.08058610558509827
Epoch: 74
Loss on hold-out set: 0.009795815451070666
MeanAbsoluteError value on hold-out data: 0.07958131283521652
Epoch: 75
Loss on hold-out set: 0.009886614566382308
MeanAbsoluteError value on hold-out data: 0.07873862981796265
Epoch: 76
Loss on hold-out set: 0.009452243586285757
MeanAbsoluteError value on hold-out data: 0.07804328948259354
Epoch: 77

Loss on hold-out set: 0.009290668065659702
MeanAbsoluteError value on hold-out data: 0.07741420716047287
Epoch: 78

Loss on hold-out set: 0.00969722494482994
MeanAbsoluteError value on hold-out data: 0.07649128884077072
Epoch: 79
Loss on hold-out set: 0.009085654639280759
MeanAbsoluteError value on hold-out data: 0.0758659616112709
Epoch: 80
Loss on hold-out set: 0.009621184140157241
MeanAbsoluteError value on hold-out data: 0.07544901967048645
Epoch: 81
Loss on hold-out set: 0.008565381894676158
MeanAbsoluteError value on hold-out data: 0.07433391362428665
Epoch: 82
Loss on hold-out set: 0.008589696783858996
MeanAbsoluteError value on hold-out data: 0.0736996978521347
Epoch: 83
Loss on hold-out set: 0.008573755586089997
MeanAbsoluteError value on hold-out data: 0.07282815128564835
Epoch: 84
```

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Loss on hold-out set: 0.008373430142035851
MeanAbsoluteError value on hold-out data: 0.07205279171466827
Epoch: 85

Loss on hold-out set: 0.00816235918766604
MeanAbsoluteError value on hold-out data: 0.07133395224809647
Epoch: 86
Loss on hold-out set: 0.007796527987990815
MeanAbsoluteError value on hold-out data: 0.07074421644210815
Epoch: 87
Loss on hold-out set: 0.008567006309301807
MeanAbsoluteError value on hold-out data: 0.06904344260692596
Epoch: 88
Loss on hold-out set: 0.007866541299825678
MeanAbsoluteError value on hold-out data: 0.0696057677268982
Epoch: 89
Loss on hold-out set: 0.007622180202116187
MeanAbsoluteError value on hold-out data: 0.06839030981063843
Epoch: 90
Loss on hold-out set: 0.007574550932846391
MeanAbsoluteError value on hold-out data: 0.06765322387218475
Epoch: 91

Loss on hold-out set: 0.008475043345242739
MeanAbsoluteError value on hold-out data: 0.067019984126091
Epoch: 92

Loss on hold-out set: 0.007206871496656766
MeanAbsoluteError value on hold-out data: 0.06652810424566269
Epoch: 93
Loss on hold-out set: 0.007148185870251977
MeanAbsoluteError value on hold-out data: 0.06700694561004639
Epoch: 94
Loss on hold-out set: 0.0068639721363209765
MeanAbsoluteError value on hold-out data: 0.06483471393585205
Epoch: 95
Loss on hold-out set: 0.007383804419077933
MeanAbsoluteError value on hold-out data: 0.06390261650085449
Epoch: 96
Loss on hold-out set: 0.006462522746565251
MeanAbsoluteError value on hold-out data: 0.06337621808052063
Epoch: 97
```

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Loss on hold-out set: 0.006197167345537589
MeanAbsoluteError value on hold-out data: 0.06242497265338898
Epoch: 98

Loss on hold-out set: 0.006284604565455363
MeanAbsoluteError value on hold-out data: 0.061732273548841476
Epoch: 99

Loss on hold-out set: 0.005946595132207641
MeanAbsoluteError value on hold-out data: 0.06114024296402931
Epoch: 100
Loss on hold-out set: 0.005891643124274337
MeanAbsoluteError value on hold-out data: 0.060250431299209595
Epoch: 101
Loss on hold-out set: 0.005891736041611204
MeanAbsoluteError value on hold-out data: 0.060163844376802444
Epoch: 102
Loss on hold-out set: 0.006058134344549706
MeanAbsoluteError value on hold-out data: 0.05924970656633377
Epoch: 103
Loss on hold-out set: 0.0053864215823033685
MeanAbsoluteError value on hold-out data: 0.05824171006679535
Epoch: 104
Loss on hold-out set: 0.005250378941687254
MeanAbsoluteError value on hold-out data: 0.05789356306195259
Epoch: 105

Loss on hold-out set: 0.005711946914044137
MeanAbsoluteError value on hold-out data: 0.05662652850151062
Epoch: 106

Loss on hold-out set: 0.005187778393379771
MeanAbsoluteError value on hold-out data: 0.055849503725767136
Epoch: 107
Loss on hold-out set: 0.0048520748610966485
MeanAbsoluteError value on hold-out data: 0.0558171309530735
Epoch: 108
Loss on hold-out set: 0.004751941977212062
MeanAbsoluteError value on hold-out data: 0.05513899400830269
Epoch: 109
Loss on hold-out set: 0.004614667993826935
```

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MeanAbsoluteError value on hold-out data: 0.0544453002512455
Epoch: 110
Loss on hold-out set: 0.004672033980918618
MeanAbsoluteError value on hold-out data: 0.054708581417798996
Epoch: 111
Loss on hold-out set: 0.004608806831618914
MeanAbsoluteError value on hold-out data: 0.05330773442983627
Epoch: 112

Loss on hold-out set: 0.004648069600359752
MeanAbsoluteError value on hold-out data: 0.051479581743478775
Epoch: 113

Loss on hold-out set: 0.004434923704068821
MeanAbsoluteError value on hold-out data: 0.05188790708780289
Epoch: 114
Loss on hold-out set: 0.004080914793750987
MeanAbsoluteError value on hold-out data: 0.050913047045469284
Epoch: 115
Loss on hold-out set: 0.003957337874453515
MeanAbsoluteError value on hold-out data: 0.04990530386567116
Epoch: 116
Loss on hold-out set: 0.0038619908020616723
MeanAbsoluteError value on hold-out data: 0.04897746443748474
Epoch: 117
Loss on hold-out set: 0.003685765286298612
MeanAbsoluteError value on hold-out data: 0.04819229990243912
Epoch: 118
Loss on hold-out set: 0.003570086251084621
MeanAbsoluteError value on hold-out data: 0.04729783162474632
Epoch: 119

Loss on hold-out set: 0.003426824651586895
MeanAbsoluteError value on hold-out data: 0.04672321304678917
Epoch: 120

Loss on hold-out set: 0.004078969780284052
MeanAbsoluteError value on hold-out data: 0.04855668172240257
Epoch: 121
Loss on hold-out set: 0.0032860852885418213
MeanAbsoluteError value on hold-out data: 0.04529883340001106
```

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Epoch: 122
Loss on hold-out set: 0.003089056806997038
MeanAbsoluteError value on hold-out data: 0.04465416818857193
Epoch: 123
Loss on hold-out set: 0.003043750059217788
MeanAbsoluteError value on hold-out data: 0.043650273233652115
Epoch: 124
Loss on hold-out set: 0.0029140441911295056
MeanAbsoluteError value on hold-out data: 0.04319941997528076
Epoch: 125
Loss on hold-out set: 0.0029870129387395885
MeanAbsoluteError value on hold-out data: 0.04311761260032654
Epoch: 126

Loss on hold-out set: 0.0027909400747515834
MeanAbsoluteError value on hold-out data: 0.04136306419968605
Epoch: 127

Loss on hold-out set: 0.002645429465561532
MeanAbsoluteError value on hold-out data: 0.041692569851875305
Epoch: 128
Loss on hold-out set: 0.0025396553011467825
MeanAbsoluteError value on hold-out data: 0.04009536653757095
Epoch: 129
Loss on hold-out set: 0.0024118597278944575
MeanAbsoluteError value on hold-out data: 0.03837907686829567
Epoch: 130
Loss on hold-out set: 0.002327003158055819
MeanAbsoluteError value on hold-out data: 0.03847073018550873
Epoch: 131
Loss on hold-out set: 0.0023451045585366394
MeanAbsoluteError value on hold-out data: 0.03800695016980171
Epoch: 132
Loss on hold-out set: 0.0023675606666634288
MeanAbsoluteError value on hold-out data: 0.03690566122531891
Epoch: 133

Loss on hold-out set: 0.002213239517564384
MeanAbsoluteError value on hold-out data: 0.03619397059082985
Epoch: 134
```

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Loss on hold-out set: 0.0019583281335564186
MeanAbsoluteError value on hold-out data: 0.03573547676205635
Epoch: 135
Loss on hold-out set: 0.001932564487036031
MeanAbsoluteError value on hold-out data: 0.03535783663392067
Epoch: 136
Loss on hold-out set: 0.0017842579265841497
MeanAbsoluteError value on hold-out data: 0.03416745364665985
Epoch: 137
Loss on hold-out set: 0.0018231773462433082
MeanAbsoluteError value on hold-out data: 0.03318868577480316
Epoch: 138
Loss on hold-out set: 0.001835535137126079
MeanAbsoluteError value on hold-out data: 0.03269292041659355
Epoch: 139
Loss on hold-out set: 0.0015944145673599938
MeanAbsoluteError value on hold-out data: 0.03165695071220398
Epoch: 140

Loss on hold-out set: 0.0019854656823624214
MeanAbsoluteError value on hold-out data: 0.032604482024908066
Epoch: 141

Loss on hold-out set: 0.0014657643668425197
MeanAbsoluteError value on hold-out data: 0.031202007085084915
Epoch: 142
Loss on hold-out set: 0.0013589300125694047
MeanAbsoluteError value on hold-out data: 0.029714561998844147
Epoch: 143
Loss on hold-out set: 0.0012877078708977653
MeanAbsoluteError value on hold-out data: 0.028559567406773567
Epoch: 144
Loss on hold-out set: 0.0011876385229138227
MeanAbsoluteError value on hold-out data: 0.02808918058872223
Epoch: 145
Loss on hold-out set: 0.0011276831792201847
MeanAbsoluteError value on hold-out data: 0.027391133829951286
Epoch: 146
Loss on hold-out set: 0.0011137310603561883
MeanAbsoluteError value on hold-out data: 0.026722107082605362
Epoch: 147
```

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Loss on hold-out set: 0.0010656736603078
MeanAbsoluteError value on hold-out data: 0.025440316647291183
Epoch: 148

Loss on hold-out set: 0.0009451829246245325
MeanAbsoluteError value on hold-out data: 0.0246929619461298
Epoch: 149
Loss on hold-out set: 0.0009181573225830037
MeanAbsoluteError value on hold-out data: 0.02388504333794117
Epoch: 150
Loss on hold-out set: 0.0008344135153143165
MeanAbsoluteError value on hold-out data: 0.022982120513916016
Epoch: 151
Loss on hold-out set: 0.0007500572856560422
MeanAbsoluteError value on hold-out data: 0.02264811098575592
Epoch: 152
Loss on hold-out set: 0.0007252912630344956
MeanAbsoluteError value on hold-out data: 0.021825628355145454
Epoch: 153
Loss on hold-out set: 0.0006581148347602441
MeanAbsoluteError value on hold-out data: 0.020542901009321213
Epoch: 154

Loss on hold-out set: 0.0006041933509270445
MeanAbsoluteError value on hold-out data: 0.020080870017409325
Epoch: 155

Loss on hold-out set: 0.0005607507191598415
MeanAbsoluteError value on hold-out data: 0.019290007650852203
Epoch: 156
Loss on hold-out set: 0.0005070154774540032
MeanAbsoluteError value on hold-out data: 0.018326343968510628
Epoch: 157
Loss on hold-out set: 0.0004796883115956846
MeanAbsoluteError value on hold-out data: 0.017491858452558517
Epoch: 158
Loss on hold-out set: 0.00042178203651789005
MeanAbsoluteError value on hold-out data: 0.016688218340277672
Epoch: 159
Loss on hold-out set: 0.00041056158527051314
MeanAbsoluteError value on hold-out data: 0.016192113980650902
Epoch: 160
```

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Loss on hold-out set: 0.0003731347600338407
MeanAbsoluteError value on hold-out data: 0.01563282683491707
Epoch: 161

Loss on hold-out set: 0.000326336725265719
MeanAbsoluteError value on hold-out data: 0.014746990986168385
Epoch: 162

Loss on hold-out set: 0.0002908081458791947
MeanAbsoluteError value on hold-out data: 0.0137709341943264
Epoch: 163
Loss on hold-out set: 0.0002704530443924551
MeanAbsoluteError value on hold-out data: 0.01338623184710741
Epoch: 164
Loss on hold-out set: 0.0002408102445770055
MeanAbsoluteError value on hold-out data: 0.012260730378329754
Epoch: 165
Loss on hold-out set: 0.00020223278219278794
MeanAbsoluteError value on hold-out data: 0.011490617878735065
Epoch: 166
Loss on hold-out set: 0.00017975038365246012
MeanAbsoluteError value on hold-out data: 0.01088340301066637
Epoch: 167
Loss on hold-out set: 0.00015452160620882822
MeanAbsoluteError value on hold-out data: 0.010003686882555485
Epoch: 168

Loss on hold-out set: 0.00013416166257229634
MeanAbsoluteError value on hold-out data: 0.009210827760398388
Epoch: 169

Loss on hold-out set: 0.00013070426362341654
MeanAbsoluteError value on hold-out data: 0.008967723697423935
Epoch: 170
Loss on hold-out set: 9.441182163964886e-05
MeanAbsoluteError value on hold-out data: 0.00780981732532382
Epoch: 171
Loss on hold-out set: 8.228235226572276e-05
MeanAbsoluteError value on hold-out data: 0.007177187129855156
Epoch: 172
Loss on hold-out set: 8.47258971379443e-05
```

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MeanAbsoluteError value on hold-out data: 0.0066846455447375774
Epoch: 173
Loss on hold-out set: 5.6676801810121666e-05
MeanAbsoluteError value on hold-out data: 0.005904245190322399
Epoch: 174
Loss on hold-out set: 0.004912102185838963
MeanAbsoluteError value on hold-out data: 0.012359362095594406
Epoch: 175

Loss on hold-out set: 5.7730162237791e-05
MeanAbsoluteError value on hold-out data: 0.005892603192478418
Epoch: 176

Loss on hold-out set: 4.593610027278863e-05
MeanAbsoluteError value on hold-out data: 0.005137087311595678
Epoch: 177
Loss on hold-out set: 3.786114190846162e-05
MeanAbsoluteError value on hold-out data: 0.00460140872746706
Epoch: 178
Loss on hold-out set: 3.258859347764743e-05
MeanAbsoluteError value on hold-out data: 0.004176593851298094
Epoch: 179
Loss on hold-out set: 2.7497720111568924e-05
MeanAbsoluteError value on hold-out data: 0.0036993243265897036
Epoch: 180
Loss on hold-out set: 2.3665790929673956e-05
MeanAbsoluteError value on hold-out data: 0.0032613947987556458
Epoch: 181
Loss on hold-out set: 1.9432563826390273e-05
MeanAbsoluteError value on hold-out data: 0.0029766031075268984
Epoch: 182

Loss on hold-out set: 3.312525317456815e-05
MeanAbsoluteError value on hold-out data: 0.003240503603592515
Epoch: 183

Loss on hold-out set: 1.4763824695434709e-05
MeanAbsoluteError value on hold-out data: 0.002582893706858158
Epoch: 184
Loss on hold-out set: 1.1641729455592353e-05
MeanAbsoluteError value on hold-out data: 0.0021460852585732937
```

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Epoch: 185
Loss on hold-out set: 2.8012511882899653e-05
MeanAbsoluteError value on hold-out data: 0.004612329415977001
Epoch: 186
Loss on hold-out set: 0.0006535549350438977
MeanAbsoluteError value on hold-out data: 0.004282521083950996
Epoch: 187
Loss on hold-out set: 8.073397356593678e-06
MeanAbsoluteError value on hold-out data: 0.001665007439441979
Epoch: 188
Loss on hold-out set: 6.7176657125855854e-06
MeanAbsoluteError value on hold-out data: 0.0014124555746093392
Epoch: 189

Loss on hold-out set: 5.9792748262365285e-06
MeanAbsoluteError value on hold-out data: 0.0012818805407732725
Epoch: 190

Loss on hold-out set: 5.187613881984222e-06
MeanAbsoluteError value on hold-out data: 0.0011944032739847898
Epoch: 191
Loss on hold-out set: 5.726123163185548e-06
MeanAbsoluteError value on hold-out data: 0.0011658488074317575
Epoch: 192
Loss on hold-out set: 5.289336854730209e-06
MeanAbsoluteError value on hold-out data: 0.0012334822677075863
Epoch: 193
Loss on hold-out set: 8.780506662403171e-06
MeanAbsoluteError value on hold-out data: 0.002184565644711256
Epoch: 194
Loss on hold-out set: 0.0005687485736503872
MeanAbsoluteError value on hold-out data: 0.0037396056577563286
Epoch: 195
Loss on hold-out set: 7.643096567405268e-06
MeanAbsoluteError value on hold-out data: 0.0013793354155495763
Epoch: 196

Loss on hold-out set: 6.491016322867766e-06
MeanAbsoluteError value on hold-out data: 0.0012773864436894655
Epoch: 197
```

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Loss on hold-out set: 8.718114258954301e-06
MeanAbsoluteError value on hold-out data: 0.0021953850518912077
Epoch: 198
Loss on hold-out set: 4.699185423690394e-06
MeanAbsoluteError value on hold-out data: 0.0011665801284834743
Epoch: 199
Loss on hold-out set: 4.054987755353068e-06
MeanAbsoluteError value on hold-out data: 0.001016181893646717
Epoch: 200
Loss on hold-out set: 4.497695928106483e-06
MeanAbsoluteError value on hold-out data: 0.001036968664266169
Epoch: 201
Loss on hold-out set: 4.25458758111465e-06
MeanAbsoluteError value on hold-out data: 0.0010143949184566736
Epoch: 202
Loss on hold-out set: 8.836261188732282e-06
MeanAbsoluteError value on hold-out data: 0.0021931070368736982
Epoch: 203

Loss on hold-out set: 0.006665506635661482
MeanAbsoluteError value on hold-out data: 0.009242143481969833
Epoch: 204

Loss on hold-out set: 3.7008537674410036e-06
MeanAbsoluteError value on hold-out data: 0.0009308442240580916
Epoch: 205
Loss on hold-out set: 3.4528305482476403e-06
MeanAbsoluteError value on hold-out data: 0.0009338099043816328
Epoch: 206
Loss on hold-out set: 3.1224251918397035e-06
MeanAbsoluteError value on hold-out data: 0.0009122909395955503
Epoch: 207
Loss on hold-out set: 9.42838344231999e-06
MeanAbsoluteError value on hold-out data: 0.001354225561954081
Epoch: 208
Loss on hold-out set: 7.811391290383304e-06
MeanAbsoluteError value on hold-out data: 0.0011898480588570237
Epoch: 209
Loss on hold-out set: 0.0002632581765563093
MeanAbsoluteError value on hold-out data: 0.0027089735958725214
Epoch: 210
```

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Loss on hold-out set: 5.2495482612777356e-05
MeanAbsoluteError value on hold-out data: 0.007129014935344458
Epoch: 211

Loss on hold-out set: 5.9455894031019015e-06
MeanAbsoluteError value on hold-out data: 0.0010587864089757204
Epoch: 212
Loss on hold-out set: 5.910657110829421e-06
MeanAbsoluteError value on hold-out data: 0.0012552720727398992
Epoch: 213
Loss on hold-out set: 4.844712372267588e-06
MeanAbsoluteError value on hold-out data: 0.0010042734211310744
Epoch: 214
Loss on hold-out set: 5.2285460320980255e-06
MeanAbsoluteError value on hold-out data: 0.0010223367717117071
Epoch: 215
Loss on hold-out set: 5.394861342613065e-06
MeanAbsoluteError value on hold-out data: 0.0009833318181335926
Epoch: 216
Loss on hold-out set: 4.846811549441554e-06
MeanAbsoluteError value on hold-out data: 0.000959196244366467
Epoch: 217

Loss on hold-out set: 5.23268437947221e-06
MeanAbsoluteError value on hold-out data: 0.0009580384357832372
Epoch: 218

Loss on hold-out set: 4.388053991988272e-05
MeanAbsoluteError value on hold-out data: 0.0015791814075782895
Epoch: 219
Loss on hold-out set: 9.080979263077237e-05
MeanAbsoluteError value on hold-out data: 0.001846847590059042
Epoch: 220
Loss on hold-out set: 6.728111254862877e-06
MeanAbsoluteError value on hold-out data: 0.0009340700344182551
Epoch: 221
Loss on hold-out set: 3.449742675999145e-06
MeanAbsoluteError value on hold-out data: 0.0008949877228587866
Epoch: 222
Loss on hold-out set: 4.305471922914596e-06
MeanAbsoluteError value on hold-out data: 0.0011400709627196193
Epoch: 223
```

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Loss on hold-out set: 3.0764865904040143e-06
MeanAbsoluteError value on hold-out data: 0.0009102062904275954
Epoch: 224

Loss on hold-out set: 2.7071058048897194e-06
MeanAbsoluteError value on hold-out data: 0.0008699782192707062
Epoch: 225

Loss on hold-out set: 2.6365045405677497e-06
MeanAbsoluteError value on hold-out data: 0.0009323209524154663
Epoch: 226
Loss on hold-out set: 2.3574562664390005e-06
MeanAbsoluteError value on hold-out data: 0.000863791850861162
Epoch: 227
Loss on hold-out set: 2.18430592396474e-06
MeanAbsoluteError value on hold-out data: 0.0008510042680427432
Epoch: 228
Loss on hold-out set: 1.978136299822626e-06
MeanAbsoluteError value on hold-out data: 0.0008383263484574854
Epoch: 229
Loss on hold-out set: 2.667466511551398e-05
MeanAbsoluteError value on hold-out data: 0.0049553681164979935
Epoch: 230
Loss on hold-out set: 8.942301948221799e-06
MeanAbsoluteError value on hold-out data: 0.0014175379183143377
Epoch: 231

Loss on hold-out set: 8.166227508774262e-06
MeanAbsoluteError value on hold-out data: 0.001477908343076706
Epoch: 232

Loss on hold-out set: 5.5430241970428215e-06
MeanAbsoluteError value on hold-out data: 0.0010275660315528512
Epoch: 233
Loss on hold-out set: 4.944743982203083e-06
MeanAbsoluteError value on hold-out data: 0.0010264150332659483
Epoch: 234
Loss on hold-out set: 5.44438740217419e-06
MeanAbsoluteError value on hold-out data: 0.0011559579288586974
Epoch: 235
Loss on hold-out set: 0.0004142314394619881
```

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MeanAbsoluteError value on hold-out data: 0.003025870071724057
Epoch: 236
Loss on hold-out set: 9.528242309478139e-06
MeanAbsoluteError value on hold-out data: 0.0019879203755408525
Epoch: 237
Loss on hold-out set: 6.1480217451704584e-06
MeanAbsoluteError value on hold-out data: 0.0010662875138223171
Epoch: 238

Loss on hold-out set: 7.043733188101424e-06
MeanAbsoluteError value on hold-out data: 0.001057920278981328
Epoch: 239

Loss on hold-out set: 6.269349315656515e-06
MeanAbsoluteError value on hold-out data: 0.0010025713127106428
Epoch: 240
Loss on hold-out set: 5.646909379755436e-06
MeanAbsoluteError value on hold-out data: 0.0010266515891999006
Epoch: 241
Loss on hold-out set: 5.314485458886618e-06
MeanAbsoluteError value on hold-out data: 0.0010395480785518885
Epoch: 242
Loss on hold-out set: 5.5311182511384404e-06
MeanAbsoluteError value on hold-out data: 0.0009869165951386094
Epoch: 243
Loss on hold-out set: 4.7827679605479016e-06
MeanAbsoluteError value on hold-out data: 0.0009407392353750765
Epoch: 244
Loss on hold-out set: 0.00011747695831314349
MeanAbsoluteError value on hold-out data: 0.001999961445108056
Epoch: 245

Loss on hold-out set: 3.7175169587464134e-06
MeanAbsoluteError value on hold-out data: 0.0009427004843018949
Epoch: 246

Loss on hold-out set: 3.918597422205914e-06
MeanAbsoluteError value on hold-out data: 0.0009667742415331304
Epoch: 247
Loss on hold-out set: 3.526510546145381e-06
MeanAbsoluteError value on hold-out data: 0.0009945123456418514
```

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Epoch: 248
Loss on hold-out set: 0.006321273147648299
MeanAbsoluteError value on hold-out data: 0.009003646671772003
Epoch: 249
Loss on hold-out set: 8.754830765575696e-06
MeanAbsoluteError value on hold-out data: 0.0015038357814773917
Epoch: 250
Loss on hold-out set: 6.456928031840247e-06
MeanAbsoluteError value on hold-out data: 0.001073716557584703
Epoch: 251
Loss on hold-out set: 4.942611039601056e-05
MeanAbsoluteError value on hold-out data: 0.0020929044112563133
Epoch: 252

Loss on hold-out set: 9.378627878548356e-06
MeanAbsoluteError value on hold-out data: 0.001217819401063025
Epoch: 253

Loss on hold-out set: 1.1680417134567297e-05
MeanAbsoluteError value on hold-out data: 0.0013288622722029686
Epoch: 254
Loss on hold-out set: 9.43598356702051e-06
MeanAbsoluteError value on hold-out data: 0.0011970284394919872
Epoch: 255
Loss on hold-out set: 1.0438967636288838e-05
MeanAbsoluteError value on hold-out data: 0.0014042311813682318
Epoch: 256
Loss on hold-out set: 8.533464516893639e-06
MeanAbsoluteError value on hold-out data: 0.0011535489466041327
Epoch: 257
Loss on hold-out set: 9.58760273743582e-06
MeanAbsoluteError value on hold-out data: 0.0015774312196299434
Epoch: 258
Loss on hold-out set: 6.69247575702824e-06
MeanAbsoluteError value on hold-out data: 0.0010172419715672731
Epoch: 259

Loss on hold-out set: 1.1350864108058326e-05
MeanAbsoluteError value on hold-out data: 0.001210212241858244
Epoch: 260
```

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Loss on hold-out set: 9.623103105346112e-06
MeanAbsoluteError value on hold-out data: 0.0011848689755424857
Epoch: 261
Loss on hold-out set: 9.525566694124931e-06
MeanAbsoluteError value on hold-out data: 0.00138147606048733
Epoch: 262
Loss on hold-out set: 7.076859289484743e-06
MeanAbsoluteError value on hold-out data: 0.0010185160208493471
Epoch: 263
Loss on hold-out set: 6.148411038417669e-06
MeanAbsoluteError value on hold-out data: 0.0009952449472621083
Epoch: 264
Loss on hold-out set: 5.5011180436919785e-06
MeanAbsoluteError value on hold-out data: 0.0009735117782838643
Epoch: 265
Loss on hold-out set: 4.924964013770687e-06
MeanAbsoluteError value on hold-out data: 0.0009540492319501936
Epoch: 266

Loss on hold-out set: 5.000745440716296e-06
MeanAbsoluteError value on hold-out data: 0.001190419658087194
Epoch: 267

Loss on hold-out set: 4.87913211180477e-06
MeanAbsoluteError value on hold-out data: 0.001293721841648221
Epoch: 268
Loss on hold-out set: 3.89744433758866e-06
MeanAbsoluteError value on hold-out data: 0.0009298314107581973
Epoch: 269
Loss on hold-out set: 3.2327142163852e-06
MeanAbsoluteError value on hold-out data: 0.0009475339902564883
Epoch: 270
Loss on hold-out set: 6.7951148139400175e-06
MeanAbsoluteError value on hold-out data: 0.0022146147675812244
Epoch: 271
Loss on hold-out set: 2.5760324302399777e-06
MeanAbsoluteError value on hold-out data: 0.00093598454259336
Epoch: 272
Loss on hold-out set: 2.6402613483556847e-06
MeanAbsoluteError value on hold-out data: 0.001012977329082787
Epoch: 273
```

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Loss on hold-out set: 6.944284404670935e-05
MeanAbsoluteError value on hold-out data: 0.001667601871304214
Epoch: 274

Loss on hold-out set: 2.0551919988065492e-06
MeanAbsoluteError value on hold-out data: 0.000851406017318368
Epoch: 275
Loss on hold-out set: 1.7479689124509325e-06
MeanAbsoluteError value on hold-out data: 0.0008526828605681658
Epoch: 276
Loss on hold-out set: 2.760118377409526e-06
MeanAbsoluteError value on hold-out data: 0.0008930623298510909
Epoch: 277
Loss on hold-out set: 3.547814633118553e-06
MeanAbsoluteError value on hold-out data: 0.0010379968443885446
Epoch: 278
Loss on hold-out set: 8.933131119612462e-05
MeanAbsoluteError value on hold-out data: 0.00939984805881977
Epoch: 279
Loss on hold-out set: 7.7702927289745e-06
MeanAbsoluteError value on hold-out data: 0.001214824034832418
Epoch: 280

Loss on hold-out set: 6.794233085062073e-06
MeanAbsoluteError value on hold-out data: 0.0012887406628578901
Epoch: 281

Loss on hold-out set: 5.4761409055222776e-06
MeanAbsoluteError value on hold-out data: 0.000999683397822082
Epoch: 282
Loss on hold-out set: 1.334175894603854e-05
MeanAbsoluteError value on hold-out data: 0.0019881632179021835
Epoch: 283
Loss on hold-out set: 1.461702719150428e-05
MeanAbsoluteError value on hold-out data: 0.00152885471470654
Epoch: 284
Loss on hold-out set: 1.79487974841882e-05
MeanAbsoluteError value on hold-out data: 0.0026663190219551325
Epoch: 285
Loss on hold-out set: 1.6422793193599388e-05
MeanAbsoluteError value on hold-out data: 0.0025320874992758036
Epoch: 286
```

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Loss on hold-out set: 1.4089359959475936e-05
MeanAbsoluteError value on hold-out data: 0.0014832030283287168
Epoch: 287

Loss on hold-out set: 1.1760174437278272e-05
MeanAbsoluteError value on hold-out data: 0.0015977532602846622
Epoch: 288

Loss on hold-out set: 9.450529653612159e-06
MeanAbsoluteError value on hold-out data: 0.0011805465910583735
Epoch: 289
Loss on hold-out set: 8.25706076914055e-06
MeanAbsoluteError value on hold-out data: 0.0011226132046431303
Epoch: 290
Loss on hold-out set: 7.32724580879781e-06
MeanAbsoluteError value on hold-out data: 0.0011697077425196767
Epoch: 291
Loss on hold-out set: 6.527914842116354e-06
MeanAbsoluteError value on hold-out data: 0.0011525916634127498
Epoch: 292
Loss on hold-out set: 5.601944993626463e-06
MeanAbsoluteError value on hold-out data: 0.0010039235930889845
Epoch: 293
Loss on hold-out set: 9.03525357478849e-06
MeanAbsoluteError value on hold-out data: 0.0012712175957858562
Epoch: 294

Loss on hold-out set: 7.3780348438608944e-06
MeanAbsoluteError value on hold-out data: 0.001066716155037284
Epoch: 295

Loss on hold-out set: 6.211833404170018e-06
MeanAbsoluteError value on hold-out data: 0.00101070711389184
Epoch: 296
Loss on hold-out set: 5.47087154464302e-06
MeanAbsoluteError value on hold-out data: 0.0009945331839844584
Epoch: 297
Loss on hold-out set: 4.839048480894585e-06
MeanAbsoluteError value on hold-out data: 0.0010085802059620619
Epoch: 298
Loss on hold-out set: 4.1935679374861275e-06
```

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MeanAbsoluteError value on hold-out data: 0.0009298357181251049
Epoch: 299
Loss on hold-out set: 3.72904018447046e-06
MeanAbsoluteError value on hold-out data: 0.0009494320838712156
Epoch: 300
Loss on hold-out set: 3.3982048666285455e-06
MeanAbsoluteError value on hold-out data: 0.0009200203348882496
Epoch: 301

Loss on hold-out set: 3.20511572209188e-06
MeanAbsoluteError value on hold-out data: 0.0009279872756451368
Epoch: 302

Loss on hold-out set: 0.0002870168346607198
MeanAbsoluteError value on hold-out data: 0.008510790765285492
Epoch: 303
Loss on hold-out set: 6.509610060972521e-06
MeanAbsoluteError value on hold-out data: 0.0011117593385279179
Epoch: 304
Loss on hold-out set: 5.375282381254902e-06
MeanAbsoluteError value on hold-out data: 0.0010044424561783671
Epoch: 305
Loss on hold-out set: 8.25781288627835e-06
MeanAbsoluteError value on hold-out data: 0.0011071542976424098
Epoch: 306
Loss on hold-out set: 7.0970163057801565e-06
MeanAbsoluteError value on hold-out data: 0.0011017635697498918
Epoch: 307
Loss on hold-out set: 6.056435869193312e-06
MeanAbsoluteError value on hold-out data: 0.0009913896210491657
Epoch: 308

Loss on hold-out set: 5.3200099789417154e-06
MeanAbsoluteError value on hold-out data: 0.0009740620735101402
Epoch: 309

Loss on hold-out set: 0.00013777562706379214
MeanAbsoluteError value on hold-out data: 0.0022770953364670277
Epoch: 310
Loss on hold-out set: 6.785046545806276e-06
MeanAbsoluteError value on hold-out data: 0.0010345438495278358
```

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Epoch: 311
Loss on hold-out set: 5.641082120396627e-06
MeanAbsoluteError value on hold-out data: 0.0009731213795021176
Epoch: 312
Loss on hold-out set: 5.777163404620576e-06
MeanAbsoluteError value on hold-out data: 0.001079283538274467
Epoch: 313
Loss on hold-out set: 5.104021673000366e-06
MeanAbsoluteError value on hold-out data: 0.001093167345970869
Epoch: 314
Loss on hold-out set: 9.677153981941116e-06
MeanAbsoluteError value on hold-out data: 0.0021895719692111015
Epoch: 315

Loss on hold-out set: 6.84452682155377e-06
MeanAbsoluteError value on hold-out data: 0.001048109377734363
Epoch: 316

Loss on hold-out set: 5.872424981298798e-06
MeanAbsoluteError value on hold-out data: 0.000985493534244597
Epoch: 317
Loss on hold-out set: 1.500982867023245e-05
MeanAbsoluteError value on hold-out data: 0.003206685883924365
Epoch: 318
Loss on hold-out set: 4.883081806803182e-06
MeanAbsoluteError value on hold-out data: 0.0010621205437928438
Epoch: 319
Loss on hold-out set: 4.389714250079963e-06
MeanAbsoluteError value on hold-out data: 0.0011093314969912171
Epoch: 320
Loss on hold-out set: 1.1110225867783951e-05
MeanAbsoluteError value on hold-out data: 0.0013213411439210176
Epoch: 321
Loss on hold-out set: 1.0687731853172758e-05
MeanAbsoluteError value on hold-out data: 0.0014005532721057534
Epoch: 322

Loss on hold-out set: 9.030067071937363e-06
MeanAbsoluteError value on hold-out data: 0.0012236429611220956
Epoch: 323
```

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Loss on hold-out set: 1.0238420298509691e-05
MeanAbsoluteError value on hold-out data: 0.0011399653740227222
Epoch: 324
Loss on hold-out set: 0.00010822804838338785
MeanAbsoluteError value on hold-out data: 0.002094631316140294
Epoch: 325
Loss on hold-out set: 1.5191237812709565e-05
MeanAbsoluteError value on hold-out data: 0.0022520306520164013
Epoch: 326
Loss on hold-out set: 0.002534105063665274
MeanAbsoluteError value on hold-out data: 0.006274139974266291
Epoch: 327
Loss on hold-out set: 9.406695351816989e-06
MeanAbsoluteError value on hold-out data: 0.0012097246944904327
Epoch: 328
Loss on hold-out set: 8.079052400069906e-06
MeanAbsoluteError value on hold-out data: 0.0010732621885836124
Epoch: 329

Loss on hold-out set: 7.66525596199804e-06
MeanAbsoluteError value on hold-out data: 0.0010742205195128918
Epoch: 330

Loss on hold-out set: 6.854139096153981e-06
MeanAbsoluteError value on hold-out data: 0.001060785842128098
Epoch: 331
Loss on hold-out set: 5.713504064120711e-06
MeanAbsoluteError value on hold-out data: 0.0009949075756594539
Epoch: 332
Loss on hold-out set: 0.00031356183163430056
MeanAbsoluteError value on hold-out data: 0.002734497422352433
Epoch: 333
Loss on hold-out set: 4.616763078502117e-06
MeanAbsoluteError value on hold-out data: 0.0009537772857584059
Epoch: 334
Loss on hold-out set: 4.404996915879495e-06
MeanAbsoluteError value on hold-out data: 0.0009571826667524874
Epoch: 335
Loss on hold-out set: 4.318906414587568e-06
MeanAbsoluteError value on hold-out data: 0.0010534613393247128
Epoch: 336
```

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Loss on hold-out set: 3.74611151152329e-06
MeanAbsoluteError value on hold-out data: 0.0009174395818263292
Epoch: 337

Loss on hold-out set: 3.4544889571791896e-06
MeanAbsoluteError value on hold-out data: 0.000918397621717304
Epoch: 338
Loss on hold-out set: 3.1937106519727913e-06
MeanAbsoluteError value on hold-out data: 0.0009032271918840706
Epoch: 339
Loss on hold-out set: 1.2692404827528382e-05
MeanAbsoluteError value on hold-out data: 0.003256389871239662
Epoch: 340
Loss on hold-out set: 4.212326302877045e-06
MeanAbsoluteError value on hold-out data: 0.0010010936530306935
Epoch: 341
Loss on hold-out set: 0.003396731790707883
MeanAbsoluteError value on hold-out data: 0.006890332326292992
Epoch: 342
Loss on hold-out set: 3.58112952024105e-06
MeanAbsoluteError value on hold-out data: 0.0009968614904209971
Epoch: 343

Loss on hold-out set: 3.0218974897112416e-06
MeanAbsoluteError value on hold-out data: 0.0009368251194246113
Epoch: 344

Loss on hold-out set: 2.7807988833326535e-06
MeanAbsoluteError value on hold-out data: 0.0009096669964492321
Epoch: 345
Loss on hold-out set: 2.515952994249696e-06
MeanAbsoluteError value on hold-out data: 0.0009575852891430259
Epoch: 346
Loss on hold-out set: 2.6094993997433517e-06
MeanAbsoluteError value on hold-out data: 0.0009022068697959185
Epoch: 347
Loss on hold-out set: 7.076658496666473e-06
MeanAbsoluteError value on hold-out data: 0.0013196587096899748
Epoch: 348
Loss on hold-out set: 7.180106514134912e-06
MeanAbsoluteError value on hold-out data: 0.0013744139578193426
Epoch: 349
```

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Loss on hold-out set: 5.561302893616253e-06
MeanAbsoluteError value on hold-out data: 0.0009907230269163847
Epoch: 350

Loss on hold-out set: 4.831649863927641e-06
MeanAbsoluteError value on hold-out data: 0.0009439380373805761
Epoch: 351

Loss on hold-out set: 4.350510004349837e-06
MeanAbsoluteError value on hold-out data: 0.0009652352309785783
Epoch: 352
Loss on hold-out set: 3.897655596701427e-06
MeanAbsoluteError value on hold-out data: 0.0009302265825681388
Epoch: 353
Loss on hold-out set: 4.014713716479981e-06
MeanAbsoluteError value on hold-out data: 0.0010494499001652002
Epoch: 354
Loss on hold-out set: 3.409913990008835e-06
MeanAbsoluteError value on hold-out data: 0.0009186989045701921
Epoch: 355
Loss on hold-out set: 9.762013633007882e-06
MeanAbsoluteError value on hold-out data: 0.002728895517066121
Epoch: 356
Loss on hold-out set: 6.148244809677495e-06
MeanAbsoluteError value on hold-out data: 0.0013279728591442108
Epoch: 357

Loss on hold-out set: 4.685255397327217e-06
MeanAbsoluteError value on hold-out data: 0.0009734343038871884
Epoch: 358

Loss on hold-out set: 5.456222201981011e-06
MeanAbsoluteError value on hold-out data: 0.0010069741401821375
Epoch: 359
Loss on hold-out set: 0.0002331406468075469
MeanAbsoluteError value on hold-out data: 0.0024638434406369925
Epoch: 360
Loss on hold-out set: 0.005698379191812819
MeanAbsoluteError value on hold-out data: 0.008910920470952988
Epoch: 361
Loss on hold-out set: 8.167405641101e-06
```

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MeanAbsoluteError value on hold-out data: 0.0015967260114848614
Epoch: 362
Loss on hold-out set: 5.972739512134677e-06
MeanAbsoluteError value on hold-out data: 0.0010548107093200088
Epoch: 363
Loss on hold-out set: 5.4983814528406165e-06
MeanAbsoluteError value on hold-out data: 0.0010598280932754278
Epoch: 364

Loss on hold-out set: 6.769512935989042e-06
MeanAbsoluteError value on hold-out data: 0.0013973064487800002
Epoch: 365

Loss on hold-out set: 4.581662114315594e-06
MeanAbsoluteError value on hold-out data: 0.0009473547106608748
Epoch: 366
Loss on hold-out set: 4.7931930654298276e-06
MeanAbsoluteError value on hold-out data: 0.0015822510467842221
Epoch: 367
Loss on hold-out set: 6.660322758132399e-06
MeanAbsoluteError value on hold-out data: 0.001989379059523344
Epoch: 368
Loss on hold-out set: 2.8110593166712324e-06
MeanAbsoluteError value on hold-out data: 0.0009800015250220895
Epoch: 369
Loss on hold-out set: 2.9864890704035274e-06
MeanAbsoluteError value on hold-out data: 0.0011182095622643828
Epoch: 370
Loss on hold-out set: 2.3938222415591344e-06
MeanAbsoluteError value on hold-out data: 0.0009557880694046617
Epoch: 371

Loss on hold-out set: 2.4925549400205245e-06
MeanAbsoluteError value on hold-out data: 0.000945568666793406
Epoch: 372

Loss on hold-out set: 3.746685671593206e-05
MeanAbsoluteError value on hold-out data: 0.005742515437304974
Epoch: 373
Loss on hold-out set: 1.0635386900048616e-05
MeanAbsoluteError value on hold-out data: 0.001463371329009533
```

```
Epoch: 374
Loss on hold-out set: 3.645594453980895e-05
MeanAbsoluteError value on hold-out data: 0.005445363465696573
Epoch: 375
Loss on hold-out set: 1.4611694021701063e-05
MeanAbsoluteError value on hold-out data: 0.0015390136977657676
Epoch: 376
Loss on hold-out set: 1.2199051284894198e-05
MeanAbsoluteError value on hold-out data: 0.0013251591008156538
Epoch: 377
Loss on hold-out set: 1.9189610480470248e-05
MeanAbsoluteError value on hold-out data: 0.0013384238118305802
Epoch: 378

Loss on hold-out set: 1.3656759725003772e-05
MeanAbsoluteError value on hold-out data: 0.0022668910678476095
Epoch: 379

Loss on hold-out set: 0.0003376697210385898
MeanAbsoluteError value on hold-out data: 0.0030571066308766603
Epoch: 380
Loss on hold-out set: 1.2358149118741634e-05
MeanAbsoluteError value on hold-out data: 0.00212215818464756
Epoch: 381
Loss on hold-out set: 8.543499022222862e-06
MeanAbsoluteError value on hold-out data: 0.0011592404916882515
Epoch: 382
Loss on hold-out set: 1.8147266193689295e-05
MeanAbsoluteError value on hold-out data: 0.002770642749965191
Epoch: 383
Loss on hold-out set: 6.279274497973557e-06
MeanAbsoluteError value on hold-out data: 0.0010038455948233604
Epoch: 384
Loss on hold-out set: 5.685520352909197e-06
MeanAbsoluteError value on hold-out data: 0.0009882375597953796
Epoch: 385

Loss on hold-out set: 6.168214235038669e-06
MeanAbsoluteError value on hold-out data: 0.0010319891152903438
Epoch: 386
```

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Loss on hold-out set: 6.108441941530775e-06
MeanAbsoluteError value on hold-out data: 0.00142048136331141
Epoch: 387
Loss on hold-out set: 4.406544418928276e-06
MeanAbsoluteError value on hold-out data: 0.0010265647433698177
Epoch: 388
Loss on hold-out set: 4.008186909214391e-06
MeanAbsoluteError value on hold-out data: 0.0009936870774254203
Epoch: 389
Loss on hold-out set: 1.08931936805535e-05
MeanAbsoluteError value on hold-out data: 0.0025686633307486773
Epoch: 390
Loss on hold-out set: 9.3365054655036e-06
MeanAbsoluteError value on hold-out data: 0.0012528927763924003
Epoch: 391
Loss on hold-out set: 8.110275460309753e-06
MeanAbsoluteError value on hold-out data: 0.001229527173563838
Epoch: 392

Loss on hold-out set: 6.793471816133835e-06
MeanAbsoluteError value on hold-out data: 0.0010519783245399594
Epoch: 393

Loss on hold-out set: 6.112048362402115e-06
MeanAbsoluteError value on hold-out data: 0.001008139457553625
Epoch: 394
Loss on hold-out set: 6.285631535809864e-06
MeanAbsoluteError value on hold-out data: 0.0010439075995236635
Epoch: 395
Loss on hold-out set: 6.0046042755437575e-06
MeanAbsoluteError value on hold-out data: 0.0010429492685943842
Epoch: 396
Loss on hold-out set: 5.692536057302697e-06
MeanAbsoluteError value on hold-out data: 0.0009734848281368613
Epoch: 397
Loss on hold-out set: 5.197523006035436e-06
MeanAbsoluteError value on hold-out data: 0.0009675362962298095
Epoch: 398
Loss on hold-out set: 4.747910574783768e-06
MeanAbsoluteError value on hold-out data: 0.0009658227791078389
Epoch: 399
```

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Loss on hold-out set: 4.330637835892048e-06
MeanAbsoluteError value on hold-out data: 0.0009403671137988567
Epoch: 400

Loss on hold-out set: 4.043586718930433e-06
MeanAbsoluteError value on hold-out data: 0.0009357254020869732
Epoch: 401
Loss on hold-out set: 3.812927670966159e-06
MeanAbsoluteError value on hold-out data: 0.0009352356428280473
Epoch: 402
Loss on hold-out set: 2.8607353101506305e-05
MeanAbsoluteError value on hold-out data: 0.0016625348944216967
Epoch: 403
Loss on hold-out set: 2.7515153992506103e-06
MeanAbsoluteError value on hold-out data: 0.000936168129555881
Early stopping at epoch 402
Fold: 4
Epoch: 1
Loss on hold-out set: 0.17806081588451678
MeanAbsoluteError value on hold-out data: 0.38412243127822876
Epoch: 2
Loss on hold-out set: 0.15875412609714729
MeanAbsoluteError value on hold-out data: 0.35873863101005554
Epoch: 3

Loss on hold-out set: 0.1173518982071143
MeanAbsoluteError value on hold-out data: 0.3056930601596832
Epoch: 4

Loss on hold-out set: 0.07420886795108135
MeanAbsoluteError value on hold-out data: 0.22908809781074524
Epoch: 5
Loss on hold-out set: 0.04330011500188938
MeanAbsoluteError value on hold-out data: 0.16993317008018494
Epoch: 6
Loss on hold-out set: 0.032208179123699665
MeanAbsoluteError value on hold-out data: 0.1431708037853241
Epoch: 7
Loss on hold-out set: 0.026200388952230032
MeanAbsoluteError value on hold-out data: 0.1309855431318283
Epoch: 8
Loss on hold-out set: 0.026908763308221333
```

```
MeanAbsoluteError value on hold-out data: 0.1289423704147339
Epoch: 9
Loss on hold-out set: 0.0269815748772369
MeanAbsoluteError value on hold-out data: 0.1264791339635849
Epoch: 10

Loss on hold-out set: 0.025751373479859188
MeanAbsoluteError value on hold-out data: 0.1260857731103897
Epoch: 11

Loss on hold-out set: 0.024945023075605813
MeanAbsoluteError value on hold-out data: 0.12577739357948303
Epoch: 12
Loss on hold-out set: 0.026939783460245684
MeanAbsoluteError value on hold-out data: 0.12557485699653625
Epoch: 13
Loss on hold-out set: 0.025735430634365633
MeanAbsoluteError value on hold-out data: 0.12531086802482605
Epoch: 14
Loss on hold-out set: 0.025751460486879714
MeanAbsoluteError value on hold-out data: 0.12516213953495026
Epoch: 15
Loss on hold-out set: 0.0255401640270765
MeanAbsoluteError value on hold-out data: 0.12490099668502808
Epoch: 16
Loss on hold-out set: 0.024692513371029727
MeanAbsoluteError value on hold-out data: 0.12465277314186096
Epoch: 17

Loss on hold-out set: 0.02493699174374342
MeanAbsoluteError value on hold-out data: 0.12436525523662567
Epoch: 18

Loss on hold-out set: 0.024763435805932835
MeanAbsoluteError value on hold-out data: 0.12416192144155502
Epoch: 19
Loss on hold-out set: 0.024758126156834457
MeanAbsoluteError value on hold-out data: 0.12392141669988632
Epoch: 20
Loss on hold-out set: 0.027137110582911052
MeanAbsoluteError value on hold-out data: 0.12364796549081802
```

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Epoch: 21
Loss on hold-out set: 0.024093970119093474
MeanAbsoluteError value on hold-out data: 0.12338705360889435
Epoch: 22
Loss on hold-out set: 0.024547792272642255
MeanAbsoluteError value on hold-out data: 0.12238672375679016
Epoch: 23
Loss on hold-out set: 0.02473498429529942
MeanAbsoluteError value on hold-out data: 0.12288334220647812
Epoch: 24

Loss on hold-out set: 0.02412601191407213
MeanAbsoluteError value on hold-out data: 0.1225883886218071
Epoch: 25

Loss on hold-out set: 0.024496916108406507
MeanAbsoluteError value on hold-out data: 0.12223819643259048
Epoch: 26
Loss on hold-out set: 0.024539916202999078
MeanAbsoluteError value on hold-out data: 0.12199708074331284
Epoch: 27
Loss on hold-out set: 0.024660820213074867
MeanAbsoluteError value on hold-out data: 0.12170806527137756
Epoch: 28
Loss on hold-out set: 0.023639759836861722
MeanAbsoluteError value on hold-out data: 0.12133248150348663
Epoch: 29
Loss on hold-out set: 0.023917678385399856
MeanAbsoluteError value on hold-out data: 0.12105537205934525
Epoch: 30
Loss on hold-out set: 0.023452681238548115
MeanAbsoluteError value on hold-out data: 0.12067472189664841
Epoch: 31

Loss on hold-out set: 0.02361172867509035
MeanAbsoluteError value on hold-out data: 0.12045548111200333
Epoch: 32

Loss on hold-out set: 0.024811327421607878
MeanAbsoluteError value on hold-out data: 0.12022734433412552
Epoch: 33
```

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Loss on hold-out set: 0.02281540994030925
MeanAbsoluteError value on hold-out data: 0.11978581547737122
Epoch: 34
Loss on hold-out set: 0.02305914387285996
MeanAbsoluteError value on hold-out data: 0.11947285383939743
Epoch: 35
Loss on hold-out set: 0.02241076106348863
MeanAbsoluteError value on hold-out data: 0.11910506337881088
Epoch: 36
Loss on hold-out set: 0.02386317466600583
MeanAbsoluteError value on hold-out data: 0.11877372860908508
Epoch: 37
Loss on hold-out set: 0.022803197579028513
MeanAbsoluteError value on hold-out data: 0.11969223618507385
Epoch: 38

Loss on hold-out set: 0.022155345059358157
MeanAbsoluteError value on hold-out data: 0.11793383955955505
Epoch: 39

Loss on hold-out set: 0.023652065616960708
MeanAbsoluteError value on hold-out data: 0.11761055141687393
Epoch: 40
Loss on hold-out set: 0.022123376910503093
MeanAbsoluteError value on hold-out data: 0.11727306991815567
Epoch: 41
Loss on hold-out set: 0.022180901267207585
MeanAbsoluteError value on hold-out data: 0.11679168045520782
Epoch: 42
Loss on hold-out set: 0.021814592110996064
MeanAbsoluteError value on hold-out data: 0.11628998816013336
Epoch: 43
Loss on hold-out set: 0.02311253282599724
MeanAbsoluteError value on hold-out data: 0.11596876382827759
Epoch: 44
Loss on hold-out set: 0.023565890410771735
MeanAbsoluteError value on hold-out data: 0.1155674159526825
Epoch: 45

Loss on hold-out set: 0.021738002793147013
MeanAbsoluteError value on hold-out data: 0.1150292232632637
Epoch: 46
```

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Loss on hold-out set: 0.021138050879996557
MeanAbsoluteError value on hold-out data: 0.11454121768474579
Epoch: 47
Loss on hold-out set: 0.020593911642208695
MeanAbsoluteError value on hold-out data: 0.11408908665180206
Epoch: 48
Loss on hold-out set: 0.020945328180319987
MeanAbsoluteError value on hold-out data: 0.1135023981332779
Epoch: 49
Loss on hold-out set: 0.02051049732388212
MeanAbsoluteError value on hold-out data: 0.11308405548334122
Epoch: 50
Loss on hold-out set: 0.021642004748663075
MeanAbsoluteError value on hold-out data: 0.11264868825674057
Epoch: 51
Loss on hold-out set: 0.020005646878137037
MeanAbsoluteError value on hold-out data: 0.11211363971233368
Epoch: 52

Loss on hold-out set: 0.019981485433303393
MeanAbsoluteError value on hold-out data: 0.11159086227416992
Epoch: 53

Loss on hold-out set: 0.020380797903411664
MeanAbsoluteError value on hold-out data: 0.11120952665805817
Epoch: 54
Loss on hold-out set: 0.019500161109205622
MeanAbsoluteError value on hold-out data: 0.11066893488168716
Epoch: 55
Loss on hold-out set: 0.020884378669926755
MeanAbsoluteError value on hold-out data: 0.11015529930591583
Epoch: 56
Loss on hold-out set: 0.019708805753347967
MeanAbsoluteError value on hold-out data: 0.10973920673131943
Epoch: 57
Loss on hold-out set: 0.019446854157230027
MeanAbsoluteError value on hold-out data: 0.1091756597161293
Epoch: 58
Loss on hold-out set: 0.019397838184466727
MeanAbsoluteError value on hold-out data: 0.10865306854248047
Epoch: 59
```

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Loss on hold-out set: 0.018916184154267494
MeanAbsoluteError value on hold-out data: 0.10814200341701508
Epoch: 60

Loss on hold-out set: 0.018648825800762728
MeanAbsoluteError value on hold-out data: 0.10758721083402634
Epoch: 61
Loss on hold-out set: 0.018399662194916837
MeanAbsoluteError value on hold-out data: 0.10704252123832703
Epoch: 62
Loss on hold-out set: 0.01824723617531932
MeanAbsoluteError value on hold-out data: 0.10651358962059021
Epoch: 63
Loss on hold-out set: 0.01847263160519875
MeanAbsoluteError value on hold-out data: 0.10598795861005783
Epoch: 64
Loss on hold-out set: 0.0183625382084686
MeanAbsoluteError value on hold-out data: 0.10543707758188248
Epoch: 65
Loss on hold-out set: 0.01859029085160448
MeanAbsoluteError value on hold-out data: 0.10489428788423538
Epoch: 66

Loss on hold-out set: 0.017857105256273195
MeanAbsoluteError value on hold-out data: 0.10434523224830627
Epoch: 67

Loss on hold-out set: 0.0182817829414629
MeanAbsoluteError value on hold-out data: 0.10375107824802399
Epoch: 68
Loss on hold-out set: 0.017448059713038113
MeanAbsoluteError value on hold-out data: 0.1032162681221962
Epoch: 69
Loss on hold-out set: 0.017988753254310444
MeanAbsoluteError value on hold-out data: 0.10262571275234222
Epoch: 70
Loss on hold-out set: 0.017418295753976472
MeanAbsoluteError value on hold-out data: 0.10205747932195663
Epoch: 71
Loss on hold-out set: 0.01808235951914237
MeanAbsoluteError value on hold-out data: 0.10116339474916458
Epoch: 72
```

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Loss on hold-out set: 0.017341056516250737
MeanAbsoluteError value on hold-out data: 0.10089929401874542
Epoch: 73

Loss on hold-out set: 0.016329493660193223
MeanAbsoluteError value on hold-out data: 0.10029752552509308
Epoch: 74

Loss on hold-out set: 0.015854823098589595
MeanAbsoluteError value on hold-out data: 0.0988139733672142
Epoch: 75
Loss on hold-out set: 0.015928544892141454
MeanAbsoluteError value on hold-out data: 0.09913379698991776
Epoch: 76
Loss on hold-out set: 0.01578973964429819
MeanAbsoluteError value on hold-out data: 0.09850575774908066
Epoch: 77
Loss on hold-out set: 0.015543870018938413
MeanAbsoluteError value on hold-out data: 0.09797924757003784
Epoch: 78
Loss on hold-out set: 0.01574372321080703
MeanAbsoluteError value on hold-out data: 0.09732073545455933
Epoch: 79
Loss on hold-out set: 0.015154579403595282
MeanAbsoluteError value on hold-out data: 0.09673713892698288
Epoch: 80

Loss on hold-out set: 0.01577287890876715
MeanAbsoluteError value on hold-out data: 0.0961897000670433
Epoch: 81

Loss on hold-out set: 0.015603199887734193
MeanAbsoluteError value on hold-out data: 0.09572918713092804
Epoch: 82
Loss on hold-out set: 0.015047700144350529
MeanAbsoluteError value on hold-out data: 0.09520459175109863
Epoch: 83
Loss on hold-out set: 0.014379094247348033
MeanAbsoluteError value on hold-out data: 0.09447812288999557
Epoch: 84
Loss on hold-out set: 0.014634848643953983
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MeanAbsoluteError value on hold-out data: 0.09393233060836792
Epoch: 85
Loss on hold-out set: 0.014835924268341981
MeanAbsoluteError value on hold-out data: 0.09328621625900269
Epoch: 86
Loss on hold-out set: 0.013820696192292066
MeanAbsoluteError value on hold-out data: 0.09262190759181976
Epoch: 87

Loss on hold-out set: 0.013549967095828973
MeanAbsoluteError value on hold-out data: 0.09196999669075012
Epoch: 88

Loss on hold-out set: 0.014178130113018246
MeanAbsoluteError value on hold-out data: 0.09136612713336945
Epoch: 89
Loss on hold-out set: 0.013151065195695711
MeanAbsoluteError value on hold-out data: 0.09087524563074112
Epoch: 90
Loss on hold-out set: 0.012977493783602348
MeanAbsoluteError value on hold-out data: 0.09023749083280563
Epoch: 91
Loss on hold-out set: 0.012777249973553877
MeanAbsoluteError value on hold-out data: 0.08967161178588867
Epoch: 92
Loss on hold-out set: 0.012438386651830604
MeanAbsoluteError value on hold-out data: 0.08900033682584763
Epoch: 93
Loss on hold-out set: 0.012470033198881608
MeanAbsoluteError value on hold-out data: 0.08860570192337036
Epoch: 94

Loss on hold-out set: 0.012691695064019699
MeanAbsoluteError value on hold-out data: 0.08785758912563324
Epoch: 95

Loss on hold-out set: 0.012726838521372814
MeanAbsoluteError value on hold-out data: 0.0870981439948082
Epoch: 96
Loss on hold-out set: 0.011899015615479304
MeanAbsoluteError value on hold-out data: 0.08652091771364212
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Epoch: 97
Loss on hold-out set: 0.012119960290594744
MeanAbsoluteError value on hold-out data: 0.08618367463350296
Epoch: 98
Loss on hold-out set: 0.011603500335835494
MeanAbsoluteError value on hold-out data: 0.08533158153295517
Epoch: 99
Loss on hold-out set: 0.011780575956576146
MeanAbsoluteError value on hold-out data: 0.08383221924304962
Epoch: 100
Loss on hold-out set: 0.01153561517667885
MeanAbsoluteError value on hold-out data: 0.08428604900836945
Epoch: 101

Loss on hold-out set: 0.011571579003849855
MeanAbsoluteError value on hold-out data: 0.08356235176324844
Epoch: 102

Loss on hold-out set: 0.011220660168104447
MeanAbsoluteError value on hold-out data: 0.08291250467300415
Epoch: 103
Loss on hold-out set: 0.010888204587480197
MeanAbsoluteError value on hold-out data: 0.08227522671222687
Epoch: 104
Loss on hold-out set: 0.01079236723196048
MeanAbsoluteError value on hold-out data: 0.08161953091621399
Epoch: 105
Loss on hold-out set: 0.010948633237813529
MeanAbsoluteError value on hold-out data: 0.08122038841247559
Epoch: 106
Loss on hold-out set: 0.010269377917910997
MeanAbsoluteError value on hold-out data: 0.08054414391517639
Epoch: 107
Loss on hold-out set: 0.010163252062809009
MeanAbsoluteError value on hold-out data: 0.08009504526853561
Epoch: 108

Loss on hold-out set: 0.010130282598905839
MeanAbsoluteError value on hold-out data: 0.07928084582090378
Epoch: 109
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Loss on hold-out set: 0.009657531367758146
MeanAbsoluteError value on hold-out data: 0.07835021615028381
Epoch: 110
Loss on hold-out set: 0.009488292575742189
MeanAbsoluteError value on hold-out data: 0.07780265063047409
Epoch: 111
Loss on hold-out set: 0.009413267575347653
MeanAbsoluteError value on hold-out data: 0.0772395059466362
Epoch: 112
Loss on hold-out set: 0.009238435224128457
MeanAbsoluteError value on hold-out data: 0.07641706615686417
Epoch: 113
Loss on hold-out set: 0.008927204538709842
MeanAbsoluteError value on hold-out data: 0.07579557597637177
Epoch: 114
Loss on hold-out set: 0.008925071004061745
MeanAbsoluteError value on hold-out data: 0.0752670019865036
Epoch: 115

Loss on hold-out set: 0.008908778787232362
MeanAbsoluteError value on hold-out data: 0.07480286806821823
Epoch: 116

Loss on hold-out set: 0.008451253211555572
MeanAbsoluteError value on hold-out data: 0.07395032048225403
Epoch: 117
Loss on hold-out set: 0.008222280607487146
MeanAbsoluteError value on hold-out data: 0.07325757294893265
Epoch: 118
Loss on hold-out set: 0.008470557164400816
MeanAbsoluteError value on hold-out data: 0.0727294459939003
Epoch: 119
Loss on hold-out set: 0.008196179987862706
MeanAbsoluteError value on hold-out data: 0.0721137523651123
Epoch: 120
Loss on hold-out set: 0.008008755430077704
MeanAbsoluteError value on hold-out data: 0.0717473030090332
Epoch: 121
Loss on hold-out set: 0.007970075248382412
MeanAbsoluteError value on hold-out data: 0.07067248225212097
Epoch: 122
```

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Loss on hold-out set: 0.007577442564070225
MeanAbsoluteError value on hold-out data: 0.07013354450464249
Epoch: 123

Loss on hold-out set: 0.00771865017640476
MeanAbsoluteError value on hold-out data: 0.06946749985218048
Epoch: 124
Loss on hold-out set: 0.007971565131671153
MeanAbsoluteError value on hold-out data: 0.06873288750648499
Epoch: 125
Loss on hold-out set: 0.007705266650121372
MeanAbsoluteError value on hold-out data: 0.06828885525465012
Epoch: 126
Loss on hold-out set: 0.007711404540504401
MeanAbsoluteError value on hold-out data: 0.06762360781431198
Epoch: 127
Loss on hold-out set: 0.007005355822352262
MeanAbsoluteError value on hold-out data: 0.06695882976055145
Epoch: 128
Loss on hold-out set: 0.006950769788370683
MeanAbsoluteError value on hold-out data: 0.06587762385606766
Epoch: 129

Loss on hold-out set: 0.0069792729157667896
MeanAbsoluteError value on hold-out data: 0.06699830293655396
Epoch: 130

Loss on hold-out set: 0.007001077881656014
MeanAbsoluteError value on hold-out data: 0.06504198163747787
Epoch: 131
Loss on hold-out set: 0.006927606381046085
MeanAbsoluteError value on hold-out data: 0.06442031264305115
Epoch: 132
Loss on hold-out set: 0.006481265080555414
MeanAbsoluteError value on hold-out data: 0.06390083581209183
Epoch: 133
Loss on hold-out set: 0.007130434951530053
MeanAbsoluteError value on hold-out data: 0.06566707789897919
Epoch: 134
Loss on hold-out set: 0.006208324715351829
MeanAbsoluteError value on hold-out data: 0.06259015202522278
Epoch: 135
```

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Loss on hold-out set: 0.006406696593890397
MeanAbsoluteError value on hold-out data: 0.06181449815630913
Epoch: 136

Loss on hold-out set: 0.005845100905459661
MeanAbsoluteError value on hold-out data: 0.06113898754119873
Epoch: 137

Loss on hold-out set: 0.005791444653788438
MeanAbsoluteError value on hold-out data: 0.060519989579916
Epoch: 138
Loss on hold-out set: 0.005569148593797133
MeanAbsoluteError value on hold-out data: 0.059815116226673126
Epoch: 139
Loss on hold-out set: 0.005764577000473554
MeanAbsoluteError value on hold-out data: 0.05938554182648659
Epoch: 140
Loss on hold-out set: 0.005419195038624681
MeanAbsoluteError value on hold-out data: 0.05867207422852516
Epoch: 141
Loss on hold-out set: 0.00542978926275212
MeanAbsoluteError value on hold-out data: 0.05811263248324394
Epoch: 142
Loss on hold-out set: 0.005275629523496788
MeanAbsoluteError value on hold-out data: 0.05766940116882324
Epoch: 143

Loss on hold-out set: 0.005233852783791148
MeanAbsoluteError value on hold-out data: 0.05682000517845154
Epoch: 144

Loss on hold-out set: 0.005212753249977071
MeanAbsoluteError value on hold-out data: 0.05665378272533417
Epoch: 145
Loss on hold-out set: 0.004906610111132837
MeanAbsoluteError value on hold-out data: 0.05576416850090027
Epoch: 146
Loss on hold-out set: 0.004848233473379738
MeanAbsoluteError value on hold-out data: 0.05504372715950012
Epoch: 147
Loss on hold-out set: 0.00489341698658581
```

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MeanAbsoluteError value on hold-out data: 0.05473547428846359
Epoch: 148
Loss on hold-out set: 0.004877361057039637
MeanAbsoluteError value on hold-out data: 0.054185882210731506
Epoch: 149
Loss on hold-out set: 0.004651850255098767
MeanAbsoluteError value on hold-out data: 0.053681593388319016
Epoch: 150

Loss on hold-out set: 0.004371475392522721
MeanAbsoluteError value on hold-out data: 0.05272547900676727
Epoch: 151

Loss on hold-out set: 0.00425467080472467
MeanAbsoluteError value on hold-out data: 0.052192818373441696
Epoch: 152
Loss on hold-out set: 0.004321446796753802
MeanAbsoluteError value on hold-out data: 0.05178406834602356
Epoch: 153
Loss on hold-out set: 0.004110806422361817
MeanAbsoluteError value on hold-out data: 0.051533717662096024
Epoch: 154
Loss on hold-out set: 0.004247418121219828
MeanAbsoluteError value on hold-out data: 0.05042857304215431
Epoch: 155
Loss on hold-out set: 0.004074829742491532
MeanAbsoluteError value on hold-out data: 0.050097621977329254
Epoch: 156
Loss on hold-out set: 0.003789559445487192
MeanAbsoluteError value on hold-out data: 0.04953628033399582
Epoch: 157

Loss on hold-out set: 0.004024633931784103
MeanAbsoluteError value on hold-out data: 0.049430884420871735
Epoch: 158

Loss on hold-out set: 0.0038125750769932684
MeanAbsoluteError value on hold-out data: 0.04854566231369972
Epoch: 159
Loss on hold-out set: 0.004355454477123343
MeanAbsoluteError value on hold-out data: 0.050290144979953766
```

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Epoch: 160
Loss on hold-out set: 0.0036010235691299806
MeanAbsoluteError value on hold-out data: 0.04703451320528984
Epoch: 161
Loss on hold-out set: 0.0033887071140970173
MeanAbsoluteError value on hold-out data: 0.0467921681702137
Epoch: 162
Loss on hold-out set: 0.003394603406867156
MeanAbsoluteError value on hold-out data: 0.046034302562475204
Epoch: 163
Loss on hold-out set: 0.00339308461228099
MeanAbsoluteError value on hold-out data: 0.045381464064121246
Epoch: 164

Loss on hold-out set: 0.0032265038104154742
MeanAbsoluteError value on hold-out data: 0.0451921783387661
Epoch: 165

Loss on hold-out set: 0.0030031928326934576
MeanAbsoluteError value on hold-out data: 0.044102687388658524
Epoch: 166
Loss on hold-out set: 0.003076337456989747
MeanAbsoluteError value on hold-out data: 0.04353926330804825
Epoch: 167
Loss on hold-out set: 0.0029321269024736606
MeanAbsoluteError value on hold-out data: 0.0432976670563221
Epoch: 168
Loss on hold-out set: 0.002844204454539487
MeanAbsoluteError value on hold-out data: 0.04236023873090744
Epoch: 169
Loss on hold-out set: 0.0028238412476359652
MeanAbsoluteError value on hold-out data: 0.041763488203287125
Epoch: 170
Loss on hold-out set: 0.002673818761160454
MeanAbsoluteError value on hold-out data: 0.041064709424972534
Epoch: 171

Loss on hold-out set: 0.002769692138267251
MeanAbsoluteError value on hold-out data: 0.041077181696891785
Epoch: 172
```

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Loss on hold-out set: 0.0027170642099988004
MeanAbsoluteError value on hold-out data: 0.0401197113096714
Epoch: 173
Loss on hold-out set: 0.002620479494978029
MeanAbsoluteError value on hold-out data: 0.039327383041381836
Epoch: 174
Loss on hold-out set: 0.002412041837277894
MeanAbsoluteError value on hold-out data: 0.03903992846608162
Epoch: 175
Loss on hold-out set: 0.00227192526933952
MeanAbsoluteError value on hold-out data: 0.03809312731027603
Epoch: 176
Loss on hold-out set: 0.0021820807865319345
MeanAbsoluteError value on hold-out data: 0.037558410316705704
Epoch: 177
Loss on hold-out set: 0.0022104614718745533
MeanAbsoluteError value on hold-out data: 0.03754545748233795
Epoch: 178

Loss on hold-out set: 0.002184457389655738
MeanAbsoluteError value on hold-out data: 0.03654472529888153
Epoch: 179

Loss on hold-out set: 0.0021076203355243285
MeanAbsoluteError value on hold-out data: 0.03626945614814758
Epoch: 180
Loss on hold-out set: 0.0020291055955637535
MeanAbsoluteError value on hold-out data: 0.035635191947221756
Epoch: 181
Loss on hold-out set: 0.002023324307699043
MeanAbsoluteError value on hold-out data: 0.03495236858725548
Epoch: 182
Loss on hold-out set: 0.0019232450823227947
MeanAbsoluteError value on hold-out data: 0.034339990466833115
Epoch: 183
Loss on hold-out set: 0.0018766229354346602
MeanAbsoluteError value on hold-out data: 0.033613577485084534
Epoch: 184
Loss on hold-out set: 0.0016854508341146777
MeanAbsoluteError value on hold-out data: 0.032992538064718246
Epoch: 185
```

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Loss on hold-out set: 0.001663614570413931
MeanAbsoluteError value on hold-out data: 0.03229956701397896
Epoch: 186

Loss on hold-out set: 0.00161403042371743
MeanAbsoluteError value on hold-out data: 0.03172792121767998
Epoch: 187
Loss on hold-out set: 0.0015137406701866824
MeanAbsoluteError value on hold-out data: 0.031159792095422745
Epoch: 188
Loss on hold-out set: 0.0014778963881186568
MeanAbsoluteError value on hold-out data: 0.030583856627345085
Epoch: 189
Loss on hold-out set: 0.0014847112319190414
MeanAbsoluteError value on hold-out data: 0.0303251501172781
Epoch: 190
Loss on hold-out set: 0.0014246545973807
MeanAbsoluteError value on hold-out data: 0.029804043471813202
Epoch: 191
Loss on hold-out set: 0.0012918844726160527
MeanAbsoluteError value on hold-out data: 0.028947554528713226
Epoch: 192

Loss on hold-out set: 0.0013136876447018809
MeanAbsoluteError value on hold-out data: 0.028436509892344475
Epoch: 193

Loss on hold-out set: 0.001176281447092501
MeanAbsoluteError value on hold-out data: 0.02765422873198986
Epoch: 194
Loss on hold-out set: 0.0012307047100666051
MeanAbsoluteError value on hold-out data: 0.0274563767015934
Epoch: 195
Loss on hold-out set: 0.001296462826968099
MeanAbsoluteError value on hold-out data: 0.027944916859269142
Epoch: 196
Loss on hold-out set: 0.0010593679079857583
MeanAbsoluteError value on hold-out data: 0.026170706376433372
Epoch: 197
Loss on hold-out set: 0.0010169574435657035
MeanAbsoluteError value on hold-out data: 0.02562245912849903
Epoch: 198
```

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Loss on hold-out set: 0.0009451938228896604
MeanAbsoluteError value on hold-out data: 0.024798918515443802
Epoch: 199

Loss on hold-out set: 0.0009448100463487208
MeanAbsoluteError value on hold-out data: 0.024246880784630775
Epoch: 200

Loss on hold-out set: 0.0009802191925700754
MeanAbsoluteError value on hold-out data: 0.024294903501868248
Epoch: 201
Loss on hold-out set: 0.0009015858399484736
MeanAbsoluteError value on hold-out data: 0.023610498756170273
Epoch: 202
Loss on hold-out set: 0.000803384170957053
MeanAbsoluteError value on hold-out data: 0.022540807723999023
Epoch: 203
Loss on hold-out set: 0.000772460907823048
MeanAbsoluteError value on hold-out data: 0.021948518231511116
Epoch: 204
Loss on hold-out set: 0.0007100822807003099
MeanAbsoluteError value on hold-out data: 0.02129797637462616
Epoch: 205
Loss on hold-out set: 0.0006891457328143028
MeanAbsoluteError value on hold-out data: 0.02091340348124504
Epoch: 206

Loss on hold-out set: 0.000679254762452239
MeanAbsoluteError value on hold-out data: 0.020474456250667572
Epoch: 207

Loss on hold-out set: 0.0006130593504237297
MeanAbsoluteError value on hold-out data: 0.019803060218691826
Epoch: 208
Loss on hold-out set: 0.000586780448569558
MeanAbsoluteError value on hold-out data: 0.01931757479906082
Epoch: 209
Loss on hold-out set: 0.0005204672701298618
MeanAbsoluteError value on hold-out data: 0.01835078001022339
Epoch: 210
Loss on hold-out set: 0.0004978816533156743
```

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MeanAbsoluteError value on hold-out data: 0.01774814911186695
Epoch: 211
Loss on hold-out set: 0.0004908469709334895
MeanAbsoluteError value on hold-out data: 0.01730761118233204
Epoch: 212
Loss on hold-out set: 0.00045230596935233247
MeanAbsoluteError value on hold-out data: 0.01665251888334751
Epoch: 213

Loss on hold-out set: 0.00042401729800845857
MeanAbsoluteError value on hold-out data: 0.016153521835803986
Epoch: 214

Loss on hold-out set: 0.0003738463072715184
MeanAbsoluteError value on hold-out data: 0.015523571521043777
Epoch: 215
Loss on hold-out set: 0.00036227473174221814
MeanAbsoluteError value on hold-out data: 0.014907739125192165
Epoch: 216
Loss on hold-out set: 0.00031304152574963297
MeanAbsoluteError value on hold-out data: 0.014258095063269138
Epoch: 217
Loss on hold-out set: 0.00029210712483081105
MeanAbsoluteError value on hold-out data: 0.013682033866643906
Epoch: 218
Loss on hold-out set: 0.0002637415936288352
MeanAbsoluteError value on hold-out data: 0.013133556582033634
Epoch: 219
Loss on hold-out set: 0.00027563317472903203
MeanAbsoluteError value on hold-out data: 0.012852673418819904
Epoch: 220

Loss on hold-out set: 0.0002346625932169935
MeanAbsoluteError value on hold-out data: 0.012067606672644615
Epoch: 221

Loss on hold-out set: 0.00020804373791459232
MeanAbsoluteError value on hold-out data: 0.01150714885443449
Epoch: 222
Loss on hold-out set: 0.0001764762374267985
MeanAbsoluteError value on hold-out data: 0.010869212448596954
```

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Epoch: 223
Loss on hold-out set: 0.00017218558731166503
MeanAbsoluteError value on hold-out data: 0.010450842790305614
Epoch: 224
Loss on hold-out set: 0.00015325397376168089
MeanAbsoluteError value on hold-out data: 0.009857259690761566
Epoch: 225
Loss on hold-out set: 0.00013559625781803893
MeanAbsoluteError value on hold-out data: 0.009388182312250137
Epoch: 226
Loss on hold-out set: 0.00831647622712458
MeanAbsoluteError value on hold-out data: 0.018070528283715248
Epoch: 227

Loss on hold-out set: 0.00011160079968529037
MeanAbsoluteError value on hold-out data: 0.00843646191060543
Epoch: 228

Loss on hold-out set: 0.00010650915814599452
MeanAbsoluteError value on hold-out data: 0.0079942736774683
Epoch: 229
Loss on hold-out set: 9.148712594581481e-05
MeanAbsoluteError value on hold-out data: 0.007503368891775608
Epoch: 230
Loss on hold-out set: 7.390398129176062e-05
MeanAbsoluteError value on hold-out data: 0.006998755969107151
Epoch: 231
Loss on hold-out set: 6.676564176954204e-05
MeanAbsoluteError value on hold-out data: 0.006683989893645048
Epoch: 232
Loss on hold-out set: 6.461014891101513e-05
MeanAbsoluteError value on hold-out data: 0.00640440359711647
Epoch: 233
Loss on hold-out set: 5.234795291751372e-05
MeanAbsoluteError value on hold-out data: 0.005888278596103191
Epoch: 234

Loss on hold-out set: 4.87080139394563e-05
MeanAbsoluteError value on hold-out data: 0.005492776166647673
Epoch: 235
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Loss on hold-out set: 4.036422237382235e-05
MeanAbsoluteError value on hold-out data: 0.005069922190159559
Epoch: 236
Loss on hold-out set: 3.6932517384859515e-05
MeanAbsoluteError value on hold-out data: 0.004803924355655909
Epoch: 237
Loss on hold-out set: 2.9393404264947792e-05
MeanAbsoluteError value on hold-out data: 0.004304845351725817
Epoch: 238
Loss on hold-out set: 2.2998214052887095e-05
MeanAbsoluteError value on hold-out data: 0.003905280726030469
Epoch: 239
Loss on hold-out set: 1.908315838451157e-05
MeanAbsoluteError value on hold-out data: 0.003557552583515644
Epoch: 240
Loss on hold-out set: 1.6894569048767713e-05
MeanAbsoluteError value on hold-out data: 0.00330606778152287
Epoch: 241

Loss on hold-out set: 1.2850543341231129e-05
MeanAbsoluteError value on hold-out data: 0.002909573959186673
Epoch: 242

Loss on hold-out set: 1.007023729471257e-05
MeanAbsoluteError value on hold-out data: 0.0026099991519004107
Epoch: 243
Loss on hold-out set: 8.068070586047655e-06
MeanAbsoluteError value on hold-out data: 0.0023245960474014282
Epoch: 244
Loss on hold-out set: 6.349388382449643e-06
MeanAbsoluteError value on hold-out data: 0.002096654148772359
Epoch: 245
Loss on hold-out set: 5.052158747695592e-06
MeanAbsoluteError value on hold-out data: 0.0018401385750621557
Epoch: 246
Loss on hold-out set: 3.96306911800191e-06
MeanAbsoluteError value on hold-out data: 0.001676076208241284
Epoch: 247
Loss on hold-out set: 3.334239802545478e-06
MeanAbsoluteError value on hold-out data: 0.0015152916312217712
Epoch: 248
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Loss on hold-out set: 2.754522304607795e-06
MeanAbsoluteError value on hold-out data: 0.0013849579263478518
Epoch: 249

Loss on hold-out set: 8.134481882175001e-05
MeanAbsoluteError value on hold-out data: 0.008970709517598152
Epoch: 250
Loss on hold-out set: 2.268211630962469e-06
MeanAbsoluteError value on hold-out data: 0.0012277597561478615
Epoch: 251
Loss on hold-out set: 1.6590915160682366e-06
MeanAbsoluteError value on hold-out data: 0.0010950943687930703
Epoch: 252
Loss on hold-out set: 1.2901688255449419e-05
MeanAbsoluteError value on hold-out data: 0.0013980300864204764
Epoch: 253
Loss on hold-out set: 1.707983762763923e-06
MeanAbsoluteError value on hold-out data: 0.001055940636433661
Epoch: 254
Loss on hold-out set: 1.652138348180625e-06
MeanAbsoluteError value on hold-out data: 0.0010662222048267722
Epoch: 255

Loss on hold-out set: 1.396512048428961e-06
MeanAbsoluteError value on hold-out data: 0.0009776243241503835
Epoch: 256

Loss on hold-out set: 1.2837793012574996e-06
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Epoch: 257
Loss on hold-out set: 1.1256327901229759e-06
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Epoch: 258
Loss on hold-out set: 9.518171785097925e-07
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Epoch: 259
Loss on hold-out set: 0.0015797936190285083
MeanAbsoluteError value on hold-out data: 0.004816367756575346
Epoch: 260
Loss on hold-out set: 8.892078037311317e-07
MeanAbsoluteError value on hold-out data: 0.0007774266414344311
Epoch: 261
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Loss on hold-out set: 7.857800946672237e-07
MeanAbsoluteError value on hold-out data: 0.0007383467745967209
Epoch: 262

Loss on hold-out set: 9.48611203127187e-07
MeanAbsoluteError value on hold-out data: 0.0008073055651038885
Epoch: 263

Loss on hold-out set: 7.448453297561523e-07
MeanAbsoluteError value on hold-out data: 0.000709921820089221
Epoch: 264
Loss on hold-out set: 9.950344764757365e-06
MeanAbsoluteError value on hold-out data: 0.00299104955047369
Epoch: 265
Loss on hold-out set: 7.64160961790157e-07
MeanAbsoluteError value on hold-out data: 0.0007341562304645777
Epoch: 266
Loss on hold-out set: 0.0015701543627659913
MeanAbsoluteError value on hold-out data: 0.004930798895657O625
Epoch: 267
Loss on hold-out set: 9.914605702586134e-07
MeanAbsoluteError value on hold-out data: 0.0007710086647421122
Epoch: 268
Loss on hold-out set: 7.382691244664294e-07
MeanAbsoluteError value on hold-out data: 0.0007275404641404748
Epoch: 269

Loss on hold-out set: 6.763802137864052e-07
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Epoch: 270

Loss on hold-out set: 6.928396356460536e-07
MeanAbsoluteError value on hold-out data: 0.0006814572843722999
Epoch: 271
Loss on hold-out set: 7.00574020129352e-07
MeanAbsoluteError value on hold-out data: 0.0007114910986274481
Epoch: 272
Loss on hold-out set: 1.7070249301608642e-06
MeanAbsoluteError value on hold-out data: 0.0011080078547820449
Epoch: 273
Loss on hold-out set: 8.093483074844698e-07
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MeanAbsoluteError value on hold-out data: 0.000752513762563467
Epoch: 274
Loss on hold-out set: 9.340846859756241e-07
MeanAbsoluteError value on hold-out data: 0.0007937630289234221
Epoch: 275
Loss on hold-out set: 7.526141536992817e-07
MeanAbsoluteError value on hold-out data: 0.0007078860071487725
Epoch: 276

Loss on hold-out set: 6.981464891326211e-07
MeanAbsoluteError value on hold-out data: 0.0006790360785089433
Epoch: 277

Loss on hold-out set: 6.828561407264016e-07
MeanAbsoluteError value on hold-out data: 0.0006673955940641463
Epoch: 278
Loss on hold-out set: 9.723744369694032e-07
MeanAbsoluteError value on hold-out data: 0.0007916840841062367
Epoch: 279
Loss on hold-out set: 2.0372353464363887e-06
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Epoch: 280
Loss on hold-out set: 7.961830841797844e-07
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Epoch: 281
Loss on hold-out set: 0.000025059695647437015
MeanAbsoluteError value on hold-out data: 0.0024394553620368242
Epoch: 282
Loss on hold-out set: 6.583248692165328e-07
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Epoch: 283

Loss on hold-out set: 7.181186987281762e-07
MeanAbsoluteError value on hold-out data: 0.0007160937529988587
Epoch: 284

Loss on hold-out set: 6.501585840641593e-07
MeanAbsoluteError value on hold-out data: 0.0006815025699324906
Epoch: 285
Loss on hold-out set: 6.572151042186865e-07
MeanAbsoluteError value on hold-out data: 0.0006633401499129832
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Epoch: 286
Loss on hold-out set: 7.095967781914134e-07
MeanAbsoluteError value on hold-out data: 0.000698029762133956
Epoch: 287
Loss on hold-out set: 6.713116091051373e-07
MeanAbsoluteError value on hold-out data: 0.0006607319228351116
Epoch: 288
Loss on hold-out set: 7.233603845144479e-07
MeanAbsoluteError value on hold-out data: 0.0006838755216449499
Epoch: 289
Loss on hold-out set: 1.0185881605523789e-06
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Epoch: 290

Loss on hold-out set: 6.864908187891999e-07
MeanAbsoluteError value on hold-out data: 0.0006696900236420333
Epoch: 291

Loss on hold-out set: 7.525690692161263e-07
MeanAbsoluteError value on hold-out data: 0.0007404500502161682
Epoch: 292
Loss on hold-out set: 2.132272741689051e-06
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Epoch: 293
Loss on hold-out set: 7.111538003265686e-07
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Epoch: 294
Loss on hold-out set: 7.771653695971719e-07
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Epoch: 295
Loss on hold-out set: 6.810402733383223e-07
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Epoch: 296
Loss on hold-out set: 6.496580635502352e-07
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Epoch: 297

Loss on hold-out set: 7.03260389820151e-07
MeanAbsoluteError value on hold-out data: 0.0007137767388485372
Epoch: 298
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Loss on hold-out set: 9.4064068670937e-07
MeanAbsoluteError value on hold-out data: 0.0007716008112765849
Epoch: 299
Loss on hold-out set: 6.774527824186057e-07
MeanAbsoluteError value on hold-out data: 0.0006815557717345655
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Loss on hold-out set: 6.672870518706567e-07
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Epoch: 301
Loss on hold-out set: 9.151919689779438e-07
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Epoch: 302
Loss on hold-out set: 8.265267778229967e-07
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Epoch: 303
Loss on hold-out set: 1.0647338272589807e-06
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Epoch: 304

Loss on hold-out set: 0.00042322149640592845
MeanAbsoluteError value on hold-out data: 0.002801756374537945
Epoch: 305

Loss on hold-out set: 8.39414413943674e-07
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Epoch: 306
Loss on hold-out set: 8.979111520637581e-07
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Epoch: 307
Loss on hold-out set: 7.289337068309228e-07
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Epoch: 308
Loss on hold-out set: 7.572667317827626e-07
MeanAbsoluteError value on hold-out data: 0.0007413980201818049
Epoch: 309
Loss on hold-out set: 1.6684384805697705e-06
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Epoch: 310
Loss on hold-out set: 3.93892916096005e-06
MeanAbsoluteError value on hold-out data: 0.0017316456651315093
Epoch: 311
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Loss on hold-out set: 9.820057672326443e-07
MeanAbsoluteError value on hold-out data: 0.0008195817354135215
Epoch: 312

Loss on hold-out set: 8.260635301947052e-07
MeanAbsoluteError value on hold-out data: 0.0007738865097053349
Epoch: 313
Loss on hold-out set: 1.3442630710449941e-06
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Epoch: 314
Loss on hold-out set: 6.782783167671789e-06
MeanAbsoluteError value on hold-out data: 0.0024794794153422117
Epoch: 315
Loss on hold-out set: 8.327343437031232e-07
MeanAbsoluteError value on hold-out data: 0.0007709466735832393
Epoch: 316
Loss on hold-out set: 7.927161111463367e-07
MeanAbsoluteError value on hold-out data: 0.0007312358939088881
Epoch: 317
Loss on hold-out set: 8.340049690174894e-07
MeanAbsoluteError value on hold-out data: 0.0007778091821819544
Epoch: 318

Loss on hold-out set: 7.63577735194933e-07
MeanAbsoluteError value on hold-out data: 0.0007283466984517872
Epoch: 319

Loss on hold-out set: 7.560017470845755e-07
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Epoch: 320
Loss on hold-out set: 6.982443188427659e-07
MeanAbsoluteError value on hold-out data: 0.0007034721202217042
Epoch: 321
Loss on hold-out set: 7.273868793443119e-07
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Epoch: 322
Loss on hold-out set: 9.423003746178438e-07
MeanAbsoluteError value on hold-out data: 0.0007782681495882571
Epoch: 323
Loss on hold-out set: 6.968228944970178e-07
MeanAbsoluteError value on hold-out data: 0.0006828390760347247
Epoch: 324
```

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Loss on hold-out set: 7.152558291286718e-07
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Epoch: 325

Loss on hold-out set: 0.0020114700249044184
MeanAbsoluteError value on hold-out data: 0.0052362289279699326
Epoch: 326

Loss on hold-out set: 0.005241797119439822
MeanAbsoluteError value on hold-out data: 0.005882797762751579
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Loss on hold-out set: 6.588094943428866e-07
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Epoch: 328
Loss on hold-out set: 8.74895377478424e-07
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Epoch: 329
Loss on hold-out set: 7.571569168563796e-07
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Epoch: 330
Loss on hold-out set: 0.0004956265062831405
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Epoch: 331
Loss on hold-out set: 7.006564649495535e-07
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Epoch: 332

Loss on hold-out set: 0.00066645432803225049
MeanAbsoluteError value on hold-out data: 0.0043547735549509525
Epoch: 333

Loss on hold-out set: 6.458073296646314e-07
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Epoch: 334
Loss on hold-out set: 6.469704116030838e-07
MeanAbsoluteError value on hold-out data: 0.00065813516266644
Epoch: 335
Loss on hold-out set: 7.804656908442316e-07
MeanAbsoluteError value on hold-out data: 0.0007527729612775147
Epoch: 336
Loss on hold-out set: 6.649542132646064e-07
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MeanAbsoluteError value on hold-out data: 0.0006596767925657332
Epoch: 337
Loss on hold-out set: 9.653051926341925e-07
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Epoch: 338
Loss on hold-out set: 8.079340322917863e-07
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Epoch: 339

Loss on hold-out set: 0.00019993160170027016
MeanAbsoluteError value on hold-out data: 0.002120750490576029
Epoch: 340

Loss on hold-out set: 7.711243789834463e-07
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Epoch: 341
Loss on hold-out set: 6.960399704124799e-07
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Epoch: 342
Loss on hold-out set: 7.48362412449611e-07
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Epoch: 343
Loss on hold-out set: 6.807309620608766e-07
MeanAbsoluteError value on hold-out data: 0.0006812140345573425
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Loss on hold-out set: 1.4424849023970846e-06
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Epoch: 345
Loss on hold-out set: 1.0940101534428181e-06
MeanAbsoluteError value on hold-out data: 0.0008662042091600597
Epoch: 346

Loss on hold-out set: 6.725851514707197e-07
MeanAbsoluteError value on hold-out data: 0.0006720263627357781
Epoch: 347

Loss on hold-out set: 0.0005825414249132931
MeanAbsoluteError value on hold-out data: 0.0031637162901461124
Epoch: 348
Loss on hold-out set: 0.00036135102641529
MeanAbsoluteError value on hold-out data: 0.002665123902261257
```

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Epoch: 349
Loss on hold-out set: 0.004999123305321536
MeanAbsoluteError value on hold-out data: 0.00795020442456007
Epoch: 350
Loss on hold-out set: 0.001209764410199035
MeanAbsoluteError value on hold-out data: 0.004244610201567411
Epoch: 351
Loss on hold-out set: 9.034803499529377e-07
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Loss on hold-out set: 6.943873944902197e-07
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Epoch: 353

Loss on hold-out set: 7.780612175058475e-07
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Epoch: 354

Loss on hold-out set: 8.398349677918304e-07
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Epoch: 355
Loss on hold-out set: 7.25570745229421e-07
MeanAbsoluteError value on hold-out data: 0.0006796782254241407
Epoch: 356
Loss on hold-out set: 8.012676481974687e-07
MeanAbsoluteError value on hold-out data: 0.000702077173627913
Epoch: 357
Loss on hold-out set: 7.546089608905066e-07
MeanAbsoluteError value on hold-out data: 0.0007274309755302966
Epoch: 358
Loss on hold-out set: 7.957829327464284e-07
MeanAbsoluteError value on hold-out data: 0.000721119053196162
Epoch: 359
Loss on hold-out set: 7.582996597823064e-07
MeanAbsoluteError value on hold-out data: 0.0006935199489817023
Epoch: 360

Loss on hold-out set: 8.026093474619792e-07
MeanAbsoluteError value on hold-out data: 0.0007469090633094311
Epoch: 361
```

```
Loss on hold-out set: 0.004895884270664597
MeanAbsoluteError value on hold-out data: 0.007973062805831432
Epoch: 362
Loss on hold-out set: 9.63456830487093e-07
MeanAbsoluteError value on hold-out data: 0.000784643751103431
Epoch: 363
Loss on hold-out set: 1.0206323854443046e-06
MeanAbsoluteError value on hold-out data: 0.0007538259960711002
Epoch: 364
Loss on hold-out set: 1.1245720110344757e-06
MeanAbsoluteError value on hold-out data: 0.0008448092848993838
Epoch: 365
Loss on hold-out set: 0.0003720803129523959
MeanAbsoluteError value on hold-out data: 0.002687375759705901
Epoch: 366
Loss on hold-out set: 1.5924161402836035e-06
MeanAbsoluteError value on hold-out data: 0.0009714420302771032
Epoch: 367

Loss on hold-out set: 6.485881105898163e-06
MeanAbsoluteError value on hold-out data: 0.0022429905366152525
Epoch: 368

Loss on hold-out set: 5.477397245648228e-06
MeanAbsoluteError value on hold-out data: 0.0021618292666971684
Epoch: 369
Loss on hold-out set: 4.442499140658094e-06
MeanAbsoluteError value on hold-out data: 0.00179831322748214
Epoch: 370
Loss on hold-out set: 1.238574874115819e-06
MeanAbsoluteError value on hold-out data: 0.0008299488108605146
Epoch: 371
Loss on hold-out set: 1.1681145355606322e-06
MeanAbsoluteError value on hold-out data: 0.0008260203176178038
Epoch: 372
Loss on hold-out set: 1.0160227908237664e-06
MeanAbsoluteError value on hold-out data: 0.0007774169207550585
Epoch: 373
Loss on hold-out set: 0.001231057642563918
MeanAbsoluteError value on hold-out data: 0.006847588811069727
Epoch: 374
```

```
Loss on hold-out set: 1.132292665645834e-06
MeanAbsoluteError value on hold-out data: 0.0007944764802232385
Epoch: 375

Loss on hold-out set: 1.1265463994137603e-06
MeanAbsoluteError value on hold-out data: 0.0007989895530045033
Epoch: 376
Loss on hold-out set: 1.1458811986113478e-06
MeanAbsoluteError value on hold-out data: 0.0008507974562235177
Epoch: 377
Loss on hold-out set: 7.800360256519175e-07
MeanAbsoluteError value on hold-out data: 0.0007176447543315589
Epoch: 378
Loss on hold-out set: 1.4315438538512983e-06
MeanAbsoluteError value on hold-out data: 0.000973452755715698
Epoch: 379
Loss on hold-out set: 7.741620235125223e-07
MeanAbsoluteError value on hold-out data: 0.0007128649740479887
Epoch: 380
Loss on hold-out set: 8.625931957777328e-07
MeanAbsoluteError value on hold-out data: 0.0007785925990901887
Epoch: 381

Loss on hold-out set: 0.00051188617678777766
MeanAbsoluteError value on hold-out data: 0.0030333700124174356
Epoch: 382

Loss on hold-out set: 7.279603747834839e-07
MeanAbsoluteError value on hold-out data: 0.0007049199193716049
Epoch: 383
Loss on hold-out set: 7.021627171665247e-07
MeanAbsoluteError value on hold-out data: 0.0006741473916918039
Epoch: 384
Loss on hold-out set: 6.634062336056209e-07
MeanAbsoluteError value on hold-out data: 0.0006646865513175726
Epoch: 385
Loss on hold-out set: 8.940809670740726e-07
MeanAbsoluteError value on hold-out data: 0.0007814182317815721
Epoch: 386
Loss on hold-out set: 1.016481660415663e-06
MeanAbsoluteError value on hold-out data: 0.0008696447475813329
Epoch: 387
```

```
Loss on hold-out set: 6.656767324714635e-07
MeanAbsoluteError value on hold-out data: 0.0006719317170791328
Epoch: 388

Loss on hold-out set: 8.564051960582639e-07
MeanAbsoluteError value on hold-out data: 0.0007671312196180224
Epoch: 389

Loss on hold-out set: 7.578017201782271e-07
MeanAbsoluteError value on hold-out data: 0.0007199340034276247
Epoch: 390
Loss on hold-out set: 1.3553229310813408e-06
MeanAbsoluteError value on hold-out data: 0.0009716861532069743
Epoch: 391
Loss on hold-out set: 1.4576445699696285e-06
MeanAbsoluteError value on hold-out data: 0.0009922406170517206
Epoch: 392
Loss on hold-out set: 9.220273726056732e-07
MeanAbsoluteError value on hold-out data: 0.0007987039280124009
Epoch: 393
Loss on hold-out set: 7.656631650066769e-07
MeanAbsoluteError value on hold-out data: 0.0007273541414178908
Epoch: 394
Loss on hold-out set: 1.054951840072905e-06
MeanAbsoluteError value on hold-out data: 0.0008454546332359314
Epoch: 395

Loss on hold-out set: 9.408257645086101e-07
MeanAbsoluteError value on hold-out data: 0.0008200237061828375
Epoch: 396

Loss on hold-out set: 1.6333173369695521e-06
MeanAbsoluteError value on hold-out data: 0.0010420925682410598
Epoch: 397
Loss on hold-out set: 1.1310948786138817e-06
MeanAbsoluteError value on hold-out data: 0.0008736859308555722
Epoch: 398
Loss on hold-out set: 9.720056980838237e-07
MeanAbsoluteError value on hold-out data: 0.0008101072744466364
Epoch: 399
Loss on hold-out set: 9.883966137854609e-07
```

```
MeanAbsoluteError value on hold-out data: 0.0008052380289882421
Epoch: 400
Loss on hold-out set: 9.534255674190298e-07
MeanAbsoluteError value on hold-out data: 0.0007905725506134331
Epoch: 401
Loss on hold-out set: 7.562552927818335e-07
MeanAbsoluteError value on hold-out data: 0.0007228020112961531
Epoch: 402

Loss on hold-out set: 7.592228056497473e-07
MeanAbsoluteError value on hold-out data: 0.0007175452774390578
Epoch: 403

Loss on hold-out set: 7.623318302089151e-07
MeanAbsoluteError value on hold-out data: 0.0007191530894488096
Epoch: 404
Loss on hold-out set: 8.775090061765065e-07
MeanAbsoluteError value on hold-out data: 0.0007663789438083768
Epoch: 405
Loss on hold-out set: 1.5698342700978594e-06
MeanAbsoluteError value on hold-out data: 0.0009981610346585512
Epoch: 406
Loss on hold-out set: 7.307009643507347e-07
MeanAbsoluteError value on hold-out data: 0.0007116891210898757
Epoch: 407
Loss on hold-out set: 8.378569086394586e-07
MeanAbsoluteError value on hold-out data: 0.0007602444966323674
Epoch: 408
Loss on hold-out set: 1.162263782379551e-06
MeanAbsoluteError value on hold-out data: 0.0008971598581410944
Epoch: 409

Loss on hold-out set: 8.234339361479215e-07
MeanAbsoluteError value on hold-out data: 0.0007554698968306184
Epoch: 410

Loss on hold-out set: 8.338077529620373e-07
MeanAbsoluteError value on hold-out data: 0.0007217020029202104
Epoch: 411
Loss on hold-out set: 7.275177635025242e-07
MeanAbsoluteError value on hold-out data: 0.0006967660156078637
```

```
Epoch: 412
Loss on hold-out set: 8.125638413065855e-07
MeanAbsoluteError value on hold-out data: 0.000736078480258584
Epoch: 413
Loss on hold-out set: 6.795996468484261e-07
MeanAbsoluteError value on hold-out data: 0.0006828283658251166
Epoch: 414
Loss on hold-out set: 7.042011899417188e-07
MeanAbsoluteError value on hold-out data: 0.0006836838438175619
Epoch: 415
Loss on hold-out set: 7.144906598673865e-07
MeanAbsoluteError value on hold-out data: 0.0006746401777490973
Epoch: 416

Loss on hold-out set: 9.209648947734632e-07
MeanAbsoluteError value on hold-out data: 0.0008074681973084807
Epoch: 417

Loss on hold-out set: 8.741615147300763e-07
MeanAbsoluteError value on hold-out data: 0.0007882205536589026
Epoch: 418
Loss on hold-out set: 7.740501053796414e-07
MeanAbsoluteError value on hold-out data: 0.0007378204027190804
Epoch: 419
Loss on hold-out set: 6.59568627270346e-07
MeanAbsoluteError value on hold-out data: 0.0006617807084694505
Epoch: 420
Loss on hold-out set: 6.692687730509743e-07
MeanAbsoluteError value on hold-out data: 0.0006770643522031605
Epoch: 421
Loss on hold-out set: 9.238032222268745e-07
MeanAbsoluteError value on hold-out data: 0.0007799273589625955
Epoch: 422
Loss on hold-out set: 1.4891058522327792e-06
MeanAbsoluteError value on hold-out data: 0.0010001258924603462
Epoch: 423

Loss on hold-out set: 7.994542491255393e-07
MeanAbsoluteError value on hold-out data: 0.0007289703353308141
Epoch: 424
```

```
Loss on hold-out set: 7.477072013163986e-07
MeanAbsoluteError value on hold-out data: 0.0006931235548108816
Epoch: 425
Loss on hold-out set: 1.1895354357595631e-06
MeanAbsoluteError value on hold-out data: 0.0008935513906180859
Epoch: 426
Loss on hold-out set: 7.285902829433046e-07
MeanAbsoluteError value on hold-out data: 0.0006825005984865129
Epoch: 427
Loss on hold-out set: 6.603208078104217e-07
MeanAbsoluteError value on hold-out data: 0.000654832401778549
Epoch: 428
Loss on hold-out set: 6.639023467869265e-06
MeanAbsoluteError value on hold-out data: 0.002439815318211913
Epoch: 429
Loss on hold-out set: 8.768191260235024e-07
MeanAbsoluteError value on hold-out data: 0.000753139378502965
Epoch: 430


Loss on hold-out set: 8.026925071974872e-07
MeanAbsoluteError value on hold-out data: 0.0007211007759906352
Epoch: 431


Loss on hold-out set: 6.839855429391789e-07
MeanAbsoluteError value on hold-out data: 0.0006950970273464918
Epoch: 432
Loss on hold-out set: 7.048035727690988e-07
MeanAbsoluteError value on hold-out data: 0.0007038579205982387
Epoch: 433
Loss on hold-out set: 0.0005454372782038009
MeanAbsoluteError value on hold-out data: 0.003096848027780652
Epoch: 434
Loss on hold-out set: 1.0714047610130924e-06
MeanAbsoluteError value on hold-out data: 0.0008699135505594313
Epoch: 435
Loss on hold-out set: 1.4217059261822074e-06
MeanAbsoluteError value on hold-out data: 0.0009647259139455855
Epoch: 436
Loss on hold-out set: 1.0694350950101439e-06
MeanAbsoluteError value on hold-out data: 0.0008240696624852717
Epoch: 437
```

```
Loss on hold-out set: 8.909386749040166e-07
MeanAbsoluteError value on hold-out data: 0.0007571771857328713
Epoch: 438

Loss on hold-out set: 7.85102951812615e-07
MeanAbsoluteError value on hold-out data: 0.0007350528030656278
Epoch: 439
Loss on hold-out set: 8.6470243095741e-07
MeanAbsoluteError value on hold-out data: 0.0007596132927574217
Epoch: 440
Loss on hold-out set: 6.936019649226812e-07
MeanAbsoluteError value on hold-out data: 0.0006899822619743645
Epoch: 441
Loss on hold-out set: 1.384945134164949e-06
MeanAbsoluteError value on hold-out data: 0.0009873234666883945
Epoch: 442
Loss on hold-out set: 8.066370185133565e-07
MeanAbsoluteError value on hold-out data: 0.0007493701414205134
Epoch: 443
Loss on hold-out set: 7.646074274921725e-07
MeanAbsoluteError value on hold-out data: 0.0007287766202352941
Epoch: 444

Loss on hold-out set: 1.945281925285459e-06
MeanAbsoluteError value on hold-out data: 0.0011429114965721965
Epoch: 445

Loss on hold-out set: 7.929886359866382e-07
MeanAbsoluteError value on hold-out data: 0.0007470042328350246
Epoch: 446
Loss on hold-out set: 8.101802721354873e-07
MeanAbsoluteError value on hold-out data: 0.0007452499121427536
Epoch: 447
Loss on hold-out set: 7.898380545157124e-07
MeanAbsoluteError value on hold-out data: 0.0007306005572900176
Epoch: 448
Loss on hold-out set: 7.330299660260117e-07
MeanAbsoluteError value on hold-out data: 0.0007144197006709874
Epoch: 449
Loss on hold-out set: 7.067835602251412e-07
MeanAbsoluteError value on hold-out data: 0.0006928217480890453
Epoch: 450
```

```
Loss on hold-out set: 6.770989966316148e-07
MeanAbsoluteError value on hold-out data: 0.000665900472085923
Epoch: 451

Loss on hold-out set: 0.0023911044062266194
MeanAbsoluteError value on hold-out data: 0.004213561769574881
Epoch: 452

Loss on hold-out set: 7.816514106742453e-07
MeanAbsoluteError value on hold-out data: 0.0007364300545305014
Epoch: 453
Loss on hold-out set: 8.76488743327942e-07
MeanAbsoluteError value on hold-out data: 0.0007801062893122435
Epoch: 454
Loss on hold-out set: 1.0770430466121839e-06
MeanAbsoluteError value on hold-out data: 0.0008266133954748511
Epoch: 455
Loss on hold-out set: 8.590437560612302e-07
MeanAbsoluteError value on hold-out data: 0.0007435433799400926
Epoch: 456
Loss on hold-out set: 7.708299136766072e-07
MeanAbsoluteError value on hold-out data: 0.0007258537225425243
Epoch: 457
Loss on hold-out set: 7.800142305733551e-07
MeanAbsoluteError value on hold-out data: 0.0007355497218668461
Epoch: 458

Loss on hold-out set: 9.873483927199582e-07
MeanAbsoluteError value on hold-out data: 0.0008058553794398904
Epoch: 459

Loss on hold-out set: 7.028289504572828e-07
MeanAbsoluteError value on hold-out data: 0.0006836891989223659
Epoch: 460
Loss on hold-out set: 6.79822441349223e-07
MeanAbsoluteError value on hold-out data: 0.0006698366487398744
Epoch: 461
Loss on hold-out set: 6.628541025467991e-07
MeanAbsoluteError value on hold-out data: 0.0006796725210733712
Early stopping at epoch 460
Fold: 5
```

```
Epoch: 1
Loss on hold-out set: 0.6074434839762174
MeanAbsoluteError value on hold-out data: 0.7578778266906738
Epoch: 2
Loss on hold-out set: 0.5563860581471369
MeanAbsoluteError value on hold-out data: 0.7288133502006531
Epoch: 3
Loss on hold-out set: 0.5291030429876767
MeanAbsoluteError value on hold-out data: 0.7059116363525391
Epoch: 4

Loss on hold-out set: 0.5124870171913734
MeanAbsoluteError value on hold-out data: 0.6860935688018799
Epoch: 5

Loss on hold-out set: 0.4729103423081912
MeanAbsoluteError value on hold-out data: 0.6681747436523438
Epoch: 6
Loss on hold-out set: 0.4496736274315761
MeanAbsoluteError value on hold-out data: 0.6515548229217529
Epoch: 7
Loss on hold-out set: 0.4404865274062523
MeanAbsoluteError value on hold-out data: 0.6358852982521057
Epoch: 8
Loss on hold-out set: 0.41732431604312015
MeanAbsoluteError value on hold-out data: 0.6209344267845154
Epoch: 9
Loss on hold-out set: 0.4038887436573322
MeanAbsoluteError value on hold-out data: 0.6065526008605957
Epoch: 10
Loss on hold-out set: 0.37774734084422773
MeanAbsoluteError value on hold-out data: 0.5926299095153809
Epoch: 11

Loss on hold-out set: 0.36334885083712065
MeanAbsoluteError value on hold-out data: 0.5791205167770386
Epoch: 12

Loss on hold-out set: 0.3544037410846123
MeanAbsoluteError value on hold-out data: 0.5659272074699402
Epoch: 13
```

```
Loss on hold-out set: 0.32864963664458346
MeanAbsoluteError value on hold-out data: 0.5530126094818115
Epoch: 14
Loss on hold-out set: 0.32493794422883254
MeanAbsoluteError value on hold-out data: 0.5403897762298584
Epoch: 15
Loss on hold-out set: 0.30533195573550004
MeanAbsoluteError value on hold-out data: 0.5279564261436462
Epoch: 16
Loss on hold-out set: 0.29529530153824735
MeanAbsoluteError value on hold-out data: 0.5157496333122253
Epoch: 17
Loss on hold-out set: 0.27991079367124116
MeanAbsoluteError value on hold-out data: 0.503707230091095
Epoch: 18

Loss on hold-out set: 0.2748705687431189
MeanAbsoluteError value on hold-out data: 0.4919375479221344
Epoch: 19

Loss on hold-out set: 0.2612510770559311
MeanAbsoluteError value on hold-out data: 0.4803467094898224
Epoch: 20
Loss on hold-out set: 0.25093576312065125
MeanAbsoluteError value on hold-out data: 0.46894246339797974
Epoch: 21
Loss on hold-out set: 0.23722368020277756
MeanAbsoluteError value on hold-out data: 0.45773547887802124
Epoch: 22
Loss on hold-out set: 0.22893801216895765
MeanAbsoluteError value on hold-out data: 0.4467228055000305
Epoch: 23
Loss on hold-out set: 0.2178374047462757
MeanAbsoluteError value on hold-out data: 0.43580710887908936
Epoch: 24
Loss on hold-out set: 0.20700090034649923
MeanAbsoluteError value on hold-out data: 0.425144761800766
Epoch: 25

Loss on hold-out set: 0.19727926987868089
MeanAbsoluteError value on hold-out data: 0.41462811827659607
Epoch: 26
```

```
Loss on hold-out set: 0.19347460797199836
MeanAbsoluteError value on hold-out data: 0.4042981266975403
Epoch: 27
Loss on hold-out set: 0.18476199817198974
MeanAbsoluteError value on hold-out data: 0.3940380811691284
Epoch: 28
Loss on hold-out set: 0.17646310306512392
MeanAbsoluteError value on hold-out data: 0.38399678468704224
Epoch: 29
Loss on hold-out set: 0.17274093685241845
MeanAbsoluteError value on hold-out data: 0.3741019368171692
Epoch: 30
Loss on hold-out set: 0.16310619448239988
MeanAbsoluteError value on hold-out data: 0.3642680048942566
Epoch: 31
Loss on hold-out set: 0.15566919858639056
MeanAbsoluteError value on hold-out data: 0.3547854721546173
Epoch: 32

Loss on hold-out set: 0.14926761503403002
MeanAbsoluteError value on hold-out data: 0.34537190198898315
Epoch: 33

Loss on hold-out set: 0.14302155260856336
MeanAbsoluteError value on hold-out data: 0.3360966145992279
Epoch: 34
Loss on hold-out set: 0.1350199683354451
MeanAbsoluteError value on hold-out data: 0.3270455300807953
Epoch: 35
Loss on hold-out set: 0.13033033792789167
MeanAbsoluteError value on hold-out data: 0.31812888383865356
Epoch: 36
Loss on hold-out set: 0.12303563236044003
MeanAbsoluteError value on hold-out data: 0.30928361415863037
Epoch: 37
Loss on hold-out set: 0.11840086258374728
MeanAbsoluteError value on hold-out data: 0.3006134033203125
Epoch: 38
Loss on hold-out set: 0.11146320603214778
MeanAbsoluteError value on hold-out data: 0.29194653034210205
Epoch: 39
```

```
Loss on hold-out set: 0.10631364841873829
MeanAbsoluteError value on hold-out data: 0.2834753692150116
Epoch: 40

Loss on hold-out set: 0.10342107999783295
MeanAbsoluteError value on hold-out data: 0.2752764821052551
Epoch: 41
Loss on hold-out set: 0.10336799317827591
MeanAbsoluteError value on hold-out data: 0.267360657453537
Epoch: 42
Loss on hold-out set: 0.09431376995948645
MeanAbsoluteError value on hold-out data: 0.2598395049571991
Epoch: 43
Loss on hold-out set: 0.08974111997164212
MeanAbsoluteError value on hold-out data: 0.2527438700199127
Epoch: 44
Loss on hold-out set: 0.0836908076531612
MeanAbsoluteError value on hold-out data: 0.2455962747335434
Epoch: 45
Loss on hold-out set: 0.08196019238004318
MeanAbsoluteError value on hold-out data: 0.2388693243265152
Epoch: 46

Loss on hold-out set: 0.07798743162017602
MeanAbsoluteError value on hold-out data: 0.23257936537265778
Epoch: 47

Loss on hold-out set: 0.07557406075871907
MeanAbsoluteError value on hold-out data: 0.22656133770942688
Epoch: 48
Loss on hold-out set: 0.0716884912779698
MeanAbsoluteError value on hold-out data: 0.22090598940849304
Epoch: 49
Loss on hold-out set: 0.06980775210719842
MeanAbsoluteError value on hold-out data: 0.21552693843841553
Epoch: 50
Loss on hold-out set: 0.06419180562862983
MeanAbsoluteError value on hold-out data: 0.2104860097169876
Epoch: 51
Loss on hold-out set: 0.06373275730472344
MeanAbsoluteError value on hold-out data: 0.20547793805599213
Epoch: 52
```

```
Loss on hold-out set: 0.05956129643779535
MeanAbsoluteError value on hold-out data: 0.20057260990142822
Epoch: 53

Loss on hold-out set: 0.05607717312299288
MeanAbsoluteError value on hold-out data: 0.19588471949100494
Epoch: 54

Loss on hold-out set: 0.056593397059119664
MeanAbsoluteError value on hold-out data: 0.19120627641677856
Epoch: 55
Loss on hold-out set: 0.05376466492620798
MeanAbsoluteError value on hold-out data: 0.18676163256168365
Epoch: 56
Loss on hold-out set: 0.05082372260781435
MeanAbsoluteError value on hold-out data: 0.18256965279579163
Epoch: 57
Loss on hold-out set: 0.04900936288042711
MeanAbsoluteError value on hold-out data: 0.17843160033226013
Epoch: 58
Loss on hold-out set: 0.04694293217303661
MeanAbsoluteError value on hold-out data: 0.17467160522937775
Epoch: 59
Loss on hold-out set: 0.04598364534859474
MeanAbsoluteError value on hold-out data: 0.1714828610420227
Epoch: 60

Loss on hold-out set: 0.04197143152571069
MeanAbsoluteError value on hold-out data: 0.16868379712104797
Epoch: 61

Loss on hold-out set: 0.042727342018714316
MeanAbsoluteError value on hold-out data: 0.1660383939743042
Epoch: 62
Loss on hold-out set: 0.04022901576872055
MeanAbsoluteError value on hold-out data: 0.16356533765792847
Epoch: 63
Loss on hold-out set: 0.038402512383002504
MeanAbsoluteError value on hold-out data: 0.1612221747636795
Epoch: 64
Loss on hold-out set: 0.03811682861011762
```

```
MeanAbsoluteError value on hold-out data: 0.15905994176864624
Epoch: 65
Loss on hold-out set: 0.03704344101536732
MeanAbsoluteError value on hold-out data: 0.15688633918762207
Epoch: 66
Loss on hold-out set: 0.0360611669289378
MeanAbsoluteError value on hold-out data: 0.15498487651348114
Epoch: 67

Loss on hold-out set: 0.03470640959074864
MeanAbsoluteError value on hold-out data: 0.1530250608921051
Epoch: 68

Loss on hold-out set: 0.03424321050540759
MeanAbsoluteError value on hold-out data: 0.15131564438343048
Epoch: 69
Loss on hold-out set: 0.03303613571020273
MeanAbsoluteError value on hold-out data: 0.14977551996707916
Epoch: 70
Loss on hold-out set: 0.03279595779111752
MeanAbsoluteError value on hold-out data: 0.14848940074443817
Epoch: 71
Loss on hold-out set: 0.03239814521601567
MeanAbsoluteError value on hold-out data: 0.14721354842185974
Epoch: 72
Loss on hold-out set: 0.031649308279156685
MeanAbsoluteError value on hold-out data: 0.14631614089012146
Epoch: 73
Loss on hold-out set: 0.031291602967450254
MeanAbsoluteError value on hold-out data: 0.14562451839447021
Epoch: 74

Loss on hold-out set: 0.031507487767017804
MeanAbsoluteError value on hold-out data: 0.14513865113258362
Epoch: 75

Loss on hold-out set: 0.031515161793392435
MeanAbsoluteError value on hold-out data: 0.1448451280593872
Epoch: 76
Loss on hold-out set: 0.03072171565145254
MeanAbsoluteError value on hold-out data: 0.14471010863780975
```

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Epoch: 77
Loss on hold-out set: 0.03148297220468521
MeanAbsoluteError value on hold-out data: 0.14463654160499573
Epoch: 78
Loss on hold-out set: 0.030711090478759546
MeanAbsoluteError value on hold-out data: 0.14457111060619354
Epoch: 79
Loss on hold-out set: 0.02967627955457339
MeanAbsoluteError value on hold-out data: 0.14457111060619354
Epoch: 80
Loss on hold-out set: 0.03074614327544203
MeanAbsoluteError value on hold-out data: 0.14457111060619354
Epoch: 81

Loss on hold-out set: 0.030041407507199507
MeanAbsoluteError value on hold-out data: 0.14457112550735474
Epoch: 82

Loss on hold-out set: 0.030601434982739963
MeanAbsoluteError value on hold-out data: 0.14457112550735474
Epoch: 83
Loss on hold-out set: 0.02999411143649083
MeanAbsoluteError value on hold-out data: 0.14457111060619354
Epoch: 84
Loss on hold-out set: 0.029738287799633466
MeanAbsoluteError value on hold-out data: 0.14457111060619354
Epoch: 85
Loss on hold-out set: 0.030059078708291054
MeanAbsoluteError value on hold-out data: 0.1445973962545395
Epoch: 86
Loss on hold-out set: 0.029751300668487184
MeanAbsoluteError value on hold-out data: 0.14462347328662872
Epoch: 87
Loss on hold-out set: 0.028945066321354646
MeanAbsoluteError value on hold-out data: 0.1446644514799118
Epoch: 88

Loss on hold-out set: 0.02974857483059168
MeanAbsoluteError value on hold-out data: 0.14471019804477692
Epoch: 89
```

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Loss on hold-out set: 0.029825251800223038
MeanAbsoluteError value on hold-out data: 0.14477115869522095
Epoch: 90
Loss on hold-out set: 0.029387046511356648
MeanAbsoluteError value on hold-out data: 0.1448196917772293
Epoch: 91
Loss on hold-out set: 0.029690334859948892
MeanAbsoluteError value on hold-out data: 0.14485490322113037
Epoch: 92
Loss on hold-out set: 0.03056913227416002
MeanAbsoluteError value on hold-out data: 0.14489765465259552
Epoch: 93
Loss on hold-out set: 0.03051256760954857
MeanAbsoluteError value on hold-out data: 0.1449616402387619
Epoch: 94
Loss on hold-out set: 0.030268391737571128
MeanAbsoluteError value on hold-out data: 0.14499199390411377
Epoch: 95

Loss on hold-out set: 0.03041894160784208
MeanAbsoluteError value on hold-out data: 0.14501750469207764
Epoch: 96

Loss on hold-out set: 0.03007787910218422
MeanAbsoluteError value on hold-out data: 0.14505895972251892
Epoch: 97
Loss on hold-out set: 0.029360280228922002
MeanAbsoluteError value on hold-out data: 0.1450759470462799
Epoch: 98
Loss on hold-out set: 0.029848678682286005
MeanAbsoluteError value on hold-out data: 0.1451091170310974
Epoch: 99
Loss on hold-out set: 0.030504990584002092
MeanAbsoluteError value on hold-out data: 0.14512209594249725
Epoch: 100
Loss on hold-out set: 0.030404842387025174
MeanAbsoluteError value on hold-out data: 0.1451239287853241
Epoch: 101
Loss on hold-out set: 0.0302171535933247
MeanAbsoluteError value on hold-out data: 0.1451602429151535
Epoch: 102
```

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Loss on hold-out set: 0.029908639665406484
MeanAbsoluteError value on hold-out data: 0.14515537023544312
Epoch: 103

Loss on hold-out set: 0.030491537414491177
MeanAbsoluteError value on hold-out data: 0.1451777219772339
Epoch: 104
Loss on hold-out set: 0.030834343642569505
MeanAbsoluteError value on hold-out data: 0.14516109228134155
Epoch: 105
Loss on hold-out set: 0.029580734168680813
MeanAbsoluteError value on hold-out data: 0.1451617330312729
Epoch: 106
Loss on hold-out set: 0.0293451167213229
MeanAbsoluteError value on hold-out data: 0.14519727230072021
Epoch: 107
Loss on hold-out set: 0.03024051166497744
MeanAbsoluteError value on hold-out data: 0.14520585536956787
Epoch: 108
Loss on hold-out set: 0.029728089960721824
MeanAbsoluteError value on hold-out data: 0.1452108919620514
Epoch: 109

Loss on hold-out set: 0.02930824451435071
MeanAbsoluteError value on hold-out data: 0.14487862586975098
Epoch: 110

Loss on hold-out set: 0.028649964871314857
MeanAbsoluteError value on hold-out data: 0.14389771223068237
Epoch: 111
Loss on hold-out set: 0.02934126011454142
MeanAbsoluteError value on hold-out data: 0.1432485729455948
Epoch: 112
Loss on hold-out set: 0.029576754484039087
MeanAbsoluteError value on hold-out data: 0.14294758439064026
Epoch: 113
Loss on hold-out set: 0.02910539457717767
MeanAbsoluteError value on hold-out data: 0.14244070649147034
Epoch: 114
Loss on hold-out set: 0.02894072005381951
MeanAbsoluteError value on hold-out data: 0.14237922430038452
Epoch: 115
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Loss on hold-out set: 0.028776223699633893
MeanAbsoluteError value on hold-out data: 0.14208175241947174
Epoch: 116

Loss on hold-out set: 0.029259614646434784
MeanAbsoluteError value on hold-out data: 0.14178094267845154
Epoch: 117

Loss on hold-out set: 0.028471951014720477
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Epoch: 118
Loss on hold-out set: 0.028833290562033653
MeanAbsoluteError value on hold-out data: 0.14106319844722748
Epoch: 119
Loss on hold-out set: 0.027892247272225525
MeanAbsoluteError value on hold-out data: 0.14105260372161865
Epoch: 120
Loss on hold-out set: 0.027716372090463456
MeanAbsoluteError value on hold-out data: 0.1405857503414154
Epoch: 121
Loss on hold-out set: 0.027583333878563
MeanAbsoluteError value on hold-out data: 0.14012475311756134
Epoch: 122
Loss on hold-out set: 0.02813202730165078
MeanAbsoluteError value on hold-out data: 0.13979272544384003
Epoch: 123

Loss on hold-out set: 0.027318407494861346
MeanAbsoluteError value on hold-out data: 0.1397632360458374
Epoch: 124

Loss on hold-out set: 0.027066583458620768
MeanAbsoluteError value on hold-out data: 0.13934993743896484
Epoch: 125
Loss on hold-out set: 0.026875328057660505
MeanAbsoluteError value on hold-out data: 0.13902562856674194
Epoch: 126
Loss on hold-out set: 0.027020797348366335
MeanAbsoluteError value on hold-out data: 0.13883650302886963
Epoch: 127
Loss on hold-out set: 0.026775300216216307

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MeanAbsoluteError value on hold-out data: 0.13825136423110962
Epoch: 128
Loss on hold-out set: 0.026706681300241213
MeanAbsoluteError value on hold-out data: 0.1380690634250641
Epoch: 129
Loss on hold-out set: 0.02653523513044302
MeanAbsoluteError value on hold-out data: 0.13789086043834686
Epoch: 130

Loss on hold-out set: 0.027937601356265638
MeanAbsoluteError value on hold-out data: 0.13740858435630798
Epoch: 131

Loss on hold-out set: 0.02761875379544038
MeanAbsoluteError value on hold-out data: 0.13680265843868256
Epoch: 132
Loss on hold-out set: 0.026370274905975048
MeanAbsoluteError value on hold-out data: 0.13628283143043518
Epoch: 133
Loss on hold-out set: 0.02643446810543537
MeanAbsoluteError value on hold-out data: 0.13676291704177856
Epoch: 134
Loss on hold-out set: 0.02658043450747545
MeanAbsoluteError value on hold-out data: 0.1356991082429886
Epoch: 135

Loss on hold-out set: 0.026067010700129546
MeanAbsoluteError value on hold-out data: 0.13523149490356445
Epoch: 136
Loss on hold-out set: 0.02551245610587872
MeanAbsoluteError value on hold-out data: 0.13505467772483826
Epoch: 137
Loss on hold-out set: 0.025502843925586112
MeanAbsoluteError value on hold-out data: 0.1346098929643631
Epoch: 138

Loss on hold-out set: 0.02526540194566433
MeanAbsoluteError value on hold-out data: 0.1341913491487503
Epoch: 139
Loss on hold-out set: 0.02620123792439699
MeanAbsoluteError value on hold-out data: 0.13363733887672424
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Epoch: 140
Loss on hold-out set: 0.025131673838656683
MeanAbsoluteError value on hold-out data: 0.1331302672624588
Epoch: 141
Loss on hold-out set: 0.024536344366004832
MeanAbsoluteError value on hold-out data: 0.13295315206050873
Epoch: 142

Loss on hold-out set: 0.025352551673467342
MeanAbsoluteError value on hold-out data: 0.1321759670972824
Epoch: 143
Loss on hold-out set: 0.02501664016968929
MeanAbsoluteError value on hold-out data: 0.13167592883110046
Epoch: 144
Loss on hold-out set: 0.02422117291448208
MeanAbsoluteError value on hold-out data: 0.1311999261379242
Epoch: 145

Loss on hold-out set: 0.024679305963218212
MeanAbsoluteError value on hold-out data: 0.13096944987773895
Epoch: 146
Loss on hold-out set: 0.02424285324433675
MeanAbsoluteError value on hold-out data: 0.13047319650650024
Epoch: 147
Loss on hold-out set: 0.02378550046481765
MeanAbsoluteError value on hold-out data: 0.1299246996641159
Epoch: 148
Loss on hold-out set: 0.023820975938668616
MeanAbsoluteError value on hold-out data: 0.12947076559066772
Epoch: 149

Loss on hold-out set: 0.02449449409659092
MeanAbsoluteError value on hold-out data: 0.12897445261478424
Epoch: 150
Loss on hold-out set: 0.02308368467940734
MeanAbsoluteError value on hold-out data: 0.12855514883995056
Epoch: 151
Loss on hold-out set: 0.023875278134185534
MeanAbsoluteError value on hold-out data: 0.12801054120063782
Epoch: 152
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Loss on hold-out set: 0.023093247786164284
MeanAbsoluteError value on hold-out data: 0.12741832435131073
Epoch: 153
Loss on hold-out set: 0.02251281488973361
MeanAbsoluteError value on hold-out data: 0.12703807651996613
Epoch: 154
Loss on hold-out set: 0.02269873503022469
MeanAbsoluteError value on hold-out data: 0.12623322010040283
Epoch: 155
Loss on hold-out set: 0.02274605968537239
MeanAbsoluteError value on hold-out data: 0.12572897970676422
Epoch: 156

Loss on hold-out set: 0.022193242939045794
MeanAbsoluteError value on hold-out data: 0.1251404732465744
Epoch: 157
Loss on hold-out set: 0.022859817514052756
MeanAbsoluteError value on hold-out data: 0.12447047233581543
Epoch: 158
Loss on hold-out set: 0.022337134139469035
MeanAbsoluteError value on hold-out data: 0.12398180365562439
Epoch: 159

Loss on hold-out set: 0.021866018883883953
MeanAbsoluteError value on hold-out data: 0.12401054054498672
Epoch: 160
Loss on hold-out set: 0.022056887069573768
MeanAbsoluteError value on hold-out data: 0.12324272841215134
Epoch: 161
Loss on hold-out set: 0.02123279830154318
MeanAbsoluteError value on hold-out data: 0.12258246541023254
Epoch: 162
Loss on hold-out set: 0.02131183886040862
MeanAbsoluteError value on hold-out data: 0.12219950556755066
Epoch: 163

Loss on hold-out set: 0.020969846894821294
MeanAbsoluteError value on hold-out data: 0.12118785828351974
Epoch: 164
Loss on hold-out set: 0.02095857269775409
MeanAbsoluteError value on hold-out data: 0.12094844877719879
Epoch: 165
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Loss on hold-out set: 0.020578121551527426
MeanAbsoluteError value on hold-out data: 0.12042073905467987
Epoch: 166

Loss on hold-out set: 0.020651842897328045
MeanAbsoluteError value on hold-out data: 0.11975638568401337
Epoch: 167
Loss on hold-out set: 0.020961046362152465
MeanAbsoluteError value on hold-out data: 0.1188606545329094
Epoch: 168
Loss on hold-out set: 0.019866094960329626
MeanAbsoluteError value on hold-out data: 0.11832114309072495
Epoch: 169
Loss on hold-out set: 0.020215591594863396
MeanAbsoluteError value on hold-out data: 0.1177559569478035
Epoch: 170

Loss on hold-out set: 0.01986634014890744
MeanAbsoluteError value on hold-out data: 0.11729710549116135
Epoch: 171
Loss on hold-out set: 0.01971803347651775
MeanAbsoluteError value on hold-out data: 0.11777561157941818
Epoch: 172
Loss on hold-out set: 0.01910395397303196
MeanAbsoluteError value on hold-out data: 0.11622460186481476
Epoch: 173

Loss on hold-out set: 0.019605983048677444
MeanAbsoluteError value on hold-out data: 0.11489436030387878
Epoch: 174
Loss on hold-out set: 0.018851007531898525
MeanAbsoluteError value on hold-out data: 0.11517760902643204
Epoch: 175
Loss on hold-out set: 0.018996403480951603
MeanAbsoluteError value on hold-out data: 0.11410266906023026
Epoch: 176
Loss on hold-out set: 0.018597945678406037
MeanAbsoluteError value on hold-out data: 0.11350597441196442
Epoch: 177

Loss on hold-out set: 0.018609213069654428
```

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MeanAbsoluteError value on hold-out data: 0.1129310205578804
Epoch: 178
Loss on hold-out set: 0.018821263005240604
MeanAbsoluteError value on hold-out data: 0.1118864044547081
Epoch: 179
Loss on hold-out set: 0.01885001053317235
MeanAbsoluteError value on hold-out data: 0.1116892620921135
Epoch: 180

Loss on hold-out set: 0.017966191857480086
MeanAbsoluteError value on hold-out data: 0.11095323413610458
Epoch: 181
Loss on hold-out set: 0.018048098418288507
MeanAbsoluteError value on hold-out data: 0.10985809564590454
Epoch: 182
Loss on hold-out set: 0.018504155584825918
MeanAbsoluteError value on hold-out data: 0.10926591604948044
Epoch: 183
Loss on hold-out set: 0.0182653942073767
MeanAbsoluteError value on hold-out data: 0.10899970680475235
Epoch: 184

Loss on hold-out set: 0.017417274702053804
MeanAbsoluteError value on hold-out data: 0.1079726442694664
Epoch: 185
Loss on hold-out set: 0.018148575622874957
MeanAbsoluteError value on hold-out data: 0.10757871717214584
Epoch: 186
Loss on hold-out set: 0.01708389539271593
MeanAbsoluteError value on hold-out data: 0.1065780520439148
Epoch: 187

Loss on hold-out set: 0.01731903267164643
MeanAbsoluteError value on hold-out data: 0.10563360154628754
Epoch: 188
Loss on hold-out set: 0.016672568646474525
MeanAbsoluteError value on hold-out data: 0.10548915714025497
Epoch: 189
Loss on hold-out set: 0.01655785381220854
MeanAbsoluteError value on hold-out data: 0.105043925344944
Epoch: 190
Loss on hold-out set: 0.01630945926388869
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MeanAbsoluteError value on hold-out data: 0.10413132607936859
Epoch: 191

Loss on hold-out set: 0.01618886996920292
MeanAbsoluteError value on hold-out data: 0.10357072204351425
Epoch: 192
Loss on hold-out set: 0.01601159182162239
MeanAbsoluteError value on hold-out data: 0.10288269817829132
Epoch: 193
Loss on hold-out set: 0.015909000371511165
MeanAbsoluteError value on hold-out data: 0.10218770802021027
Epoch: 194

Loss on hold-out set: 0.015761629678308964
MeanAbsoluteError value on hold-out data: 0.1019231528043747
Epoch: 195
Loss on hold-out set: 0.01549663939155065
MeanAbsoluteError value on hold-out data: 0.1011066734790802
Epoch: 196
Loss on hold-out set: 0.015850499738007784
MeanAbsoluteError value on hold-out data: 0.100033238530159
Epoch: 197
Loss on hold-out set: 0.014665829841620646
MeanAbsoluteError value on hold-out data: 0.09948502480983734
Epoch: 198

Loss on hold-out set: 0.014923874181337081
MeanAbsoluteError value on hold-out data: 0.09907893091440201
Epoch: 199
Loss on hold-out set: 0.01491772007340422
MeanAbsoluteError value on hold-out data: 0.09825298190116882
Epoch: 200
Loss on hold-out set: 0.015043850271747662
MeanAbsoluteError value on hold-out data: 0.09859072417020798
Epoch: 201

Loss on hold-out set: 0.014015904878481077
MeanAbsoluteError value on hold-out data: 0.09684698283672333
Epoch: 202
Loss on hold-out set: 0.014576441733739696
MeanAbsoluteError value on hold-out data: 0.09611241519451141
```

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Epoch: 203
Loss on hold-out set: 0.01404361605930787
MeanAbsoluteError value on hold-out data: 0.09531079232692719
Epoch: 204
Loss on hold-out set: 0.013309855251393925
MeanAbsoluteError value on hold-out data: 0.09466487914323807
Epoch: 205

Loss on hold-out set: 0.01352982552578816
MeanAbsoluteError value on hold-out data: 0.0941050797700882
Epoch: 206
Loss on hold-out set: 0.013430328287470799
MeanAbsoluteError value on hold-out data: 0.09332413971424103
Epoch: 207
Loss on hold-out set: 0.012978077830316929
MeanAbsoluteError value on hold-out data: 0.09265702962875366
Epoch: 208

Loss on hold-out set: 0.013824317711763658
MeanAbsoluteError value on hold-out data: 0.09184788912534714
Epoch: 209
Loss on hold-out set: 0.013081602823848907
MeanAbsoluteError value on hold-out data: 0.09119708836078644
Epoch: 210
Loss on hold-out set: 0.012625336288832702
MeanAbsoluteError value on hold-out data: 0.09050319343805313
Epoch: 211
Loss on hold-out set: 0.012250631868552703
MeanAbsoluteError value on hold-out data: 0.08992865681648254
Epoch: 212

Loss on hold-out set: 0.012446509835381921
MeanAbsoluteError value on hold-out data: 0.08918946981430054
Epoch: 213
Loss on hold-out set: 0.012061377987265587
MeanAbsoluteError value on hold-out data: 0.08850505203008652
Epoch: 214
Loss on hold-out set: 0.011943970591976093
MeanAbsoluteError value on hold-out data: 0.08786743879318237
Epoch: 215
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Loss on hold-out set: 0.011772252852097154
MeanAbsoluteError value on hold-out data: 0.08712539076805115
Epoch: 216
Loss on hold-out set: 0.011926471434820157
MeanAbsoluteError value on hold-out data: 0.08646637946367264
Epoch: 217
Loss on hold-out set: 0.011652042999720344
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Epoch: 218
Loss on hold-out set: 0.011579617392271757
MeanAbsoluteError value on hold-out data: 0.0856311097741127
Epoch: 219

Loss on hold-out set: 0.011505456533856116
MeanAbsoluteError value on hold-out data: 0.08456104248762131
Epoch: 220
Loss on hold-out set: 0.011013300946125617
MeanAbsoluteError value on hold-out data: 0.08356904238462448
Epoch: 221
Loss on hold-out set: 0.010546988950899014
MeanAbsoluteError value on hold-out data: 0.08287733048200607
Epoch: 222

Loss on hold-out set: 0.010950010645991335
MeanAbsoluteError value on hold-out data: 0.08210550248622894
Epoch: 223
Loss on hold-out set: 0.010155737561245378
MeanAbsoluteError value on hold-out data: 0.0813651978969574
Epoch: 224
Loss on hold-out set: 0.010079059499100996
MeanAbsoluteError value on hold-out data: 0.08067461848258972
Epoch: 225
Loss on hold-out set: 0.009908508563127656
MeanAbsoluteError value on hold-out data: 0.08063725382089615
Epoch: 226

Loss on hold-out set: 0.00972922071098135
MeanAbsoluteError value on hold-out data: 0.07923724502325058
Epoch: 227
Loss on hold-out set: 0.010003812037981473
MeanAbsoluteError value on hold-out data: 0.0785134807229042
Epoch: 228
```

Loss on hold-out set: 0.009552746402243009
MeanAbsoluteError value on hold-out data: 0.07770328968763351
Epoch: 229

Loss on hold-out set: 0.009383502380492596
MeanAbsoluteError value on hold-out data: 0.07701199501752853
Epoch: 230
Loss on hold-out set: 0.009043073944317607
MeanAbsoluteError value on hold-out data: 0.07653769850730896
Epoch: 231
Loss on hold-out set: 0.008829004328268079
MeanAbsoluteError value on hold-out data: 0.07542799413204193
Epoch: 232
Loss on hold-out set: 0.008661387703166558
MeanAbsoluteError value on hold-out data: 0.07465171068906784
Epoch: 233

Loss on hold-out set: 0.008489426055278342
MeanAbsoluteError value on hold-out data: 0.07398229837417603
Epoch: 234
Loss on hold-out set: 0.00848686145260357
MeanAbsoluteError value on hold-out data: 0.07308357954025269
Epoch: 235
Loss on hold-out set: 0.00846127626629403
MeanAbsoluteError value on hold-out data: 0.07262808084487915
Epoch: 236

Loss on hold-out set: 0.008394808168164812
MeanAbsoluteError value on hold-out data: 0.07151870429515839
Epoch: 237
Loss on hold-out set: 0.007824962313931722
MeanAbsoluteError value on hold-out data: 0.07087714970111847
Epoch: 238
Loss on hold-out set: 0.008050549381340925
MeanAbsoluteError value on hold-out data: 0.06993812322616577
Epoch: 239
Loss on hold-out set: 0.008006996600530468
MeanAbsoluteError value on hold-out data: 0.06919947266578674
Epoch: 240

Loss on hold-out set: 0.007547659727816398

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MeanAbsoluteError value on hold-out data: 0.06841219216585159
Epoch: 241
Loss on hold-out set: 0.007518450460898189
MeanAbsoluteError value on hold-out data: 0.06752870231866837
Epoch: 242
Loss on hold-out set: 0.007412069154760012
MeanAbsoluteError value on hold-out data: 0.06677006930112839
Epoch: 243

Loss on hold-out set: 0.006991611113055394
MeanAbsoluteError value on hold-out data: 0.06577317416667938
Epoch: 244
Loss on hold-out set: 0.007012159957622106
MeanAbsoluteError value on hold-out data: 0.06498037278652191
Epoch: 245
Loss on hold-out set: 0.006703801130732665
MeanAbsoluteError value on hold-out data: 0.06434120237827301
Epoch: 246
Loss on hold-out set: 0.006652218397133625
MeanAbsoluteError value on hold-out data: 0.06385896354913712
Epoch: 247

Loss on hold-out set: 0.006484373633821423
MeanAbsoluteError value on hold-out data: 0.06257407367229462
Epoch: 248
Loss on hold-out set: 0.00615671631665184
MeanAbsoluteError value on hold-out data: 0.061957139521837234
Epoch: 249
Loss on hold-out set: 0.006107927085115359
MeanAbsoluteError value on hold-out data: 0.06121441349387169
Epoch: 250

Loss on hold-out set: 0.005843000432762962
MeanAbsoluteError value on hold-out data: 0.060396548360586166
Epoch: 251
Loss on hold-out set: 0.005822110545033446
MeanAbsoluteError value on hold-out data: 0.059556860476732254
Epoch: 252
Loss on hold-out set: 0.005739325147050505
MeanAbsoluteError value on hold-out data: 0.05851440876722336
Epoch: 253
Loss on hold-out set: 0.00567863885169992
```

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MeanAbsoluteError value on hold-out data: 0.057769641280174255
Epoch: 254

Loss on hold-out set: 0.005238646198099909
MeanAbsoluteError value on hold-out data: 0.05696296691894531
Epoch: 255
Loss on hold-out set: 0.005173191329679237
MeanAbsoluteError value on hold-out data: 0.056334421038627625
Epoch: 256
Loss on hold-out set: 0.004965696098784415
MeanAbsoluteError value on hold-out data: 0.05532228946685791
Epoch: 257

Loss on hold-out set: 0.005011086137248919
MeanAbsoluteError value on hold-out data: 0.05451907962560654
Epoch: 258
Loss on hold-out set: 0.0046578398995244736
MeanAbsoluteError value on hold-out data: 0.0537697896361351
Epoch: 259
Loss on hold-out set: 0.00452416162722959
MeanAbsoluteError value on hold-out data: 0.052803922444581985
Epoch: 260
Loss on hold-out set: 0.004440390218335848
MeanAbsoluteError value on hold-out data: 0.0519866980612278
Epoch: 261

Loss on hold-out set: 0.004415209190203593
MeanAbsoluteError value on hold-out data: 0.051232676953077316
Epoch: 262
Loss on hold-out set: 0.0043749131011561705
MeanAbsoluteError value on hold-out data: 0.0504717081785202
Epoch: 263
Loss on hold-out set: 0.00416393861031303
MeanAbsoluteError value on hold-out data: 0.049530163407325745
Epoch: 264

Loss on hold-out set: 0.003873935273776834
MeanAbsoluteError value on hold-out data: 0.04868166148662567
Epoch: 265
Loss on hold-out set: 0.004250387929809781
MeanAbsoluteError value on hold-out data: 0.04795941710472107
```

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Epoch: 266
Loss on hold-out set: 0.0035897053939361987
MeanAbsoluteError value on hold-out data: 0.04700389876961708
Epoch: 267
Loss on hold-out set: 0.003498703989092834
MeanAbsoluteError value on hold-out data: 0.04607338830828667
Epoch: 268

Loss on hold-out set: 0.0033032418701063413
MeanAbsoluteError value on hold-out data: 0.04538677632808685
Epoch: 269
Loss on hold-out set: 0.0033068360868268288
MeanAbsoluteError value on hold-out data: 0.04460472613573074
Epoch: 270
Loss on hold-out set: 0.0032366119468441377
MeanAbsoluteError value on hold-out data: 0.04427376389503479
Epoch: 271

Loss on hold-out set: 0.003045686690781552
MeanAbsoluteError value on hold-out data: 0.04270458221435547
Epoch: 272
Loss on hold-out set: 0.003066208392668229
MeanAbsoluteError value on hold-out data: 0.04268316924571991
Epoch: 273
Loss on hold-out set: 0.002807566699070426
MeanAbsoluteError value on hold-out data: 0.04131093621253967
Epoch: 274
Loss on hold-out set: 0.0026639827992767096
MeanAbsoluteError value on hold-out data: 0.03998253494501114
Epoch: 275

Loss on hold-out set: 0.0047556061226014905
MeanAbsoluteError value on hold-out data: 0.04353606700897217
Epoch: 276
Loss on hold-out set: 0.0025135952522619986
MeanAbsoluteError value on hold-out data: 0.03814229369163513
Epoch: 277
Loss on hold-out set: 0.0023267279567125323
MeanAbsoluteError value on hold-out data: 0.037593379616737366
Epoch: 278
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Loss on hold-out set: 0.0022082860456206477
MeanAbsoluteError value on hold-out data: 0.036381181329488754
Epoch: 279
Loss on hold-out set: 0.0022357031658220175
MeanAbsoluteError value on hold-out data: 0.03544529899954796
Epoch: 280
Loss on hold-out set: 0.0020207059077130486
MeanAbsoluteError value on hold-out data: 0.03453590348362923
Epoch: 281
Loss on hold-out set: 0.0018897280757440827
MeanAbsoluteError value on hold-out data: 0.03357037529349327
Epoch: 282

Loss on hold-out set: 0.0018509591463953257
MeanAbsoluteError value on hold-out data: 0.03263750299811363
Epoch: 283
Loss on hold-out set: 0.0017372658610558854
MeanAbsoluteError value on hold-out data: 0.03168413043022156
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Loss on hold-out set: 0.001634013500454155
MeanAbsoluteError value on hold-out data: 0.030968716368079185
Epoch: 285

Loss on hold-out set: 0.0016030072068903022
MeanAbsoluteError value on hold-out data: 0.02974654734134674
Epoch: 286
Loss on hold-out set: 0.0014895041150828968
MeanAbsoluteError value on hold-out data: 0.028832165524363518
Epoch: 287
Loss on hold-out set: 0.0013727736323534583
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Epoch: 288
Loss on hold-out set: 0.001292925836213936
MeanAbsoluteError value on hold-out data: 0.02685318887233734
Epoch: 289

Loss on hold-out set: 0.0012121912284503477
MeanAbsoluteError value on hold-out data: 0.02586902305483818
Epoch: 290
Loss on hold-out set: 0.0011697111790104269
MeanAbsoluteError value on hold-out data: 0.024942554533481598
Epoch: 291
```

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Loss on hold-out set: 0.0010845142600234025
MeanAbsoluteError value on hold-out data: 0.024172628298401833
Epoch: 292

Loss on hold-out set: 0.0010544861031051439
MeanAbsoluteError value on hold-out data: 0.022962547838687897
Epoch: 293
Loss on hold-out set: 0.0009323305040687466
MeanAbsoluteError value on hold-out data: 0.02194567210972309
Epoch: 294
Loss on hold-out set: 0.0009229670977219939
MeanAbsoluteError value on hold-out data: 0.021114816889166832
Epoch: 295
Loss on hold-out set: 0.0008472275870959633
MeanAbsoluteError value on hold-out data: 0.020712589845061302
Epoch: 296

Loss on hold-out set: 0.0007605506107211113
MeanAbsoluteError value on hold-out data: 0.019401833415031433
Epoch: 297
Loss on hold-out set: 0.0007253627420420974
MeanAbsoluteError value on hold-out data: 0.0183417946100235
Epoch: 298
Loss on hold-out set: 0.0006603355969463547
MeanAbsoluteError value on hold-out data: 0.01747848466038704
Epoch: 299

Loss on hold-out set: 0.0006190861682765759
MeanAbsoluteError value on hold-out data: 0.017035651952028275
Epoch: 300
Loss on hold-out set: 0.000569576846408801
MeanAbsoluteError value on hold-out data: 0.015820737928152084
Epoch: 301
Loss on hold-out set: 0.0005219423339720099
MeanAbsoluteError value on hold-out data: 0.01491627562791109
Epoch: 302
Loss on hold-out set: 0.00047664611786156177
MeanAbsoluteError value on hold-out data: 0.014091048389673233
Epoch: 303

Loss on hold-out set: 0.00044768853191411693
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MeanAbsoluteError value on hold-out data: 0.013538987375795841
Epoch: 304
Loss on hold-out set: 0.00041049983477793063
MeanAbsoluteError value on hold-out data: 0.012702662497758865
Epoch: 305
Loss on hold-out set: 0.00037297808571915643
MeanAbsoluteError value on hold-out data: 0.011682400479912758
Epoch: 306

Loss on hold-out set: 0.0005065806169743434
MeanAbsoluteError value on hold-out data: 0.012044533155858517
Epoch: 307
Loss on hold-out set: 0.00033573183687761997
MeanAbsoluteError value on hold-out data: 0.01100123766809702
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Loss on hold-out set: 0.000316877268722657
MeanAbsoluteError value on hold-out data: 0.009879895485937595
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Loss on hold-out set: 0.000271914523182204
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Epoch: 310

Loss on hold-out set: 0.0011445553812406545
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Epoch: 311
Loss on hold-out set: 0.00023019687250780407
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Epoch: 312
Loss on hold-out set: 0.000213796240551836
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Epoch: 313

Loss on hold-out set: 0.00019442253701876884
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Epoch: 314
Loss on hold-out set: 0.00017860099517117935
MeanAbsoluteError value on hold-out data: 0.006142555270344019
Epoch: 315
Loss on hold-out set: 0.00016493120088293485
MeanAbsoluteError value on hold-out data: 0.005611165892332792
Epoch: 316
Loss on hold-out set: 0.00015194905063253827
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MeanAbsoluteError value on hold-out data: 0.005111110862344503
Epoch: 317

Loss on hold-out set: 0.00014096650028687488
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Epoch: 318
Loss on hold-out set: 0.00013140840470581154
MeanAbsoluteError value on hold-out data: 0.0042267246171832085
Epoch: 319
Loss on hold-out set: 0.00012133980429168262
MeanAbsoluteError value on hold-out data: 0.0038665011525154114
Epoch: 320

Loss on hold-out set: 0.00011500311449288766
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Loss on hold-out set: 0.00010591690901352334
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Epoch: 322
Loss on hold-out set: 9.908452439224045e-05
MeanAbsoluteError value on hold-out data: 0.002785999793559313
Epoch: 323
Loss on hold-out set: 9.406546326737534e-05
MeanAbsoluteError value on hold-out data: 0.0026002624072134495
Epoch: 324

Loss on hold-out set: 8.714984326511163e-05
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Epoch: 325
Loss on hold-out set: 8.22197412949558e-05
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Epoch: 326
Loss on hold-out set: 0.001589913818642904
MeanAbsoluteError value on hold-out data: 0.0059592388570308685
Epoch: 327

Loss on hold-out set: 7.26619267237101e-05
MeanAbsoluteError value on hold-out data: 0.0017703842604532838
Epoch: 328
Loss on hold-out set: 6.821920504106717e-05
MeanAbsoluteError value on hold-out data: 0.0016704415902495384
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Epoch: 329
Loss on hold-out set: 6.530172186977815e-05
MeanAbsoluteError value on hold-out data: 0.0015914854593575
Epoch: 330
Loss on hold-out set: 6.166186958230705e-05
MeanAbsoluteError value on hold-out data: 0.0016996839549392462
Epoch: 331

Loss on hold-out set: 5.7796070983875746e-05
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Epoch: 332
Loss on hold-out set: 5.597669697775788e-05
MeanAbsoluteError value on hold-out data: 0.0019597497303038836
Epoch: 333
Loss on hold-out set: 5.454381368963368e-05
MeanAbsoluteError value on hold-out data: 0.0017748394748196006
Epoch: 334

Loss on hold-out set: 5.170237657982678e-05
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Epoch: 335
Loss on hold-out set: 5.52332956326259e-05
MeanAbsoluteError value on hold-out data: 0.0032428293488919735
Epoch: 336
Loss on hold-out set: 4.725679368260234e-05
MeanAbsoluteError value on hold-out data: 0.001497899298556149
Epoch: 337
Loss on hold-out set: 4.4742867596771525e-05
MeanAbsoluteError value on hold-out data: 0.001424836227670312
Epoch: 338

Loss on hold-out set: 4.214243155058302e-05
MeanAbsoluteError value on hold-out data: 0.0013621854595839977
Epoch: 339
Loss on hold-out set: 3.982630157067363e-05
MeanAbsoluteError value on hold-out data: 0.0014932308113202453
Epoch: 340
Loss on hold-out set: 7.460683105346806e-05
MeanAbsoluteError value on hold-out data: 0.0015935596311464906
Epoch: 341
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Loss on hold-out set: 3.6070749694352766e-05
MeanAbsoluteError value on hold-out data: 0.0015615633456036448
Epoch: 342
Loss on hold-out set: 3.402463711119288e-05
MeanAbsoluteError value on hold-out data: 0.0014054813655093312
Epoch: 343
Loss on hold-out set: 3.221360701279362e-05
MeanAbsoluteError value on hold-out data: 0.0013138193171471357
Epoch: 344
Loss on hold-out set: 3.184372337290579e-05
MeanAbsoluteError value on hold-out data: 0.001545421197079122
Epoch: 345

Loss on hold-out set: 3.0095532239853968e-05
MeanAbsoluteError value on hold-out data: 0.0014194458490237594
Epoch: 346
Loss on hold-out set: 2.8304319781769802e-05
MeanAbsoluteError value on hold-out data: 0.0012579277390614152
Epoch: 347
Loss on hold-out set: 2.6090770384931042e-05
MeanAbsoluteError value on hold-out data: 0.001256367890164256
Epoch: 348

Loss on hold-out set: 2.4684864495856556e-05
MeanAbsoluteError value on hold-out data: 0.0012062069727107882
Epoch: 349
Loss on hold-out set: 2.3754503617877934e-05
MeanAbsoluteError value on hold-out data: 0.001303922850638628
Epoch: 350
Loss on hold-out set: 2.2824563694930825e-05
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Epoch: 351
Loss on hold-out set: 2.1346708308556117e-05
MeanAbsoluteError value on hold-out data: 0.0012250051368027925
Epoch: 352

Loss on hold-out set: 2.0048093578959826e-05
MeanAbsoluteError value on hold-out data: 0.0011865240521728992
Epoch: 353
Loss on hold-out set: 1.8821502467202525e-05
MeanAbsoluteError value on hold-out data: 0.001193034346215427
Epoch: 354
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Loss on hold-out set: 1.7031602890955793e-05
MeanAbsoluteError value on hold-out data: 0.0011705475626513362
Epoch: 355

Loss on hold-out set: 1.6045737277946817e-05
MeanAbsoluteError value on hold-out data: 0.0011004763655364513
Epoch: 356
Loss on hold-out set: 1.5409235054711153e-05
MeanAbsoluteError value on hold-out data: 0.0012026033364236355
Epoch: 357
Loss on hold-out set: 1.5158488609428718e-05
MeanAbsoluteError value on hold-out data: 0.0012374523794278502
Epoch: 358
Loss on hold-out set: 1.451667355704208e-05
MeanAbsoluteError value on hold-out data: 0.0012432810617610812
Epoch: 359

Loss on hold-out set: 1.4485029348284465e-05
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Epoch: 360
Loss on hold-out set: 1.3088308448389467e-05
MeanAbsoluteError value on hold-out data: 0.0011667173821479082
Epoch: 361
Loss on hold-out set: 0.0009520897776663053
MeanAbsoluteError value on hold-out data: 0.009021544829010963
Epoch: 362

Loss on hold-out set: 1.1335747247952755e-05
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Epoch: 363
Loss on hold-out set: 1.3945732077375466e-05
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Epoch: 364
Loss on hold-out set: 1.1372414073426065e-05
MeanAbsoluteError value on hold-out data: 0.00118189153727144
Epoch: 365
Loss on hold-out set: 1.0615687720325275e-05
MeanAbsoluteError value on hold-out data: 0.001089592231437564
Epoch: 366

Loss on hold-out set: 1.0848915779276398e-05
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MeanAbsoluteError value on hold-out data: 0.0013290903298184276
Epoch: 367
Loss on hold-out set: 1.8158734357817033e-05
MeanAbsoluteError value on hold-out data: 0.001132622011937201
Epoch: 368
Loss on hold-out set: 9.32294615005538e-06
MeanAbsoluteError value on hold-out data: 0.0012570911785587668
Epoch: 369

Loss on hold-out set: 8.207655313823965e-06
MeanAbsoluteError value on hold-out data: 0.0010409855749458075
Epoch: 370
Loss on hold-out set: 8.27100614759939e-06
MeanAbsoluteError value on hold-out data: 0.00119405472651124
Epoch: 371
Loss on hold-out set: 7.361652786987459e-06
MeanAbsoluteError value on hold-out data: 0.0010595092317089438
Epoch: 372
Loss on hold-out set: 6.938416050799718e-06
MeanAbsoluteError value on hold-out data: 0.0009725245763547719
Epoch: 373

Loss on hold-out set: 7.3467559524523e-06
MeanAbsoluteError value on hold-out data: 0.0013743516756221652
Epoch: 374
Loss on hold-out set: 6.2812842735673676e-06
MeanAbsoluteError value on hold-out data: 0.0010302785085514188
Epoch: 375
Loss on hold-out set: 0.0018931525705651298
MeanAbsoluteError value on hold-out data: 0.006227419245988131
Epoch: 376

Loss on hold-out set: 6.226571616051702e-06
MeanAbsoluteError value on hold-out data: 0.0010013553546741605
Epoch: 377
Loss on hold-out set: 6.148611097737207e-06
MeanAbsoluteError value on hold-out data: 0.0010502475779503584
Epoch: 378
Loss on hold-out set: 5.765824989968958e-06
MeanAbsoluteError value on hold-out data: 0.0010477653704583645
Epoch: 379
Loss on hold-out set: 6.044495320950843e-06
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MeanAbsoluteError value on hold-out data: 0.0012596931774169207
Epoch: 380

Loss on hold-out set: 5.869327323510403e-06
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Epoch: 381
Loss on hold-out set: 2.4801061464621362e-05
MeanAbsoluteError value on hold-out data: 0.0045743584632873535
Epoch: 382
Loss on hold-out set: 4.626322631651192e-06
MeanAbsoluteError value on hold-out data: 0.0010078644845634699
Epoch: 383

Loss on hold-out set: 4.431168334279461e-06
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Epoch: 384
Loss on hold-out set: 4.4523708573671265e-06
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Epoch: 385
Loss on hold-out set: 4.220433282853264e-06
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Epoch: 386
Loss on hold-out set: 4.590053309199832e-06
MeanAbsoluteError value on hold-out data: 0.0011547356843948364
Epoch: 387

Loss on hold-out set: 0.0026445828709448995
MeanAbsoluteError value on hold-out data: 0.00519359577447176
Epoch: 388
Loss on hold-out set: 3.5234683519565106e-06
MeanAbsoluteError value on hold-out data: 0.000927042041439563
Epoch: 389
Loss on hold-out set: 3.774935246033587e-06
MeanAbsoluteError value on hold-out data: 0.0009301537065766752
Epoch: 390

Loss on hold-out set: 3.728546380225103e-06
MeanAbsoluteError value on hold-out data: 0.000971057394053787
Epoch: 391
Loss on hold-out set: 3.520803340087206e-06
MeanAbsoluteError value on hold-out data: 0.0009390381164848804
```

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Epoch: 392
Loss on hold-out set: 0.003955283468109463
MeanAbsoluteError value on hold-out data: 0.0075818453915417194
Epoch: 393
Loss on hold-out set: 3.1835880459031896e-06
MeanAbsoluteError value on hold-out data: 0.0009988388046622276
Epoch: 394

Loss on hold-out set: 3.228508269068278e-06
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Epoch: 395
Loss on hold-out set: 2.8565669170942642e-06
MeanAbsoluteError value on hold-out data: 0.0009426978067494929
Epoch: 396
Loss on hold-out set: 4.381447798078415e-06
MeanAbsoluteError value on hold-out data: 0.0009729454177431762
Epoch: 397

Loss on hold-out set: 0.0011114217044835711
MeanAbsoluteError value on hold-out data: 0.004460516385734081
Epoch: 398
Loss on hold-out set: 2.458972093021517e-06
MeanAbsoluteError value on hold-out data: 0.0009793371427804232
Epoch: 399
Loss on hold-out set: 2.3554650349174503e-06
MeanAbsoluteError value on hold-out data: 0.0009334403439424932
Epoch: 400
Loss on hold-out set: 2.2189122585831892e-06
MeanAbsoluteError value on hold-out data: 0.0009345859289169312
Epoch: 401

Loss on hold-out set: 2.7052743322341346e-05
MeanAbsoluteError value on hold-out data: 0.005062864627689123
Epoch: 402
Loss on hold-out set: 1.8689707723332015e-06
MeanAbsoluteError value on hold-out data: 0.0008937829989008605
Epoch: 403
Loss on hold-out set: 2.482470154501033e-06
MeanAbsoluteError value on hold-out data: 0.0010672137141227722
Epoch: 404
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Loss on hold-out set: 6.326708181894412e-06
MeanAbsoluteError value on hold-out data: 0.0022013846319168806
Epoch: 405
Loss on hold-out set: 1.6462287052176039e-06
MeanAbsoluteError value on hold-out data: 0.0008399283979088068
Epoch: 406
Loss on hold-out set: 1.5111416889095171e-06
MeanAbsoluteError value on hold-out data: 0.0008290663245134056
Epoch: 407
Loss on hold-out set: 1.4878281870796154e-06
MeanAbsoluteError value on hold-out data: 0.0008340710191987455
Epoch: 408

Loss on hold-out set: 3.373784112717168e-05
MeanAbsoluteError value on hold-out data: 0.005691206082701683
Epoch: 409
Loss on hold-out set: 7.030252065148418e-05
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Epoch: 410
Loss on hold-out set: 1.2434668712138284e-06
MeanAbsoluteError value on hold-out data: 0.0007976126507855952
Epoch: 411

Loss on hold-out set: 0.0011338335581263857
MeanAbsoluteError value on hold-out data: 0.004286274779587984
Epoch: 412
Loss on hold-out set: 1.476717124240587e-06
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Epoch: 413
Loss on hold-out set: 1.3663001823260856e-06
MeanAbsoluteError value on hold-out data: 0.000884781766217202
Epoch: 414
Loss on hold-out set: 1.5824799806278652e-06
MeanAbsoluteError value on hold-out data: 0.000976903480477631
Epoch: 415

Loss on hold-out set: 1.5004531038497448e-06
MeanAbsoluteError value on hold-out data: 0.0009217435144819319
Epoch: 416
Loss on hold-out set: 1.2849155837102444e-06
MeanAbsoluteError value on hold-out data: 0.0008967170142568648
Epoch: 417
```

```
Loss on hold-out set: 1.2689969012696495e-06
MeanAbsoluteError value on hold-out data: 0.0008627730421721935
Epoch: 418

Loss on hold-out set: 1.4249874311644817e-06
MeanAbsoluteError value on hold-out data: 0.0009185582166537642
Epoch: 419
Loss on hold-out set: 1.1709046291868547e-06
MeanAbsoluteError value on hold-out data: 0.0008738839533179998
Epoch: 420
Loss on hold-out set: 1.794451109687473e-06
MeanAbsoluteError value on hold-out data: 0.0011066633742302656
Epoch: 421
Loss on hold-out set: 1.3534415013684618e-06
MeanAbsoluteError value on hold-out data: 0.0009435671381652355
Epoch: 422

Loss on hold-out set: 9.312045633053528e-07
MeanAbsoluteError value on hold-out data: 0.0007677141111344099
Epoch: 423
Loss on hold-out set: 1.402588531198909e-06
MeanAbsoluteError value on hold-out data: 0.000921908300369978
Epoch: 424
Loss on hold-out set: 1.1106147654188064e-06
MeanAbsoluteError value on hold-out data: 0.0008818274945951998
Epoch: 425

Loss on hold-out set: 6.5483931253905984e-06
MeanAbsoluteError value on hold-out data: 0.0023589434567838907
Epoch: 426
Loss on hold-out set: 1.2387043590514133e-06
MeanAbsoluteError value on hold-out data: 0.0008952003554441035
Epoch: 427
Loss on hold-out set: 9.083097908684906e-07
MeanAbsoluteError value on hold-out data: 0.0007884794613346457
Epoch: 428
Loss on hold-out set: 1.1472020953708404e-06
MeanAbsoluteError value on hold-out data: 0.000855781720019877
Epoch: 429

Loss on hold-out set: 1.4146597886967636e-06
```

```
MeanAbsoluteError value on hold-out data: 0.0009279802325181663
Epoch: 430
Loss on hold-out set: 1.1846859444211498e-06
MeanAbsoluteError value on hold-out data: 0.0008447170257568359
Epoch: 431
Loss on hold-out set: 1.6191280215375277e-06
MeanAbsoluteError value on hold-out data: 0.00098606466781348
Epoch: 432

Loss on hold-out set: 1.5403005787762736e-06
MeanAbsoluteError value on hold-out data: 0.0010503301164135337
Epoch: 433
Loss on hold-out set: 9.73989835109443e-07
MeanAbsoluteError value on hold-out data: 0.0008140054414980114
Epoch: 434
Loss on hold-out set: 1.0905105096543803e-06
MeanAbsoluteError value on hold-out data: 0.0008401861996389925
Epoch: 435
Loss on hold-out set: 8.561664733756165e-07
MeanAbsoluteError value on hold-out data: 0.0007650691550225019
Epoch: 436

Loss on hold-out set: 1.0821404714533855e-06
MeanAbsoluteError value on hold-out data: 0.0008229130762629211
Epoch: 437
Loss on hold-out set: 1.0911279437445606e-05
MeanAbsoluteError value on hold-out data: 0.00309965037740767
Epoch: 438
Loss on hold-out set: 1.0220137701603212e-06
MeanAbsoluteError value on hold-out data: 0.0008058372186496854
Epoch: 439

Loss on hold-out set: 8.112125180140048e-07
MeanAbsoluteError value on hold-out data: 0.0007099789218045771
Epoch: 440
Loss on hold-out set: 8.241590034703432e-07
MeanAbsoluteError value on hold-out data: 0.0007269856287166476
Epoch: 441
Loss on hold-out set: 1.0392155943988585e-06
MeanAbsoluteError value on hold-out data: 0.0008069753530435264
Epoch: 442
Loss on hold-out set: 8.94683471240289e-07
```

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MeanAbsoluteError value on hold-out data: 0.0008002054528333247
Epoch: 443

Loss on hold-out set: 8.861553208834476e-07
MeanAbsoluteError value on hold-out data: 0.0007566204876638949
Epoch: 444
Loss on hold-out set: 2.350440277391149e-05
MeanAbsoluteError value on hold-out data: 0.004751894157379866
Epoch: 445
Loss on hold-out set: 1.2148532933819156e-06
MeanAbsoluteError value on hold-out data: 0.0009015992400236428
Epoch: 446

Loss on hold-out set: 1.01310331064479e-06
MeanAbsoluteError value on hold-out data: 0.0008180835866369307
Epoch: 447
Loss on hold-out set: 1.0991054575872392e-06
MeanAbsoluteError value on hold-out data: 0.0008503541466780007
Epoch: 448
Loss on hold-out set: 9.270528599140212e-07
MeanAbsoluteError value on hold-out data: 0.0007515245815739036
Epoch: 449
Loss on hold-out set: 2.0613171920138902e-06
MeanAbsoluteError value on hold-out data: 0.0011397487251088023
Epoch: 450

Loss on hold-out set: 9.424546913823389e-07
MeanAbsoluteError value on hold-out data: 0.0007746979827061296
Epoch: 451
Loss on hold-out set: 9.13291895716821e-07
MeanAbsoluteError value on hold-out data: 0.0007642066339030862
Epoch: 452
Loss on hold-out set: 9.987117900541657e-07
MeanAbsoluteError value on hold-out data: 0.0007809048984199762
Epoch: 453

Loss on hold-out set: 1.0719200990759139e-06
MeanAbsoluteError value on hold-out data: 0.000876244914252311
Epoch: 454
Loss on hold-out set: 6.378677881002659e-06
MeanAbsoluteError value on hold-out data: 0.002334460848942399
```

```
Epoch: 455
Loss on hold-out set: 1.2690145511512058e-06
MeanAbsoluteError value on hold-out data: 0.0008698225137777627
Epoch: 456
Loss on hold-out set: 1.263565639402049e-06
MeanAbsoluteError value on hold-out data: 0.0008734679431654513
Epoch: 457

Loss on hold-out set: 1.0188347757251065e-06
MeanAbsoluteError value on hold-out data: 0.0008311486453749239
Epoch: 458
Loss on hold-out set: 1.6319418005668222e-06
MeanAbsoluteError value on hold-out data: 0.001071603037416935
Epoch: 459
Loss on hold-out set: 3.1329652319282804e-06
MeanAbsoluteError value on hold-out data: 0.001486559514887631
Epoch: 460

Loss on hold-out set: 9.120609088488261e-07
MeanAbsoluteError value on hold-out data: 0.0007601433899253607
Epoch: 461
Loss on hold-out set: 6.662666692136554e-06
MeanAbsoluteError value on hold-out data: 0.0023740814067423344
Epoch: 462
Loss on hold-out set: 1.0453684484883315e-06
MeanAbsoluteError value on hold-out data: 0.000826918170787394
Epoch: 463
Loss on hold-out set: 1.057953668875528e-06
MeanAbsoluteError value on hold-out data: 0.0008559560519643128
Epoch: 464

Loss on hold-out set: 1.001440411895461e-06
MeanAbsoluteError value on hold-out data: 0.0008063295390456915
Epoch: 465
Loss on hold-out set: 9.58940975036827e-07
MeanAbsoluteError value on hold-out data: 0.000799775414634496
Epoch: 466
Loss on hold-out set: 8.913001706262619e-07
MeanAbsoluteError value on hold-out data: 0.0007794624543748796
Epoch: 467
```

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Loss on hold-out set: 8.293417513763975e-07
MeanAbsoluteError value on hold-out data: 0.0007392311235889792
Epoch: 468
Loss on hold-out set: 9.155484187536226e-07
MeanAbsoluteError value on hold-out data: 0.0007939648348838091
Epoch: 469
Loss on hold-out set: 1.124142878202642e-06
MeanAbsoluteError value on hold-out data: 0.000847257673740387
Epoch: 470
Loss on hold-out set: 9.620491447584266e-07
MeanAbsoluteError value on hold-out data: 0.0007894450682215393
Epoch: 471

Loss on hold-out set: 1.1109381235795668e-06
MeanAbsoluteError value on hold-out data: 0.0008778726914897561
Epoch: 472
Loss on hold-out set: 9.863387093061576e-07
MeanAbsoluteError value on hold-out data: 0.0007981493836268783
Epoch: 473
Loss on hold-out set: 1.098986280987027e-06
MeanAbsoluteError value on hold-out data: 0.0008387464331462979
Epoch: 474

Loss on hold-out set: 1.028618710891421e-06
MeanAbsoluteError value on hold-out data: 0.0008150499779731035
Epoch: 475
Loss on hold-out set: 0.001092414555899906
MeanAbsoluteError value on hold-out data: 0.004156508017331362
Epoch: 476
Loss on hold-out set: 9.640164714360603e-07
MeanAbsoluteError value on hold-out data: 0.000799061672296375
Epoch: 477
Loss on hold-out set: 4.3508815276884256e-05
MeanAbsoluteError value on hold-out data: 0.006493380758911371
Epoch: 478

Loss on hold-out set: 1.0095482751309576e-06
MeanAbsoluteError value on hold-out data: 0.0007316896226257086
Epoch: 479
Loss on hold-out set: 9.100099698746187e-07
MeanAbsoluteError value on hold-out data: 0.0007393616251647472
Epoch: 480
```

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Loss on hold-out set: 1.0025470986035473e-06
MeanAbsoluteError value on hold-out data: 0.0007676309323869646
Epoch: 481

Loss on hold-out set: 1.4017903534015484e-06
MeanAbsoluteError value on hold-out data: 0.0009082949254661798
Epoch: 482
Loss on hold-out set: 9.865124053039135e-07
MeanAbsoluteError value on hold-out data: 0.0008052680059336126
Epoch: 483
Loss on hold-out set: 9.527633995258628e-07
MeanAbsoluteError value on hold-out data: 0.0008015143685042858
Epoch: 484
Loss on hold-out set: 1.1922436442546314e-06
MeanAbsoluteError value on hold-out data: 0.0009233275195583701
Epoch: 485

Loss on hold-out set: 1.1093802859599796e-06
MeanAbsoluteError value on hold-out data: 0.0008738046744838357
Epoch: 486
Loss on hold-out set: 1.0997928563063817e-06
MeanAbsoluteError value on hold-out data: 0.0008843955583870411
Epoch: 487
Loss on hold-out set: 1.0287549099092967e-06
MeanAbsoluteError value on hold-out data: 0.0008192774839699268
Epoch: 488

Loss on hold-out set: 1.0114020395891343e-06
MeanAbsoluteError value on hold-out data: 0.0008282089256681502
Epoch: 489
Loss on hold-out set: 1.0928001428895257e-06
MeanAbsoluteError value on hold-out data: 0.0008169042994268239
Epoch: 490
Loss on hold-out set: 1.1822481663050264e-06
MeanAbsoluteError value on hold-out data: 0.0008544555166736245
Epoch: 491
Loss on hold-out set: 1.0196008326182402e-06
MeanAbsoluteError value on hold-out data: 0.0008458018419332802
Epoch: 492

Loss on hold-out set: 1.0936406165630895e-06
```

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MeanAbsoluteError value on hold-out data: 0.0008401042432524264
Epoch: 493
Loss on hold-out set: 1.6472648514291695e-06
MeanAbsoluteError value on hold-out data: 0.0010814729612320662
Epoch: 494
Loss on hold-out set: 1.1099501543517713e-06
MeanAbsoluteError value on hold-out data: 0.0008456695359200239
Epoch: 495

Loss on hold-out set: 1.1902409041270473e-06
MeanAbsoluteError value on hold-out data: 0.0008430078742094338
Epoch: 496
Loss on hold-out set: 1.0499061514880082e-06
MeanAbsoluteError value on hold-out data: 0.0008254090207628906
Epoch: 497
Loss on hold-out set: 9.844916152045557e-07
MeanAbsoluteError value on hold-out data: 0.0008092030766420066
Epoch: 498
Loss on hold-out set: 1.0969016404242911e-06
MeanAbsoluteError value on hold-out data: 0.0008143079467117786
Epoch: 499

Loss on hold-out set: 1.2206571747915755e-06
MeanAbsoluteError value on hold-out data: 0.000889575167093426
Epoch: 500
Loss on hold-out set: 9.810318908001557e-07
MeanAbsoluteError value on hold-out data: 0.0008200028678402305
Epoch: 501
Loss on hold-out set: 4.302404956363786e-05
MeanAbsoluteError value on hold-out data: 0.006452461704611778
Epoch: 502

Loss on hold-out set: 1.0118246458126543e-06
MeanAbsoluteError value on hold-out data: 0.0008139017154462636
Epoch: 503
Loss on hold-out set: 8.488620809342907e-07
MeanAbsoluteError value on hold-out data: 0.0007165390416048467
Epoch: 504
Loss on hold-out set: 8.292035519074349e-07
MeanAbsoluteError value on hold-out data: 0.0007378527661785483
Epoch: 505
Loss on hold-out set: 1.0792042202795599e-06
```

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MeanAbsoluteError value on hold-out data: 0.0008218681905418634
Epoch: 506

Loss on hold-out set: 1.2280258156002114e-06
MeanAbsoluteError value on hold-out data: 0.0009116396540775895
Epoch: 507
Loss on hold-out set: 1.554364613499414e-06
MeanAbsoluteError value on hold-out data: 0.000986390165053308
Epoch: 508
Loss on hold-out set: 9.257070263839313e-07
MeanAbsoluteError value on hold-out data: 0.000769153528381139
Epoch: 509

Loss on hold-out set: 1.1450563710888253e-06
MeanAbsoluteError value on hold-out data: 0.0008298939210362732
Epoch: 510
Loss on hold-out set: 8.623471965909e-07
MeanAbsoluteError value on hold-out data: 0.0007577839423902333
Epoch: 511
Loss on hold-out set: 1.148136992521988e-06
MeanAbsoluteError value on hold-out data: 0.000855692895129323
Epoch: 512
Loss on hold-out set: 1.2398366974454034e-06
MeanAbsoluteError value on hold-out data: 0.0008732968708500266
Epoch: 513

Loss on hold-out set: 1.740890540811681e-05
MeanAbsoluteError value on hold-out data: 0.0040301792323589325
Epoch: 514
Loss on hold-out set: 1.1256684549957404e-06
MeanAbsoluteError value on hold-out data: 0.0008130827336572111
Epoch: 515
Loss on hold-out set: 1.3555225870312336e-06
MeanAbsoluteError value on hold-out data: 0.0009764542919583619
Epoch: 516

Loss on hold-out set: 9.723117802178212e-07
MeanAbsoluteError value on hold-out data: 0.0007877549505792558
Epoch: 517
Loss on hold-out set: 9.493011160744712e-07
MeanAbsoluteError value on hold-out data: 0.0008052763296291232
```

```
Epoch: 518
Loss on hold-out set: 1.1918446909056422e-06
MeanAbsoluteError value on hold-out data: 0.0008293390274047852
Epoch: 519
Loss on hold-out set: 3.0321630919598438e-06
MeanAbsoluteError value on hold-out data: 0.001492933603003621
Epoch: 520

Loss on hold-out set: 1.2114315972247334e-06
MeanAbsoluteError value on hold-out data: 0.0008677378064021468
Epoch: 521
Loss on hold-out set: 9.847925814308558e-07
MeanAbsoluteError value on hold-out data: 0.0008338532061316073
Epoch: 522
Loss on hold-out set: 8.413756649343458e-07
MeanAbsoluteError value on hold-out data: 0.0007609364110976458
Epoch: 523

Loss on hold-out set: 8.926924233667075e-07
MeanAbsoluteError value on hold-out data: 0.0007585939601995051
Epoch: 524
Loss on hold-out set: 8.881586032097962e-07
MeanAbsoluteError value on hold-out data: 0.0007347413920797408
Epoch: 525
Loss on hold-out set: 9.165753803804714e-07
MeanAbsoluteError value on hold-out data: 0.0007608148735016584
Epoch: 526
Loss on hold-out set: 1.0410943087453443e-06
MeanAbsoluteError value on hold-out data: 0.0007947471458464861
Epoch: 527

Loss on hold-out set: 9.245845415779723e-07
MeanAbsoluteError value on hold-out data: 0.0007655340596102178
Epoch: 528
Loss on hold-out set: 8.833949498064333e-07
MeanAbsoluteError value on hold-out data: 0.0007937633781693876
Epoch: 529
Loss on hold-out set: 1.026148236878026e-06
MeanAbsoluteError value on hold-out data: 0.0008031135657802224
Epoch: 530
```

```
Loss on hold-out set: 1.3992881235935783e-06
MeanAbsoluteError value on hold-out data: 0.0009081781026907265
Epoch: 531
Loss on hold-out set: 9.358282212063457e-07
MeanAbsoluteError value on hold-out data: 0.0007789954543113708
Epoch: 532
Loss on hold-out set: 9.96177092815742e-07
MeanAbsoluteError value on hold-out data: 0.000803177070338279
Epoch: 533
Loss on hold-out set: 0.00011561851148109362
MeanAbsoluteError value on hold-out data: 0.0019581562373787165
Epoch: 534

Loss on hold-out set: 1.573137543923272e-06
MeanAbsoluteError value on hold-out data: 0.0009422114235349
Epoch: 535
Loss on hold-out set: 1.0152572050751237e-06
MeanAbsoluteError value on hold-out data: 0.0008027165895327926
Epoch: 536
Loss on hold-out set: 9.262430751277861e-07
MeanAbsoluteError value on hold-out data: 0.0007861393969506025
Epoch: 537

Loss on hold-out set: 9.755773362485343e-07
MeanAbsoluteError value on hold-out data: 0.0008211878011934459
Epoch: 538
Loss on hold-out set: 9.682257047398498e-07
MeanAbsoluteError value on hold-out data: 0.0007806509966030717
Epoch: 539
Loss on hold-out set: 1.2831204729151907e-06
MeanAbsoluteError value on hold-out data: 0.0009464970207773149
Epoch: 540
Loss on hold-out set: 8.887681067685312e-07
MeanAbsoluteError value on hold-out data: 0.0007740157889202237
Epoch: 541

Loss on hold-out set: 1.0239680600184679e-06
MeanAbsoluteError value on hold-out data: 0.0008457389194518328
Epoch: 542
Loss on hold-out set: 0.0001960460317550227
MeanAbsoluteError value on hold-out data: 0.002192940330132842
Epoch: 543
```

```
Loss on hold-out set: 1.3629394725984848e-06
MeanAbsoluteError value on hold-out data: 0.0009363919380120933
Epoch: 544

Loss on hold-out set: 1.5949723407314964e-06
MeanAbsoluteError value on hold-out data: 0.0010004761861637235
Epoch: 545
Loss on hold-out set: 9.15999053701783e-07
MeanAbsoluteError value on hold-out data: 0.0007562219980172813
Epoch: 546
Loss on hold-out set: 9.002719620044585e-07
MeanAbsoluteError value on hold-out data: 0.0007641222910024226
Epoch: 547
Loss on hold-out set: 1.0063171334177941e-06
MeanAbsoluteError value on hold-out data: 0.000839997548609972
Epoch: 548

Loss on hold-out set: 8.580633880009932e-07
MeanAbsoluteError value on hold-out data: 0.0007525172550231218
Epoch: 549
Loss on hold-out set: 1.367450041610797e-06
MeanAbsoluteError value on hold-out data: 0.0009048834326677024
Epoch: 550
Loss on hold-out set: 1.352120316019304e-06
MeanAbsoluteError value on hold-out data: 0.0009894483955577016
Epoch: 551

Loss on hold-out set: 3.0829585372115475e-06
MeanAbsoluteError value on hold-out data: 0.0015614739386364818
Epoch: 552
Loss on hold-out set: 8.363020880936417e-07
MeanAbsoluteError value on hold-out data: 0.000734261586330831
Epoch: 553
Loss on hold-out set: 4.465111459677036e-05
MeanAbsoluteError value on hold-out data: 0.006626633461564779
Epoch: 554
Loss on hold-out set: 9.348987821165513e-07
MeanAbsoluteError value on hold-out data: 0.0007560122176073492
Epoch: 555

Loss on hold-out set: 8.130929846681913e-07
```

```
MeanAbsoluteError value on hold-out data: 0.0007075411267578602
Epoch: 556
Loss on hold-out set: 1.0082907292686427e-06
MeanAbsoluteError value on hold-out data: 0.0007724863244220614
Epoch: 557
Loss on hold-out set: 8.232126381594403e-07
MeanAbsoluteError value on hold-out data: 0.0007414218853227794
Epoch: 558

Loss on hold-out set: 3.918632168838835e-06
MeanAbsoluteError value on hold-out data: 0.0017735058208927512
Epoch: 559
Loss on hold-out set: 1.000537845531933e-06
MeanAbsoluteError value on hold-out data: 0.0007641044212505221
Epoch: 560
Loss on hold-out set: 3.445387444746582e-06
MeanAbsoluteError value on hold-out data: 0.0016091489233076572
Epoch: 561
Loss on hold-out set: 1.1828302123061662e-06
MeanAbsoluteError value on hold-out data: 0.0008439305238425732
Epoch: 562

Loss on hold-out set: 8.503739169240222e-07
MeanAbsoluteError value on hold-out data: 0.0007447412353940308
Epoch: 563
Loss on hold-out set: 1.0844139043141554e-06
MeanAbsoluteError value on hold-out data: 0.0008723711944185197
Epoch: 564
Loss on hold-out set: 8.978185650658605e-07
MeanAbsoluteError value on hold-out data: 0.0007562205428257585
Epoch: 565

Loss on hold-out set: 1.9044397119544625e-05
MeanAbsoluteError value on hold-out data: 0.004268063232302666
Epoch: 566
Loss on hold-out set: 1.2987084731391335e-06
MeanAbsoluteError value on hold-out data: 0.0009143072529695928
Epoch: 567
Loss on hold-out set: 8.26237020681639e-07
MeanAbsoluteError value on hold-out data: 0.0007462215144187212
Early stopping at epoch 566
Fold: 6
```

```
Epoch: 1
Loss on hold-out set: 0.03624718066734763
MeanAbsoluteError value on hold-out data: 0.1447027176618576
Epoch: 2

Loss on hold-out set: 0.032902575456179105
MeanAbsoluteError value on hold-out data: 0.1421678066253662
Epoch: 3
Loss on hold-out set: 0.03292210056231572
MeanAbsoluteError value on hold-out data: 0.14086978137493134
Epoch: 4
Loss on hold-out set: 0.03130613944421594
MeanAbsoluteError value on hold-out data: 0.13947688043117523
Epoch: 5

Loss on hold-out set: 0.031257789582014084
MeanAbsoluteError value on hold-out data: 0.13806132972240448
Epoch: 6
Loss on hold-out set: 0.032843004195736006
MeanAbsoluteError value on hold-out data: 0.13700684905052185
Epoch: 7
Loss on hold-out set: 0.030449391915821113
MeanAbsoluteError value on hold-out data: 0.13603892922401428
Epoch: 8
Loss on hold-out set: 0.030271718708368447
MeanAbsoluteError value on hold-out data: 0.13507473468780518
Epoch: 9

Loss on hold-out set: 0.029032158522078626
MeanAbsoluteError value on hold-out data: 0.13414286077022552
Epoch: 10
Loss on hold-out set: 0.0293569232050616
MeanAbsoluteError value on hold-out data: 0.133377805352211
Epoch: 11
Loss on hold-out set: 0.02964330206696804
MeanAbsoluteError value on hold-out data: 0.13251738250255585
Epoch: 12

Loss on hold-out set: 0.027460610780578393
MeanAbsoluteError value on hold-out data: 0.13175569474697113
Epoch: 13
```

```
Loss on hold-out set: 0.028132637962698936
MeanAbsoluteError value on hold-out data: 0.13097883760929108
Epoch: 14
Loss on hold-out set: 0.028374462101895075
MeanAbsoluteError value on hold-out data: 0.13021531701087952
Epoch: 15
Loss on hold-out set: 0.028661580183185063
MeanAbsoluteError value on hold-out data: 0.1294056475162506
Epoch: 16

Loss on hold-out set: 0.02844589289564353
MeanAbsoluteError value on hold-out data: 0.12865470349788666
Epoch: 17
Loss on hold-out set: 0.026016113008014284
MeanAbsoluteError value on hold-out data: 0.12779684364795685
Epoch: 18
Loss on hold-out set: 0.02578869526489423
MeanAbsoluteError value on hold-out data: 0.12688176333904266
Epoch: 19

Loss on hold-out set: 0.02643384225666523
MeanAbsoluteError value on hold-out data: 0.12607012689113617
Epoch: 20
Loss on hold-out set: 0.026212766121786375
MeanAbsoluteError value on hold-out data: 0.12500262260437012
Epoch: 21
Loss on hold-out set: 0.026147155592647884
MeanAbsoluteError value on hold-out data: 0.12418469786643982
Epoch: 22
Loss on hold-out set: 0.024491593528252382
MeanAbsoluteError value on hold-out data: 0.12311092019081116
Epoch: 23

Loss on hold-out set: 0.024365915558659114
MeanAbsoluteError value on hold-out data: 0.12219474464654922
Epoch: 24
Loss on hold-out set: 0.02367409884643096
MeanAbsoluteError value on hold-out data: 0.12107709795236588
Epoch: 25
Loss on hold-out set: 0.024542475334153727
MeanAbsoluteError value on hold-out data: 0.1202351376414299
Epoch: 26
```

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Loss on hold-out set: 0.024036752203336127
MeanAbsoluteError value on hold-out data: 0.1189577579498291
Epoch: 27
Loss on hold-out set: 0.022779602127579544
MeanAbsoluteError value on hold-out data: 0.11782532930374146
Epoch: 28
Loss on hold-out set: 0.022000741106099807
MeanAbsoluteError value on hold-out data: 0.11691092699766159
Epoch: 29
Loss on hold-out set: 0.021650695886749487
MeanAbsoluteError value on hold-out data: 0.11538778990507126
Epoch: 30

Loss on hold-out set: 0.021161998174368188
MeanAbsoluteError value on hold-out data: 0.11426856368780136
Epoch: 31
Loss on hold-out set: 0.020677216870423693
MeanAbsoluteError value on hold-out data: 0.11309957504272461
Epoch: 32
Loss on hold-out set: 0.02010934230370017
MeanAbsoluteError value on hold-out data: 0.1118970513343811
Epoch: 33

Loss on hold-out set: 0.020185221505996127
MeanAbsoluteError value on hold-out data: 0.1103491485118866
Epoch: 34
Loss on hold-out set: 0.019806814666550893
MeanAbsoluteError value on hold-out data: 0.10922425985336304
Epoch: 35
Loss on hold-out set: 0.0189920449271225
MeanAbsoluteError value on hold-out data: 0.10795362293720245
Epoch: 36
Loss on hold-out set: 0.019321072631730482
MeanAbsoluteError value on hold-out data: 0.10641774535179138
Epoch: 37

Loss on hold-out set: 0.017734236298845366
MeanAbsoluteError value on hold-out data: 0.10497311502695084
Epoch: 38
Loss on hold-out set: 0.017337412430116765
MeanAbsoluteError value on hold-out data: 0.1038443073630333
Epoch: 39
```

```
Loss on hold-out set: 0.01745049350966628
MeanAbsoluteError value on hold-out data: 0.10204846411943436
Epoch: 40

Loss on hold-out set: 0.01712003708458864
MeanAbsoluteError value on hold-out data: 0.10054231435060501
Epoch: 41
Loss on hold-out set: 0.015877297291388877
MeanAbsoluteError value on hold-out data: 0.09913817048072815
Epoch: 42
Loss on hold-out set: 0.015772043610922992
MeanAbsoluteError value on hold-out data: 0.09763381630182266
Epoch: 43
Loss on hold-out set: 0.015054957188952427
MeanAbsoluteError value on hold-out data: 0.09645429253578186
Epoch: 44

Loss on hold-out set: 0.014615189427366624
MeanAbsoluteError value on hold-out data: 0.09459695965051651
Epoch: 45
Loss on hold-out set: 0.014188111401521243
MeanAbsoluteError value on hold-out data: 0.093406543135643
Epoch: 46
Loss on hold-out set: 0.013797878968314482
MeanAbsoluteError value on hold-out data: 0.09249179810285568
Epoch: 47

Loss on hold-out set: 0.013116150700415555
MeanAbsoluteError value on hold-out data: 0.09094136953353882
Epoch: 48
Loss on hold-out set: 0.012841816203525433
MeanAbsoluteError value on hold-out data: 0.08829572051763535
Epoch: 49
Loss on hold-out set: 0.011849873388060726
MeanAbsoluteError value on hold-out data: 0.08689650893211365
Epoch: 50
Loss on hold-out set: 0.011797534158596626
MeanAbsoluteError value on hold-out data: 0.08498049527406693
Epoch: 51

Loss on hold-out set: 0.010974538279697299
```

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MeanAbsoluteError value on hold-out data: 0.0834965780377388
Epoch: 52
Loss on hold-out set: 0.011043978702778427
MeanAbsoluteError value on hold-out data: 0.08206718415021896
Epoch: 53
Loss on hold-out set: 0.010424043875760756
MeanAbsoluteError value on hold-out data: 0.08016225695610046
Epoch: 54

Loss on hold-out set: 0.009649225242006091
MeanAbsoluteError value on hold-out data: 0.0778677687048912
Epoch: 55
Loss on hold-out set: 0.009606139573196951
MeanAbsoluteError value on hold-out data: 0.07641433924436569
Epoch: 56
Loss on hold-out set: 0.009056818367053684
MeanAbsoluteError value on hold-out data: 0.07408726960420609
Epoch: 57
Loss on hold-out set: 0.008320147708918039
MeanAbsoluteError value on hold-out data: 0.07224029302597046
Epoch: 58

Loss on hold-out set: 0.007799837792005677
MeanAbsoluteError value on hold-out data: 0.07091344892978668
Epoch: 59
Loss on hold-out set: 0.007618526946036861
MeanAbsoluteError value on hold-out data: 0.06969127804040909
Epoch: 60
Loss on hold-out set: 0.006923704291693866
MeanAbsoluteError value on hold-out data: 0.06709565967321396
Epoch: 61

Loss on hold-out set: 0.006934848184195848
MeanAbsoluteError value on hold-out data: 0.0658351480960846
Epoch: 62
Loss on hold-out set: 0.006103019722594092
MeanAbsoluteError value on hold-out data: 0.06380603462457657
Epoch: 63
Loss on hold-out set: 0.005821276133736739
MeanAbsoluteError value on hold-out data: 0.06266672909259796
Epoch: 64
Loss on hold-out set: 0.005707785702095582
```

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MeanAbsoluteError value on hold-out data: 0.05993720889091492
Epoch: 65

Loss on hold-out set: 0.005248790418800826
MeanAbsoluteError value on hold-out data: 0.05875931307673454
Epoch: 66
Loss on hold-out set: 0.0046715600541434605
MeanAbsoluteError value on hold-out data: 0.055800434201955795
Epoch: 67
Loss on hold-out set: 0.004417194886347995
MeanAbsoluteError value on hold-out data: 0.05519977957010269
Epoch: 68

Loss on hold-out set: 0.004118726355955005
MeanAbsoluteError value on hold-out data: 0.05368737876415253
Epoch: 69
Loss on hold-out set: 0.0038347483540956792
MeanAbsoluteError value on hold-out data: 0.05091540887951851
Epoch: 70
Loss on hold-out set: 0.00352447446829711
MeanAbsoluteError value on hold-out data: 0.04883401840925217
Epoch: 71
Loss on hold-out set: 0.0032598586045563794
MeanAbsoluteError value on hold-out data: 0.04748646914958954
Epoch: 72

Loss on hold-out set: 0.0029712690828511347
MeanAbsoluteError value on hold-out data: 0.04508699104189873
Epoch: 73
Loss on hold-out set: 0.002654808913715757
MeanAbsoluteError value on hold-out data: 0.04287092387676239
Epoch: 74
Loss on hold-out set: 0.002435813998230375
MeanAbsoluteError value on hold-out data: 0.0410148985683918
Epoch: 75

Loss on hold-out set: 0.0023647477948823227
MeanAbsoluteError value on hold-out data: 0.03927663713693619
Epoch: 76
Loss on hold-out set: 0.002016628599868944
MeanAbsoluteError value on hold-out data: 0.03754006698727608
```

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Epoch: 77
Loss on hold-out set: 0.0018759330761475633
MeanAbsoluteError value on hold-out data: 0.03537861257791519
Epoch: 78
Loss on hold-out set: 0.0016135698130640846
MeanAbsoluteError value on hold-out data: 0.033867135643959045
Epoch: 79

Loss on hold-out set: 0.0015413203822950332
MeanAbsoluteError value on hold-out data: 0.03213203698396683
Epoch: 80
Loss on hold-out set: 0.0012808461995938649
MeanAbsoluteError value on hold-out data: 0.029750637710094452
Epoch: 81
Loss on hold-out set: 0.0011751965212170035
MeanAbsoluteError value on hold-out data: 0.028142742812633514
Epoch: 82

Loss on hold-out set: 0.0010838393377175985
MeanAbsoluteError value on hold-out data: 0.027626659721136093
Epoch: 83
Loss on hold-out set: 0.0009021523516052044
MeanAbsoluteError value on hold-out data: 0.025063958019018173
Epoch: 84
Loss on hold-out set: 0.0013179206244575863
MeanAbsoluteError value on hold-out data: 0.02507789619266987
Epoch: 85
Loss on hold-out set: 0.0007213063273901263
MeanAbsoluteError value on hold-out data: 0.022313687950372696
Epoch: 86

Loss on hold-out set: 0.0006043714305493408
MeanAbsoluteError value on hold-out data: 0.01979972794651985
Epoch: 87
Loss on hold-out set: 0.0005118686693514554
MeanAbsoluteError value on hold-out data: 0.019071202725172043
Epoch: 88
Loss on hold-out set: 0.00044324379436707555
MeanAbsoluteError value on hold-out data: 0.01744060590863228
Epoch: 89
```

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Loss on hold-out set: 0.00036123712533690897
MeanAbsoluteError value on hold-out data: 0.015713438391685486
Epoch: 90
Loss on hold-out set: 0.00035441617309026275
MeanAbsoluteError value on hold-out data: 0.014781304635107517
Epoch: 91
Loss on hold-out set: 0.0002608997590589122
MeanAbsoluteError value on hold-out data: 0.013176224194467068
Epoch: 92
Loss on hold-out set: 0.00048028080849550094
MeanAbsoluteError value on hold-out data: 0.014364553615450859
Epoch: 93

Loss on hold-out set: 0.00020463948525363006
MeanAbsoluteError value on hold-out data: 0.011890776455402374
Epoch: 94
Loss on hold-out set: 0.004281222587451339
MeanAbsoluteError value on hold-out data: 0.02064943127334118
Epoch: 95
Loss on hold-out set: 0.0001319442490057554
MeanAbsoluteError value on hold-out data: 0.008688447996973991
Epoch: 96

Loss on hold-out set: 9.522410227173868e-05
MeanAbsoluteError value on hold-out data: 0.007927415892481804
Epoch: 97
Loss on hold-out set: 7.628448432884537e-05
MeanAbsoluteError value on hold-out data: 0.0071653020568192005
Epoch: 98
Loss on hold-out set: 6.122095846177007e-05
MeanAbsoluteError value on hold-out data: 0.005876203067600727
Epoch: 99
Loss on hold-out set: 5.424801607799824e-05
MeanAbsoluteError value on hold-out data: 0.005289812106639147
Epoch: 100

Loss on hold-out set: 3.752224683222057e-05
MeanAbsoluteError value on hold-out data: 0.0046159205958247185
Epoch: 101
Loss on hold-out set: 2.721607657244581e-05
MeanAbsoluteError value on hold-out data: 0.0039335875771939754
Epoch: 102
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Loss on hold-out set: 2.085104216138671e-05
MeanAbsoluteError value on hold-out data: 0.00334456330165267
Epoch: 103

Loss on hold-out set: 4.343700486340542e-05
MeanAbsoluteError value on hold-out data: 0.003341466886922717
Epoch: 104
Loss on hold-out set: 1.317194759254702e-05
MeanAbsoluteError value on hold-out data: 0.002438189461827278
Epoch: 105
Loss on hold-out set: 9.246489508558834e-06
MeanAbsoluteError value on hold-out data: 0.0020803881343454123
Epoch: 106
Loss on hold-out set: 7.920596737256767e-06
MeanAbsoluteError value on hold-out data: 0.002097455784678459
Epoch: 107

Loss on hold-out set: 7.935583163578905e-06
MeanAbsoluteError value on hold-out data: 0.0022667215671390295
Epoch: 108
Loss on hold-out set: 5.581116817246277e-06
MeanAbsoluteError value on hold-out data: 0.0014991143252700567
Epoch: 109
Loss on hold-out set: 4.976805275174019e-06
MeanAbsoluteError value on hold-out data: 0.001431785523891449
Epoch: 110

Loss on hold-out set: 4.010422781693006e-06
MeanAbsoluteError value on hold-out data: 0.0013680380070582032
Epoch: 111
Loss on hold-out set: 3.061434676090777e-05
MeanAbsoluteError value on hold-out data: 0.002036635298281908
Epoch: 112
Loss on hold-out set: 2.7222280060903777e-06
MeanAbsoluteError value on hold-out data: 0.0010478886542841792
Epoch: 113
Loss on hold-out set: 3.9949338682932785e-06
MeanAbsoluteError value on hold-out data: 0.0014786527026444674
Epoch: 114

Loss on hold-out set: 3.1131378298491304e-06
```

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MeanAbsoluteError value on hold-out data: 0.0011134055675938725
Epoch: 115
Loss on hold-out set: 2.9258078593731907e-06
MeanAbsoluteError value on hold-out data: 0.0011247872607782483
Epoch: 116
Loss on hold-out set: 1.0096481498924102e-05
MeanAbsoluteError value on hold-out data: 0.0029088472947478294
Epoch: 117

Loss on hold-out set: 0.0006465420482737289
MeanAbsoluteError value on hold-out data: 0.00450007664039731
Epoch: 118
Loss on hold-out set: 2.7897276857821944e-06
MeanAbsoluteError value on hold-out data: 0.001259382115676999
Epoch: 119
Loss on hold-out set: 2.0037568945624048e-06
MeanAbsoluteError value on hold-out data: 0.0009802759159356356
Epoch: 120
Loss on hold-out set: 5.493555608364449e-06
MeanAbsoluteError value on hold-out data: 0.002033487893640995
Epoch: 121

Loss on hold-out set: 2.332350277356454e-06
MeanAbsoluteError value on hold-out data: 0.0012454671086743474
Epoch: 122
Loss on hold-out set: 1.560545379893833e-06
MeanAbsoluteError value on hold-out data: 0.0009304668637923896
Epoch: 123
Loss on hold-out set: 1.6815999707922367e-06
MeanAbsoluteError value on hold-out data: 0.0008838888024911284
Epoch: 124

Loss on hold-out set: 4.629900996196039e-06
MeanAbsoluteError value on hold-out data: 0.0016999170184135437
Epoch: 125
Loss on hold-out set: 2.7305717891907148e-06
MeanAbsoluteError value on hold-out data: 0.0012939732987433672
Epoch: 126
Loss on hold-out set: 3.756575481999719e-06
MeanAbsoluteError value on hold-out data: 0.0016404378693550825
Epoch: 127
Loss on hold-out set: 5.936854449828388e-06
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MeanAbsoluteError value on hold-out data: 0.002184100216254592
Epoch: 128

Loss on hold-out set: 1.5683140803118406e-06
MeanAbsoluteError value on hold-out data: 0.000988127663731575
Epoch: 129
Loss on hold-out set: 4.020892954660947e-06
MeanAbsoluteError value on hold-out data: 0.0016292774816974998
Epoch: 130
Loss on hold-out set: 1.5075402473030408e-06
MeanAbsoluteError value on hold-out data: 0.0009518571896478534
Epoch: 131

Loss on hold-out set: 1.3608470138793705e-06
MeanAbsoluteError value on hold-out data: 0.0009060839656740427
Epoch: 132
Loss on hold-out set: 1.1699180777651027e-06
MeanAbsoluteError value on hold-out data: 0.0008391772862523794
Epoch: 133
Loss on hold-out set: 1.2411942800729146e-06
MeanAbsoluteError value on hold-out data: 0.0008450651657767594
Epoch: 134
Loss on hold-out set: 1.5794857622845134e-06
MeanAbsoluteError value on hold-out data: 0.0010169908637180924
Epoch: 135

Loss on hold-out set: 1.6224400120825942e-06
MeanAbsoluteError value on hold-out data: 0.0009418840054422617
Epoch: 136
Loss on hold-out set: 1.0452349880114734e-05
MeanAbsoluteError value on hold-out data: 0.003072599181905389
Epoch: 137
Loss on hold-out set: 1.3317475559933182e-06
MeanAbsoluteError value on hold-out data: 0.0008386056870222092
Epoch: 138

Loss on hold-out set: 1.2261427909921763e-06
MeanAbsoluteError value on hold-out data: 0.0008625239715911448
Epoch: 139
Loss on hold-out set: 1.1101663495502669e-06
MeanAbsoluteError value on hold-out data: 0.0008087903843261302
```

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Epoch: 140
Loss on hold-out set: 2.1331077146686976e-06
MeanAbsoluteError value on hold-out data: 0.0011802162043750286
Epoch: 141
Loss on hold-out set: 1.2276284757298038e-06
MeanAbsoluteError value on hold-out data: 0.0008621896267868578
Epoch: 142

Loss on hold-out set: 1.1958010838078246e-05
MeanAbsoluteError value on hold-out data: 0.003295213682577014
Epoch: 143
Loss on hold-out set: 0.0013901410756143552
MeanAbsoluteError value on hold-out data: 0.004640522412955761
Epoch: 144
Loss on hold-out set: 3.3165513811512096e-06
MeanAbsoluteError value on hold-out data: 0.0015650573186576366
Epoch: 145

Loss on hold-out set: 1.461090702238065e-06
MeanAbsoluteError value on hold-out data: 0.0008957370300777256
Epoch: 146
Loss on hold-out set: 0.00035752968869928736
MeanAbsoluteError value on hold-out data: 0.005086245480924845
Epoch: 147
Loss on hold-out set: 1.930488460507499e-06
MeanAbsoluteError value on hold-out data: 0.0009968391386792064
Epoch: 148
Loss on hold-out set: 1.348546975831456e-06
MeanAbsoluteError value on hold-out data: 0.0008564019808545709
Epoch: 149

Loss on hold-out set: 1.7775496067210602e-06
MeanAbsoluteError value on hold-out data: 0.0010769657092168927
Epoch: 150
Loss on hold-out set: 1.1879017318523647e-06
MeanAbsoluteError value on hold-out data: 0.0008221874595619738
Epoch: 151
Loss on hold-out set: 1.3391646864245279e-06
MeanAbsoluteError value on hold-out data: 0.0008280561305582523
Epoch: 152
```

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Loss on hold-out set: 0.0001183109516904761
MeanAbsoluteError value on hold-out data: 0.010747785679996014
Epoch: 153
Loss on hold-out set: 1.929245447976987e-06
MeanAbsoluteError value on hold-out data: 0.0011247799266129732
Epoch: 154
Loss on hold-out set: 0.0003336240267941548
MeanAbsoluteError value on hold-out data: 0.0027420539408922195
Epoch: 155
Loss on hold-out set: 1.3803514775645453e-06
MeanAbsoluteError value on hold-out data: 0.0009398178081028163
Epoch: 156

Loss on hold-out set: 1.0838840668069538e-06
MeanAbsoluteError value on hold-out data: 0.0007997073698788881
Epoch: 157
Loss on hold-out set: 1.5344163688706221e-06
MeanAbsoluteError value on hold-out data: 0.0009359265095554292
Epoch: 158
Loss on hold-out set: 2.3108509026315005e-06
MeanAbsoluteError value on hold-out data: 0.0012935036793351173
Epoch: 159

Loss on hold-out set: 4.675414052494139e-06
MeanAbsoluteError value on hold-out data: 0.001899716560728848
Epoch: 160
Loss on hold-out set: 1.7120144246536465e-06
MeanAbsoluteError value on hold-out data: 0.0008416527998633683
Epoch: 161
Loss on hold-out set: 1.9103934680340617e-06
MeanAbsoluteError value on hold-out data: 0.001022604643367231
Epoch: 162
Loss on hold-out set: 1.3293619142237171e-06
MeanAbsoluteError value on hold-out data: 0.0009233645396307111
Epoch: 163

Loss on hold-out set: 1.1740929525016186e-06
MeanAbsoluteError value on hold-out data: 0.000843335292302072
Epoch: 164
Loss on hold-out set: 1.1707058302608157e-06
MeanAbsoluteError value on hold-out data: 0.0008342502405866981
Epoch: 165
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Loss on hold-out set: 0.0011190591647461518
MeanAbsoluteError value on hold-out data: 0.004277586471289396
Epoch: 166

Loss on hold-out set: 1.3491618806081253e-06
MeanAbsoluteError value on hold-out data: 0.0008416431373916566
Epoch: 167
Loss on hold-out set: 2.9353199212122352e-05
MeanAbsoluteError value on hold-out data: 0.0053098262287676334
Epoch: 168
Loss on hold-out set: 2.260801658429465e-06
MeanAbsoluteError value on hold-out data: 0.0009698515641503036
Epoch: 169
Loss on hold-out set: 9.128974432734629e-06
MeanAbsoluteError value on hold-out data: 0.0028097338508814573
Epoch: 170

Loss on hold-out set: 2.26491450715772e-06
MeanAbsoluteError value on hold-out data: 0.0010649145115166903
Epoch: 171
Loss on hold-out set: 1.6716033953273907e-06
MeanAbsoluteError value on hold-out data: 0.0009362336131744087
Epoch: 172
Loss on hold-out set: 2.902567099629148e-06
MeanAbsoluteError value on hold-out data: 0.0010231154737994075
Epoch: 173

Loss on hold-out set: 1.9766841734718373e-06
MeanAbsoluteError value on hold-out data: 0.0009405671735294163
Epoch: 174
Loss on hold-out set: 1.4988485562438514e-06
MeanAbsoluteError value on hold-out data: 0.0008975326200015843
Epoch: 175
Loss on hold-out set: 1.3239696132726609e-05
MeanAbsoluteError value on hold-out data: 0.003474412253126502
Epoch: 176
Loss on hold-out set: 0.00010750190862679049
MeanAbsoluteError value on hold-out data: 0.0018884259043261409
Epoch: 177

Loss on hold-out set: 1.6363217390300213e-06

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MeanAbsoluteError value on hold-out data: 0.0011008409783244133
Epoch: 178
Loss on hold-out set: 1.2862443161163985e-06
MeanAbsoluteError value on hold-out data: 0.0009413496591150761
Epoch: 179
Loss on hold-out set: 1.5246030478430419e-06
MeanAbsoluteError value on hold-out data: 0.0010421044426038861
Epoch: 180

Loss on hold-out set: 1.86156632060794e-05
MeanAbsoluteError value on hold-out data: 0.004151586443185806
Epoch: 181
Loss on hold-out set: 1.8815746635972084e-06
MeanAbsoluteError value on hold-out data: 0.0011392866726964712
Epoch: 182
Loss on hold-out set: 0.0018592851474750205
MeanAbsoluteError value on hold-out data: 0.007503650151193142
Epoch: 183
Loss on hold-out set: 2.000304546247487e-05
MeanAbsoluteError value on hold-out data: 0.004312774632126093
Epoch: 184

Loss on hold-out set: 1.3959662510387716e-06
MeanAbsoluteError value on hold-out data: 0.0009493703255429864
Epoch: 185
Loss on hold-out set: 1.8776477081526257e-06
MeanAbsoluteError value on hold-out data: 0.0011428592260926962
Epoch: 186
Loss on hold-out set: 1.4783936487324704e-06
MeanAbsoluteError value on hold-out data: 0.0009004494058899581
Epoch: 187

Loss on hold-out set: 1.7587006228635662e-05
MeanAbsoluteError value on hold-out data: 0.004004348069429398
Epoch: 188
Loss on hold-out set: 3.0174564139647723e-06
MeanAbsoluteError value on hold-out data: 0.0014870730228722095
Epoch: 189
Loss on hold-out set: 2.3708631278378352e-06
MeanAbsoluteError value on hold-out data: 0.0011691874824464321
Epoch: 190
Loss on hold-out set: 4.683978239392252e-06
```

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MeanAbsoluteError value on hold-out data: 0.0018078774446621537
Epoch: 191

Loss on hold-out set: 1.1928808939606265e-06
MeanAbsoluteError value on hold-out data: 0.0008510855841450393
Epoch: 192
Loss on hold-out set: 1.1671672531030288e-06
MeanAbsoluteError value on hold-out data: 0.0008875370840542018
Epoch: 193
Loss on hold-out set: 2.1499332223566642e-05
MeanAbsoluteError value on hold-out data: 0.004496429115533829
Epoch: 194

Loss on hold-out set: 1.0667665151231631e-06
MeanAbsoluteError value on hold-out data: 0.0008185002952814102
Epoch: 195
Loss on hold-out set: 1.0128935278211989e-06
MeanAbsoluteError value on hold-out data: 0.000813316204585135
Epoch: 196
Loss on hold-out set: 1.2449890592646484e-06
MeanAbsoluteError value on hold-out data: 0.000852807832416147
Epoch: 197
Loss on hold-out set: 4.997731506451741e-06
MeanAbsoluteError value on hold-out data: 0.0019109343411400914
Epoch: 198

Loss on hold-out set: 1.0602407507156806e-06
MeanAbsoluteError value on hold-out data: 0.0008145967731252313
Epoch: 199
Loss on hold-out set: 1.3444199239004845e-06
MeanAbsoluteError value on hold-out data: 0.000884438690263778
Epoch: 200
Loss on hold-out set: 1.7806213835368767e-06
MeanAbsoluteError value on hold-out data: 0.0010599683737382293
Epoch: 201

Loss on hold-out set: 9.767394212408712e-07
MeanAbsoluteError value on hold-out data: 0.0008157063275575638
Epoch: 202
Loss on hold-out set: 2.4643753442013313e-06
MeanAbsoluteError value on hold-out data: 0.001335242879576981
```

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Epoch: 203
Loss on hold-out set: 1.2553078363453096e-06
MeanAbsoluteError value on hold-out data: 0.0009077254799194634
Epoch: 204
Loss on hold-out set: 1.0255161096385843e-06
MeanAbsoluteError value on hold-out data: 0.0008410895825363696
Epoch: 205

Loss on hold-out set: 1.1532872270855967e-06
MeanAbsoluteError value on hold-out data: 0.0008423287654295564
Epoch: 206
Loss on hold-out set: 1.1908645879325027e-06
MeanAbsoluteError value on hold-out data: 0.0008939696126617491
Epoch: 207
Loss on hold-out set: 1.063552909604718e-06
MeanAbsoluteError value on hold-out data: 0.0008156714611686766
Epoch: 208

Loss on hold-out set: 2.3016303141678063e-06
MeanAbsoluteError value on hold-out data: 0.001175001496449113
Epoch: 209
Loss on hold-out set: 1.1451120765461662e-06
MeanAbsoluteError value on hold-out data: 0.0007965227123349905
Epoch: 210
Loss on hold-out set: 0.00013445536348381 91
MeanAbsoluteError value on hold-out data: 0.0022280539851635695
Epoch: 211
Loss on hold-out set: 1.757884428325969e-05
MeanAbsoluteError value on hold-out data: 0.003749365918338299
Epoch: 212

Loss on hold-out set: 1.778106274321964e-06
MeanAbsoluteError value on hold-out data: 0.0010378336301073432
Epoch: 213
Loss on hold-out set: 1.089816606299092e-05
MeanAbsoluteError value on hold-out data: 0.0031541252974420786
Epoch: 214
Loss on hold-out set: 3.686775331656323e-06
MeanAbsoluteError value on hold-out data: 0.0016676043160259724
Epoch: 215
```

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Loss on hold-out set: 1.4032626832151716e-06
MeanAbsoluteError value on hold-out data: 0.0009127219673246145
Epoch: 216
Loss on hold-out set: 1.1396020297000248e-06
MeanAbsoluteError value on hold-out data: 0.0008675309363752604
Epoch: 217
Loss on hold-out set: 9.921416768485449e-07
MeanAbsoluteError value on hold-out data: 0.000809328630566597
Epoch: 218
Loss on hold-out set: 1.382803794478185e-06
MeanAbsoluteError value on hold-out data: 0.0010066780960187316
Epoch: 219

Loss on hold-out set: 0.000985414500344352
MeanAbsoluteError value on hold-out data: 0.004445791710168123
Epoch: 220
Loss on hold-out set: 1.9187895645700337e-06
MeanAbsoluteError value on hold-out data: 0.001085289171896875
Epoch: 221
Loss on hold-out set: 1.5593912398624245e-06
MeanAbsoluteError value on hold-out data: 0.0009886054322123528
Epoch: 222

Loss on hold-out set: 7.373493441447793e-05
MeanAbsoluteError value on hold-out data: 0.0016496172174811363
Epoch: 223
Loss on hold-out set: 3.212796435456347e-06
MeanAbsoluteError value on hold-out data: 0.0015094249974936247
Epoch: 224
Loss on hold-out set: 0.000279752948624325
MeanAbsoluteError value on hold-out data: 0.002519709523767233
Epoch: 225
Loss on hold-out set: 1.1566987001725256e-06
MeanAbsoluteError value on hold-out data: 0.0008947805035859346
Epoch: 226

Loss on hold-out set: 2.8728574954164706e-06
MeanAbsoluteError value on hold-out data: 0.001481765997596085
Epoch: 227
Loss on hold-out set: 9.990333095489545e-07
MeanAbsoluteError value on hold-out data: 0.0007995138294063509
Epoch: 228
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Loss on hold-out set: 1.993999498713842e-06
MeanAbsoluteError value on hold-out data: 0.0011914897477254272
Epoch: 229

Loss on hold-out set: 1.2156879646541852e-06
MeanAbsoluteError value on hold-out data: 0.0009170853300020099
Epoch: 230
Loss on hold-out set: 1.2951896206476913e-06
MeanAbsoluteError value on hold-out data: 0.0009509674273431301
Epoch: 231
Loss on hold-out set: 1.1614747913531924e-06
MeanAbsoluteError value on hold-out data: 0.0008406842243857682
Epoch: 232
Loss on hold-out set: 1.4174897098830395e-06
MeanAbsoluteError value on hold-out data: 0.000985140330158174
Epoch: 233

Loss on hold-out set: 1.4650063217931556e-06
MeanAbsoluteError value on hold-out data: 0.0009707877761684358
Epoch: 234
Loss on hold-out set: 1.1325520585632357e-06
MeanAbsoluteError value on hold-out data: 0.0008248958620242774
Epoch: 235
Loss on hold-out set: 1.061308593692117e-06
MeanAbsoluteError value on hold-out data: 0.0008785351528786123
Epoch: 236

Loss on hold-out set: 1.2484721292611748e-05
MeanAbsoluteError value on hold-out data: 0.0034053612034767866
Epoch: 237
Loss on hold-out set: 1.2555103082307212e-06
MeanAbsoluteError value on hold-out data: 0.000889603397808969
Epoch: 238
Loss on hold-out set: 1.5995629474638497e-06
MeanAbsoluteError value on hold-out data: 0.0010767641942948103
Epoch: 239
Loss on hold-out set: 9.221986112187061e-07
MeanAbsoluteError value on hold-out data: 0.0007927445112727582
Epoch: 240

Loss on hold-out set: 1.1815649980480184e-06
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MeanAbsoluteError value on hold-out data: 0.0008330420241691172
Epoch: 241
Loss on hold-out set: 1.364015492282096e-06
MeanAbsoluteError value on hold-out data: 0.0009839606937021017
Epoch: 242
Loss on hold-out set: 0.0018791731882856766
MeanAbsoluteError value on hold-out data: 0.005291008856147528
Epoch: 243

Loss on hold-out set: 2.5028089811922446e-06
MeanAbsoluteError value on hold-out data: 0.0013804248301312327
Epoch: 244
Loss on hold-out set: 1.3972172041576414e-06
MeanAbsoluteError value on hold-out data: 0.001010735402815044
Epoch: 245
Loss on hold-out set: 2.3761072253154663e-05
MeanAbsoluteError value on hold-out data: 0.004695299081504345
Epoch: 246
Loss on hold-out set: 3.965767615017495e-06
MeanAbsoluteError value on hold-out data: 0.0017338389297947288
Epoch: 247

Loss on hold-out set: 0.0006313532709240322
MeanAbsoluteError value on hold-out data: 0.005439430940896273
Epoch: 248
Loss on hold-out set: 1.1106537621904304e-06
MeanAbsoluteError value on hold-out data: 0.0008179270662367344
Epoch: 249
Loss on hold-out set: 5.845909737007997e-06
MeanAbsoluteError value on hold-out data: 0.002134410897269845
Epoch: 250

Loss on hold-out set: 1.683779937768402e-06
MeanAbsoluteError value on hold-out data: 0.001000437536276877
Epoch: 251
Loss on hold-out set: 1.2726198559238792e-06
MeanAbsoluteError value on hold-out data: 0.0009198401239700615
Epoch: 252
Loss on hold-out set: 1.3002967482232355e-06
MeanAbsoluteError value on hold-out data: 0.0009404353331774473
Epoch: 253
Loss on hold-out set: 1.7895466442041652e-06
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MeanAbsoluteError value on hold-out data: 0.000985892373137176
Epoch: 254

Loss on hold-out set: 1.2843231441085943e-06
MeanAbsoluteError value on hold-out data: 0.0008885850547812879
Epoch: 255
Loss on hold-out set: 1.49155814509728e-06
MeanAbsoluteError value on hold-out data: 0.0010268588084727526
Epoch: 256
Loss on hold-out set: 6.242421232645239e-06
MeanAbsoluteError value on hold-out data: 0.0022595245391130447
Epoch: 257

Loss on hold-out set: 2.236782428064124e-06
MeanAbsoluteError value on hold-out data: 0.0012740945676341653
Epoch: 258
Loss on hold-out set: 1.1516841617811644e-06
MeanAbsoluteError value on hold-out data: 0.0008241518517024815
Epoch: 259
Loss on hold-out set: 0.00029655025859326017
MeanAbsoluteError value on hold-out data: 0.002886136993765831
Epoch: 260
Loss on hold-out set: 1.282247731856282e-06
MeanAbsoluteError value on hold-out data: 0.0009761107503436506
Epoch: 261

Loss on hold-out set: 1.1128958459056985e-06
MeanAbsoluteError value on hold-out data: 0.0008837638306431472
Epoch: 262
Loss on hold-out set: 2.030763076058625e-06
MeanAbsoluteError value on hold-out data: 0.0011422763345763087
Epoch: 263
Loss on hold-out set: 0.0003455730393397971
MeanAbsoluteError value on hold-out data: 0.0037109917029738426
Epoch: 264

Loss on hold-out set: 1.165846111479578e-06
MeanAbsoluteError value on hold-out data: 0.0008327298564836383
Epoch: 265
Loss on hold-out set: 1.5590769176189776e-06
MeanAbsoluteError value on hold-out data: 0.0009604532388038933
```

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Epoch: 266
Loss on hold-out set: 9.80079936250779e-07
MeanAbsoluteError value on hold-out data: 0.0007931368891149759
Epoch: 267
Loss on hold-out set: 0.0003205832978254036
MeanAbsoluteError value on hold-out data: 0.0026721730828285217
Epoch: 268

Loss on hold-out set: 1.528115395698338e-05
MeanAbsoluteError value on hold-out data: 0.0037998694460839033
Epoch: 269
Loss on hold-out set: 1.9614065842268665e-06
MeanAbsoluteError value on hold-out data: 0.001082539209164679
Epoch: 270
Loss on hold-out set: 1.548472622604235e-05
MeanAbsoluteError value on hold-out data: 0.0037193235475569963
Epoch: 271

Loss on hold-out set: 2.9750467722176554e-06
MeanAbsoluteError value on hold-out data: 0.0013454919680953026
Epoch: 272
Loss on hold-out set: 1.5822994415569924e-06
MeanAbsoluteError value on hold-out data: 0.0009573862771503627
Epoch: 273
Loss on hold-out set: 0.00034847901392472873
MeanAbsoluteError value on hold-out data: 0.0029253691900521517
Epoch: 274
Loss on hold-out set: 1.675178702078903e-06
MeanAbsoluteError value on hold-out data: 0.0010793583933264017
Epoch: 275

Loss on hold-out set: 1.3896077177832922e-06
MeanAbsoluteError value on hold-out data: 0.0008710348047316074
Epoch: 276
Loss on hold-out set: 1.234451080843148e-06
MeanAbsoluteError value on hold-out data: 0.0008413245668634772
Epoch: 277
Loss on hold-out set: 3.771886003260778e-06
MeanAbsoluteError value on hold-out data: 0.0016893197316676378
Epoch: 278
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Loss on hold-out set: 2.323973868319976e-06
MeanAbsoluteError value on hold-out data: 0.0010738075943663716
Epoch: 279
Loss on hold-out set: 1.6130647483036087e-06
MeanAbsoluteError value on hold-out data: 0.0010077876504510641
Epoch: 280
Loss on hold-out set: 0.002125413872966839
MeanAbsoluteError value on hold-out data: 0.005901758093386885
Epoch: 281
Loss on hold-out set: 0.0003596351762448299
MeanAbsoluteError value on hold-out data: 0.0030070359352976084
Epoch: 282

Loss on hold-out set: 1.8972491620143746e-06
MeanAbsoluteError value on hold-out data: 0.0010450218105688691
Epoch: 283
Loss on hold-out set: 1.0888979606813966e-05
MeanAbsoluteError value on hold-out data: 0.003146280301734805
Epoch: 284
Loss on hold-out set: 1.454422270687526e-06
MeanAbsoluteError value on hold-out data: 0.0008960964623838663
Epoch: 285

Loss on hold-out set: 1.2692626027134024e-06
MeanAbsoluteError value on hold-out data: 0.0008677274454385042
Epoch: 286
Loss on hold-out set: 1.6539002296247838e-06
MeanAbsoluteError value on hold-out data: 0.0009670614381320775
Epoch: 287
Loss on hold-out set: 1.2855839989137726e-06
MeanAbsoluteError value on hold-out data: 0.0008432394824922085
Epoch: 288
Loss on hold-out set: 1.7780113720478907e-06
MeanAbsoluteError value on hold-out data: 0.0011308995308354497
Epoch: 289

Loss on hold-out set: 1.203299813841323e-06
MeanAbsoluteError value on hold-out data: 0.0008778527844697237
Epoch: 290
Loss on hold-out set: 1.4052380685405717e-06
MeanAbsoluteError value on hold-out data: 0.000981851015239954
Epoch: 291
```

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Loss on hold-out set: 4.805705412554044e-06
MeanAbsoluteError value on hold-out data: 0.0018350583268329501
Epoch: 292

Loss on hold-out set: 7.062388739051619e-06
MeanAbsoluteError value on hold-out data: 0.0022826569620519876
Epoch: 293
Loss on hold-out set: 2.3752637441877878e-06
MeanAbsoluteError value on hold-out data: 0.0013254130026325583
Epoch: 294
Loss on hold-out set: 3.6678144309777194e-06
MeanAbsoluteError value on hold-out data: 0.0015256780898198485
Epoch: 295
Loss on hold-out set: 1.9567406534056668e-06
MeanAbsoluteError value on hold-out data: 0.001048339530825615
Epoch: 296

Loss on hold-out set: 0.00061656681471875709
MeanAbsoluteError value on hold-out data: 0.0034921658225357533
Epoch: 297
Loss on hold-out set: 1.2730101056709268e-06
MeanAbsoluteError value on hold-out data: 0.0009160945774056017
Epoch: 298
Loss on hold-out set: 1.2614959289819055e-06
MeanAbsoluteError value on hold-out data: 0.0008847857243381441
Epoch: 299

Loss on hold-out set: 1.930400051500888e-06
MeanAbsoluteError value on hold-out data: 0.0010757347336038947
Epoch: 300
Loss on hold-out set: 4.395276659553159e-05
MeanAbsoluteError value on hold-out data: 0.0015563878696411848
Epoch: 301
Loss on hold-out set: 1.1484001884827403e-06
MeanAbsoluteError value on hold-out data: 0.0008400697261095047
Epoch: 302
Loss on hold-out set: 1.2087836012142361e-06
MeanAbsoluteError value on hold-out data: 0.000881427142303437
Epoch: 303

Loss on hold-out set: 1.7264720563266915e-06
```

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MeanAbsoluteError value on hold-out data: 0.0009690768201835454
Epoch: 304
Loss on hold-out set: 1.5603301040283231e-06
MeanAbsoluteError value on hold-out data: 0.0009389487677253783
Epoch: 305
Loss on hold-out set: 1.3031935981626493e-06
MeanAbsoluteError value on hold-out data: 0.0008764562662690878
Epoch: 306

Loss on hold-out set: 1.1800948807551601e-06
MeanAbsoluteError value on hold-out data: 0.0008442515973001719
Epoch: 307
Loss on hold-out set: 1.877931035428796e-06
MeanAbsoluteError value on hold-out data: 0.001155829057097435
Epoch: 308
Loss on hold-out set: 0.0005804661787027936
MeanAbsoluteError value on hold-out data: 0.0035044134128838778
Epoch: 309
Loss on hold-out set: 1.7837085955271994e-06
MeanAbsoluteError value on hold-out data: 0.001049522077664733
Epoch: 310

Loss on hold-out set: 1.5047006758532707e-06
MeanAbsoluteError value on hold-out data: 0.0009068030631169677
Epoch: 311
Loss on hold-out set: 1.1735225484699185e-06
MeanAbsoluteError value on hold-out data: 0.0008395615732297301
Epoch: 312
Loss on hold-out set: 0.0008570899501285986
MeanAbsoluteError value on hold-out data: 0.003860434517264366
Epoch: 313

Loss on hold-out set: 2.0498609387686884e-06
MeanAbsoluteError value on hold-out data: 0.0008783359080553055
Epoch: 314
Loss on hold-out set: 1.7886900882156344e-06
MeanAbsoluteError value on hold-out data: 0.0009962425101548433
Epoch: 315
Loss on hold-out set: 3.0431103429971418e-06
MeanAbsoluteError value on hold-out data: 0.0011574086965993047
Epoch: 316
Loss on hold-out set: 2.8090588076478384e-06
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MeanAbsoluteError value on hold-out data: 0.0013348003849387169
Epoch: 317

Loss on hold-out set: 1.6867433338610192e-06
MeanAbsoluteError value on hold-out data: 0.0009659334318712354
Epoch: 318
Loss on hold-out set: 1.6051355837239847e-05
MeanAbsoluteError value on hold-out data: 0.0038549453020095825
Epoch: 319
Loss on hold-out set: 0.0005311930035969243
MeanAbsoluteError value on hold-out data: 0.003517338540405035
Epoch: 320

Loss on hold-out set: 1.4617579171709413e-06
MeanAbsoluteError value on hold-out data: 0.000940465135499835
Epoch: 321
Loss on hold-out set: 1.5919412703624403e-06
MeanAbsoluteError value on hold-out data: 0.0010469782864674926
Epoch: 322
Loss on hold-out set: 1.5875821584533976e-06
MeanAbsoluteError value on hold-out data: 0.001026193262077868
Epoch: 323
Loss on hold-out set: 1.1952035772712686e-06
MeanAbsoluteError value on hold-out data: 0.0008172408561222255
Epoch: 324

Loss on hold-out set: 1.970178400457511e-06
MeanAbsoluteError value on hold-out data: 0.0011747737880796194
Epoch: 325
Loss on hold-out set: 1.1624416629274492e-06
MeanAbsoluteError value on hold-out data: 0.0008161150617524981
Epoch: 326
Loss on hold-out set: 1.8179367158994025e-06
MeanAbsoluteError value on hold-out data: 0.0011367825791239738
Epoch: 327

Loss on hold-out set: 1.0760792839356816e-06
MeanAbsoluteError value on hold-out data: 0.0008403895189985633
Epoch: 328
Loss on hold-out set: 5.044720690141101e-06
MeanAbsoluteError value on hold-out data: 0.002023859415203333
```

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Epoch: 329
Loss on hold-out set: 1.441429792346473e-06
MeanAbsoluteError value on hold-out data: 0.0009187982068397105
Epoch: 330
Loss on hold-out set: 4.497740615778849e-06
MeanAbsoluteError value on hold-out data: 0.001758827012963593
Epoch: 331

Loss on hold-out set: 1.531970951873518e-06
MeanAbsoluteError value on hold-out data: 0.0009813307551667094
Epoch: 332
Loss on hold-out set: 3.647612412840737e-05
MeanAbsoluteError value on hold-out data: 0.005935113411396742
Epoch: 333
Loss on hold-out set: 1.888596723522194e-06
MeanAbsoluteError value on hold-out data: 0.0011762180365622044
Epoch: 334

Loss on hold-out set: 1.1048036867578048e-06
MeanAbsoluteError value on hold-out data: 0.0008058547391556203
Epoch: 335
Loss on hold-out set: 2.408458140752583e-06
MeanAbsoluteError value on hold-out data: 0.0013625728897750378
Epoch: 336
Loss on hold-out set: 2.1239378830054752e-06
MeanAbsoluteError value on hold-out data: 0.001207505352795124
Epoch: 337
Loss on hold-out set: 1.6620198900559794e-06
MeanAbsoluteError value on hold-out data: 0.0009729111916385591
Epoch: 338

Loss on hold-out set: 1.5219213502440164e-06
MeanAbsoluteError value on hold-out data: 0.0010271683568134904
Epoch: 339
Loss on hold-out set: 1.157522645528913e-06
MeanAbsoluteError value on hold-out data: 0.0008025392307899892
Epoch: 340
Loss on hold-out set: 1.0986057383468926e-06
MeanAbsoluteError value on hold-out data: 0.0008010823512449861
Epoch: 341
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Loss on hold-out set: 1.5878170157835625e-06
MeanAbsoluteError value on hold-out data: 0.0008709225803613663
Epoch: 342
Loss on hold-out set: 1.1013217081549205e-06
MeanAbsoluteError value on hold-out data: 0.0008013562182895839
Epoch: 343
Loss on hold-out set: 2.3315117669671263e-06
MeanAbsoluteError value on hold-out data: 0.001166052999906242
Epoch: 344
Loss on hold-out set: 2.3189677930391695e-06
MeanAbsoluteError value on hold-out data: 0.0011242227628827095
Epoch: 345

Loss on hold-out set: 1.294396661513439e-06
MeanAbsoluteError value on hold-out data: 0.0008248926023952663
Epoch: 346
Loss on hold-out set: 2.093008906565676e-06
MeanAbsoluteError value on hold-out data: 0.001217635697685182
Epoch: 347
Loss on hold-out set: 1.1018388477168628e-06
MeanAbsoluteError value on hold-out data: 0.0008713098359294236
Epoch: 348

Loss on hold-out set: 1.0336916886899417e-06
MeanAbsoluteError value on hold-out data: 0.0008211776148527861
Epoch: 349
Loss on hold-out set: 1.1444153467611893e-06
MeanAbsoluteError value on hold-out data: 0.0008295113802887499
Epoch: 350
Loss on hold-out set: 1.4044557981553505e-06
MeanAbsoluteError value on hold-out data: 0.0009512438555248082
Epoch: 351
Loss on hold-out set: 2.526852251951193e-06
MeanAbsoluteError value on hold-out data: 0.001359049347229302
Epoch: 352

Loss on hold-out set: 1.651212154631419e-06
MeanAbsoluteError value on hold-out data: 0.0009993049316108227
Epoch: 353
Loss on hold-out set: 1.1334672977297416e-06
MeanAbsoluteError value on hold-out data: 0.0008143784943968058
Epoch: 354
```

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Loss on hold-out set: 1.0493504567840807e-06
MeanAbsoluteError value on hold-out data: 0.0008420864469371736
Epoch: 355

Loss on hold-out set: 1.2631720643149981e-06
MeanAbsoluteError value on hold-out data: 0.000848874100483954
Epoch: 356
Loss on hold-out set: 1.1584797063663315e-05
MeanAbsoluteError value on hold-out data: 0.003230560105293989
Epoch: 357
Loss on hold-out set: 1.5070488337607037e-06
MeanAbsoluteError value on hold-out data: 0.000983929610811174
Epoch: 358
Loss on hold-out set: 5.882327951230064e-06
MeanAbsoluteError value on hold-out data: 0.002230831189081073
Epoch: 359

Loss on hold-out set: 1.1736844866251117e-06
MeanAbsoluteError value on hold-out data: 0.0008623393368907273
Epoch: 360
Loss on hold-out set: 1.0375626271315223e-06
MeanAbsoluteError value on hold-out data: 0.0008235911373049021
Epoch: 361
Loss on hold-out set: 1.0930165304811312e-06
MeanAbsoluteError value on hold-out data: 0.0008683069609105587
Epoch: 362

Loss on hold-out set: 1.1639951367214962e-06
MeanAbsoluteError value on hold-out data: 0.0008417809731326997
Epoch: 363
Loss on hold-out set: 9.218865206260209e-07
MeanAbsoluteError value on hold-out data: 0.0008113718940876424
Epoch: 364
Loss on hold-out set: 1.1302287685584115e-06
MeanAbsoluteError value on hold-out data: 0.0008435898344032466
Epoch: 365
Loss on hold-out set: 9.596553940564963e-07
MeanAbsoluteError value on hold-out data: 0.0007823857013136148
Epoch: 366

Loss on hold-out set: 9.619277053528863e-07
```

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MeanAbsoluteError value on hold-out data: 0.0007984779076650739
Epoch: 367
Loss on hold-out set: 9.190803168096934e-07
MeanAbsoluteError value on hold-out data: 0.0007808383670635521
Epoch: 368
Loss on hold-out set: 1.3123903604886996e-06
MeanAbsoluteError value on hold-out data: 0.0009751754114404321
Epoch: 369

Loss on hold-out set: 1.2121129049529163e-06
MeanAbsoluteError value on hold-out data: 0.00095360167324543
Epoch: 370
Loss on hold-out set: 9.664157534399028e-07
MeanAbsoluteError value on hold-out data: 0.0007849248358979821
Epoch: 371
Loss on hold-out set: 1.0135792081200634e-06
MeanAbsoluteError value on hold-out data: 0.0008539014379493892
Epoch: 372
Loss on hold-out set: 1.3392756229152908e-06
MeanAbsoluteError value on hold-out data: 0.0009547972003929317
Epoch: 373

Loss on hold-out set: 1.00479402275456e-06
MeanAbsoluteError value on hold-out data: 0.0008270553662441671
Epoch: 374
Loss on hold-out set: 1.0768292738178459e-06
MeanAbsoluteError value on hold-out data: 0.0008387998677790165
Epoch: 375
Loss on hold-out set: 9.321077221522081e-07
MeanAbsoluteError value on hold-out data: 0.0007785027264617383
Epoch: 376

Loss on hold-out set: 0.00019273629900103866
MeanAbsoluteError value on hold-out data: 0.013751878403127193
Epoch: 377
Loss on hold-out set: 1.4139848835052012e-06
MeanAbsoluteError value on hold-out data: 0.000941967882681638
Epoch: 378
Loss on hold-out set: 0.00024259743806326768
MeanAbsoluteError value on hold-out data: 0.0024365412537008524
Epoch: 379
Loss on hold-out set: 2.7177531032626015e-05
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MeanAbsoluteError value on hold-out data: 0.005106932017952204
Epoch: 380

Loss on hold-out set: 7.580290037787143e-06
MeanAbsoluteError value on hold-out data: 0.002428103471174836
Epoch: 381
Loss on hold-out set: 1.6317187907169193e-06
MeanAbsoluteError value on hold-out data: 0.0010563380783423781
Epoch: 382
Loss on hold-out set: 1.1412535365287533e-06
MeanAbsoluteError value on hold-out data: 0.0008766336250118911
Epoch: 383

Loss on hold-out set: 3.379528397300209e-05
MeanAbsoluteError value on hold-out data: 0.005708416923880577
Epoch: 384
Loss on hold-out set: 1.1054756721652946e-06
MeanAbsoluteError value on hold-out data: 0.0008524841978214681
Epoch: 385
Loss on hold-out set: 0.0005044429760538641
MeanAbsoluteError value on hold-out data: 0.0030896251555532217
Epoch: 386
Loss on hold-out set: 1.1012851490914518e-06
MeanAbsoluteError value on hold-out data: 0.0008553008083254099
Epoch: 387

Loss on hold-out set: 2.04139089768992e-06
MeanAbsoluteError value on hold-out data: 0.001203257474116981
Epoch: 388
Loss on hold-out set: 1.1056375403593568e-06
MeanAbsoluteError value on hold-out data: 0.0008588563650846481
Epoch: 389
Loss on hold-out set: 1.3439426884185825e-06
MeanAbsoluteError value on hold-out data: 0.0008725858642719686
Epoch: 390

Loss on hold-out set: 1.1877792758241412e-06
MeanAbsoluteError value on hold-out data: 0.0009185157250612974
Epoch: 391
Loss on hold-out set: 1.097743828145562e-06
MeanAbsoluteError value on hold-out data: 0.0008634192636236548
```

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Epoch: 392
Loss on hold-out set: 9.743489619915215e-07
MeanAbsoluteError value on hold-out data: 0.0007979492074809968
Epoch: 393
Loss on hold-out set: 9.517345850221877e-07
MeanAbsoluteError value on hold-out data: 0.0007898533949628472
Epoch: 394

Loss on hold-out set: 1.256533940144996e-06
MeanAbsoluteError value on hold-out data: 0.0009381466079503298
Epoch: 395
Loss on hold-out set: 2.3148607991830572e-06
MeanAbsoluteError value on hold-out data: 0.0012267675483599305
Epoch: 396
Loss on hold-out set: 1.371506958601178e-06
MeanAbsoluteError value on hold-out data: 0.0009866810869425535
Epoch: 397

Loss on hold-out set: 2.1973742325196954e-06
MeanAbsoluteError value on hold-out data: 0.001237786142155528
Epoch: 398
Loss on hold-out set: 1.3595973769042757e-06
MeanAbsoluteError value on hold-out data: 0.0009796745143830776
Epoch: 399
Loss on hold-out set: 1.900276948582849e-06
MeanAbsoluteError value on hold-out data: 0.0010222562123090029
Epoch: 400
Loss on hold-out set: 8.478772367827612e-06
MeanAbsoluteError value on hold-out data: 0.0027284494135528803
Epoch: 401

Loss on hold-out set: 1.349775852934097e-06
MeanAbsoluteError value on hold-out data: 0.0009406378376297653
Epoch: 402
Loss on hold-out set: 0.0011361462660138737
MeanAbsoluteError value on hold-out data: 0.004464413039386272
Epoch: 403
Loss on hold-out set: 1.477489893029717e-06
MeanAbsoluteError value on hold-out data: 0.0010337315034121275
Epoch: 404
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Loss on hold-out set: 1.0555441506837199e-06
MeanAbsoluteError value on hold-out data: 0.0008248133235611022
Epoch: 405
Loss on hold-out set: 0.0003995689492713749
MeanAbsoluteError value on hold-out data: 0.002953438088297844
Epoch: 406
Loss on hold-out set: 1.1038666667235912e-06
MeanAbsoluteError value on hold-out data: 0.0008711605332791805
Epoch: 407
Loss on hold-out set: 1.0729317414013797e-06
MeanAbsoluteError value on hold-out data: 0.0008435749332420528
Epoch: 408

Loss on hold-out set: 1.6182052779465896e-06
MeanAbsoluteError value on hold-out data: 0.0009758449159562588
Epoch: 409
Loss on hold-out set: 1.0640278560458682e-06
MeanAbsoluteError value on hold-out data: 0.0008161751320585608
Epoch: 410
Loss on hold-out set: 1.3785944081344217e-06
MeanAbsoluteError value on hold-out data: 0.0008873692713677883
Epoch: 411

Loss on hold-out set: 0.0014860616711958896
MeanAbsoluteError value on hold-out data: 0.00634763715788722
Epoch: 412
Loss on hold-out set: 1.4775541567010246e-06
MeanAbsoluteError value on hold-out data: 0.0009410592028871179
Epoch: 413
Loss on hold-out set: 1.0580199964001972e-06
MeanAbsoluteError value on hold-out data: 0.0007969584548845887
Epoch: 414
Loss on hold-out set: 0.0005454484220658392
MeanAbsoluteError value on hold-out data: 0.003411828074604273
Epoch: 415

Loss on hold-out set: 1.071234757651277e-06
MeanAbsoluteError value on hold-out data: 0.0008632009266875684
Epoch: 416
Loss on hold-out set: 0.00037541305353163177
MeanAbsoluteError value on hold-out data: 0.002850654767826199
Epoch: 417
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Loss on hold-out set: 1.058671080919829e-06
MeanAbsoluteError value on hold-out data: 0.0008144418243318796
Epoch: 418

Loss on hold-out set: 1.1046571050708455e-06
MeanAbsoluteError value on hold-out data: 0.0008062172564677894
Epoch: 419
Loss on hold-out set: 1.0568057969241916e-06
MeanAbsoluteError value on hold-out data: 0.0008235936402343214
Epoch: 420
Loss on hold-out set: 1.2993769123918005e-06
MeanAbsoluteError value on hold-out data: 0.0009530024835839868
Epoch: 421
Loss on hold-out set: 9.90557769962554e-07
MeanAbsoluteError value on hold-out data: 0.0008254436543211341
Epoch: 422

Loss on hold-out set: 1.498476089741766e-06
MeanAbsoluteError value on hold-out data: 0.0009713870822452009
Epoch: 423
Loss on hold-out set: 1.1332557199658857e-06
MeanAbsoluteError value on hold-out data: 0.0008265624055638909
Epoch: 424
Loss on hold-out set: 9.616420759182522e-07
MeanAbsoluteError value on hold-out data: 0.0008033335907384753
Epoch: 425

Loss on hold-out set: 1.0467555896936503e-06
MeanAbsoluteError value on hold-out data: 0.0008478040108457208
Epoch: 426
Loss on hold-out set: 4.738957543920081e-06
MeanAbsoluteError value on hold-out data: 0.0018735507037490606
Epoch: 427
Loss on hold-out set: 9.94464204932928e-07
MeanAbsoluteError value on hold-out data: 0.0007876682793721557
Epoch: 428
Loss on hold-out set: 4.19512936717253e-06
MeanAbsoluteError value on hold-out data: 0.0017523199785500765
Epoch: 429

Loss on hold-out set: 1.043988104444137e-06
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MeanAbsoluteError value on hold-out data: 0.0008092913776636124
Epoch: 430
Loss on hold-out set: 6.689597570969524e-05
MeanAbsoluteError value on hold-out data: 0.0017084989231079817
Epoch: 431
Loss on hold-out set: 9.999703612843055e-07
MeanAbsoluteError value on hold-out data: 0.0008067000890150666
Epoch: 432

Loss on hold-out set: 0.0013318160424660164
MeanAbsoluteError value on hold-out data: 0.00490570068359375
Epoch: 433
Loss on hold-out set: 5.1052037550702014e-05
MeanAbsoluteError value on hold-out data: 0.001675951643846929
Epoch: 434
Loss on hold-out set: 1.0233667681474728e-06
MeanAbsoluteError value on hold-out data: 0.0007929820567369461
Epoch: 435
Loss on hold-out set: 1.2787552700151886e-05
MeanAbsoluteError value on hold-out data: 0.0033181789331138134
Epoch: 436

Loss on hold-out set: 4.3439966143173824e-06
MeanAbsoluteError value on hold-out data: 0.0018792430637404323
Epoch: 437
Loss on hold-out set: 2.4846678894181632e-06
MeanAbsoluteError value on hold-out data: 0.001338908332400024
Epoch: 438
Loss on hold-out set: 1.5722252179819827e-06
MeanAbsoluteError value on hold-out data: 0.0010605803690850735
Epoch: 439

Loss on hold-out set: 1.2764679083305125e-06
MeanAbsoluteError value on hold-out data: 0.0009467527852393687
Epoch: 440
Loss on hold-out set: 9.87165649873462e-07
MeanAbsoluteError value on hold-out data: 0.0008054103818722069
Epoch: 441
Loss on hold-out set: 9.471205074235584e-07
MeanAbsoluteError value on hold-out data: 0.0007916543399915099
Epoch: 442
Loss on hold-out set: 1.1974280745072554e-06
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MeanAbsoluteError value on hold-out data: 0.0008279741741716862
Epoch: 443

Loss on hold-out set: 1.542569018161325e-06
MeanAbsoluteError value on hold-out data: 0.001071713399142027
Epoch: 444
Loss on hold-out set: 1.0071334595697688e-06
MeanAbsoluteError value on hold-out data: 0.0007830453687347472
Epoch: 445
Loss on hold-out set: 1.2609218935302545e-06
MeanAbsoluteError value on hold-out data: 0.0009193564183078706
Epoch: 446

Loss on hold-out set: 3.533743410326469e-05
MeanAbsoluteError value on hold-out data: 0.005827318411320448
Epoch: 447
Loss on hold-out set: 1.875734623214297e-06
MeanAbsoluteError value on hold-out data: 0.001117756706662476
Epoch: 448
Loss on hold-out set: 1.5474868309166386e-06
MeanAbsoluteError value on hold-out data: 0.0009987688390538096
Epoch: 449
Loss on hold-out set: 1.5318835966564411e-06
MeanAbsoluteError value on hold-out data: 0.0010295734973624349
Epoch: 450

Loss on hold-out set: 2.421558104095731e-05
MeanAbsoluteError value on hold-out data: 0.001435545040294528
Epoch: 451
Loss on hold-out set: 8.0486990485112e-06
MeanAbsoluteError value on hold-out data: 0.0026483996771275997
Epoch: 452
Loss on hold-out set: 0.0007038220877487989
MeanAbsoluteError value on hold-out data: 0.0036841377150267363
Epoch: 453

Loss on hold-out set: 1.4395015630095888e-06
MeanAbsoluteError value on hold-out data: 0.0010077083716169
Epoch: 454
Loss on hold-out set: 2.5533338342798884e-06
MeanAbsoluteError value on hold-out data: 0.0013403019402176142
```

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Epoch: 455
Loss on hold-out set: 1.1370187674121833e-06
MeanAbsoluteError value on hold-out data: 0.0008966613677330315
Epoch: 456
Loss on hold-out set: 1.5612969570191547e-06
MeanAbsoluteError value on hold-out data: 0.0010713962838053703
Epoch: 457

Loss on hold-out set: 9.95094642173801e-07
MeanAbsoluteError value on hold-out data: 0.0008249870734289289
Epoch: 458
Loss on hold-out set: 9.937437758148567e-07
MeanAbsoluteError value on hold-out data: 0.0008367610862478614
Epoch: 459
Loss on hold-out set: 9.759713190778011e-07
MeanAbsoluteError value on hold-out data: 0.0007887368556112051
Epoch: 460

Loss on hold-out set: 1.0138724217785448e-06
MeanAbsoluteError value on hold-out data: 0.0007996197673492134
Epoch: 461
Loss on hold-out set: 0.00012267950740334316
MeanAbsoluteError value on hold-out data: 0.001677948865108192
Epoch: 462
Loss on hold-out set: 1.1691101502282645e-06
MeanAbsoluteError value on hold-out data: 0.0008623955654911697
Epoch: 463
Loss on hold-out set: 4.793740467553457e-06
MeanAbsoluteError value on hold-out data: 0.001888322876766324
Epoch: 464

Loss on hold-out set: 1.2394840758553562e-06
MeanAbsoluteError value on hold-out data: 0.0008996237302199006
Epoch: 465
Loss on hold-out set: 1.2640725405897404e-06
MeanAbsoluteError value on hold-out data: 0.0009338586824014783
Epoch: 466
Loss on hold-out set: 1.043233597696459e-06
MeanAbsoluteError value on hold-out data: 0.0008408313151448965
Epoch: 467
```

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Loss on hold-out set: 1.538105926521474e-06
MeanAbsoluteError value on hold-out data: 0.0010624915594235063
Epoch: 468
Loss on hold-out set: 9.630822856475054e-07
MeanAbsoluteError value on hold-out data: 0.0008024258422665298
Epoch: 469
Loss on hold-out set: 1.0115224470679934e-06
MeanAbsoluteError value on hold-out data: 0.0008278877357952297
Epoch: 470
Loss on hold-out set: 1.1405139817865206e-06
MeanAbsoluteError value on hold-out data: 0.0008456312934868038
Epoch: 471

Loss on hold-out set: 1.446527365855078e-06
MeanAbsoluteError value on hold-out data: 0.001007851562462747
Epoch: 472
Loss on hold-out set: 1.3174142692990315e-06
MeanAbsoluteError value on hold-out data: 0.0009651223663240671
Epoch: 473
Loss on hold-out set: 2.094512301307707e-06
MeanAbsoluteError value on hold-out data: 0.0012396747479215264
Epoch: 474

Loss on hold-out set: 9.331307222300194e-07
MeanAbsoluteError value on hold-out data: 0.0007857216405682266
Epoch: 475
Loss on hold-out set: 0.00012451374144662762
MeanAbsoluteError value on hold-out data: 0.005271154455840588
Epoch: 476
Loss on hold-out set: 9.765306462948222e-07
MeanAbsoluteError value on hold-out data: 0.0008076591184362769
Epoch: 477
Loss on hold-out set: 1.2363427336262807e-06
MeanAbsoluteError value on hold-out data: 0.0008574185776524246
Epoch: 478

Loss on hold-out set: 0.0005354356846265335
MeanAbsoluteError value on hold-out data: 0.0025700009427964687
Epoch: 479
Loss on hold-out set: 1.0068341724106106e-06
MeanAbsoluteError value on hold-out data: 0.0007837427547201514
Epoch: 480
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Loss on hold-out set: 9.489259910494113e-07
MeanAbsoluteError value on hold-out data: 0.0008027487201616168
Epoch: 481

Loss on hold-out set: 4.13961189713938e-05
MeanAbsoluteError value on hold-out data: 0.006327233277261257
Epoch: 482
Loss on hold-out set: 1.2418880059018334e-06
MeanAbsoluteError value on hold-out data: 0.000938628101721406
Epoch: 483
Loss on hold-out set: 1.069948998869782e-06
MeanAbsoluteError value on hold-out data: 0.000817874155472964
Epoch: 484
Loss on hold-out set: 1.1479168576373083e-06
MeanAbsoluteError value on hold-out data: 0.0009053168469108641
Epoch: 485

Loss on hold-out set: 1.064138637310372e-06
MeanAbsoluteError value on hold-out data: 0.0007821763283573091
Epoch: 486
Loss on hold-out set: 1.1271266242392112e-06
MeanAbsoluteError value on hold-out data: 0.0008208497893065214
Epoch: 487
Loss on hold-out set: 2.4078698594656507e-06
MeanAbsoluteError value on hold-out data: 0.001260274089872837
Epoch: 488

Loss on hold-out set: 3.5208218885320375e-06
MeanAbsoluteError value on hold-out data: 0.0015480020083487034
Epoch: 489
Loss on hold-out set: 2.109628168839733e-06
MeanAbsoluteError value on hold-out data: 0.0012260193470865488
Epoch: 490
Loss on hold-out set: 0.00031094172324777413
MeanAbsoluteError value on hold-out data: 0.0025408153887838125
Epoch: 491
Loss on hold-out set: 9.059396771905225e-07
MeanAbsoluteError value on hold-out data: 0.0007640706608071923
Epoch: 492

Loss on hold-out set: 9.425079678766662e-07
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MeanAbsoluteError value on hold-out data: 0.0008068851311691105
Epoch: 493
Loss on hold-out set: 7.02144115376331e-06
MeanAbsoluteError value on hold-out data: 0.0022864933125674725
Epoch: 494
Loss on hold-out set: 1.0833731603445183e-06
MeanAbsoluteError value on hold-out data: 0.000801672984380275
Epoch: 495

Loss on hold-out set: 1.0306992095365786e-06
MeanAbsoluteError value on hold-out data: 0.0008537039975635707
Epoch: 496
Loss on hold-out set: 9.687224287692795e-07
MeanAbsoluteError value on hold-out data: 0.000813538208603859
Epoch: 497
Loss on hold-out set: 0.00026863213878l9554
MeanAbsoluteError value on hold-out data: 0.0025120184291154146
Epoch: 498
Loss on hold-out set: 1.3159462136732495e-06
MeanAbsoluteError value on hold-out data: 0.0009306933498010039
Epoch: 499

Loss on hold-out set: 9.434869853591338e-07
MeanAbsoluteError value on hold-out data: 0.000784395553637296
Epoch: 500
Loss on hold-out set: 9.281111182155236e-07
MeanAbsoluteError value on hold-out data: 0.0007634253124706447
Epoch: 501
Loss on hold-out set: 1.0341781568548379e-06
MeanAbsoluteError value on hold-out data: 0.000853097066283226
Epoch: 502

Loss on hold-out set: 9.814501901508685e-06
MeanAbsoluteError value on hold-out data: 0.0028984639793634415
Epoch: 503
Loss on hold-out set: 1.3593154116838728e-06
MeanAbsoluteError value on hold-out data: 0.000912643619813025
Epoch: 504
Loss on hold-out set: 1.8580720480853274e-06
MeanAbsoluteError value on hold-out data: 0.001144400448538363
Epoch: 505
Loss on hold-out set: 8.203357496173479e-05
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MeanAbsoluteError value on hold-out data: 0.008986183442175388
Epoch: 506

Loss on hold-out set: 1.7671698322793907e-06
MeanAbsoluteError value on hold-out data: 0.0009442568407393992
Epoch: 507
Loss on hold-out set: 1.3138824215275235e-06
MeanAbsoluteError value on hold-out data: 0.0009184780064970255
Epoch: 508
Loss on hold-out set: 1.0371103843891224e-05
MeanAbsoluteError value on hold-out data: 0.0030580516904592514
Epoch: 509

Loss on hold-out set: 3.471103361964477e-05
MeanAbsoluteError value on hold-out data: 0.005756605416536331
Epoch: 510
Loss on hold-out set: 9.983225809789403e-07
MeanAbsoluteError value on hold-out data: 0.0008126496686600149
Epoch: 511
Loss on hold-out set: 2.019523474945555e-06
MeanAbsoluteError value on hold-out data: 0.0012093759141862392
Epoch: 512
Loss on hold-out set: 9.44952765061876e-07
MeanAbsoluteError value on hold-out data: 0.0007914019515737891
Epoch: 513

Loss on hold-out set: 2.2925247549210326e-06
MeanAbsoluteError value on hold-out data: 0.0012294824700802565
Epoch: 514
Loss on hold-out set: 0.00067582779131105l6
MeanAbsoluteError value on hold-out data: 0.0034612310118973255
Epoch: 515
Loss on hold-out set: 1.0719602633239097e-06
MeanAbsoluteError value on hold-out data: 0.0008558606496080756
Epoch: 516

Loss on hold-out set: 3.4067010731702726e-06
MeanAbsoluteError value on hold-out data: 0.0014768879627808928
Epoch: 517
Loss on hold-out set: 2.260907457149677e-06
MeanAbsoluteError value on hold-out data: 0.0009629891137592494
```

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Epoch: 518
Loss on hold-out set: 3.075372817945138e-06
MeanAbsoluteError value on hold-out data: 0.0014750281115993857
Epoch: 519
Loss on hold-out set: 1.2384747488060664e-06
MeanAbsoluteError value on hold-out data: 0.0009186192764900625
Epoch: 520

Loss on hold-out set: 1.149290122489569e-06
MeanAbsoluteError value on hold-out data: 0.0008394111064262688
Epoch: 521
Loss on hold-out set: 2.525701008747861e-05
MeanAbsoluteError value on hold-out data: 0.0014381567016243935
Epoch: 522
Loss on hold-out set: 1.135373272868142e-06
MeanAbsoluteError value on hold-out data: 0.0008460030658170581
Epoch: 523

Loss on hold-out set: 1.6253712304275653e-06
MeanAbsoluteError value on hold-out data: 0.0009840417187660933
Epoch: 524
Loss on hold-out set: 1.3009180249285307e-06
MeanAbsoluteError value on hold-out data: 0.0009166873060166836
Epoch: 525
Loss on hold-out set: 1.3206705970193211e-06
MeanAbsoluteError value on hold-out data: 0.0009161880007013679
Epoch: 526
Loss on hold-out set: 0.00047191893676112016
MeanAbsoluteError value on hold-out data: 0.0036975136026740074
Epoch: 527

Loss on hold-out set: 1.1256139006176313e-06
MeanAbsoluteError value on hold-out data: 0.0008360999054275453
Epoch: 528
Loss on hold-out set: 1.178277249034811e-06
MeanAbsoluteError value on hold-out data: 0.0009066157508641481
Epoch: 529
Loss on hold-out set: 1.1256276042541476e-06
MeanAbsoluteError value on hold-out data: 0.0008306208765134215
Epoch: 530
```

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Loss on hold-out set: 1.6791188911086535e-06
MeanAbsoluteError value on hold-out data: 0.0011001842794939876
Epoch: 531
Loss on hold-out set: 9.353774321250687e-07
MeanAbsoluteError value on hold-out data: 0.0007980463560670614
Epoch: 532
Loss on hold-out set: 9.615113229371602e-07
MeanAbsoluteError value on hold-out data: 0.0007975510670803487
Epoch: 533
Loss on hold-out set: 1.1311982002728025e-06
MeanAbsoluteError value on hold-out data: 0.0008687794907018542
Epoch: 534

Loss on hold-out set: 1.0167628637156247e-06
MeanAbsoluteError value on hold-out data: 0.0007781503372825682
Epoch: 535
Loss on hold-out set: 1.0737072802140365e-06
MeanAbsoluteError value on hold-out data: 0.0008091283380053937
Epoch: 536
Loss on hold-out set: 7.864907837966502e-05
MeanAbsoluteError value on hold-out data: 0.001840156503021717
Epoch: 537

Loss on hold-out set: 4.388322010457229e-06
MeanAbsoluteError value on hold-out data: 0.0018844099249690771
Epoch: 538
Loss on hold-out set: 0.00036632687934019695
MeanAbsoluteError value on hold-out data: 0.002779364585876465
Epoch: 539
Loss on hold-out set: 1.0091358192837035e-06
MeanAbsoluteError value on hold-out data: 0.000829762895591557
Epoch: 540
Loss on hold-out set: 9.232648232262783e-07
MeanAbsoluteError value on hold-out data: 0.0007958572241477668
Epoch: 541

Loss on hold-out set: 1.5053971065544129e-05
MeanAbsoluteError value on hold-out data: 0.0037689392920583487
Epoch: 542
Loss on hold-out set: 1.3377272431660879e-06
MeanAbsoluteError value on hold-out data: 0.0009617398027330637
Epoch: 543
```

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Loss on hold-out set: 9.987040768394834e-07
MeanAbsoluteError value on hold-out data: 0.0008110330090858042
Epoch: 544

Loss on hold-out set: 7.872682901349366e-06
MeanAbsoluteError value on hold-out data: 0.001056656357832253
Epoch: 545
Loss on hold-out set: 1.7607390182442591e-06
MeanAbsoluteError value on hold-out data: 0.0011258581653237343
Epoch: 546
Loss on hold-out set: 8.817062542640577e-07
MeanAbsoluteError value on hold-out data: 0.0007952574524097145
Epoch: 547
Loss on hold-out set: 8.738186396000785e-07
MeanAbsoluteError value on hold-out data: 0.0007902695797383785
Epoch: 548

Loss on hold-out set: 6.30370235600052e-06
MeanAbsoluteError value on hold-out data: 0.002328339032828808
Epoch: 549
Loss on hold-out set: 9.978615371262724e-07
MeanAbsoluteError value on hold-out data: 0.0008112142095342278
Epoch: 550
Loss on hold-out set: 9.15187062953639e-07
MeanAbsoluteError value on hold-out data: 0.0007527829147875309
Epoch: 551

Loss on hold-out set: 9.68596951294715e-07
MeanAbsoluteError value on hold-out data: 0.0008321109926328063
Epoch: 552
Loss on hold-out set: 3.465596880512469e-06
MeanAbsoluteError value on hold-out data: 0.00157597241923213
Epoch: 553
Loss on hold-out set: 2.270460129238927e-06
MeanAbsoluteError value on hold-out data: 0.0012136871227994561
Epoch: 554
Loss on hold-out set: 1.0914997010156815e-06
MeanAbsoluteError value on hold-out data: 0.0008423601975664496
Epoch: 555

Loss on hold-out set: 1.0360801114144963e-06
```

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MeanAbsoluteError value on hold-out data: 0.0008614733233116567
Epoch: 556
Loss on hold-out set: 1.0271456694419192e-06
MeanAbsoluteError value on hold-out data: 0.0007914219168014824
Epoch: 557
Loss on hold-out set: 9.821156739830117e-07
MeanAbsoluteError value on hold-out data: 0.0007730480283498764
Epoch: 558

Loss on hold-out set: 9.914295862227636e-07
MeanAbsoluteError value on hold-out data: 0.0008466438157483935
Epoch: 559
Loss on hold-out set: 1.0496810843435994e-06
MeanAbsoluteError value on hold-out data: 0.0008688505622558296
Epoch: 560
Loss on hold-out set: 1.08248361549648e-06
MeanAbsoluteError value on hold-out data: 0.0008797227637842298
Epoch: 561
Loss on hold-out set: 1.2281052695820667e-06
MeanAbsoluteError value on hold-out data: 0.0009264787076972425
Epoch: 562

Loss on hold-out set: 1.150374622774017e-06
MeanAbsoluteError value on hold-out data: 0.0008749709231778979
Epoch: 563
Loss on hold-out set: 1.0126020019750006e-06
MeanAbsoluteError value on hold-out data: 0.0007817291188985109
Epoch: 564
Loss on hold-out set: 1.3846473380523933e-06
MeanAbsoluteError value on hold-out data: 0.0009780213003978133
Epoch: 565

Loss on hold-out set: 5.29332358452778e-05
MeanAbsoluteError value on hold-out data: 0.0016639019595459104
Epoch: 566
Loss on hold-out set: 0.0008899121217299266
MeanAbsoluteError value on hold-out data: 0.004754946101456881
Epoch: 567
Loss on hold-out set: 1.7432183898773264e-06
MeanAbsoluteError value on hold-out data: 0.0009766233852133155
Epoch: 568
Loss on hold-out set: 1.326373557311364e-06
```

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MeanAbsoluteError value on hold-out data: 0.0009286738350056112
Epoch: 569

Loss on hold-out set: 3.4063612894477465e-06
MeanAbsoluteError value on hold-out data: 0.0015506077324971557
Epoch: 570
Loss on hold-out set: 9.660290411025367e-07
MeanAbsoluteError value on hold-out data: 0.0008249442907981575
Epoch: 571
Loss on hold-out set: 9.761889156852003e-07
MeanAbsoluteError value on hold-out data: 0.0007827178342267871
Epoch: 572

Loss on hold-out set: 6.838148027992037e-06
MeanAbsoluteError value on hold-out data: 0.002407345687970519
Epoch: 573
Loss on hold-out set: 1.196383215948607e-06
MeanAbsoluteError value on hold-out data: 0.0009141452028416097
Epoch: 574
Loss on hold-out set: 9.648567680205115e-07
MeanAbsoluteError value on hold-out data: 0.0007998573128134012
Epoch: 575
Loss on hold-out set: 4.568977549122512e-06
MeanAbsoluteError value on hold-out data: 0.0019234279170632362
Epoch: 576

Loss on hold-out set: 0.00038842588042615925
MeanAbsoluteError value on hold-out data: 0.004050068557262421
Epoch: 577
Loss on hold-out set: 0.00014391208156456952
MeanAbsoluteError value on hold-out data: 0.002909037284553051
Epoch: 578
Loss on hold-out set: 1.0442765563731462e-06
MeanAbsoluteError value on hold-out data: 0.0008436585194431245
Epoch: 579

Loss on hold-out set: 1.0231348142042407e-06
MeanAbsoluteError value on hold-out data: 0.0008359991479665041
Epoch: 580
Loss on hold-out set: 1.0291107300347974e-06
MeanAbsoluteError value on hold-out data: 0.0008432061295025051
```

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Epoch: 581
Loss on hold-out set: 9.379191855994297e-07
MeanAbsoluteError value on hold-out data: 0.0007844693027436733
Epoch: 582
Loss on hold-out set: 0.0008118377114669784
MeanAbsoluteError value on hold-out data: 0.003692241618409753
Epoch: 583

Loss on hold-out set: 1.331398025810743e-06
MeanAbsoluteError value on hold-out data: 0.0009794136276468635
Epoch: 584
Loss on hold-out set: 1.1262375013442438e-06
MeanAbsoluteError value on hold-out data: 0.0008907828596420586
Epoch: 585
Loss on hold-out set: 4.115296108536243e-06
MeanAbsoluteError value on hold-out data: 0.0017769804690033197
Epoch: 586

Loss on hold-out set: 1.0683596743687162e-06
MeanAbsoluteError value on hold-out data: 0.000871957337949425
Epoch: 587
Loss on hold-out set: 5.159427736054147e-06
MeanAbsoluteError value on hold-out data: 0.0016843632329255342
Epoch: 588
Loss on hold-out set: 2.7591950391489754e-06
MeanAbsoluteError value on hold-out data: 0.0010649100877344608
Epoch: 589
Loss on hold-out set: 3.931356537542832e-06
MeanAbsoluteError value on hold-out data: 0.0016911651473492384
Epoch: 590

Loss on hold-out set: 1.2601407556408399e-06
MeanAbsoluteError value on hold-out data: 0.0009308675653301179
Epoch: 591
Loss on hold-out set: 0.00022187704379370224
MeanAbsoluteError value on hold-out data: 0.002309724921360612
Epoch: 592
Loss on hold-out set: 1.045250098303978e-06
MeanAbsoluteError value on hold-out data: 0.0008479843381792307
Epoch: 593
```

Loss on hold-out set: 1.0344483882818167e-06
MeanAbsoluteError value on hold-out data: 0.0008657812140882015
Epoch: 594
Loss on hold-out set: 1.2038929596131381e-06
MeanAbsoluteError value on hold-out data: 0.0008315516170114279
Epoch: 595
Loss on hold-out set: 1.5811125597163202e-06
MeanAbsoluteError value on hold-out data: 0.0010580263333395123
Epoch: 596
Loss on hold-out set: 6.479767928515055e-05
MeanAbsoluteError value on hold-out data: 0.001653779298067093
Epoch: 597

Loss on hold-out set: 4.550858210887572e-06
MeanAbsoluteError value on hold-out data: 0.0018966415664181113
Epoch: 598
Loss on hold-out set: 1.2101121641832763e-06
MeanAbsoluteError value on hold-out data: 0.0009564667125232518
Epoch: 599
Loss on hold-out set: 1.2004836181544165e-06
MeanAbsoluteError value on hold-out data: 0.0009260541992262006
Epoch: 600

Loss on hold-out set: 1.056246372417473e-06
MeanAbsoluteError value on hold-out data: 0.0008348391274921596
Epoch: 601
Loss on hold-out set: 0.000502166053099
MeanAbsoluteError value on hold-out data: 0.0026580332778394222
Epoch: 602
Loss on hold-out set: 0.0002269601566437219
MeanAbsoluteError value on hold-out data: 0.001889219623990357
Epoch: 603
Loss on hold-out set: 3.870746485727767e-06
MeanAbsoluteError value on hold-out data: 0.0015990138053894043
Epoch: 604

Loss on hold-out set: 1.190110611905591e-06
MeanAbsoluteError value on hold-out data: 0.0008296011947095394
Epoch: 605
Loss on hold-out set: 9.896579889265502e-07
MeanAbsoluteError value on hold-out data: 0.0007972398889251053
Epoch: 606

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Loss on hold-out set: 9.789065394180886e-07
MeanAbsoluteError value on hold-out data: 0.0008072615601122379
Epoch: 607

Loss on hold-out set: 6.723604271358524e-05
MeanAbsoluteError value on hold-out data: 0.00814949069172144
Epoch: 608
Loss on hold-out set: 1.2304983163001173e-06
MeanAbsoluteError value on hold-out data: 0.0009299425291828811
Epoch: 609
Loss on hold-out set: 0.00023822368266862142
MeanAbsoluteError value on hold-out data: 0.0024052925873547792
Epoch: 610
Loss on hold-out set: 1.0253551181449438e-06
MeanAbsoluteError value on hold-out data: 0.000799947592895478
Epoch: 611

Loss on hold-out set: 1.000344018218759e-06
MeanAbsoluteError value on hold-out data: 0.0008311294950544834
Epoch: 612
Loss on hold-out set: 3.6962213926017284e-05
MeanAbsoluteError value on hold-out data: 0.005973074585199356
Epoch: 613
Loss on hold-out set: 1.477858282109642e-06
MeanAbsoluteError value on hold-out data: 0.0008735435549169779
Epoch: 614

Loss on hold-out set: 1.5087848405178543e-06
MeanAbsoluteError value on hold-out data: 0.0010118352947756648
Epoch: 615
Loss on hold-out set: 1.6269315997655772e-06
MeanAbsoluteError value on hold-out data: 0.001091639045625925
Epoch: 616
Loss on hold-out set: 9.153690690219754e-07
MeanAbsoluteError value on hold-out data: 0.0007705121533945203
Epoch: 617
Loss on hold-out set: 9.681459774723267e-07
MeanAbsoluteError value on hold-out data: 0.0008190718945115805
Epoch: 618

Loss on hold-out set: 9.815866213522475e-07
```

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MeanAbsoluteError value on hold-out data: 0.0008323179790750146
Epoch: 619
Loss on hold-out set: 1.7978651910128135e-06
MeanAbsoluteError value on hold-out data: 0.0011078525567427278
Epoch: 620
Loss on hold-out set: 3.452725327581273e-05
MeanAbsoluteError value on hold-out data: 0.001615126384422183
Epoch: 621

Loss on hold-out set: 1.4938335915268488e-06
MeanAbsoluteError value on hold-out data: 0.0009464792092330754
Epoch: 622
Loss on hold-out set: 2.0209296871179013e-06
MeanAbsoluteError value on hold-out data: 0.0011134003289043903
Epoch: 623
Loss on hold-out set: 1.1621973586583267e-06
MeanAbsoluteError value on hold-out data: 0.0008289220277220011
Epoch: 624
Loss on hold-out set: 1.2034501581253537e-06
MeanAbsoluteError value on hold-out data: 0.0008901613182388246
Epoch: 625

Loss on hold-out set: 2.2887804614303886e-06
MeanAbsoluteError value on hold-out data: 0.0012070833472535014
Epoch: 626
Loss on hold-out set: 1.3733581191935139e-06
MeanAbsoluteError value on hold-out data: 0.0009574036812409759
Epoch: 627
Loss on hold-out set: 2.187797109015194e-06
MeanAbsoluteError value on hold-out data: 0.0012695055920630693
Epoch: 628

Loss on hold-out set: 0.00013184736862224502
MeanAbsoluteError value on hold-out data: 0.002017662627622485
Epoch: 629
Loss on hold-out set: 9.482108286927262e-07
MeanAbsoluteError value on hold-out data: 0.0008023843984119594
Epoch: 630
Loss on hold-out set: 0.0003586656368690036
MeanAbsoluteError value on hold-out data: 0.0027069998905062675
Epoch: 631
Loss on hold-out set: 0.0003098880971317787
```

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MeanAbsoluteError value on hold-out data: 0.0028990856371819973
Epoch: 632

Loss on hold-out set: 1.1092069310227369e-06
MeanAbsoluteError value on hold-out data: 0.0008280507754534483
Epoch: 633
Loss on hold-out set: 1.5070005223203855e-06
MeanAbsoluteError value on hold-out data: 0.0009142229682765901
Epoch: 634
Loss on hold-out set: 1.2759534043355486e-06
MeanAbsoluteError value on hold-out data: 0.0008680850733071566
Epoch: 635

Loss on hold-out set: 3.040502065232431e-06
MeanAbsoluteError value on hold-out data: 0.0015453622909262776
Epoch: 636
Loss on hold-out set: 1.6414834537779545e-06
MeanAbsoluteError value on hold-out data: 0.0010671705240383744
Epoch: 637
Loss on hold-out set: 1.09828958399633e-06
MeanAbsoluteError value on hold-out data: 0.0008463884005323052
Epoch: 638
Loss on hold-out set: 1.1285033368634545e-06
MeanAbsoluteError value on hold-out data: 0.000873230048455298
Epoch: 639

Loss on hold-out set: 1.3007495355693138e-06
MeanAbsoluteError value on hold-out data: 0.000857372535392642
Epoch: 640
Loss on hold-out set: 1.4860477921711908e-06
MeanAbsoluteError value on hold-out data: 0.0009486364433541894
Epoch: 641
Loss on hold-out set: 1.079113594379613e-06
MeanAbsoluteError value on hold-out data: 0.0008302349597215652
Epoch: 642

Loss on hold-out set: 2.442710633833765e-06
MeanAbsoluteError value on hold-out data: 0.001175054581835866
Epoch: 643
Loss on hold-out set: 0.0007210725991932612
MeanAbsoluteError value on hold-out data: 0.00360093149356544
```

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Epoch: 644
Loss on hold-out set: 1.2374664033988945e-06
MeanAbsoluteError value on hold-out data: 0.000881678075529635
Epoch: 645
Loss on hold-out set: 1.2701182754426554e-06
MeanAbsoluteError value on hold-out data: 0.0009353692294098437
Epoch: 646

Loss on hold-out set: 1.2144238347935664e-06
MeanAbsoluteError value on hold-out data: 0.0008344926754944026
Epoch: 647
Loss on hold-out set: 1.151671155569672e-06
MeanAbsoluteError value on hold-out data: 0.0009168537799268961
Epoch: 648
Loss on hold-out set: 0.00033488945862595405
MeanAbsoluteError value on hold-out data: 0.002967025153338909
Epoch: 649

Loss on hold-out set: 1.0147991946933662e-06
MeanAbsoluteError value on hold-out data: 0.0008184521575458348
Epoch: 650
Loss on hold-out set: 1.0436476866988623e-06
MeanAbsoluteError value on hold-out data: 0.0008147724438458681
Epoch: 651
Loss on hold-out set: 1.100650896782659e-06
MeanAbsoluteError value on hold-out data: 0.000820376502815634
Epoch: 652
Loss on hold-out set: 9.463661504364259e-07
MeanAbsoluteError value on hold-out data: 0.0007994235493242741
Epoch: 653

Loss on hold-out set: 1.1690885409839561e-06
MeanAbsoluteError value on hold-out data: 0.0009078169823624194
Epoch: 654
Loss on hold-out set: 1.0627143489308275e-06
MeanAbsoluteError value on hold-out data: 0.0008452524780295789
Epoch: 655
Loss on hold-out set: 2.8536066915526484e-05
MeanAbsoluteError value on hold-out data: 0.005203719716519117
Epoch: 656
```

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Loss on hold-out set: 3.624955127179419e-06
MeanAbsoluteError value on hold-out data: 0.0010306055191904306
Epoch: 657
Loss on hold-out set: 0.0007110699472237824
MeanAbsoluteError value on hold-out data: 0.004467980470508337
Epoch: 658
Loss on hold-out set: 1.7254035902589328e-06
MeanAbsoluteError value on hold-out data: 0.0009755974169820547
Epoch: 659
Loss on hold-out set: 1.3108656560234522e-06
MeanAbsoluteError value on hold-out data: 0.0009009646601043642
Epoch: 660

Loss on hold-out set: 1.2887399717643489e-06
MeanAbsoluteError value on hold-out data: 0.0008815296459943056
Epoch: 661
Loss on hold-out set: 1.2212496143932256e-06
MeanAbsoluteError value on hold-out data: 0.0008712041890248656
Epoch: 662
Loss on hold-out set: 1.053366470562021e-06
MeanAbsoluteError value on hold-out data: 0.0008642155444249511
Epoch: 663

Loss on hold-out set: 1.6912785160736978e-06
MeanAbsoluteError value on hold-out data: 0.001010052626952529
Epoch: 664
Loss on hold-out set: 1.6713999264958638e-05
MeanAbsoluteError value on hold-out data: 0.00389125756919384
Epoch: 665
Loss on hold-out set: 3.3817485001026607e-06
MeanAbsoluteError value on hold-out data: 0.0015787051524966955
Epoch: 666
Loss on hold-out set: 1.4764301786621777e-06
MeanAbsoluteError value on hold-out data: 0.000870273623149842
Epoch: 667

Loss on hold-out set: 2.3094938753204656e-06
MeanAbsoluteError value on hold-out data: 0.001250420231372118
Epoch: 668
Loss on hold-out set: 1.0843535847016028e-06
MeanAbsoluteError value on hold-out data: 0.0008413094910793006
Epoch: 669
```

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Loss on hold-out set: 1.0431977841562912e-06
MeanAbsoluteError value on hold-out data: 0.0008420955273322761
Epoch: 670

Loss on hold-out set: 1.484550881951481e-06
MeanAbsoluteError value on hold-out data: 0.0010342239402234554
Epoch: 671
Loss on hold-out set: 2.4673352444236887e-05
MeanAbsoluteError value on hold-out data: 0.0013165670679882169
Epoch: 672
Loss on hold-out set: 1.1054548456111381e-06
MeanAbsoluteError value on hold-out data: 0.0008329429547302425
Epoch: 673
Loss on hold-out set: 1.1142020989259786e-06
MeanAbsoluteError value on hold-out data: 0.0008242184412665665
Epoch: 674

Loss on hold-out set: 5.175771390825573e-06
MeanAbsoluteError value on hold-out data: 0.0020441391970962286
Epoch: 675
Loss on hold-out set: 1.018820698233797e-06
MeanAbsoluteError value on hold-out data: 0.0008214449044317007
Early stopping at epoch 674
Fold: 7
Epoch: 1
Loss on hold-out set: 0.10952566420802703
MeanAbsoluteError value on hold-out data: 0.3033932149410248
Epoch: 2

Loss on hold-out set: 0.05299039958761288
MeanAbsoluteError value on hold-out data: 0.19843702018260956
Epoch: 3
Loss on hold-out set: 0.03072012670767995
MeanAbsoluteError value on hold-out data: 0.13764889538288116
Epoch: 4
Loss on hold-out set: 0.02098597433919517
MeanAbsoluteError value on hold-out data: 0.11281033605337143
Epoch: 5
Loss on hold-out set: 0.01753072841809346
MeanAbsoluteError value on hold-out data: 0.10461654514074326
Epoch: 6
```

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Loss on hold-out set: 0.016469947850474946
MeanAbsoluteError value on hold-out data: 0.10217569023370743
Epoch: 7
Loss on hold-out set: 0.01634229622924557
MeanAbsoluteError value on hold-out data: 0.1013626679778099
Epoch: 8
Loss on hold-out set: 0.016271374725665037
MeanAbsoluteError value on hold-out data: 0.10098926723003387
Epoch: 9

Loss on hold-out set: 0.016338532611441154
MeanAbsoluteError value on hold-out data: 0.10076904296875
Epoch: 10
Loss on hold-out set: 0.015877668298064515
MeanAbsoluteError value on hold-out data: 0.10054216533899307
Epoch: 11
Loss on hold-out set: 0.016917301091150597
MeanAbsoluteError value on hold-out data: 0.10035432875156403
Epoch: 12
Loss on hold-out set: 0.01622560641799982
MeanAbsoluteError value on hold-out data: 0.10016419738531113
Epoch: 13

Loss on hold-out set: 0.016448000266861457
MeanAbsoluteError value on hold-out data: 0.09995821118354797
Epoch: 14
Loss on hold-out set: 0.016141171280581217
MeanAbsoluteError value on hold-out data: 0.09975025802850723
Epoch: 15
Loss on hold-out set: 0.01599197182804346
MeanAbsoluteError value on hold-out data: 0.09953805059194565
Epoch: 16

Loss on hold-out set: 0.01750865807900062
MeanAbsoluteError value on hold-out data: 0.09931843727827072
Epoch: 17
Loss on hold-out set: 0.016366494067299824
MeanAbsoluteError value on hold-out data: 0.09909538924694061
Epoch: 18
Loss on hold-out set: 0.01539616478392138
MeanAbsoluteError value on hold-out data: 0.09887164831161499
Epoch: 19
```

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Loss on hold-out set: 0.015258707159843583
MeanAbsoluteError value on hold-out data: 0.09864775836467743
Epoch: 20

Loss on hold-out set: 0.015588184675345054
MeanAbsoluteError value on hold-out data: 0.0984027162194252
Epoch: 21
Loss on hold-out set: 0.01559504594367284
MeanAbsoluteError value on hold-out data: 0.09817153960466385
Epoch: 22
Loss on hold-out set: 0.015213070544772424
MeanAbsoluteError value on hold-out data: 0.09795359522104263
Epoch: 23

Loss on hold-out set: 0.015258003133707322
MeanAbsoluteError value on hold-out data: 0.0976974219083786
Epoch: 24
Loss on hold-out set: 0.015191261441661762
MeanAbsoluteError value on hold-out data: 0.09754159301519394
Epoch: 25
Loss on hold-out set: 0.014833257354509372
MeanAbsoluteError value on hold-out data: 0.09720359742641449
Epoch: 26
Loss on hold-out set: 0.014924573855331311
MeanAbsoluteError value on hold-out data: 0.09697122871875763
Epoch: 27

Loss on hold-out set: 0.015855897791110553
MeanAbsoluteError value on hold-out data: 0.09671132266521454
Epoch: 28
Loss on hold-out set: 0.015057425050494762
MeanAbsoluteError value on hold-out data: 0.0964457243680954
Epoch: 29
Loss on hold-out set: 0.015044478269723745
MeanAbsoluteError value on hold-out data: 0.0961902067065239
Epoch: 30

Loss on hold-out set: 0.015160286655792823
MeanAbsoluteError value on hold-out data: 0.0959070697426796
Epoch: 31
Loss on hold-out set: 0.014588303147600247
```

```
MeanAbsoluteError value on hold-out data: 0.09560728818178177
Epoch: 32
Loss on hold-out set: 0.01564637295758495
MeanAbsoluteError value on hold-out data: 0.09534358233213425
Epoch: 33
Loss on hold-out set: 0.014184560268544234
MeanAbsoluteError value on hold-out data: 0.0950760766863823
Epoch: 34

Loss on hold-out set: 0.013973514585254284
MeanAbsoluteError value on hold-out data: 0.09481317549943924
Epoch: 35
Loss on hold-out set: 0.014237901751095286
MeanAbsoluteError value on hold-out data: 0.09447118639945984
Epoch: 36
Loss on hold-out set: 0.014188905246555805
MeanAbsoluteError value on hold-out data: 0.0943191796541214
Epoch: 37

Loss on hold-out set: 0.013843628040586527
MeanAbsoluteError value on hold-out data: 0.0939306989312172
Epoch: 38
Loss on hold-out set: 0.013714218583817665
MeanAbsoluteError value on hold-out data: 0.09351620823144913
Epoch: 39
Loss on hold-out set: 0.013651909915587077
MeanAbsoluteError value on hold-out data: 0.09328556060791016
Epoch: 40
Loss on hold-out set: 0.013517550407693936
MeanAbsoluteError value on hold-out data: 0.09299976378679276
Epoch: 41

Loss on hold-out set: 0.014434606553270267
MeanAbsoluteError value on hold-out data: 0.09268553555011749
Epoch: 42
Loss on hold-out set: 0.013303163568847455
MeanAbsoluteError value on hold-out data: 0.0923859179019928
Epoch: 43
Loss on hold-out set: 0.013324094327309957
MeanAbsoluteError value on hold-out data: 0.0919702798128128
Epoch: 44
```

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Loss on hold-out set: 0.013042884305692636
MeanAbsoluteError value on hold-out data: 0.09166628867387772
Epoch: 45
Loss on hold-out set: 0.01299078373883206
MeanAbsoluteError value on hold-out data: 0.09129653126001358
Epoch: 46
Loss on hold-out set: 0.012857306748628616
MeanAbsoluteError value on hold-out data: 0.09092248231172562
Epoch: 47
Loss on hold-out set: 0.012792874951488696
MeanAbsoluteError value on hold-out data: 0.0906863808631897
Epoch: 48

Loss on hold-out set: 0.012619051544998702
MeanAbsoluteError value on hold-out data: 0.09028415381908417
Epoch: 49
Loss on hold-out set: 0.0129128355317964
MeanAbsoluteError value on hold-out data: 0.08992250263690948
Epoch: 50
Loss on hold-out set: 0.012442000962507267
MeanAbsoluteError value on hold-out data: 0.08952726423740387
Epoch: 51

Loss on hold-out set: 0.01229873987344595
MeanAbsoluteError value on hold-out data: 0.08909452706575394
Epoch: 52
Loss on hold-out set: 0.01296956640166732
MeanAbsoluteError value on hold-out data: 0.08881177753210068
Epoch: 53
Loss on hold-out set: 0.012243967718229843
MeanAbsoluteError value on hold-out data: 0.0884523093700409
Epoch: 54
Loss on hold-out set: 0.012186149385972666
MeanAbsoluteError value on hold-out data: 0.08805030584335327
Epoch: 55

Loss on hold-out set: 0.01204156710837896
MeanAbsoluteError value on hold-out data: 0.08757901936769485
Epoch: 56
Loss on hold-out set: 0.01162097648305532
MeanAbsoluteError value on hold-out data: 0.0872582271695137
Epoch: 57
```

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Loss on hold-out set: 0.011988432021238483
MeanAbsoluteError value on hold-out data: 0.08675181120634079
Epoch: 58

Loss on hold-out set: 0.011466710362583399
MeanAbsoluteError value on hold-out data: 0.08647499978542328
Epoch: 59
Loss on hold-out set: 0.011902316115223445
MeanAbsoluteError value on hold-out data: 0.0860961377620697
Epoch: 60
Loss on hold-out set: 0.011254864207540568
MeanAbsoluteError value on hold-out data: 0.08559887111186981
Epoch: 61
Loss on hold-out set: 0.011165083171083378
MeanAbsoluteError value on hold-out data: 0.08520190417766571
Epoch: 62

Loss on hold-out set: 0.011880619881244807
MeanAbsoluteError value on hold-out data: 0.08478036522865295
Epoch: 63
Loss on hold-out set: 0.011539466267165083
MeanAbsoluteError value on hold-out data: 0.0844179168343544
Epoch: 64
Loss on hold-out set: 0.011201322150345031
MeanAbsoluteError value on hold-out data: 0.08398788422346115
Epoch: 65

Loss on hold-out set: 0.010996870499534102
MeanAbsoluteError value on hold-out data: 0.08356219530105591
Epoch: 66
Loss on hold-out set: 0.01071067526936531
MeanAbsoluteError value on hold-out data: 0.08316688239574432
Epoch: 67
Loss on hold-out set: 0.010647251521452116
MeanAbsoluteError value on hold-out data: 0.08273667097091675
Epoch: 68
Loss on hold-out set: 0.010371407619319283
MeanAbsoluteError value on hold-out data: 0.08232460916042328
Epoch: 69

Loss on hold-out set: 0.010270505677908659
```

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MeanAbsoluteError value on hold-out data: 0.0818963497877121
Epoch: 70
Loss on hold-out set: 0.010517223451573115
MeanAbsoluteError value on hold-out data: 0.08147601783275604
Epoch: 71
Loss on hold-out set: 0.010082885658798309
MeanAbsoluteError value on hold-out data: 0.081082284450531
Epoch: 72

Loss on hold-out set: 0.010114698563344203
MeanAbsoluteError value on hold-out data: 0.08061399310827255
Epoch: 73
Loss on hold-out set: 0.01026106382218691
MeanAbsoluteError value on hold-out data: 0.08024661988019943
Epoch: 74
Loss on hold-out set: 0.009886816788751345
MeanAbsoluteError value on hold-out data: 0.07981163263320923
Epoch: 75
Loss on hold-out set: 0.009626874485268043
MeanAbsoluteError value on hold-out data: 0.07932540774345398
Epoch: 76

Loss on hold-out set: 0.010052864475605579
MeanAbsoluteError value on hold-out data: 0.07887723296880722
Epoch: 77
Loss on hold-out set: 0.009536561681530796
MeanAbsoluteError value on hold-out data: 0.07845152914524078
Epoch: 78
Loss on hold-out set: 0.00928564889069933
MeanAbsoluteError value on hold-out data: 0.07790515571832657
Epoch: 79

Loss on hold-out set: 0.009462918683241766
MeanAbsoluteError value on hold-out data: 0.0775206983089447
Epoch: 80
Loss on hold-out set: 0.009228437959861297
MeanAbsoluteError value on hold-out data: 0.07707249373197556
Epoch: 81
Loss on hold-out set: 0.009098619312191239
MeanAbsoluteError value on hold-out data: 0.07664107531309128
Epoch: 82
Loss on hold-out set: 0.009276111216212694
```

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MeanAbsoluteError value on hold-out data: 0.07631215453147888
Epoch: 83

Loss on hold-out set: 0.009273698248972114
MeanAbsoluteError value on hold-out data: 0.07580383121967316
Epoch: 84
Loss on hold-out set: 0.008616910459330449
MeanAbsoluteError value on hold-out data: 0.07538667321205139
Epoch: 85
Loss on hold-out set: 0.008955551848675195
MeanAbsoluteError value on hold-out data: 0.07495617866516113
Epoch: 86

Loss on hold-out set: 0.008402392089080352
MeanAbsoluteError value on hold-out data: 0.07441181689500809
Epoch: 87
Loss on hold-out set: 0.008633677310381945
MeanAbsoluteError value on hold-out data: 0.07401538640260696
Epoch: 88
Loss on hold-out set: 0.00807733891101984
MeanAbsoluteError value on hold-out data: 0.07354577630758286
Epoch: 89
Loss on hold-out set: 0.008024328853935003
MeanAbsoluteError value on hold-out data: 0.07311892509460449
Epoch: 90

Loss on hold-out set: 0.008014290020442925
MeanAbsoluteError value on hold-out data: 0.07282976061105728
Epoch: 91
Loss on hold-out set: 0.00821749514971788
MeanAbsoluteError value on hold-out data: 0.07221366465091705
Epoch: 92
Loss on hold-out set: 0.007765060496659806
MeanAbsoluteError value on hold-out data: 0.07188877463340759
Epoch: 93

Loss on hold-out set: 0.007536104450432153 4
MeanAbsoluteError value on hold-out data: 0.07135116308927536
Epoch: 94
Loss on hold-out set: 0.007465232495003595
MeanAbsoluteError value on hold-out data: 0.0708647146821022
```

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Epoch: 95
Loss on hold-out set: 0.008121502209598055
MeanAbsoluteError value on hold-out data: 0.07040431350469589
Epoch: 96
Loss on hold-out set: 0.007317558898089023
MeanAbsoluteError value on hold-out data: 0.06990791112184525
Epoch: 97

Loss on hold-out set: 0.007300872463159836
MeanAbsoluteError value on hold-out data: 0.06945203989744186
Epoch: 98
Loss on hold-out set: 0.007104032959502477
MeanAbsoluteError value on hold-out data: 0.06897766888141632
Epoch: 99
Loss on hold-out set: 0.00699684691006461
MeanAbsoluteError value on hold-out data: 0.06877739727497101
Epoch: 100

Loss on hold-out set: 0.007036530788844595
MeanAbsoluteError value on hold-out data: 0.06800372898578644
Epoch: 101
Loss on hold-out set: 0.006936423211859969
MeanAbsoluteError value on hold-out data: 0.06754762679338455
Epoch: 102
Loss on hold-out set: 0.006649035441044431
MeanAbsoluteError value on hold-out data: 0.06703963130712509
Epoch: 103
Loss on hold-out set: 0.006868392658921389
MeanAbsoluteError value on hold-out data: 0.0665663406252861
Epoch: 104

Loss on hold-out set: 0.006477322787619554
MeanAbsoluteError value on hold-out data: 0.06611019372940063
Epoch: 105
Loss on hold-out set: 0.006358092077649557
MeanAbsoluteError value on hold-out data: 0.06566715240478516
Epoch: 106
Loss on hold-out set: 0.006595020057060397
MeanAbsoluteError value on hold-out data: 0.06523074954748154
Epoch: 107
```

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Loss on hold-out set: 0.006506202446941573
MeanAbsoluteError value on hold-out data: 0.06469839811325073
Epoch: 108
Loss on hold-out set: 0.0061365660423269635
MeanAbsoluteError value on hold-out data: 0.0641682893037796
Epoch: 109
Loss on hold-out set: 0.006383158588925233
MeanAbsoluteError value on hold-out data: 0.06371291726827621
Epoch: 110
Loss on hold-out set: 0.006043958244845271
MeanAbsoluteError value on hold-out data: 0.06323214620351791
Epoch: 111

Loss on hold-out set: 0.005883891153364227
MeanAbsoluteError value on hold-out data: 0.06277113407850266
Epoch: 112
Loss on hold-out set: 0.005628029726302395
MeanAbsoluteError value on hold-out data: 0.06230807304382324
Epoch: 113
Loss on hold-out set: 0.005835989382691109
MeanAbsoluteError value on hold-out data: 0.06189155951142311
Epoch: 114

Loss on hold-out set: 0.005606472886239107
MeanAbsoluteError value on hold-out data: 0.06135620176792145
Epoch: 115
Loss on hold-out set: 0.005387615322923431
MeanAbsoluteError value on hold-out data: 0.06103130429983139
Epoch: 116
Loss on hold-out set: 0.005320366570511117
MeanAbsoluteError value on hold-out data: 0.06041131913661957
Epoch: 117
Loss on hold-out set: 0.005246805779349346
MeanAbsoluteError value on hold-out data: 0.05994481220841408
Epoch: 118

Loss on hold-out set: 0.005601987887460452
MeanAbsoluteError value on hold-out data: 0.05943594127893448
Epoch: 119
Loss on hold-out set: 0.005008306676665178
MeanAbsoluteError value on hold-out data: 0.0589691586792469
Epoch: 120
```

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Loss on hold-out set: 0.0049847731760774665
MeanAbsoluteError value on hold-out data: 0.05894230306148529
Epoch: 121

Loss on hold-out set: 0.004979686319039991
MeanAbsoluteError value on hold-out data: 0.05806476250290871
Epoch: 122
Loss on hold-out set: 0.004902698538409403
MeanAbsoluteError value on hold-out data: 0.05755294859409332
Epoch: 123
Loss on hold-out set: 0.004751398550489774
MeanAbsoluteError value on hold-out data: 0.05700671300292015
Epoch: 124
Loss on hold-out set: 0.0046162148042080495
MeanAbsoluteError value on hold-out data: 0.05651543661952019
Epoch: 125

Loss on hold-out set: 0.004617206877670609
MeanAbsoluteError value on hold-out data: 0.055967070162296295
Epoch: 126
Loss on hold-out set: 0.004513394392023866
MeanAbsoluteError value on hold-out data: 0.055728696286678314
Epoch: 127
Loss on hold-out set: 0.004295925932148328
MeanAbsoluteError value on hold-out data: 0.05495112016797066
Epoch: 128

Loss on hold-out set: 0.004455323832539411
MeanAbsoluteError value on hold-out data: 0.05447504669427872
Epoch: 129
Loss on hold-out set: 0.004195299904005459
MeanAbsoluteError value on hold-out data: 0.05399111658334732
Epoch: 130
Loss on hold-out set: 0.004280196699815301
MeanAbsoluteError value on hold-out data: 0.05362941324710846
Epoch: 131
Loss on hold-out set: 0.004191097633268397
MeanAbsoluteError value on hold-out data: 0.053020816296339035
Epoch: 132

Loss on hold-out set: 0.003952553097266131
```

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MeanAbsoluteError value on hold-out data: 0.05249674245715141
Epoch: 133
Loss on hold-out set: 0.003941722500782747
MeanAbsoluteError value on hold-out data: 0.051924146711826324
Epoch: 134
Loss on hold-out set: 0.003953385435474606
MeanAbsoluteError value on hold-out data: 0.05142096430063248
Epoch: 135

Loss on hold-out set: 0.003754541394300759
MeanAbsoluteError value on hold-out data: 0.05128442123532295
Epoch: 136
Loss on hold-out set: 0.003769028143813977
MeanAbsoluteError value on hold-out data: 0.05048106610774994
Epoch: 137
Loss on hold-out set: 0.003615515297636963
MeanAbsoluteError value on hold-out data: 0.04997263103723526
Epoch: 138
Loss on hold-out set: 0.003559085988224699
MeanAbsoluteError value on hold-out data: 0.04961888864636421
Epoch: 139

Loss on hold-out set: 0.0034700129136371496
MeanAbsoluteError value on hold-out data: 0.04915480315685272
Epoch: 140
Loss on hold-out set: 0.0034594553289934993
MeanAbsoluteError value on hold-out data: 0.04858683422207832
Epoch: 141
Loss on hold-out set: 0.003552445658267691
MeanAbsoluteError value on hold-out data: 0.04785554111003876
Epoch: 142

Loss on hold-out set: 0.003263364447495685
MeanAbsoluteError value on hold-out data: 0.04767259955406189
Epoch: 143
Loss on hold-out set: 0.003268168289930775
MeanAbsoluteError value on hold-out data: 0.04694150388240814
Epoch: 144
Loss on hold-out set: 0.0031548840925097466
MeanAbsoluteError value on hold-out data: 0.04685693606734276
Epoch: 145
Loss on hold-out set: 0.003088339822939955
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MeanAbsoluteError value on hold-out data: 0.04620129615068436
Epoch: 146

Loss on hold-out set: 0.00295488339347335
MeanAbsoluteError value on hold-out data: 0.04569792374968529
Epoch: 147
Loss on hold-out set: 0.0029489648564217184
MeanAbsoluteError value on hold-out data: 0.045083459466695786
Epoch: 148
Loss on hold-out set: 0.002927799530040759
MeanAbsoluteError value on hold-out data: 0.04462525248527527
Epoch: 149

Loss on hold-out set: 0.0028703732039922704
MeanAbsoluteError value on hold-out data: 0.04410785064101219
Epoch: 150
Loss on hold-out set: 0.002666317347365503
MeanAbsoluteError value on hold-out data: 0.04288259893655777
Epoch: 151
Loss on hold-out set: 0.0027542484279435417
MeanAbsoluteError value on hold-out data: 0.0426480658352375
Epoch: 152
Loss on hold-out set: 0.002582935858159684
MeanAbsoluteError value on hold-out data: 0.04160081222653389
Epoch: 153

Loss on hold-out set: 0.002431752778088244
MeanAbsoluteError value on hold-out data: 0.04086923599243164
Epoch: 154
Loss on hold-out set: 0.0023578804505702397
MeanAbsoluteError value on hold-out data: 0.04027775675058365
Epoch: 155
Loss on hold-out set: 0.0023251581677378942
MeanAbsoluteError value on hold-out data: 0.04002618417143822
Epoch: 156

Loss on hold-out set: 0.0023487528669647872
MeanAbsoluteError value on hold-out data: 0.03918997570872307
Epoch: 157
Loss on hold-out set: 0.002155720112988582
MeanAbsoluteError value on hold-out data: 0.03858159855008125
```

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Epoch: 158
Loss on hold-out set: 0.0020837081605210328
MeanAbsoluteError value on hold-out data: 0.038008250296115875
Epoch: 159
Loss on hold-out set: 0.0020268214508317984
MeanAbsoluteError value on hold-out data: 0.03736200928688049
Epoch: 160

Loss on hold-out set: 0.0019807347965140184
MeanAbsoluteError value on hold-out data: 0.036791179329156876
Epoch: 161
Loss on hold-out set: 0.0020051762112416327
MeanAbsoluteError value on hold-out data: 0.03625372797250748
Epoch: 162
Loss on hold-out set: 0.001842803971018069
MeanAbsoluteError value on hold-out data: 0.035759665071964264
Epoch: 163

Loss on hold-out set: 0.001861230443375042
MeanAbsoluteError value on hold-out data: 0.03530087321996689
Epoch: 164
Loss on hold-out set: 0.0017339740700733203
MeanAbsoluteError value on hold-out data: 0.03458599001169205
Epoch: 165
Loss on hold-out set: 0.0017625088490044267
MeanAbsoluteError value on hold-out data: 0.03422631323337555
Epoch: 166
Loss on hold-out set: 0.0017426228620864165
MeanAbsoluteError value on hold-out data: 0.03377864137291908
Epoch: 167

Loss on hold-out set: 0.0015579272428742396
MeanAbsoluteError value on hold-out data: 0.032964106649160385
Epoch: 168
Loss on hold-out set: 0.0015491501186401225
MeanAbsoluteError value on hold-out data: 0.03257337585091591
Epoch: 169
Loss on hold-out set: 0.0014469406361548374
MeanAbsoluteError value on hold-out data: 0.031796034425497055
Epoch: 170
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Loss on hold-out set: 0.0014814206179625427
MeanAbsoluteError value on hold-out data: 0.031191611662507057
Epoch: 171
Loss on hold-out set: 0.0013355514204774338
MeanAbsoluteError value on hold-out data: 0.03076169453561306
Epoch: 172
Loss on hold-out set: 0.0013706346418565283
MeanAbsoluteError value on hold-out data: 0.030694887042045593
Epoch: 173
Loss on hold-out set: 0.007564020907291426
MeanAbsoluteError value on hold-out data: 0.03815465420484543
Epoch: 174

Loss on hold-out set: 0.0012103516492061317
MeanAbsoluteError value on hold-out data: 0.029092896729707718
Epoch: 175
Loss on hold-out set: 0.0011790070129791275
MeanAbsoluteError value on hold-out data: 0.02878226712346077
Epoch: 176
Loss on hold-out set: 0.00115990158295832
MeanAbsoluteError value on hold-out data: 0.02826206386089325
Epoch: 177

Loss on hold-out set: 0.0011180284961413306
MeanAbsoluteError value on hold-out data: 0.027679765596985817
Epoch: 178
Loss on hold-out set: 0.0010620528057468338
MeanAbsoluteError value on hold-out data: 0.02680273726582527
Epoch: 179
Loss on hold-out set: 0.000989478334444217
MeanAbsoluteError value on hold-out data: 0.02638438157737255
Epoch: 180
Loss on hold-out set: 0.0009966235889945752
MeanAbsoluteError value on hold-out data: 0.02667655237019062
Epoch: 181

Loss on hold-out set: 0.0009001949981141549
MeanAbsoluteError value on hold-out data: 0.025264792144298553
Epoch: 182
Loss on hold-out set: 0.0008788416721822264
MeanAbsoluteError value on hold-out data: 0.024791069328784943
Epoch: 183
```

```
Loss on hold-out set: 0.000839965503053883
MeanAbsoluteError value on hold-out data: 0.024200711399316788
Epoch: 184

Loss on hold-out set: 0.006446447243573717
MeanAbsoluteError value on hold-out data: 0.031127728521823883
Epoch: 185
Loss on hold-out set: 0.000752400959474751
MeanAbsoluteError value on hold-out data: 0.02303890883922577
Epoch: 186
Loss on hold-out set: 0.0007155478278246636
MeanAbsoluteError value on hold-out data: 0.02255762554705143
Epoch: 187
Loss on hold-out set: 0.0009555415017530322
MeanAbsoluteError value on hold-out data: 0.023397469893097878
Epoch: 188

Loss on hold-out set: 0.0006660960408715674
MeanAbsoluteError value on hold-out data: 0.02149938978254795
Epoch: 189
Loss on hold-out set: 0.0018571899944128324
MeanAbsoluteError value on hold-out data: 0.024409372359514236
Epoch: 190
Loss on hold-out set: 0.0005983231844416318
MeanAbsoluteError value on hold-out data: 0.020363328978419304
Epoch: 191

Loss on hold-out set: 0.0006039686671171624
MeanAbsoluteError value on hold-out data: 0.019946863874793053
Epoch: 192
Loss on hold-out set: 0.0005673824131148509
MeanAbsoluteError value on hold-out data: 0.019543074071407318
Epoch: 193
Loss on hold-out set: 0.000515480074682273
MeanAbsoluteError value on hold-out data: 0.01916470378637314
Epoch: 194
Loss on hold-out set: 0.00048705712498094025
MeanAbsoluteError value on hold-out data: 0.01839420013129711
Epoch: 195

Loss on hold-out set: 0.0012906486002835804
```

```
MeanAbsoluteError value on hold-out data: 0.020686116069555283
Epoch: 196
Loss on hold-out set: 0.00043374495446467056
MeanAbsoluteError value on hold-out data: 0.017291059717535973
Epoch: 197
Loss on hold-out set: 0.00041685738632133085
MeanAbsoluteError value on hold-out data: 0.016870219260454178
Epoch: 198

Loss on hold-out set: 0.00037546515858803806
MeanAbsoluteError value on hold-out data: 0.016330504789948463
Epoch: 199
Loss on hold-out set: 0.00036917056422680616
MeanAbsoluteError value on hold-out data: 0.016095604747533798
Epoch: 200
Loss on hold-out set: 0.0003490313812597798
MeanAbsoluteError value on hold-out data: 0.015436920337378979
Epoch: 201
Loss on hold-out set: 0.0003342527555874907
MeanAbsoluteError value on hold-out data: 0.014714491553604603
Epoch: 202

Loss on hold-out set: 0.0014776735770283267
MeanAbsoluteError value on hold-out data: 0.0180972907692194
Epoch: 203
Loss on hold-out set: 0.0002880411602046269
MeanAbsoluteError value on hold-out data: 0.013866228982806206
Epoch: 204
Loss on hold-out set: 0.00025553857659150916
MeanAbsoluteError value on hold-out data: 0.013394603505730629
Epoch: 205

Loss on hold-out set: 0.0002396737713402567
MeanAbsoluteError value on hold-out data: 0.01279191579669714
Epoch: 206
Loss on hold-out set: 0.000220349816887532
MeanAbsoluteError value on hold-out data: 0.012228995561599731
Epoch: 207
Loss on hold-out set: 0.0002355625239523271
MeanAbsoluteError value on hold-out data: 0.0122993728145957
Epoch: 208
Loss on hold-out set: 0.00018406934451867038
```

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MeanAbsoluteError value on hold-out data: 0.011262407526373863
Epoch: 209

Loss on hold-out set: 0.00016949752730747254
MeanAbsoluteError value on hold-out data: 0.010782718658447266
Epoch: 210
Loss on hold-out set: 0.000162008448499434
MeanAbsoluteError value on hold-out data: 0.010273030959069729
Epoch: 211
Loss on hold-out set: 0.00016266681383081282
MeanAbsoluteError value on hold-out data: 0.010590486228466034
Epoch: 212

Loss on hold-out set: 0.00013308763006464759
MeanAbsoluteError value on hold-out data: 0.009365241974592209
Epoch: 213
Loss on hold-out set: 0.00012115168619157675
MeanAbsoluteError value on hold-out data: 0.009106519632041454
Epoch: 214
Loss on hold-out set: 0.0001077359232182901
MeanAbsoluteError value on hold-out data: 0.008494601584970951
Epoch: 215
Loss on hold-out set: 0.00011867058408545115
MeanAbsoluteError value on hold-out data: 0.008972438983619213
Epoch: 216

Loss on hold-out set: 9.185924108561057e-05
MeanAbsoluteError value on hold-out data: 0.007798297796398401
Epoch: 217
Loss on hold-out set: 7.96937324943988e-05
MeanAbsoluteError value on hold-out data: 0.0072709606029093266
Epoch: 218
Loss on hold-out set: 7.086221474030305e-05
MeanAbsoluteError value on hold-out data: 0.006853346712887287
Epoch: 219

Loss on hold-out set: 6.61622526912162e-05
MeanAbsoluteError value on hold-out data: 0.006461437791585922
Epoch: 220
Loss on hold-out set: 6.252598079579632e-05
MeanAbsoluteError value on hold-out data: 0.006270725280046463
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Epoch: 221
Loss on hold-out set: 5.472189513966441e-05
MeanAbsoluteError value on hold-out data: 0.005734188482165337
Epoch: 222
Loss on hold-out set: 4.729473627006743e-05
MeanAbsoluteError value on hold-out data: 0.005369067657738924
Epoch: 223

Loss on hold-out set: 4.517966667313326e-05
MeanAbsoluteError value on hold-out data: 0.005014276597648859
Epoch: 224
Loss on hold-out set: 4.667257718000865e-05
MeanAbsoluteError value on hold-out data: 0.005321712698787451
Epoch: 225
Loss on hold-out set: 3.5674414623197386e-05
MeanAbsoluteError value on hold-out data: 0.004433218389749527
Epoch: 226

Loss on hold-out set: 3.037887171768279e-05
MeanAbsoluteError value on hold-out data: 0.004133859649300575
Epoch: 227
Loss on hold-out set: 2.8119712344330485e-05
MeanAbsoluteError value on hold-out data: 0.003869886975735426
Epoch: 228
Loss on hold-out set: 2.435987223109875e-05
MeanAbsoluteError value on hold-out data: 0.003664839779958129
Epoch: 229
Loss on hold-out set: 2.8527850015682186e-05
MeanAbsoluteError value on hold-out data: 0.003267871215939522
Epoch: 230

Loss on hold-out set: 1.856869088302259e-05
MeanAbsoluteError value on hold-out data: 0.003018733812496066
Epoch: 231
Loss on hold-out set: 1.713551992347325e-05
MeanAbsoluteError value on hold-out data: 0.0028095629531890154
Epoch: 232
Loss on hold-out set: 1.5171172890404705e-05
MeanAbsoluteError value on hold-out data: 0.002569150412455201
Epoch: 233
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Loss on hold-out set: 1.3316627875890565e-05
MeanAbsoluteError value on hold-out data: 0.002358191879466176
Epoch: 234
Loss on hold-out set: 1.2210713311315676e-05
MeanAbsoluteError value on hold-out data: 0.0021494287066161633
Epoch: 235
Loss on hold-out set: 0.0012406101799517554
MeanAbsoluteError value on hold-out data: 0.005533060058951378
Epoch: 236
Loss on hold-out set: 1.0326852134312503e-05
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Epoch: 237

Loss on hold-out set: 9.557099557556425e-06
MeanAbsoluteError value on hold-out data: 0.001606351463124156
Epoch: 238
Loss on hold-out set: 0.0008417122528761376
MeanAbsoluteError value on hold-out data: 0.004570052493363619
Epoch: 239
Loss on hold-out set: 7.988113797917042e-06
MeanAbsoluteError value on hold-out data: 0.0014411440351977944
Epoch: 240

Loss on hold-out set: 7.584973887402996e-06
MeanAbsoluteError value on hold-out data: 0.0013537234626710415
Epoch: 241
Loss on hold-out set: 6.837949928677307e-06
MeanAbsoluteError value on hold-out data: 0.001224858220666647
Epoch: 242
Loss on hold-out set: 7.0903851547672484e-06
MeanAbsoluteError value on hold-out data: 0.001204811385832727
Epoch: 243
Loss on hold-out set: 7.581171255074319e-06
MeanAbsoluteError value on hold-out data: 0.0011736968299373984
Epoch: 244

Loss on hold-out set: 7.157572746599237e-06
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Epoch: 245
Loss on hold-out set: 3.270477673840315e-05
MeanAbsoluteError value on hold-out data: 0.005491999443620443
Epoch: 246

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Loss on hold-out set: 6.896070422394237e-06
MeanAbsoluteError value on hold-out data: 0.0010947382543236017
Epoch: 247

Loss on hold-out set: 7.335255114290144e-06
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Epoch: 248
Loss on hold-out set: 6.716463852504044e-06
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Epoch: 249
Loss on hold-out set: 6.8302139066662885e-06
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Epoch: 250
Loss on hold-out set: 7.229526311483334e-06
MeanAbsoluteError value on hold-out data: 0.0010892340214923024
Epoch: 251

Loss on hold-out set: 7.602787521731303e-06
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Epoch: 252
Loss on hold-out set: 7.825575380593364e-06
MeanAbsoluteError value on hold-out data: 0.0011294090654700994
Epoch: 253
Loss on hold-out set: 7.636804339811602e-06
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Epoch: 254

Loss on hold-out set: 7.494453624391239e-06
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Epoch: 255
Loss on hold-out set: 7.998367550499097e-06
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Epoch: 256
Loss on hold-out set: 8.099758074509877e-06
MeanAbsoluteError value on hold-out data: 0.0011351400753483176
Epoch: 257
Loss on hold-out set: 7.1779189520034725e-06
MeanAbsoluteError value on hold-out data: 0.0010349127696827054
Epoch: 258

Loss on hold-out set: 7.769974755634534e-06
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MeanAbsoluteError value on hold-out data: 0.0010394129203632474
Epoch: 259
Loss on hold-out set: 8.412306512512329e-06
MeanAbsoluteError value on hold-out data: 0.0011672484688460827
Epoch: 260
Loss on hold-out set: 7.7041589605642e-06
MeanAbsoluteError value on hold-out data: 0.0010070443386211991
Epoch: 261

Loss on hold-out set: 7.213355655284641e-06
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Epoch: 262
Loss on hold-out set: 6.938470604084684e-06
MeanAbsoluteError value on hold-out data: 0.0009755274513736367
Epoch: 263
Loss on hold-out set: 7.736798702003747e-06
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Epoch: 264
Loss on hold-out set: 8.212299984113368e-06
MeanAbsoluteError value on hold-out data: 0.0010403197957202792
Epoch: 265

Loss on hold-out set: 7.56491412035897e-06
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Epoch: 266
Loss on hold-out set: 7.18129099106171e-06
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Epoch: 267
Loss on hold-out set: 7.024673261814594e-06
MeanAbsoluteError value on hold-out data: 0.0009454339742660522
Epoch: 268

Loss on hold-out set: 7.298616988184502e-06
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Epoch: 269
Loss on hold-out set: 8.938525689053187e-06
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Epoch: 270
Loss on hold-out set: 8.143874238770037e-06
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Epoch: 271
Loss on hold-out set: 7.71563624915381e-06
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MeanAbsoluteError value on hold-out data: 0.0009666165569797158
Epoch: 272

Loss on hold-out set: 8.942350125205568e-06
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Epoch: 273
Loss on hold-out set: 1.2295669709881342e-05
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Epoch: 274
Loss on hold-out set: 8.853861247031931e-06
MeanAbsoluteError value on hold-out data: 0.0010381743777543306
Epoch: 275

Loss on hold-out set: 8.7964370174212e-06
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Epoch: 276
Loss on hold-out set: 8.50241314782789e-06
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Epoch: 277
Loss on hold-out set: 8.957821705735114e-06
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Epoch: 278
Loss on hold-out set: 8.027458828398547e-06
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Epoch: 279

Loss on hold-out set: 7.734679104924699e-06
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Epoch: 280
Loss on hold-out set: 7.375799769376429e-06
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Epoch: 281
Loss on hold-out set: 1.3439282414450505e-05
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Epoch: 282

Loss on hold-out set: 6.866147567909418e-06
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Epoch: 283
Loss on hold-out set: 6.77779582776321e-06
MeanAbsoluteError value on hold-out data: 0.0009685113909654319
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Epoch: 284
Loss on hold-out set: 6.691219569942265e-06
MeanAbsoluteError value on hold-out data: 0.0012433615047484636
Epoch: 285
Loss on hold-out set: 6.057427370365076e-06
MeanAbsoluteError value on hold-out data: 0.0009649416897445917
Epoch: 286

Loss on hold-out set: 6.014104373482846e-06
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Epoch: 287
Loss on hold-out set: 5.613324925836703e-06
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Epoch: 288
Loss on hold-out set: 5.552577879195898e-06
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Epoch: 289

Loss on hold-out set: 7.439772887734692e-06
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Epoch: 290
Loss on hold-out set: 7.043171826545893e-06
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Epoch: 291
Loss on hold-out set: 6.23253937813108e-06
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Epoch: 292
Loss on hold-out set: 7.10250354420448e-06
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Epoch: 293

Loss on hold-out set: 1.4326548003177428e-05
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Epoch: 294
Loss on hold-out set: 7.277585060941979e-06
MeanAbsoluteError value on hold-out data: 0.001016253256238997
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Loss on hold-out set: 7.0521008826045336e-06
MeanAbsoluteError value on hold-out data: 0.0009863695595413446
Epoch: 296
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Loss on hold-out set: 6.251506927303406e-06
MeanAbsoluteError value on hold-out data: 0.0010202110279351473
Epoch: 297
Loss on hold-out set: 5.936007863301012e-06
MeanAbsoluteError value on hold-out data: 0.0009977868758141994
Epoch: 298
Loss on hold-out set: 7.40796027160356e-06
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Epoch: 299
Loss on hold-out set: 6.614577769753921e-06
MeanAbsoluteError value on hold-out data: 0.0010674622608348727
Epoch: 300

Loss on hold-out set: 6.38705619866624e-06
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Epoch: 301
Loss on hold-out set: 6.090939234144781e-06
MeanAbsoluteError value on hold-out data: 0.0010186198633164167
Epoch: 302
Loss on hold-out set: 6.110295413026716e-06
MeanAbsoluteError value on hold-out data: 0.0009630995918996632
Epoch: 303

Loss on hold-out set: 5.8235700963065865e-06
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Epoch: 304
Loss on hold-out set: 0.000855808114701736
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Epoch: 305
Loss on hold-out set: 5.532974357108217e-06
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Epoch: 306
Loss on hold-out set: 5.411863187331479e-06
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Epoch: 307

Loss on hold-out set: 1.0509671763149807e-05
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Epoch: 308
Loss on hold-out set: 5.608682945771411e-06
MeanAbsoluteError value on hold-out data: 0.0009169501136057079
Epoch: 309
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Loss on hold-out set: 7.1281414718144406e-06
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Epoch: 310

Loss on hold-out set: 6.886802393724933e-06
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Epoch: 311
Loss on hold-out set: 6.672294375675847e-06
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Epoch: 312
Loss on hold-out set: 6.502777329532049e-06
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Epoch: 313
Loss on hold-out set: 6.263296540964802e-06
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Epoch: 314

Loss on hold-out set: 6.350356706810509e-06
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Loss on hold-out set: 6.8488603714146075e-06
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Epoch: 316
Loss on hold-out set: 6.802589679521221e-06
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Epoch: 317

Loss on hold-out set: 6.533512618034365e-06
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Loss on hold-out set: 6.5101677911081006e-06
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Epoch: 319
Loss on hold-out set: 7.021048863665468e-06
MeanAbsoluteError value on hold-out data: 0.0009566104272380471
Epoch: 320
Loss on hold-out set: 7.382619613757959e-06
MeanAbsoluteError value on hold-out data: 0.0010464655933901668
Epoch: 321

Loss on hold-out set: 6.6977986031920755e-06
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MeanAbsoluteError value on hold-out data: 0.0009296855423599482
Epoch: 322
Loss on hold-out set: 7.558155066187912e-06
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Epoch: 323
Loss on hold-out set: 6.9563235981079815e-06
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Epoch: 324

Loss on hold-out set: 8.640325767408705e-06
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Epoch: 325
Loss on hold-out set: 6.4143209608748575e-06
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Epoch: 326
Loss on hold-out set: 6.10432322262638e-06
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Loss on hold-out set: 6.2867523918332435e-06
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Epoch: 328

Loss on hold-out set: 7.024434451680533e-06
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Epoch: 329
Loss on hold-out set: 6.168853076360392e-06
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Loss on hold-out set: 6.4178254888247466e-06
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Epoch: 331

Loss on hold-out set: 6.085880508740397e-06
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Epoch: 332
Loss on hold-out set: 0.0014927643759217691
MeanAbsoluteError value on hold-out data: 0.004966460634022951
Epoch: 333
Loss on hold-out set: 0.0010740840453947315
MeanAbsoluteError value on hold-out data: 0.004400665406137705
Epoch: 334
Loss on hold-out set: 6.7531981653263965e-06
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Epoch: 335

Loss on hold-out set: 6.532987094068141e-06
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Loss on hold-out set: 0.0009523872987900772
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Loss on hold-out set: 8.238952782099099e-06
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Epoch: 338

Loss on hold-out set: 6.5349547333845785e-06
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Epoch: 339
Loss on hold-out set: 6.203586049370922e-06
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Loss on hold-out set: 6.083924194382024e-06
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Loss on hold-out set: 5.69682655701889e-06
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Epoch: 342

Loss on hold-out set: 0.0064715828861319725
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Epoch: 343

Loss on hold-out set: 5.449494934212523e-06
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Loss on hold-out set: 5.390843534988003e-06
MeanAbsoluteError value on hold-out data: 0.0009288087603636086
Epoch: 345
Loss on hold-out set: 5.672000727285054e-06
MeanAbsoluteError value on hold-out data: 0.0009293991606682539
Epoch: 346
Loss on hold-out set: 5.366701755677311e-06
MeanAbsoluteError value on hold-out data: 0.0009557482553645968
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Epoch: 347
Loss on hold-out set: 5.597969297136492e-06
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Loss on hold-out set: 5.364850140337624e-06
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Epoch: 349

Loss on hold-out set: 5.668345798207715e-06
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Epoch: 350

Loss on hold-out set: 1.2407545378542076e-05
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Epoch: 351
Loss on hold-out set: 6.868345490847088e-06
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Loss on hold-out set: 7.833223400246845e-06
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Loss on hold-out set: 6.835590045721591e-06
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Epoch: 354
Loss on hold-out set: 8.39168568562015e-06
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Epoch: 355
Loss on hold-out set: 1.4591388162006506e-05
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Epoch: 356

Loss on hold-out set: 7.4617637721985375e-06
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Epoch: 357

Loss on hold-out set: 7.6020947841033585e-06
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Epoch: 358
Loss on hold-out set: 6.954536817060076e-06
MeanAbsoluteError value on hold-out data: 0.0010086431866511703
Epoch: 359
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Loss on hold-out set: 7.197802591900444e-06
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Epoch: 360
Loss on hold-out set: 6.846496196780768e-06
MeanAbsoluteError value on hold-out data: 0.0010147463763132691
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Loss on hold-out set: 7.6201765062058676e-06
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Loss on hold-out set: 5.570288380760338e-05
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Epoch: 363

Loss on hold-out set: 6.567995659823877e-06
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Epoch: 364

Loss on hold-out set: 0.0008499108439034094
MeanAbsoluteError value on hold-out data: 0.0038963877595961094
Epoch: 365
Loss on hold-out set: 6.443254707077218e-06
MeanAbsoluteError value on hold-out data: 0.0009336817311123013
Epoch: 366
Loss on hold-out set: 7.466898801147601e-06
MeanAbsoluteError value on hold-out data: 0.0010649028699845076
Epoch: 367
Loss on hold-out set: 6.609156315562359e-06
MeanAbsoluteError value on hold-out data: 0.0009681305382400751
Epoch: 368
Loss on hold-out set: 7.512701791676171e-06
MeanAbsoluteError value on hold-out data: 0.001084299641661346
Epoch: 369
Loss on hold-out set: 0.0011502353914680113
MeanAbsoluteError value on hold-out data: 0.00442380178719759
Epoch: 370

Loss on hold-out set: 6.362832571391244e-06
MeanAbsoluteError value on hold-out data: 0.0009608870605006814
Epoch: 371

Loss on hold-out set: 7.5005870817571685e-06
```

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MeanAbsoluteError value on hold-out data: 0.0015363740967586637
Epoch: 372
Loss on hold-out set: 0.0006625551996885056
MeanAbsoluteError value on hold-out data: 0.0036683371290564537
Epoch: 373
Loss on hold-out set: 5.373769323131665e-06
MeanAbsoluteError value on hold-out data: 0.001143603352829814
Epoch: 374
Loss on hold-out set: 5.4674498222504135e-06
MeanAbsoluteError value on hold-out data: 0.0012152537237852812
Epoch: 375
Loss on hold-out set: 4.8649199835783574e-06
MeanAbsoluteError value on hold-out data: 0.000945139501709491
Epoch: 376
Loss on hold-out set: 4.782307522296273e-06
MeanAbsoluteError value on hold-out data: 0.0010142457904294133
Epoch: 377

Loss on hold-out set: 4.540025873194071e-06
MeanAbsoluteError value on hold-out data: 0.0009310576133430004
Epoch: 378

Loss on hold-out set: 8.10085363739815e-06
MeanAbsoluteError value on hold-out data: 0.0018990910612046719
Epoch: 379
Loss on hold-out set: 4.670467354536902e-06
MeanAbsoluteError value on hold-out data: 0.000883298518601805
Epoch: 380
Loss on hold-out set: 6.8180565838597085e-06
MeanAbsoluteError value on hold-out data: 0.0010242318967357278
Epoch: 381
Loss on hold-out set: 6.688038043788625e-06
MeanAbsoluteError value on hold-out data: 0.000979725387878716
Epoch: 382
Loss on hold-out set: 6.258715363681124e-06
MeanAbsoluteError value on hold-out data: 0.0009961697505787015
Epoch: 383
Loss on hold-out set: 5.4810383574022126e-06
MeanAbsoluteError value on hold-out data: 0.0010219052201136947
Epoch: 384

Loss on hold-out set: 5.246830159404243e-06
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MeanAbsoluteError value on hold-out data: 0.0009719610097818077
Epoch: 385

Loss on hold-out set: 4.862773367291923e-06
MeanAbsoluteError value on hold-out data: 0.0009397810790687799
Epoch: 386
Loss on hold-out set: 4.69952482699927e-06
MeanAbsoluteError value on hold-out data: 0.0010050302371382713
Epoch: 387
Loss on hold-out set: 4.487022397807567e-06
MeanAbsoluteError value on hold-out data: 0.0009093624539673328
Epoch: 388
Loss on hold-out set: 4.384802562203032e-06
MeanAbsoluteError value on hold-out data: 0.0008990928763523698
Epoch: 389
Loss on hold-out set: 3.0021441629147514e-05
MeanAbsoluteError value on hold-out data: 0.005342630669474602
Epoch: 390
Loss on hold-out set: 4.856057704326024e-06
MeanAbsoluteError value on hold-out data: 0.0009188359836116433
Epoch: 391

Loss on hold-out set: 4.697802797164303e-06
MeanAbsoluteError value on hold-out data: 0.0009223148226737976
Epoch: 392

Loss on hold-out set: 3.925840609589124e-06
MeanAbsoluteError value on hold-out data: 0.0009458780405111611
Epoch: 393
Loss on hold-out set: 6.643617441481043e-06
MeanAbsoluteError value on hold-out data: 0.0008776962640695274
Epoch: 394
Loss on hold-out set: 6.7024720395308505e-06
MeanAbsoluteError value on hold-out data: 0.0019002145854756236
Epoch: 395
Loss on hold-out set: 4.274691424764289e-06
MeanAbsoluteError value on hold-out data: 0.0009680429357104003
Epoch: 396
Loss on hold-out set: 9.72819288318323e-06
MeanAbsoluteError value on hold-out data: 0.002590511692687869
Epoch: 397
Loss on hold-out set: 0.00017956957868556437
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MeanAbsoluteError value on hold-out data: 0.0022783749736845493
Epoch: 398

Loss on hold-out set: 0.0007463244968213609
MeanAbsoluteError value on hold-out data: 0.003685331903398037
Epoch: 399

Loss on hold-out set: 3.7436069030368694e-06
MeanAbsoluteError value on hold-out data: 0.0009770706528797746
Epoch: 400
Loss on hold-out set: 2.7658377103552295e-05
MeanAbsoluteError value on hold-out data: 0.005116431508213282
Epoch: 401
Loss on hold-out set: 9.753447522178669e-06
MeanAbsoluteError value on hold-out data: 0.0026685029733926058
Epoch: 402
Loss on hold-out set: 3.978226615686253e-06
MeanAbsoluteError value on hold-out data: 0.0010590797755867243
Epoch: 403
Loss on hold-out set: 3.784197354242189e-06
MeanAbsoluteError value on hold-out data: 0.0010057603940367699
Epoch: 404
Loss on hold-out set: 3.6134347567440273e-06
MeanAbsoluteError value on hold-out data: 0.0009669974679127336
Epoch: 405

Loss on hold-out set: 3.5263216576507916e-06
MeanAbsoluteError value on hold-out data: 0.0009385079029016197
Epoch: 406

Loss on hold-out set: 3.459922103624754e-06
MeanAbsoluteError value on hold-out data: 0.0009111014078371227
Epoch: 407
Loss on hold-out set: 2.966606601262356e-06
MeanAbsoluteError value on hold-out data: 0.0009295970085076988
Epoch: 408
Loss on hold-out set: 2.845917326619831e-06
MeanAbsoluteError value on hold-out data: 0.0009287729626521468
Epoch: 409
Loss on hold-out set: 4.717588957156784e-06
MeanAbsoluteError value on hold-out data: 0.000874288089107722
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Epoch: 410
Loss on hold-out set: 3.689272613900567e-06
MeanAbsoluteError value on hold-out data: 0.0010333156678825617
Epoch: 411
Loss on hold-out set: 3.127136623631416e-06
MeanAbsoluteError value on hold-out data: 0.0009088239166885614
Epoch: 412

Loss on hold-out set: 0.002344298089151555
MeanAbsoluteError value on hold-out data: 0.005861091427505016
Epoch: 413

Loss on hold-out set: 3.4514234440708747e-06
MeanAbsoluteError value on hold-out data: 0.0008834826876409352
Epoch: 414
Loss on hold-out set: 3.3235277214771486e-06
MeanAbsoluteError value on hold-out data: 0.0008677238365635276
Epoch: 415
Loss on hold-out set: 1.675055178706176e-05
MeanAbsoluteError value on hold-out data: 0.003865655278787017
Epoch: 416
Loss on hold-out set: 3.653688548428573e-06
MeanAbsoluteError value on hold-out data: 0.0008955177618190646
Epoch: 417
Loss on hold-out set: 3.496232715441203e-06
MeanAbsoluteError value on hold-out data: 0.0008772701257839799
Epoch: 418
Loss on hold-out set: 3.441896878414879e-06
MeanAbsoluteError value on hold-out data: 0.0009358131792396307
Epoch: 419

Loss on hold-out set: 4.760718421983676e-05
MeanAbsoluteError value on hold-out data: 0.006844643503427505
Epoch: 420

Loss on hold-out set: 6.541326309581145e-05
MeanAbsoluteError value on hold-out data: 0.007997850887477398
Epoch: 421
Loss on hold-out set: 2.6085898175901652e-06
MeanAbsoluteError value on hold-out data: 0.0009493165998719633
Epoch: 422
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Loss on hold-out set: 3.2440254139706108e-06
MeanAbsoluteError value on hold-out data: 0.0010213759960606694
Epoch: 423
Loss on hold-out set: 3.366049032120617e-06
MeanAbsoluteError value on hold-out data: 0.0010097366757690907
Epoch: 424
Loss on hold-out set: 3.1653441090803917e-06
MeanAbsoluteError value on hold-out data: 0.0009654363966546953
Epoch: 425
Loss on hold-out set: 3.3568626327870825e-06
MeanAbsoluteError value on hold-out data: 0.0009534209966659546
Epoch: 426

Loss on hold-out set: 3.094235359832545e-06
MeanAbsoluteError value on hold-out data: 0.0009497371502220631
Epoch: 427

Loss on hold-out set: 3.0041042184445987e-06
MeanAbsoluteError value on hold-out data: 0.0009501054883003235
Epoch: 428
Loss on hold-out set: 2.8548379960879033e-06
MeanAbsoluteError value on hold-out data: 0.0009451842051930726
Epoch: 429
Loss on hold-out set: 2.7804638351041763e-06
MeanAbsoluteError value on hold-out data: 0.0008816418121568859
Epoch: 430
Loss on hold-out set: 2.766803342742955e-06
MeanAbsoluteError value on hold-out data: 0.0008636257261969149
Epoch: 431
Loss on hold-out set: 2.6235605474767e-06
MeanAbsoluteError value on hold-out data: 0.0008630186202935874
Epoch: 432
Loss on hold-out set: 2.599532958942501e-06
MeanAbsoluteError value on hold-out data: 0.0008776885224506259
Epoch: 433

Loss on hold-out set: 2.8443520490712285e-06
MeanAbsoluteError value on hold-out data: 0.0008745354134589434
Epoch: 434

Loss on hold-out set: 3.109136011621908e-06
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MeanAbsoluteError value on hold-out data: 0.0008460110402666032
Epoch: 435
Loss on hold-out set: 5.097301456002102e-06
MeanAbsoluteError value on hold-out data: 0.001502153929322958
Epoch: 436
Loss on hold-out set: 4.746127226203848e-06
MeanAbsoluteError value on hold-out data: 0.0010079497005790472
Epoch: 437
Loss on hold-out set: 4.817111003009044e-06
MeanAbsoluteError value on hold-out data: 0.0009758445667102933
Epoch: 438
Loss on hold-out set: 4.665693656245541e-06
MeanAbsoluteError value on hold-out data: 0.0009415599633939564
Epoch: 439
Loss on hold-out set: 1.6710974705347326e-05
MeanAbsoluteError value on hold-out data: 0.0037509885150939226
Epoch: 440

Loss on hold-out set: 5.218691663563172e-06
MeanAbsoluteError value on hold-out data: 0.0009776082588359714
Epoch: 441

Loss on hold-out set: 5.531230707097516e-06
MeanAbsoluteError value on hold-out data: 0.0009894680697470903
Epoch: 442
Loss on hold-out set: 7.114511694794601e-05
MeanAbsoluteError value on hold-out data: 0.0018141168402507901
Epoch: 443
Loss on hold-out set: 7.121960331565228e-06
MeanAbsoluteError value on hold-out data: 0.00112811173312366
Epoch: 444
Loss on hold-out set: 0.00020695728596820118
MeanAbsoluteError value on hold-out data: 0.002478739246726036
Epoch: 445
Loss on hold-out set: 6.59025392206576e-06
MeanAbsoluteError value on hold-out data: 0.0010128900175914168
Epoch: 446
Loss on hold-out set: 6.579124253938482e-06
MeanAbsoluteError value on hold-out data: 0.0010176885407418013
Epoch: 447

Loss on hold-out set: 6.398715599359023e-06
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MeanAbsoluteError value on hold-out data: 0.0009981110924854875
Epoch: 448

Loss on hold-out set: 1.1491293247008098e-05
MeanAbsoluteError value on hold-out data: 0.0010507794795557857
Epoch: 449
Loss on hold-out set: 0.0008504073738355198
MeanAbsoluteError value on hold-out data: 0.003904809942469001
Epoch: 450
Loss on hold-out set: 6.2320212142944565e-06
MeanAbsoluteError value on hold-out data: 0.0009838688420131803
Epoch: 451
Loss on hold-out set: 6.089732179449269e-06
MeanAbsoluteError value on hold-out data: 0.0009640866774134338
Epoch: 452
Loss on hold-out set: 5.8679875285004246e-06
MeanAbsoluteError value on hold-out data: 0.000949909386690706
Epoch: 453
Loss on hold-out set: 5.686948712152046e-06
MeanAbsoluteError value on hold-out data: 0.0009401163551956415
Epoch: 454

Loss on hold-out set: 5.508491360145102e-06
MeanAbsoluteError value on hold-out data: 0.0009338307427242398
Epoch: 455

Loss on hold-out set: 5.627317928149121e-06
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Epoch: 456
Loss on hold-out set: 6.894146849845129e-06
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Epoch: 457
Loss on hold-out set: 5.649481943455962e-06
MeanAbsoluteError value on hold-out data: 0.0009373307111673057
Epoch: 458
Loss on hold-out set: 7.095113884448578e-06
MeanAbsoluteError value on hold-out data: 0.0010298792039975524
Epoch: 459
Loss on hold-out set: 8.59863675591791e-06
MeanAbsoluteError value on hold-out data: 0.0016396254068240523
Epoch: 460
Loss on hold-out set: 6.397712422330397e-06
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MeanAbsoluteError value on hold-out data: 0.0010887602111324668
Epoch: 461

Loss on hold-out set: 6.523588598821124e-06
MeanAbsoluteError value on hold-out data: 0.0010423889616504312
Epoch: 462

Loss on hold-out set: 6.393909088204125e-06
MeanAbsoluteError value on hold-out data: 0.0010099405189976096
Epoch: 463
Loss on hold-out set: 6.535467565964399e-06
MeanAbsoluteError value on hold-out data: 0.0012292953906580806
Epoch: 464
Loss on hold-out set: 6.980519812644231e-06
MeanAbsoluteError value on hold-out data: 0.0010644674766808748
Epoch: 465
Loss on hold-out set: 7.3817429696331464e-06
MeanAbsoluteError value on hold-out data: 0.001036343863233924
Epoch: 466
Loss on hold-out set: 0.0020459998443916796
MeanAbsoluteError value on hold-out data: 0.005981483496725559
Epoch: 467
Loss on hold-out set: 9.95188046405159e-06
MeanAbsoluteError value on hold-out data: 0.0013196032959967852
Epoch: 468

Loss on hold-out set: 0.00515407722788443
MeanAbsoluteError value on hold-out data: 0.008558119647204876
Epoch: 469

Loss on hold-out set: 1.124303628767638e-05
MeanAbsoluteError value on hold-out data: 0.00141207966953516
Epoch: 470
Loss on hold-out set: 9.234127953907144e-06
MeanAbsoluteError value on hold-out data: 0.0011266851797699928
Epoch: 471
Loss on hold-out set: 1.6458076618601597e-05
MeanAbsoluteError value on hold-out data: 0.0011499413521960378
Epoch: 472
Loss on hold-out set: 8.372681277863263e-06
MeanAbsoluteError value on hold-out data: 0.0010983574902638793
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```
Epoch: 473
Loss on hold-out set: 9.329830325336494e-06
MeanAbsoluteError value on hold-out data: 0.0012520920718088746
Epoch: 474
Loss on hold-out set: 9.821894567406931e-06
MeanAbsoluteError value on hold-out data: 0.0012996533187106252
Epoch: 475

Loss on hold-out set: 9.351442739758708e-06
MeanAbsoluteError value on hold-out data: 0.00123025628272444
Epoch: 476

Loss on hold-out set: 9.818890825604634e-06
MeanAbsoluteError value on hold-out data: 0.0014622786547988653
Epoch: 477
Loss on hold-out set: 7.990210751638817e-06
MeanAbsoluteError value on hold-out data: 0.0010780527954921126
Epoch: 478
Loss on hold-out set: 8.59720527247331e-06
MeanAbsoluteError value on hold-out data: 0.0010939204366877675
Epoch: 479
Loss on hold-out set: 8.194130637880684e-06
MeanAbsoluteError value on hold-out data: 0.001047487836331129
Epoch: 480
Loss on hold-out set: 8.75635669217445e-06
MeanAbsoluteError value on hold-out data: 0.0011006874265149236
Epoch: 481
Loss on hold-out set: 7.889095662414127e-06
MeanAbsoluteError value on hold-out data: 0.0010730079375207424
Epoch: 482

Loss on hold-out set: 8.043257563573346e-06
MeanAbsoluteError value on hold-out data: 0.0010394540149718523
Epoch: 483

Loss on hold-out set: 7.67110407414643e-06
MeanAbsoluteError value on hold-out data: 0.0010120553197339177
Epoch: 484
Loss on hold-out set: 9.291777679174209e-06
MeanAbsoluteError value on hold-out data: 0.0011455446947366
Epoch: 485
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Loss on hold-out set: 9.033018334146338e-06
MeanAbsoluteError value on hold-out data: 0.0011259684106335044
Epoch: 486
Loss on hold-out set: 9.156577618796291e-06
MeanAbsoluteError value on hold-out data: 0.0011560320854187012
Epoch: 487
Loss on hold-out set: 9.747461134041329e-06
MeanAbsoluteError value on hold-out data: 0.0011199972359463573
Epoch: 488
Loss on hold-out set: 1.040931043733578e-05
MeanAbsoluteError value on hold-out data: 0.0011981764109805226
Epoch: 489

Loss on hold-out set: 1.033347903190728e-05
MeanAbsoluteError value on hold-out data: 0.0011399489594623446
Epoch: 490

Loss on hold-out set: 9.950006520179719e-06
MeanAbsoluteError value on hold-out data: 0.0010974517790600657
Epoch: 491
Loss on hold-out set: 9.935211542492303e-06
MeanAbsoluteError value on hold-out data: 0.0011459821835160255
Epoch: 492
Loss on hold-out set: 9.901963682505784e-06
MeanAbsoluteError value on hold-out data: 0.001353193772956729
Epoch: 493
Loss on hold-out set: 1.0406558469246473e-05
MeanAbsoluteError value on hold-out data: 0.0011228942312300205
Epoch: 494
Loss on hold-out set: 9.394576538240402e-06
MeanAbsoluteError value on hold-out data: 0.0010337447747588158
Epoch: 495
Loss on hold-out set: 9.175724320934583e-06
MeanAbsoluteError value on hold-out data: 0.0010268976911902428
Epoch: 496

Loss on hold-out set: 8.963931581827357e-06
MeanAbsoluteError value on hold-out data: 0.0010924944654107094
Epoch: 497

Loss on hold-out set: 1.6226698588840147e-05
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MeanAbsoluteError value on hold-out data: 0.001003988436423242
Epoch: 498
Loss on hold-out set: 3.882920951416334e-05
MeanAbsoluteError value on hold-out data: 0.001631018822081387
Epoch: 499
Loss on hold-out set: 1.8716472368396353e-05
MeanAbsoluteError value on hold-out data: 0.003622378222644329
Epoch: 500
Loss on hold-out set: 9.046274975879407e-06
MeanAbsoluteError value on hold-out data: 0.0010525152320042253
Epoch: 501
Loss on hold-out set: 8.788135509427355e-06
MeanAbsoluteError value on hold-out data: 0.001001983298920095
Epoch: 502
Loss on hold-out set: 9.057643607727292e-06
MeanAbsoluteError value on hold-out data: 0.0010483100777491927
Epoch: 503

Loss on hold-out set: 8.77918347004407e-06
MeanAbsoluteError value on hold-out data: 0.001022171345539391
Epoch: 504

Loss on hold-out set: 8.486069003328548e-06
MeanAbsoluteError value on hold-out data: 0.0010361677268519998
Epoch: 505
Loss on hold-out set: 8.807704047670155e-06
MeanAbsoluteError value on hold-out data: 0.0012235278263688087
Epoch: 506
Loss on hold-out set: 1.8145935637921168e-05
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Epoch: 507
Loss on hold-out set: 8.560585087025174e-06
MeanAbsoluteError value on hold-out data: 0.001091990154236555
Epoch: 508
Loss on hold-out set: 8.389971935247768e-06
MeanAbsoluteError value on hold-out data: 0.0010266267927363515
Epoch: 509
Loss on hold-out set: 7.980064129224747e-06
MeanAbsoluteError value on hold-out data: 0.0010211843764409423
Epoch: 510

Loss on hold-out set: 7.724545755448931e-06
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MeanAbsoluteError value on hold-out data: 0.0010479012271389365
Epoch: 511

Loss on hold-out set: 7.470069631993353e-06
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Epoch: 512
Loss on hold-out set: 8.290350269117671e-06
MeanAbsoluteError value on hold-out data: 0.0009761723922565579
Epoch: 513
Loss on hold-out set: 1.4937103971900657e-05
MeanAbsoluteError value on hold-out data: 0.0009623181540518999
Epoch: 514
Loss on hold-out set: 8.188337574210891e-06
MeanAbsoluteError value on hold-out data: 0.0010018423199653625
Epoch: 515
Loss on hold-out set: 7.738054516328073e-06
MeanAbsoluteError value on hold-out data: 0.0009736540960147977
Epoch: 516
Loss on hold-out set: 0.004953594539037235
MeanAbsoluteError value on hold-out data: 0.008113479241728783
Epoch: 517

Loss on hold-out set: 8.630611581303618e-06
MeanAbsoluteError value on hold-out data: 0.0010710355127230287
Epoch: 518

Loss on hold-out set: 8.762479574478186e-06
MeanAbsoluteError value on hold-out data: 0.0011166045442223549
Epoch: 519
Loss on hold-out set: 8.789600658386777e-06
MeanAbsoluteError value on hold-out data: 0.001083830837160349
Epoch: 520
Loss on hold-out set: 2.4751372620812617e-05
MeanAbsoluteError value on hold-out data: 0.004469634499400854
Epoch: 521
Loss on hold-out set: 8.436103030362574e-06
MeanAbsoluteError value on hold-out data: 0.0010171910980716348
Epoch: 522
Loss on hold-out set: 7.966183628783396e-06
MeanAbsoluteError value on hold-out data: 0.001005643862299621
Epoch: 523
Loss on hold-out set: 7.5543942443800915e-06
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MeanAbsoluteError value on hold-out data: 0.001013817498460412
Epoch: 524

Loss on hold-out set: 7.484515875306058e-06
MeanAbsoluteError value on hold-out data: 0.0010060745989903808
Epoch: 525

Loss on hold-out set: 1.1905668823321601e-05
MeanAbsoluteError value on hold-out data: 0.001966940239071846
Epoch: 526
Loss on hold-out set: 8.472556439952628e-06
MeanAbsoluteError value on hold-out data: 0.0010038060136139393
Epoch: 527
Loss on hold-out set: 7.826371809362452e-06
MeanAbsoluteError value on hold-out data: 0.0009821903659030795
Epoch: 528
Loss on hold-out set: 7.349339345917262e-06
MeanAbsoluteError value on hold-out data: 0.0010644289432093501
Epoch: 529
Loss on hold-out set: 7.037321189237935e-06
MeanAbsoluteError value on hold-out data: 0.0010010760743170977
Epoch: 530
Loss on hold-out set: 1.428861504301984e-05
MeanAbsoluteError value on hold-out data: 0.0031335288658738136
Epoch: 531

Loss on hold-out set: 7.184054932342686e-06
MeanAbsoluteError value on hold-out data: 0.0009944114135578275
Epoch: 532

Loss on hold-out set: 7.075712398082383e-06
MeanAbsoluteError value on hold-out data: 0.0009696546476334333
Epoch: 533
Loss on hold-out set: 0.002410954001115547
MeanAbsoluteError value on hold-out data: 0.005926451645791531
Epoch: 534
Loss on hold-out set: 6.261302834021675e-06
MeanAbsoluteError value on hold-out data: 0.0009820822160691023
Epoch: 535
Loss on hold-out set: 6.76215298347835e-06
MeanAbsoluteError value on hold-out data: 0.0009678742499090731
```

```
Epoch: 536
Loss on hold-out set: 6.337292825483369e-06
MeanAbsoluteError value on hold-out data: 0.0009745812276378274
Epoch: 537
Loss on hold-out set: 0.005900346394499733
MeanAbsoluteError value on hold-out data: 0.008798534981906414
Epoch: 538

Loss on hold-out set: 7.348342133075046e-06
MeanAbsoluteError value on hold-out data: 0.0011333826696500182
Epoch: 539

Loss on hold-out set: 5.925092335264008e-06
MeanAbsoluteError value on hold-out data: 0.0010395923163741827
Epoch: 540
Loss on hold-out set: 5.704143885710577e-06
MeanAbsoluteError value on hold-out data: 0.00096685322932899
Epoch: 541
Loss on hold-out set: 5.657482238173263e-06
MeanAbsoluteError value on hold-out data: 0.0009917416609823704
Epoch: 542
Loss on hold-out set: 5.4742040359857265e-06
MeanAbsoluteError value on hold-out data: 0.0010122677776962519
Epoch: 543
Loss on hold-out set: 8.056387869496226e-05
MeanAbsoluteError value on hold-out data: 0.001787481945939362
Epoch: 544
Loss on hold-out set: 4.251721896672769e-06
MeanAbsoluteError value on hold-out data: 0.0009055960108526051
Epoch: 545

Loss on hold-out set: 5.6018409002088165e-06
MeanAbsoluteError value on hold-out data: 0.0014386049006134272
Epoch: 546

Loss on hold-out set: 4.735781214566697e-06
MeanAbsoluteError value on hold-out data: 0.001071152975782752
Epoch: 547
Loss on hold-out set: 3.7516257779001394e-06
MeanAbsoluteError value on hold-out data: 0.0009447851916775107
Epoch: 548
```

```
Loss on hold-out set: 7.971325011077659e-06
MeanAbsoluteError value on hold-out data: 0.002048394177109003
Epoch: 549
Loss on hold-out set: 3.72190506298536e-06
MeanAbsoluteError value on hold-out data: 0.00098833825904876
Epoch: 550
Loss on hold-out set: 3.5317478538952573e-06
MeanAbsoluteError value on hold-out data: 0.0008945438312366605
Epoch: 551
Loss on hold-out set: 3.3007265690580075e-06
MeanAbsoluteError value on hold-out data: 0.0009659352945163846
Epoch: 552

Loss on hold-out set: 2.7698175524794633e-06
MeanAbsoluteError value on hold-out data: 0.0008907586452551186
Epoch: 553

Loss on hold-out set: 4.050582027467988e-06
MeanAbsoluteError value on hold-out data: 0.001133797224611044
Epoch: 554
Loss on hold-out set: 3.068699903416508e-06
MeanAbsoluteError value on hold-out data: 0.0008694457937963307
Epoch: 555
Loss on hold-out set: 3.6713603999662437e-06
MeanAbsoluteError value on hold-out data: 0.0009217536426149309
Epoch: 556
Loss on hold-out set: 2.5206174961147972e-05
MeanAbsoluteError value on hold-out data: 0.004898202605545521
Epoch: 557
Loss on hold-out set: 4.478515008416322e-06
MeanAbsoluteError value on hold-out data: 0.0009630754357203841
Epoch: 558
Loss on hold-out set: 4.519527141593034e-06
MeanAbsoluteError value on hold-out data: 0.0009663698147051036
Epoch: 559

Loss on hold-out set: 8.08497714589206e-06
MeanAbsoluteError value on hold-out data: 0.0009275308111682534
Epoch: 560

Loss on hold-out set: 0.0013202110234260545
```

```
MeanAbsoluteError value on hold-out data: 0.004651966039091349
Early stopping at epoch 559
Fold: 8
Epoch: 1
Loss on hold-out set: 0.02782090251835493
MeanAbsoluteError value on hold-out data: 0.13514769077301025
Epoch: 2
Loss on hold-out set: 0.0271829951267976
MeanAbsoluteError value on hold-out data: 0.13343879580497742
Epoch: 3
Loss on hold-out set: 0.026588830165565014
MeanAbsoluteError value on hold-out data: 0.13314476609230042
Epoch: 4
Loss on hold-out set: 0.02837822690176276
MeanAbsoluteError value on hold-out data: 0.13279712200164795
Epoch: 5
Loss on hold-out set: 0.02691214080326832
MeanAbsoluteError value on hold-out data: 0.13278254866600037
Epoch: 6

Loss on hold-out set: 0.02640376318819248
MeanAbsoluteError value on hold-out data: 0.1326037347316742
Epoch: 7

Loss on hold-out set: 0.026744607764367875
MeanAbsoluteError value on hold-out data: 0.13259930908679962
Epoch: 8
Loss on hold-out set: 0.027012170292437077
MeanAbsoluteError value on hold-out data: 0.13253843784332275
Epoch: 9
Loss on hold-out set: 0.027118209606179826
MeanAbsoluteError value on hold-out data: 0.1325586438179016
Epoch: 10
Loss on hold-out set: 0.02697420184715436
MeanAbsoluteError value on hold-out data: 0.1325099915266037
Epoch: 11
Loss on hold-out set: 0.026784966198297646
MeanAbsoluteError value on hold-out data: 0.13247331976890564
Epoch: 12
Loss on hold-out set: 0.026612137659237936
MeanAbsoluteError value on hold-out data: 0.1324358880519867
Epoch: 13
```

```
Loss on hold-out set: 0.026440974074200943
MeanAbsoluteError value on hold-out data: 0.13244205713272095
Epoch: 14

Loss on hold-out set: 0.027152776861420043
MeanAbsoluteError value on hold-out data: 0.13249976933002472
Epoch: 15
Loss on hold-out set: 0.026181524261259116
MeanAbsoluteError value on hold-out data: 0.13228894770145416
Epoch: 16
Loss on hold-out set: 0.026439229671198588
MeanAbsoluteError value on hold-out data: 0.13229568302631378
Epoch: 17
Loss on hold-out set: 0.02683071018411563
MeanAbsoluteError value on hold-out data: 0.13231191039085388
Epoch: 18
Loss on hold-out set: 0.026404630249509446
MeanAbsoluteError value on hold-out data: 0.1321965456008911
Epoch: 19
Loss on hold-out set: 0.026076156574373063
MeanAbsoluteError value on hold-out data: 0.13221609592437744
Epoch: 20

Loss on hold-out set: 0.027007863355370667
MeanAbsoluteError value on hold-out data: 0.132173553109169
Epoch: 21

Loss on hold-out set: 0.026587219192431524
MeanAbsoluteError value on hold-out data: 0.13209953904151917
Epoch: 22
Loss on hold-out set: 0.026079123588995293
MeanAbsoluteError value on hold-out data: 0.13208653032779694
Epoch: 23
Loss on hold-out set: 0.026230785279319838
MeanAbsoluteError value on hold-out data: 0.13209600746631622
Epoch: 24
Loss on hold-out set: 0.027841528734335534
MeanAbsoluteError value on hold-out data: 0.13195985555648804
Epoch: 25
Loss on hold-out set: 0.025946998574699346
MeanAbsoluteError value on hold-out data: 0.13196666538715363
Epoch: 26
```

```
Loss on hold-out set: 0.026231449383955736
MeanAbsoluteError value on hold-out data: 0.13188284635543823
Epoch: 27

Loss on hold-out set: 0.02605745468575221
MeanAbsoluteError value on hold-out data: 0.13184131681919098
Epoch: 28

Loss on hold-out set: 0.025948562157841828
MeanAbsoluteError value on hold-out data: 0.13177143037319183
Epoch: 29
Loss on hold-out set: 0.025942512966979008
MeanAbsoluteError value on hold-out data: 0.1316835731267929
Epoch: 30
Loss on hold-out set: 0.026414684808024995
MeanAbsoluteError value on hold-out data: 0.13157828152179718
Epoch: 31
Loss on hold-out set: 0.02600406124614752
MeanAbsoluteError value on hold-out data: 0.1315712034702301
Epoch: 32
Loss on hold-out set: 0.026434179467077438
MeanAbsoluteError value on hold-out data: 0.13147728145122528
Epoch: 33
Loss on hold-out set: 0.026699022819789555
MeanAbsoluteError value on hold-out data: 0.13143528997898102
Epoch: 34

Loss on hold-out set: 0.025787728552061778
MeanAbsoluteError value on hold-out data: 0.13134945929050446
Epoch: 35

Loss on hold-out set: 0.02643972857353779
MeanAbsoluteError value on hold-out data: 0.13131999969482422
Epoch: 36
Loss on hold-out set: 0.02605358590013706
MeanAbsoluteError value on hold-out data: 0.1312052309513092
Epoch: 37
Loss on hold-out set: 0.025784736212629538
MeanAbsoluteError value on hold-out data: 0.1311364322900772
Epoch: 38
Loss on hold-out set: 0.026596172999304075
```

```
MeanAbsoluteError value on hold-out data: 0.1310253143310547
Epoch: 39
Loss on hold-out set: 0.026144659934708707
MeanAbsoluteError value on hold-out data: 0.1310429722070694
Epoch: 40
Loss on hold-out set: 0.026672500687149856
MeanAbsoluteError value on hold-out data: 0.13088853657245636
Epoch: 41

Loss on hold-out set: 0.02574666732778916
MeanAbsoluteError value on hold-out data: 0.131031334400177
Epoch: 42

Loss on hold-out set: 0.027270836325792167
MeanAbsoluteError value on hold-out data: 0.13070043921470642
Epoch: 43
Loss on hold-out set: 0.026083710245214976
MeanAbsoluteError value on hold-out data: 0.13061955571174622
Epoch: 44
Loss on hold-out set: 0.026997828999390967
MeanAbsoluteError value on hold-out data: 0.13051271438598633
Epoch: 45
Loss on hold-out set: 0.025688741069573622
MeanAbsoluteError value on hold-out data: 0.13044822216033936
Epoch: 46
Loss on hold-out set: 0.025453835510863707
MeanAbsoluteError value on hold-out data: 0.1301518678665161
Epoch: 47
Loss on hold-out set: 0.025696829319573365
MeanAbsoluteError value on hold-out data: 0.1302512139081955
Epoch: 48

Loss on hold-out set: 0.025925972140752353
MeanAbsoluteError value on hold-out data: 0.12999506294727325
Epoch: 49

Loss on hold-out set: 0.025837483600928232
MeanAbsoluteError value on hold-out data: 0.12986202538013458
Epoch: 50
Loss on hold-out set: 0.025837644934654236
MeanAbsoluteError value on hold-out data: 0.12974810600280762
```

```
Epoch: 51
Loss on hold-out set: 0.025393266517382402
MeanAbsoluteError value on hold-out data: 0.12968003749847412
Epoch: 52
Loss on hold-out set: 0.02612747445415992
MeanAbsoluteError value on hold-out data: 0.1294064074754715
Epoch: 53
Loss on hold-out set: 0.027301221799391966
MeanAbsoluteError value on hold-out data: 0.12924736738204956
Epoch: 54
Loss on hold-out set: 0.02735100672222101
MeanAbsoluteError value on hold-out data: 0.12911750376224518
Epoch: 55

Loss on hold-out set: 0.02692053488527353
MeanAbsoluteError value on hold-out data: 0.12898661196231842
Epoch: 56

Loss on hold-out set: 0.024743583984673023
MeanAbsoluteError value on hold-out data: 0.12887905538082123
Epoch: 57
Loss on hold-out set: 0.02467463924907721
MeanAbsoluteError value on hold-out data: 0.1285940557718277
Epoch: 58
Loss on hold-out set: 0.024731866012399014
MeanAbsoluteError value on hold-out data: 0.12843216955661774
Epoch: 59
Loss on hold-out set: 0.025259356802472703
MeanAbsoluteError value on hold-out data: 0.12816238403320312
Epoch: 60
Loss on hold-out set: 0.02527318773074792
MeanAbsoluteError value on hold-out data: 0.12794697284698486
Epoch: 61
Loss on hold-out set: 0.025255910908946626
MeanAbsoluteError value on hold-out data: 0.12773576378822327
Epoch: 62

Loss on hold-out set: 0.02516755608555216
MeanAbsoluteError value on hold-out data: 0.12746407091617584
Epoch: 63
```

```
Loss on hold-out set: 0.02584209945052862
MeanAbsoluteError value on hold-out data: 0.12727287411689758
Epoch: 64
Loss on hold-out set: 0.024557988302638896
MeanAbsoluteError value on hold-out data: 0.12703187763690948
Epoch: 65
Loss on hold-out set: 0.02468112469292604
MeanAbsoluteError value on hold-out data: 0.12683339416980743
Epoch: 66
Loss on hold-out set: 0.025663186581088945
MeanAbsoluteError value on hold-out data: 0.12657210230827332
Epoch: 67
Loss on hold-out set: 0.02374422224238515
MeanAbsoluteError value on hold-out data: 0.12621790170669556
Epoch: 68
Loss on hold-out set: 0.025104026954907637
MeanAbsoluteError value on hold-out data: 0.12593117356300354
Epoch: 69

Loss on hold-out set: 0.02369639055373577
MeanAbsoluteError value on hold-out data: 0.12564019858837128
Epoch: 70

Loss on hold-out set: 0.02336809400898906
MeanAbsoluteError value on hold-out data: 0.12520557641983032
Epoch: 71
Loss on hold-out set: 0.023662063436439403
MeanAbsoluteError value on hold-out data: 0.1249571442604065
Epoch: 72
Loss on hold-out set: 0.023775010262257777
MeanAbsoluteError value on hold-out data: 0.12463044375181198
Epoch: 73
Loss on hold-out set: 0.023586636015142385
MeanAbsoluteError value on hold-out data: 0.12431679666042328
Epoch: 74
Loss on hold-out set: 0.023368150246544525
MeanAbsoluteError value on hold-out data: 0.12343987822532654
Epoch: 75
Loss on hold-out set: 0.023177449949658833
MeanAbsoluteError value on hold-out data: 0.12375282496213913
Epoch: 76
```

```
Loss on hold-out set: 0.023459464454880126
MeanAbsoluteError value on hold-out data: 0.12339390069246292
Epoch: 77

Loss on hold-out set: 0.023061506020335052
MeanAbsoluteError value on hold-out data: 0.12294657528400421
Epoch: 78
Loss on hold-out set: 0.022385975990730982
MeanAbsoluteError value on hold-out data: 0.12246015667915344
Epoch: 79
Loss on hold-out set: 0.022548558190464973
MeanAbsoluteError value on hold-out data: 0.12206046283245087
Epoch: 80
Loss on hold-out set: 0.02283308101603045
MeanAbsoluteError value on hold-out data: 0.12159344553947449
Epoch: 81
Loss on hold-out set: 0.023060657227268584
MeanAbsoluteError value on hold-out data: 0.12122995406389236
Epoch: 82
Loss on hold-out set: 0.02339371619746089
MeanAbsoluteError value on hold-out data: 0.1207764521241188
Epoch: 83

Loss on hold-out set: 0.021847294213680122
MeanAbsoluteError value on hold-out data: 0.1203092560172081
Epoch: 84

Loss on hold-out set: 0.021816418076363895
MeanAbsoluteError value on hold-out data: 0.11981961876153946
Epoch: 85
Loss on hold-out set: 0.021689232152241927
MeanAbsoluteError value on hold-out data: 0.11946091055870056
Epoch: 86
Loss on hold-out set: 0.022121443646028638
MeanAbsoluteError value on hold-out data: 0.11904062330722809
Epoch: 87
Loss on hold-out set: 0.021661081172239322
MeanAbsoluteError value on hold-out data: 0.11844120919704437
Epoch: 88
Loss on hold-out set: 0.022105553259070102
MeanAbsoluteError value on hold-out data: 0.11811693012714386
Epoch: 89
```

```
Loss on hold-out set: 0.021778947960298795
MeanAbsoluteError value on hold-out data: 0.11749256402254105
Epoch: 90

Loss on hold-out set: 0.020791734425494306
MeanAbsoluteError value on hold-out data: 0.11685596406459808
Epoch: 91

Loss on hold-out set: 0.020880467258393764
MeanAbsoluteError value on hold-out data: 0.11647623777389526
Epoch: 92
Loss on hold-out set: 0.020381058996113446
MeanAbsoluteError value on hold-out data: 0.11590927839279175
Epoch: 93
Loss on hold-out set: 0.020620356528804853
MeanAbsoluteError value on hold-out data: 0.11537806689739227
Epoch: 94
Loss on hold-out set: 0.02040053793014242
MeanAbsoluteError value on hold-out data: 0.11518979072570801
Epoch: 95
Loss on hold-out set: 0.01968645530108076
MeanAbsoluteError value on hold-out data: 0.11424650996923447
Epoch: 96
Loss on hold-out set: 0.021311773130526908
MeanAbsoluteError value on hold-out data: 0.11377225071191788
Epoch: 97

Loss on hold-out set: 0.020070801345774762
MeanAbsoluteError value on hold-out data: 0.11310622841119766
Epoch: 98

Loss on hold-out set: 0.019323298707604408
MeanAbsoluteError value on hold-out data: 0.11248528212308884
Epoch: 99
Loss on hold-out set: 0.01913137615729983
MeanAbsoluteError value on hold-out data: 0.11181319504976273
Epoch: 100
Loss on hold-out set: 0.01931054825679614
MeanAbsoluteError value on hold-out data: 0.11136280745267868
Epoch: 101
Loss on hold-out set: 0.019028913408804398
```

```
MeanAbsoluteError value on hold-out data: 0.11097423732280731
Epoch: 102
Loss on hold-out set: 0.01851408126262518
MeanAbsoluteError value on hold-out data: 0.11026807874441147
Epoch: 103
Loss on hold-out set: 0.01932390148823078
MeanAbsoluteError value on hold-out data: 0.10957422852516174
Epoch: 104

Loss on hold-out set: 0.018197242098932084
MeanAbsoluteError value on hold-out data: 0.10879694670438766
Epoch: 105

Loss on hold-out set: 0.019649157157311074
MeanAbsoluteError value on hold-out data: 0.10801995545625687
Epoch: 106
Loss on hold-out set: 0.01863087950131068
MeanAbsoluteError value on hold-out data: 0.10748031735420227
Epoch: 107
Loss on hold-out set: 0.017421667392437275
MeanAbsoluteError value on hold-out data: 0.10680864006280899
Epoch: 108
Loss on hold-out set: 0.018434724161544673
MeanAbsoluteError value on hold-out data: 0.1058657169342041
Epoch: 109
Loss on hold-out set: 0.017394791787060406
MeanAbsoluteError value on hold-out data: 0.10523943603038788
Epoch: 110
Loss on hold-out set: 0.016716852712516602
MeanAbsoluteError value on hold-out data: 0.10419478267431259
Epoch: 111

Loss on hold-out set: 0.017286306175474938
MeanAbsoluteError value on hold-out data: 0.10368737578392029
Epoch: 112

Loss on hold-out set: 0.016339317608911257
MeanAbsoluteError value on hold-out data: 0.10300356149673462
Epoch: 113
Loss on hold-out set: 0.016373066768909875
MeanAbsoluteError value on hold-out data: 0.10210563987493515
```

```
Epoch: 114
Loss on hold-out set: 0.016097160915915783
MeanAbsoluteError value on hold-out data: 0.10107220709323883
Epoch: 115
Loss on hold-out set: 0.016390167499104373
MeanAbsoluteError value on hold-out data: 0.10013552755117416
Epoch: 116
Loss on hold-out set: 0.015370390879420133
MeanAbsoluteError value on hold-out data: 0.09964492172002792
Epoch: 117
Loss on hold-out set: 0.015867777204570863
MeanAbsoluteError value on hold-out data: 0.09993448853492737
Epoch: 118

Loss on hold-out set: 0.01491400828728309
MeanAbsoluteError value on hold-out data: 0.09795892983675003
Epoch: 119

Loss on hold-out set: 0.01552190212532878
MeanAbsoluteError value on hold-out data: 0.0974947139620781
Epoch: 120
Loss on hold-out set: 0.01502250930151114
MeanAbsoluteError value on hold-out data: 0.09668397158384323
Epoch: 121
Loss on hold-out set: 0.014853587732292138
MeanAbsoluteError value on hold-out data: 0.09576787054538727
Epoch: 122
Loss on hold-out set: 0.014752791048242496
MeanAbsoluteError value on hold-out data: 0.0957823246717453
Epoch: 123
Loss on hold-out set: 0.014459650676984053
MeanAbsoluteError value on hold-out data: 0.09398119151592255
Epoch: 124
Loss on hold-out set: 0.014827657562608901
MeanAbsoluteError value on hold-out data: 0.09350939095020294
Epoch: 125

Loss on hold-out set: 0.013690855210790267
MeanAbsoluteError value on hold-out data: 0.09250578284263611
Epoch: 126
```

```
Loss on hold-out set: 0.013688314777772731
MeanAbsoluteError value on hold-out data: 0.09217783808708191
Epoch: 127
Loss on hold-out set: 0.013428742173486032
MeanAbsoluteError value on hold-out data: 0.09118208289146423
Epoch: 128
Loss on hold-out set: 0.013326138607226312
MeanAbsoluteError value on hold-out data: 0.09058796614408493
Epoch: 129
Loss on hold-out set: 0.012884060529848704
MeanAbsoluteError value on hold-out data: 0.08955768495798111
Epoch: 130
Loss on hold-out set: 0.012787055833121905
MeanAbsoluteError value on hold-out data: 0.08848579227924347
Epoch: 131
Loss on hold-out set: 0.01227253981722662
MeanAbsoluteError value on hold-out data: 0.08801146596670151
Epoch: 132

Loss on hold-out set: 0.012445289713258926
MeanAbsoluteError value on hold-out data: 0.08723636716604233
Epoch: 133

Loss on hold-out set: 0.011862538942995552
MeanAbsoluteError value on hold-out data: 0.08620402216911316
Epoch: 134
Loss on hold-out set: 0.011950449158365909
MeanAbsoluteError value on hold-out data: 0.08557705581188202
Epoch: 135
Loss on hold-out set: 0.011811533190596562
MeanAbsoluteError value on hold-out data: 0.08453574031591415
Epoch: 136
Loss on hold-out set: 0.010995220464582626
MeanAbsoluteError value on hold-out data: 0.08387583494186401
Epoch: 137
Loss on hold-out set: 0.011353184083978144
MeanAbsoluteError value on hold-out data: 0.08297239989042282
Epoch: 138
Loss on hold-out set: 0.010537008396708049
MeanAbsoluteError value on hold-out data: 0.08253850787878036
Epoch: 139
```

```
Loss on hold-out set: 0.012190023114761481
MeanAbsoluteError value on hold-out data: 0.08351588249206543
Epoch: 140

Loss on hold-out set: 0.010814564929415401
MeanAbsoluteError value on hold-out data: 0.08039803802967072
Epoch: 141
Loss on hold-out set: 0.009857788646163849
MeanAbsoluteError value on hold-out data: 0.07988189905881882
Epoch: 142
Loss on hold-out set: 0.00987826083571865
MeanAbsoluteError value on hold-out data: 0.0789494588971138
Epoch: 143
Loss on hold-out set: 0.009352361154294787
MeanAbsoluteError value on hold-out data: 0.0782662108540535
Epoch: 144
Loss on hold-out set: 0.00945485970721795
MeanAbsoluteError value on hold-out data: 0.0771011933684349
Epoch: 145
Loss on hold-out set: 0.00891003361903131
MeanAbsoluteError value on hold-out data: 0.07671532779932022
Epoch: 146

Loss on hold-out set: 0.009004705204950789
MeanAbsoluteError value on hold-out data: 0.07598411291837692
Epoch: 147

Loss on hold-out set: 0.008768436292974422
MeanAbsoluteError value on hold-out data: 0.07508882135152817
Epoch: 148
Loss on hold-out set: 0.008694028213190345
MeanAbsoluteError value on hold-out data: 0.07421091943979263
Epoch: 149
Loss on hold-out set: 0.0086853695102036
MeanAbsoluteError value on hold-out data: 0.07330755144357681
Epoch: 150
Loss on hold-out set: 0.008205613175120492
MeanAbsoluteError value on hold-out data: 0.07265639305114746
Epoch: 151
Loss on hold-out set: 0.007590740990753357
MeanAbsoluteError value on hold-out data: 0.0718618780374527
Epoch: 152
```

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Loss on hold-out set: 0.007424180127250461
MeanAbsoluteError value on hold-out data: 0.07063788175582886
Epoch: 153

Loss on hold-out set: 0.00774376979097724
MeanAbsoluteError value on hold-out data: 0.07170229405164719
Epoch: 154

Loss on hold-out set: 0.006949217900490532
MeanAbsoluteError value on hold-out data: 0.06882329285144806
Epoch: 155
Loss on hold-out set: 0.006744748859021526
MeanAbsoluteError value on hold-out data: 0.06804600358009338
Epoch: 156
Loss on hold-out set: 0.006477084530230898
MeanAbsoluteError value on hold-out data: 0.06688534468412399
Epoch: 157
Loss on hold-out set: 0.006213327565302069
MeanAbsoluteError value on hold-out data: 0.06587184220552444
Epoch: 158
Loss on hold-out set: 0.006279239932504984
MeanAbsoluteError value on hold-out data: 0.06508584320545197
Epoch: 159
Loss on hold-out set: 0.005888443422288849
MeanAbsoluteError value on hold-out data: 0.06380078196525574
Epoch: 160

Loss on hold-out set: 0.0058298359016099805
MeanAbsoluteError value on hold-out data: 0.06271684914827347
Epoch: 161

Loss on hold-out set: 0.005601812924186771
MeanAbsoluteError value on hold-out data: 0.061610862612724304
Epoch: 162
Loss on hold-out set: 0.005262031524370496
MeanAbsoluteError value on hold-out data: 0.06040315330028534
Epoch: 163
Loss on hold-out set: 0.004975960786955861
MeanAbsoluteError value on hold-out data: 0.058927878737449646
Epoch: 164
Loss on hold-out set: 0.0048568731693264386
```

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MeanAbsoluteError value on hold-out data: 0.05783983692526817
Epoch: 165
Loss on hold-out set: 0.004632486764771434
MeanAbsoluteError value on hold-out data: 0.056391242891550064
Epoch: 166
Loss on hold-out set: 0.004559015479082098
MeanAbsoluteError value on hold-out data: 0.05531081184744835
Epoch: 167

Loss on hold-out set: 0.004138505999715283
MeanAbsoluteError value on hold-out data: 0.0534975528717041
Epoch: 168

Loss on hold-out set: 0.004052984456603344
MeanAbsoluteError value on hold-out data: 0.052711062133312225
Epoch: 169
Loss on hold-out set: 0.0038815354659723546
MeanAbsoluteError value on hold-out data: 0.05130281299352646
Epoch: 170
Loss on hold-out set: 0.003680925484961615
MeanAbsoluteError value on hold-out data: 0.050003837794065475
Epoch: 171
Loss on hold-out set: 0.003466045976473162
MeanAbsoluteError value on hold-out data: 0.04868529364466667
Epoch: 172
Loss on hold-out set: 0.003246317931021062
MeanAbsoluteError value on hold-out data: 0.0474562793970108
Epoch: 173
Loss on hold-out set: 0.0031746542260337332
MeanAbsoluteError value on hold-out data: 0.04604869335889816
Epoch: 174

Loss on hold-out set: 0.0029871275988765634
MeanAbsoluteError value on hold-out data: 0.04477235674858093
Epoch: 175

Loss on hold-out set: 0.0028312290445543253
MeanAbsoluteError value on hold-out data: 0.043265797197818756
Epoch: 176
Loss on hold-out set: 0.0025513531335701165
MeanAbsoluteError value on hold-out data: 0.0418521873652935
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Epoch: 177
Loss on hold-out set: 0.0024931997759267688
MeanAbsoluteError value on hold-out data: 0.04047621414065361
Epoch: 178
Loss on hold-out set: 0.0022595387507373323
MeanAbsoluteError value on hold-out data: 0.03902494162321091
Epoch: 179
Loss on hold-out set: 0.0021153428735068212
MeanAbsoluteError value on hold-out data: 0.03762103617191315
Epoch: 180
Loss on hold-out set: 0.002074371658426781
MeanAbsoluteError value on hold-out data: 0.03614194691181183
Epoch: 181

Loss on hold-out set: 0.002046500679660732
MeanAbsoluteError value on hold-out data: 0.035314496606588364
Epoch: 182

Loss on hold-out set: 0.0017801010846876754
MeanAbsoluteError value on hold-out data: 0.03331564739346504
Epoch: 183
Loss on hold-out set: 0.002030524304315734
MeanAbsoluteError value on hold-out data: 0.03385234251618385
Epoch: 184
Loss on hold-out set: 0.0014703622884833468
MeanAbsoluteError value on hold-out data: 0.030646096915006638
Epoch: 185
Loss on hold-out set: 0.001376456769111638
MeanAbsoluteError value on hold-out data: 0.02961048297584057
Epoch: 186
Loss on hold-out set: 0.0012117807636968791
MeanAbsoluteError value on hold-out data: 0.028047261759638786
Epoch: 187
Loss on hold-out set: 0.0011656527976111437
MeanAbsoluteError value on hold-out data: 0.02716456912457943
Epoch: 188

Loss on hold-out set: 0.0010732499493035274
MeanAbsoluteError value on hold-out data: 0.0255704578012228
Epoch: 189
```

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Loss on hold-out set: 0.0010478754456226642
MeanAbsoluteError value on hold-out data: 0.024405980482697487
Epoch: 190
Loss on hold-out set: 0.0008728282163456942
MeanAbsoluteError value on hold-out data: 0.022947771474719048
Epoch: 191
Loss on hold-out set: 0.0008250453415362594
MeanAbsoluteError value on hold-out data: 0.02184496819972992
Epoch: 192
Loss on hold-out set: 0.0007152579962096822
MeanAbsoluteError value on hold-out data: 0.020533962175250053
Epoch: 193
Loss on hold-out set: 0.0006357271038443566
MeanAbsoluteError value on hold-out data: 0.01927092857658863
Epoch: 194
Loss on hold-out set: 0.0005766819203227686
MeanAbsoluteError value on hold-out data: 0.018149947747588158
Epoch: 195

Loss on hold-out set: 0.000529598918197175
MeanAbsoluteError value on hold-out data: 0.017024213448166847
Epoch: 196

Loss on hold-out set: 0.00048414275247173815
MeanAbsoluteError value on hold-out data: 0.015898430719971657
Epoch: 197
Loss on hold-out set: 0.0004205903264496905
MeanAbsoluteError value on hold-out data: 0.014845744706690311
Epoch: 198
Loss on hold-out set: 0.00038640409547952004
MeanAbsoluteError value on hold-out data: 0.014040840789675713
Epoch: 199
Loss on hold-out set: 0.00033579200918701157
MeanAbsoluteError value on hold-out data: 0.012943434529006481
Epoch: 200
Loss on hold-out set: 0.0003413452868699096
MeanAbsoluteError value on hold-out data: 0.012338485568761826
Epoch: 201
Loss on hold-out set: 0.0002982687566635342
MeanAbsoluteError value on hold-out data: 0.011287433095276356
Epoch: 202
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Loss on hold-out set: 0.00024430994562862907
MeanAbsoluteError value on hold-out data: 0.010548479855060577
Epoch: 203

Loss on hold-out set: 0.0002189684037148254
MeanAbsoluteError value on hold-out data: 0.009954642504453659
Epoch: 204
Loss on hold-out set: 0.00020602404919582812
MeanAbsoluteError value on hold-out data: 0.008992021903395653
Epoch: 205
Loss on hold-out set: 0.00019621105848972758
MeanAbsoluteError value on hold-out data: 0.008708875626325607
Epoch: 206
Loss on hold-out set: 0.00016461163473790153
MeanAbsoluteError value on hold-out data: 0.007940836250782013
Epoch: 207
Loss on hold-out set: 0.0001495158209693797
MeanAbsoluteError value on hold-out data: 0.007658363785594702
Epoch: 208
Loss on hold-out set: 0.00014102148676241856
MeanAbsoluteError value on hold-out data: 0.007137869484722614
Epoch: 209

Loss on hold-out set: 0.00012953750274391496
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Epoch: 210

Loss on hold-out set: 0.0001198974568279272
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Epoch: 211
Loss on hold-out set: 0.0008547616169800257
MeanAbsoluteError value on hold-out data: 0.008616483770310879
Epoch: 212
Loss on hold-out set: 8.992097557963392e-05
MeanAbsoluteError value on hold-out data: 0.00551203265786171
Epoch: 213
Loss on hold-out set: 8.642877123048283e-05
MeanAbsoluteError value on hold-out data: 0.0048923310823738575
Epoch: 214
Loss on hold-out set: 7.59943127902191e-05
MeanAbsoluteError value on hold-out data: 0.004984220955520868
Epoch: 215
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Loss on hold-out set: 7.093701175947969e-05
MeanAbsoluteError value on hold-out data: 0.004300406668335199
Epoch: 216

Loss on hold-out set: 6.218364296728396e-05
MeanAbsoluteError value on hold-out data: 0.00427791615948081
Epoch: 217

Loss on hold-out set: 5.778137887528619e-05
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Epoch: 218
Loss on hold-out set: 5.034880074652812e-05
MeanAbsoluteError value on hold-out data: 0.0035704458132386208
Epoch: 219
Loss on hold-out set: 4.843322872497643e-05
MeanAbsoluteError value on hold-out data: 0.003523229854181409
Epoch: 220
Loss on hold-out set: 4.614818149443286e-05
MeanAbsoluteError value on hold-out data: 0.003691107966005802
Epoch: 221
Loss on hold-out set: 4.5003837647947454e-05
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Epoch: 222
Loss on hold-out set: 4.214195293500849e-05
MeanAbsoluteError value on hold-out data: 0.0029528411105275154
Epoch: 223

Loss on hold-out set: 4.008501942875088e-05
MeanAbsoluteError value on hold-out data: 0.003818063996732235
Epoch: 224

Loss on hold-out set: 3.6224551872867145e-05
MeanAbsoluteError value on hold-out data: 0.0026708077639341354
Epoch: 225
Loss on hold-out set: 3.281384119173499e-05
MeanAbsoluteError value on hold-out data: 0.0027231490239501
Epoch: 226
Loss on hold-out set: 4.1095165976492775e-05
MeanAbsoluteError value on hold-out data: 0.0024862985592335463
Epoch: 227
Loss on hold-out set: 2.840415509826226e-05
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MeanAbsoluteError value on hold-out data: 0.0026479170192033052
Epoch: 228
Loss on hold-out set: 2.7219744582068346e-05
MeanAbsoluteError value on hold-out data: 0.002409874927252531
Epoch: 229
Loss on hold-out set: 2.501640638176748e-05
MeanAbsoluteError value on hold-out data: 0.0025995662435889244
Epoch: 230

Loss on hold-out set: 2.5839682638644052e-05
MeanAbsoluteError value on hold-out data: 0.0021035978570580482
Epoch: 231

Loss on hold-out set: 2.2323264882008796e-05
MeanAbsoluteError value on hold-out data: 0.0019906891975551844
Epoch: 232
Loss on hold-out set: 2.956350107734369e-05
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Epoch: 233
Loss on hold-out set: 2.0147086720848725e-05
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Epoch: 234
Loss on hold-out set: 1.966357618462448e-05
MeanAbsoluteError value on hold-out data: 0.0018178082536906004
Epoch: 235
Loss on hold-out set: 2.5028616951553537e-05
MeanAbsoluteError value on hold-out data: 0.0027757808566093445
Epoch: 236
Loss on hold-out set: 1.8184456179754376e-05
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Epoch: 237

Loss on hold-out set: 1.3591299735848084e-05
MeanAbsoluteError value on hold-out data: 0.0016842229524627328
Epoch: 238

Loss on hold-out set: 1.3803902736351749e-05
MeanAbsoluteError value on hold-out data: 0.0019749589264392853
Epoch: 239
Loss on hold-out set: 1.4981251537777167e-05
MeanAbsoluteError value on hold-out data: 0.0017234368715435266
```

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Epoch: 240
Loss on hold-out set: 1.6130121357841395e-05
MeanAbsoluteError value on hold-out data: 0.0018177140736952424
Epoch: 241
Loss on hold-out set: 1.4274457503058959e-05
MeanAbsoluteError value on hold-out data: 0.0016293807420879602
Epoch: 242
Loss on hold-out set: 1.4320136441571007e-05
MeanAbsoluteError value on hold-out data: 0.0016478832112625241
Epoch: 243
Loss on hold-out set: 1.532841115739267e-05
MeanAbsoluteError value on hold-out data: 0.001709669129922986
Epoch: 244

Loss on hold-out set: 1.2130574716068692e-05
MeanAbsoluteError value on hold-out data: 0.001894149580039084
Epoch: 245

Loss on hold-out set: 1.1625883123892541e-05
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Epoch: 246
Loss on hold-out set: 7.929777495974122e-06
MeanAbsoluteError value on hold-out data: 0.0013444836949929595
Epoch: 247
Loss on hold-out set: 9.174939335182968e-06
MeanAbsoluteError value on hold-out data: 0.0013937221374362707
Epoch: 248
Loss on hold-out set: 1.0998584737255722e-05
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Epoch: 249
Loss on hold-out set: 1.0262774944399447e-05
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Epoch: 250
Loss on hold-out set: 9.684835585123717e-06
MeanAbsoluteError value on hold-out data: 0.0014209352666512132
Epoch: 251

Loss on hold-out set: 9.54745299325693e-06
MeanAbsoluteError value on hold-out data: 0.0013857469893991947
Epoch: 252
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Loss on hold-out set: 8.83585246706039e-06
MeanAbsoluteError value on hold-out data: 0.0014248710358515382
Epoch: 253
Loss on hold-out set: 7.4068937261874735e-06
MeanAbsoluteError value on hold-out data: 0.001338346628472209
Epoch: 254
Loss on hold-out set: 7.136074425663817e-06
MeanAbsoluteError value on hold-out data: 0.0012807899620383978
Epoch: 255
Loss on hold-out set: 8.002301198163108e-06
MeanAbsoluteError value on hold-out data: 0.001298566348850727
Epoch: 256
Loss on hold-out set: 0.0008360869592733112
MeanAbsoluteError value on hold-out data: 0.004237705375999212
Epoch: 257
Loss on hold-out set: 6.150732839562177e-06
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Epoch: 258

Loss on hold-out set: 7.3203319481343406e-06
MeanAbsoluteError value on hold-out data: 0.0013184918789193034
Epoch: 259

Loss on hold-out set: 7.202641486313811e-06
MeanAbsoluteError value on hold-out data: 0.001222347724251449
Epoch: 260
Loss on hold-out set: 7.604302661198185e-06
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Epoch: 261
Loss on hold-out set: 7.015223423842634e-06
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Epoch: 262
Loss on hold-out set: 7.432711422202724e-06
MeanAbsoluteError value on hold-out data: 0.001608951948583126
Epoch: 263
Loss on hold-out set: 6.9383819436552585e-06
MeanAbsoluteError value on hold-out data: 0.0013301511062309146
Epoch: 264
Loss on hold-out set: 6.5881895811624136e-06
MeanAbsoluteError value on hold-out data: 0.0012115015415474772
Epoch: 265
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Loss on hold-out set: 6.3987111371506426e-06
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Epoch: 266

Loss on hold-out set: 6.513900335501323e-06
MeanAbsoluteError value on hold-out data: 0.0012020840076729655
Epoch: 267
Loss on hold-out set: 4.925120702654777e-06
MeanAbsoluteError value on hold-out data: 0.001589777646586299
Epoch: 268
Loss on hold-out set: 5.005031900177178e-06
MeanAbsoluteError value on hold-out data: 0.0010297669796273112
Epoch: 269
Loss on hold-out set: 4.0290395479412555e-06
MeanAbsoluteError value on hold-out data: 0.0010070822900161147
Epoch: 270
Loss on hold-out set: 2.7819587339413724e-06
MeanAbsoluteError value on hold-out data: 0.0010984702967107296
Epoch: 271
Loss on hold-out set: 3.18072294738578e-06
MeanAbsoluteError value on hold-out data: 0.0009815788362175226
Epoch: 272

Loss on hold-out set: 3.7128166573333706e-06
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Epoch: 273

Loss on hold-out set: 4.227844595579182e-06
MeanAbsoluteError value on hold-out data: 0.0010136186610907316
Epoch: 274
Loss on hold-out set: 5.6863580412552365e-06
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Epoch: 275
Loss on hold-out set: 4.045081915102435e-06
MeanAbsoluteError value on hold-out data: 0.0010496844770386815
Epoch: 276
Loss on hold-out set: 4.556494729968108e-06
MeanAbsoluteError value on hold-out data: 0.001046559656970203
Epoch: 277
Loss on hold-out set: 0.0009045609715485625
MeanAbsoluteError value on hold-out data: 0.00526341563090682
Epoch: 278
```

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Loss on hold-out set: 5.661089438455327e-06
MeanAbsoluteError value on hold-out data: 0.001183299464173615
Epoch: 279

Loss on hold-out set: 5.36846030522261e-06
MeanAbsoluteError value on hold-out data: 0.001076918444596231
Epoch: 280

Loss on hold-out set: 5.730051603117877e-06
MeanAbsoluteError value on hold-out data: 0.001102006179280579
Epoch: 281
Loss on hold-out set: 5.676423191184417e-06
MeanAbsoluteError value on hold-out data: 0.0011001782258972526
Epoch: 282
Loss on hold-out set: 8.186547688637802e-06
MeanAbsoluteError value on hold-out data: 0.0017205902840942144
Epoch: 283
Loss on hold-out set: 5.789336291592497e-06
MeanAbsoluteError value on hold-out data: 0.001095867482945323
Epoch: 284
Loss on hold-out set: 5.90281919917638e-06
MeanAbsoluteError value on hold-out data: 0.0011686031939461827
Epoch: 285
Loss on hold-out set: 6.035242624700633e-06
MeanAbsoluteError value on hold-out data: 0.001219429774209857
Epoch: 286

Loss on hold-out set: 6.175933942988475e-06
MeanAbsoluteError value on hold-out data: 0.0012344744754955173
Epoch: 287

Loss on hold-out set: 5.529525166226589e-06
MeanAbsoluteError value on hold-out data: 0.001135474187321961
Epoch: 288
Loss on hold-out set: 5.151574236186627e-06
MeanAbsoluteError value on hold-out data: 0.001135227270424366
Epoch: 289
Loss on hold-out set: 5.402187901801461e-06
MeanAbsoluteError value on hold-out data: 0.0011072889901697636
Epoch: 290
Loss on hold-out set: 5.383429659389094e-06
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MeanAbsoluteError value on hold-out data: 0.0011389139108359814
Epoch: 291
Loss on hold-out set: 5.1693219124724865e-06
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Epoch: 292
Loss on hold-out set: 5.044140941925854e-06
MeanAbsoluteError value on hold-out data: 0.001066831755451858
Epoch: 293

Loss on hold-out set: 4.912611276407775e-06
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Epoch: 294

Loss on hold-out set: 4.634012642467356e-06
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Epoch: 295
Loss on hold-out set: 4.69279128677814e-06
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Loss on hold-out set: 2.5770191926382654e-06
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Epoch: 297
Loss on hold-out set: 3.359917469170936e-06
MeanAbsoluteError value on hold-out data: 0.0010130570735782385
Epoch: 298
Loss on hold-out set: 1.3036248954169703e-05
MeanAbsoluteError value on hold-out data: 0.0029821034986525774
Epoch: 299
Loss on hold-out set: 2.844969318315494e-06
MeanAbsoluteError value on hold-out data: 0.0009472566889598966
Epoch: 300

Loss on hold-out set: 3.3785630255176957e-06
MeanAbsoluteError value on hold-out data: 0.0009744089911691844
Epoch: 301

Loss on hold-out set: 4.882793175052204e-06
MeanAbsoluteError value on hold-out data: 0.0009615589515306056
Epoch: 302
Loss on hold-out set: 4.4054455044645765e-06
MeanAbsoluteError value on hold-out data: 0.0010333426762372255
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Epoch: 303
Loss on hold-out set: 4.641458931386156e-06
MeanAbsoluteError value on hold-out data: 0.0010526505066081882
Epoch: 304
Loss on hold-out set: 1.3382744362808387e-05
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Epoch: 305
Loss on hold-out set: 5.017787115181049e-06
MeanAbsoluteError value on hold-out data: 0.0011159784626215696
Epoch: 306
Loss on hold-out set: 9.616072999891072e-06
MeanAbsoluteError value on hold-out data: 0.0022975809406489134
Epoch: 307

Loss on hold-out set: 4.750352487165471e-06
MeanAbsoluteError value on hold-out data: 0.0010341319721192122
Epoch: 308

Loss on hold-out set: 4.5473564125149305e-06
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Epoch: 309
Loss on hold-out set: 4.509874488488864e-06
MeanAbsoluteError value on hold-out data: 0.0011080956319347024
Epoch: 310
Loss on hold-out set: 6.441300281669381e-06
MeanAbsoluteError value on hold-out data: 0.0010242995340377092
Epoch: 311
Loss on hold-out set: 4.551123665281081e-06
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Epoch: 312
Loss on hold-out set: 4.43670088237433e-06
MeanAbsoluteError value on hold-out data: 0.0010358014842495322
Epoch: 313
Loss on hold-out set: 4.2645144381262635e-06
MeanAbsoluteError value on hold-out data: 0.00101613556034863
Epoch: 314

Loss on hold-out set: 3.6553099872750095e-06
MeanAbsoluteError value on hold-out data: 0.001087636686861515
Epoch: 315
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Loss on hold-out set: 4.5745178629029115e-06
MeanAbsoluteError value on hold-out data: 0.0012434807140380144
Epoch: 316
Loss on hold-out set: 4.960871013264085e-06
MeanAbsoluteError value on hold-out data: 0.0011581380385905504
Epoch: 317
Loss on hold-out set: 4.614901552730981e-06
MeanAbsoluteError value on hold-out data: 0.0011246296344324946
Epoch: 318
Loss on hold-out set: 5.34558124889792e-06
MeanAbsoluteError value on hold-out data: 0.0013966178521513939
Epoch: 319
Loss on hold-out set: 0.0011213255493552983
MeanAbsoluteError value on hold-out data: 0.004479011986404657
Epoch: 320
Loss on hold-out set: 6.675506240911161e-06
MeanAbsoluteError value on hold-out data: 0.0010765163460746408
Epoch: 321

Loss on hold-out set: 5.267050423841423e-06
MeanAbsoluteError value on hold-out data: 0.0011770823039114475
Epoch: 322

Loss on hold-out set: 4.898074560235098e-06
MeanAbsoluteError value on hold-out data: 0.0010585401905700564
Epoch: 323
Loss on hold-out set: 0.0006831425254745227
MeanAbsoluteError value on hold-out data: 0.0036895987577736378
Epoch: 324
Loss on hold-out set: 5.017275550646726e-06
MeanAbsoluteError value on hold-out data: 0.0010653292993083596
Epoch: 325
Loss on hold-out set: 4.732656732970169e-06
MeanAbsoluteError value on hold-out data: 0.0010523743694648147
Epoch: 326
Loss on hold-out set: 1.9758844893238766e-06
MeanAbsoluteError value on hold-out data: 0.0011038450757041574
Epoch: 327
Loss on hold-out set: 2.4455433556515627e-06
MeanAbsoluteError value on hold-out data: 0.001181089086458087
Epoch: 328
```

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Loss on hold-out set: 1.9886990925827445e-06
MeanAbsoluteError value on hold-out data: 0.0008907681913115084
Epoch: 329

Loss on hold-out set: 2.2022226318085814e-06
MeanAbsoluteError value on hold-out data: 0.0008942760759964585
Epoch: 330
Loss on hold-out set: 3.0916164610936485e-06
MeanAbsoluteError value on hold-out data: 0.0010797196300700307
Epoch: 331
Loss on hold-out set: 2.92126868937605e-06
MeanAbsoluteError value on hold-out data: 0.0009528437512926757
Epoch: 332
Loss on hold-out set: 3.1049061069902214e-06
MeanAbsoluteError value on hold-out data: 0.0009316800278611481
Epoch: 333
Loss on hold-out set: 3.9106955770106515e-06
MeanAbsoluteError value on hold-out data: 0.0011560353450477123
Epoch: 334
Loss on hold-out set: 2.08689753942683e-06
MeanAbsoluteError value on hold-out data: 0.0008964358130469918
Epoch: 335

Loss on hold-out set: 2.9793986239103386e-05
MeanAbsoluteError value on hold-out data: 0.005255701020359993
Epoch: 336

Loss on hold-out set: 3.2557098847973975e-06
MeanAbsoluteError value on hold-out data: 0.001136511447839439
Epoch: 337
Loss on hold-out set: 3.382434298460934e-06
MeanAbsoluteError value on hold-out data: 0.001066812896169722
Epoch: 338
Loss on hold-out set: 1.9868102360585626e-06
MeanAbsoluteError value on hold-out data: 0.0009123611380346119
Epoch: 339
Loss on hold-out set: 2.3322117302681222e-06
MeanAbsoluteError value on hold-out data: 0.0009537096484564245
Epoch: 340
Loss on hold-out set: 2.535256149153261e-06
MeanAbsoluteError value on hold-out data: 0.0009213667945005
Epoch: 341
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Loss on hold-out set: 3.845972464397653e-06
MeanAbsoluteError value on hold-out data: 0.0009300808887928724
Epoch: 342

Loss on hold-out set: 2.8628131255677895e-06
MeanAbsoluteError value on hold-out data: 0.0009148962562903762
Epoch: 343

Loss on hold-out set: 3.122361509720297e-06
MeanAbsoluteError value on hold-out data: 0.0009366495651192963
Epoch: 344
Loss on hold-out set: 3.3400005463590787e-06
MeanAbsoluteError value on hold-out data: 0.0009512384422123432
Epoch: 345
Loss on hold-out set: 4.371634006999487e-06
MeanAbsoluteError value on hold-out data: 0.0011557925026863813
Epoch: 346
Loss on hold-out set: 2.8979053730346586e-06
MeanAbsoluteError value on hold-out data: 0.0011490003671497107
Epoch: 347
Loss on hold-out set: 2.553060944329935e-06
MeanAbsoluteError value on hold-out data: 0.0009235039469785988
Epoch: 348
Loss on hold-out set: 3.951753014392195e-06
MeanAbsoluteError value on hold-out data: 0.0012949411757290363
Epoch: 349

Loss on hold-out set: 3.4378933067868134e-06
MeanAbsoluteError value on hold-out data: 0.0009547549416311085
Epoch: 350

Loss on hold-out set: 0.00015895889484122212
MeanAbsoluteError value on hold-out data: 0.0023811692371964455
Epoch: 351
Loss on hold-out set: 4.024176497261158e-06
MeanAbsoluteError value on hold-out data: 0.0013496370520442724
Epoch: 352
Loss on hold-out set: 3.0426141742841887e-06
MeanAbsoluteError value on hold-out data: 0.0009748573647812009
Epoch: 353
Loss on hold-out set: 3.3951678539359327e-06
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MeanAbsoluteError value on hold-out data: 0.0009464077884331346
Epoch: 354
Loss on hold-out set: 3.5072680628463086e-06
MeanAbsoluteError value on hold-out data: 0.0009566366788931191
Epoch: 355
Loss on hold-out set: 4.026492418391242e-06
MeanAbsoluteError value on hold-out data: 0.0010829612147063017
Epoch: 356

Loss on hold-out set: 2.2511847729534706e-06
MeanAbsoluteError value on hold-out data: 0.0009869493078440428
Epoch: 357

Loss on hold-out set: 2.267584573718733e-06
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Epoch: 358
Loss on hold-out set: 2.61184823102667e-06
MeanAbsoluteError value on hold-out data: 0.000905779015738517
Epoch: 359
Loss on hold-out set: 1.8453561162564606e-06
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Epoch: 360
Loss on hold-out set: 2.077308999140279e-06
MeanAbsoluteError value on hold-out data: 0.0008926644804887474
Epoch: 361
Loss on hold-out set: 1.4958228947447283e-06
MeanAbsoluteError value on hold-out data: 0.000869381008669734
Epoch: 362
Loss on hold-out set: 1.9806254731345407e-06
MeanAbsoluteError value on hold-out data: 0.0008749102125875652
Epoch: 363

Loss on hold-out set: 2.3928286754408664e-06
MeanAbsoluteError value on hold-out data: 0.0009018914424814284
Epoch: 364

Loss on hold-out set: 3.583618063902787e-06
MeanAbsoluteError value on hold-out data: 0.0012607509270310402
Epoch: 365
Loss on hold-out set: 3.219232059319228e-06
MeanAbsoluteError value on hold-out data: 0.0010322881862521172
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Epoch: 366
Loss on hold-out set: 3.6736922711410302e-06
MeanAbsoluteError value on hold-out data: 0.0010791191598400474
Epoch: 367
Loss on hold-out set: 4.909298247377172e-06
MeanAbsoluteError value on hold-out data: 0.0009955678833648562
Epoch: 368
Loss on hold-out set: 3.7489835055846643e-06
MeanAbsoluteError value on hold-out data: 0.0010848219972103834
Epoch: 369
Loss on hold-out set: 2.079894780028833e-06
MeanAbsoluteError value on hold-out data: 0.0009308351436629891
Epoch: 370

Loss on hold-out set: 2.501960400772637e-06
MeanAbsoluteError value on hold-out data: 0.00091812654864043
Epoch: 371

Loss on hold-out set: 3.294513183286304e-06
MeanAbsoluteError value on hold-out data: 0.001053003710694611
Epoch: 372
Loss on hold-out set: 3.387753454175114e-06
MeanAbsoluteError value on hold-out data: 0.0010065946262329817
Epoch: 373
Loss on hold-out set: 2.2975803823590886e-06
MeanAbsoluteError value on hold-out data: 0.0009243361419066787
Epoch: 374
Loss on hold-out set: 2.8991753162279983e-06
MeanAbsoluteError value on hold-out data: 0.0009625612292438745
Epoch: 375
Loss on hold-out set: 3.4171836380035247e-06
MeanAbsoluteError value on hold-out data: 0.0010480009950697422
Epoch: 376
Loss on hold-out set: 4.233249119177064e-06
MeanAbsoluteError value on hold-out data: 0.0011754706501960754
Epoch: 377

Loss on hold-out set: 3.844256368141102e-06
MeanAbsoluteError value on hold-out data: 0.0010271546198055148
Epoch: 378
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Loss on hold-out set: 4.972156917714388e-06
MeanAbsoluteError value on hold-out data: 0.0010053567821159959
Epoch: 379
Loss on hold-out set: 4.7097361088022945e-06
MeanAbsoluteError value on hold-out data: 0.0010727361077442765
Epoch: 380
Loss on hold-out set: 4.884353608339063e-06
MeanAbsoluteError value on hold-out data: 0.0011283823987469077
Epoch: 381
Loss on hold-out set: 4.837614592536109e-06
MeanAbsoluteError value on hold-out data: 0.00110627431422472
Epoch: 382
Loss on hold-out set: 5.2169361616996375e-06
MeanAbsoluteError value on hold-out data: 0.001157921738922596
Epoch: 383
Loss on hold-out set: 3.921859226570982e-06
MeanAbsoluteError value on hold-out data: 0.0010736099211499095
Epoch: 384


Loss on hold-out set: 4.270528716705695e-06
MeanAbsoluteError value on hold-out data: 0.001107213320210576
Epoch: 385


Loss on hold-out set: 5.2995145639355405e-06
MeanAbsoluteError value on hold-out data: 0.0012896285625174642
Epoch: 386
Loss on hold-out set: 6.91443194857409e-06
MeanAbsoluteError value on hold-out data: 0.0018442129949107766
Epoch: 387
Loss on hold-out set: 5.434389744498101e-06
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Epoch: 388
Loss on hold-out set: 5.021654731562054e-06
MeanAbsoluteError value on hold-out data: 0.0011641288874670863
Epoch: 389
Loss on hold-out set: 3.6552338586331575e-06
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Epoch: 390
Loss on hold-out set: 4.699471117839074e-05
MeanAbsoluteError value on hold-out data: 0.006734390277415514
Epoch: 391
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Loss on hold-out set: 5.418368783256693e-06
MeanAbsoluteError value on hold-out data: 0.0016007742378860712
Epoch: 392

Loss on hold-out set: 3.3239587476320876e-06
MeanAbsoluteError value on hold-out data: 0.0009509377414360642
Epoch: 393
Loss on hold-out set: 3.71413833459673e-06
MeanAbsoluteError value on hold-out data: 0.0009944040793925524
Epoch: 394
Loss on hold-out set: 4.157990629822122e-06
MeanAbsoluteError value on hold-out data: 0.0010471343994140625
Epoch: 395
Loss on hold-out set: 5.994305649455083e-06
MeanAbsoluteError value on hold-out data: 0.0011098894756287336
Epoch: 396
Loss on hold-out set: 4.512973840921684e-06
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Epoch: 397
Loss on hold-out set: 4.972880460102785e-06
MeanAbsoluteError value on hold-out data: 0.0011197589337825775
Epoch: 398

Loss on hold-out set: 0.0011726813618508913
MeanAbsoluteError value on hold-out data: 0.004452945664525032
Epoch: 399

Loss on hold-out set: 2.1635532913950765e-06
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Epoch: 400
Loss on hold-out set: 2.90860739281785e-06
MeanAbsoluteError value on hold-out data: 0.0010245970916002989
Epoch: 401
Loss on hold-out set: 2.9195517142327913e-06
MeanAbsoluteError value on hold-out data: 0.0009256425546482205
Epoch: 402
Loss on hold-out set: 3.1924598912470315e-06
MeanAbsoluteError value on hold-out data: 0.0009538065060041845
Epoch: 403
Loss on hold-out set: 3.607728248110876e-06
MeanAbsoluteError value on hold-out data: 0.0009771361947059631
Epoch: 404
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Loss on hold-out set: 3.898970290422837e-06
MeanAbsoluteError value on hold-out data: 0.0009882121812552214
Epoch: 405

Loss on hold-out set: 4.10419297316786e-06
MeanAbsoluteError value on hold-out data: 0.0010023735230788589
Epoch: 406

Loss on hold-out set: 4.188877135482891e-06
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Epoch: 407
Loss on hold-out set: 4.46561136868695e-06
MeanAbsoluteError value on hold-out data: 0.0011022979160770774
Epoch: 408
Loss on hold-out set: 4.589491750878621e-06
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Epoch: 409
Loss on hold-out set: 4.438893457658056e-06
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Epoch: 410
Loss on hold-out set: 4.602627307384375e-06
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Epoch: 411
Loss on hold-out set: 4.995811138996942e-06
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Epoch: 412

Loss on hold-out set: 4.652754101313733e-06
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Epoch: 413

Loss on hold-out set: 4.378464073904699e-06
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Epoch: 414
Loss on hold-out set: 4.595059550638325e-06
MeanAbsoluteError value on hold-out data: 0.0010580032831057906
Epoch: 415
Loss on hold-out set: 4.309355692664842e-06
MeanAbsoluteError value on hold-out data: 0.0010544885881245136
Epoch: 416
Loss on hold-out set: 4.311006115096041e-06
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MeanAbsoluteError value on hold-out data: 0.0010346194030717015
Epoch: 417
Loss on hold-out set: 4.29409384686061e-06
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Epoch: 418
Loss on hold-out set: 4.548328143108358e-06
MeanAbsoluteError value on hold-out data: 0.0011094467481598258
Epoch: 419

Loss on hold-out set: 4.41097744039955e-06
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Epoch: 420

Loss on hold-out set: 6.426378827375e-06
MeanAbsoluteError value on hold-out data: 0.0010305349715054035
Epoch: 421
Loss on hold-out set: 5.102000360378812e-06
MeanAbsoluteError value on hold-out data: 0.0011009594891220331
Epoch: 422
Loss on hold-out set: 6.068828729264798e-06
MeanAbsoluteError value on hold-out data: 0.0014805927639827132
Epoch: 423
Loss on hold-out set: 2.5612468688835247e-06
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Epoch: 424
Loss on hold-out set: 2.0931619662161e-06
MeanAbsoluteError value on hold-out data: 0.0009657815098762512
Epoch: 425
Loss on hold-out set: 2.169160788630856e-06
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Epoch: 426

Loss on hold-out set: 2.48836854246712e-06
MeanAbsoluteError value on hold-out data: 0.0009042999008670449
Epoch: 427

Loss on hold-out set: 1.5247725286826608e-06
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Epoch: 428
Loss on hold-out set: 1.888422096166883e-06
MeanAbsoluteError value on hold-out data: 0.0008715179283171892
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Epoch: 429
Loss on hold-out set: 3.626038858547313e-05
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Loss on hold-out set: 2.499007282407407e-06
MeanAbsoluteError value on hold-out data: 0.0008922040578909218
Epoch: 431
Loss on hold-out set: 2.628694392552251e-06
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Epoch: 432
Loss on hold-out set: 5.0028054330980994e-06
MeanAbsoluteError value on hold-out data: 0.001360772061161697
Epoch: 433

Loss on hold-out set: 3.5317390059984832e-06
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Epoch: 434

Loss on hold-out set: 3.5340822382050437e-06
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Epoch: 435
Loss on hold-out set: 3.7927673566593094e-06
MeanAbsoluteError value on hold-out data: 0.0009878667769953609
Epoch: 436
Loss on hold-out set: 4.292086823800044e-06
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Loss on hold-out set: 3.870704535284648e-06
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Epoch: 438
Loss on hold-out set: 9.499809334993888e-05
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Epoch: 439
Loss on hold-out set: 3.896016865977659e-06
MeanAbsoluteError value on hold-out data: 0.001001642202027142
Epoch: 440

Loss on hold-out set: 3.841652148121983e-06
MeanAbsoluteError value on hold-out data: 0.0009964604396373034
Epoch: 441
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Loss on hold-out set: 4.306866055860435e-06
MeanAbsoluteError value on hold-out data: 0.0012198480544611812
Epoch: 442
Loss on hold-out set: 3.552468235476716e-06
MeanAbsoluteError value on hold-out data: 0.0010478943586349487
Epoch: 443
Loss on hold-out set: 0.0018993879524793135
MeanAbsoluteError value on hold-out data: 0.00529368780553409
Epoch: 444
Loss on hold-out set: 4.189153390125984e-06
MeanAbsoluteError value on hold-out data: 0.0010156340431421995
Epoch: 445
Loss on hold-out set: 5.254383613471593e-06
MeanAbsoluteError value on hold-out data: 0.001178080914542079
Epoch: 446
Loss on hold-out set: 5.272817186498567e-06
MeanAbsoluteError value on hold-out data: 0.0012049865908920765
Epoch: 447

Loss on hold-out set: 9.79069227731508e-05
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Epoch: 448

Loss on hold-out set: 2.450642665070728e-06
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Epoch: 449
Loss on hold-out set: 3.872209066895056e-06
MeanAbsoluteError value on hold-out data: 0.0013830672251060605
Epoch: 450
Loss on hold-out set: 3.122057683832771e-06
MeanAbsoluteError value on hold-out data: 0.0009547538938932121
Epoch: 451
Loss on hold-out set: 3.8252652442539466e-06
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Epoch: 452
Loss on hold-out set: 4.167149164948989e-06
MeanAbsoluteError value on hold-out data: 0.0010868761455640197
Epoch: 453
Loss on hold-out set: 3.873338523764967e-06
MeanAbsoluteError value on hold-out data: 0.0010022022761404514
Epoch: 454
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Loss on hold-out set: 3.969914910857579e-06
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Epoch: 455

Loss on hold-out set: 3.916939144451485e-06
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Epoch: 456
Loss on hold-out set: 4.190466018354317e-06
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Epoch: 457
Loss on hold-out set: 2.916007557674815e-06
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Epoch: 458
Loss on hold-out set: 2.490087041451261e-06
MeanAbsoluteError value on hold-out data: 0.0009017908596433699
Epoch: 459
Loss on hold-out set: 6.788153069255014e-06
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Epoch: 460
Loss on hold-out set: 2.342763125922759e-06
MeanAbsoluteError value on hold-out data: 0.0009179662447422743
Epoch: 461

Loss on hold-out set: 3.2844516008131345e-06
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Epoch: 462

Loss on hold-out set: 4.3205403589861535e-06
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Epoch: 463
Loss on hold-out set: 8.063549452904575e-06
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Epoch: 464
Loss on hold-out set: 4.338111992296945e-06
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Epoch: 465
Loss on hold-out set: 4.164513355292981e-06
MeanAbsoluteError value on hold-out data: 0.0010195779614150524
Epoch: 466
Loss on hold-out set: 4.506275335923139e-06
MeanAbsoluteError value on hold-out data: 0.0011167819611728191
Epoch: 467
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Loss on hold-out set: 4.408081167639466e-06
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Epoch: 468

Loss on hold-out set: 5.1269333968006185e-06
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Epoch: 469

Loss on hold-out set: 5.67673508009228e-06
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Epoch: 470
Loss on hold-out set: 4.320968829373529e-06
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Epoch: 471
Loss on hold-out set: 4.210289786827231e-06
MeanAbsoluteError value on hold-out data: 0.0010499493218958378
Epoch: 472
Loss on hold-out set: 3.7191575953644274e-06
MeanAbsoluteError value on hold-out data: 0.0010102905798703432
Epoch: 473
Loss on hold-out set: 3.94043224852899e-06
MeanAbsoluteError value on hold-out data: 0.0010447980603203177
Epoch: 474
Loss on hold-out set: 3.7902531536596703e-06
MeanAbsoluteError value on hold-out data: 0.0010075144236907363
Epoch: 475

Loss on hold-out set: 4.745425284314619e-06
MeanAbsoluteError value on hold-out data: 0.0015641903737559915
Epoch: 476

Loss on hold-out set: 3.2720008326018265e-06
MeanAbsoluteError value on hold-out data: 0.001022517797537148
Epoch: 477
Loss on hold-out set: 3.3892503884439625e-06
MeanAbsoluteError value on hold-out data: 0.0009925169870257378
Epoch: 478
Loss on hold-out set: 3.976292869258312e-06
MeanAbsoluteError value on hold-out data: 0.0010300390422344208
Epoch: 479
Loss on hold-out set: 3.846819202871861e-06
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MeanAbsoluteError value on hold-out data: 0.0010454573202878237
Epoch: 480
Loss on hold-out set: 4.6910580697210835e-06
MeanAbsoluteError value on hold-out data: 0.0011387818958610296
Epoch: 481
Loss on hold-out set: 4.960021455574931e-06
MeanAbsoluteError value on hold-out data: 0.001119785476475954
Epoch: 482

Loss on hold-out set: 2.6952961889037397e-06
MeanAbsoluteError value on hold-out data: 0.0010017642052844167
Epoch: 483

Loss on hold-out set: 2.797400388597173e-06
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Epoch: 484
Loss on hold-out set: 2.8774284561887516e-06
MeanAbsoluteError value on hold-out data: 0.0009472080855630338
Epoch: 485
Loss on hold-out set: 3.103399441565321e-06
MeanAbsoluteError value on hold-out data: 0.0009706491255201399
Epoch: 486
Loss on hold-out set: 9.612701992759517e-06
MeanAbsoluteError value on hold-out data: 0.002846843097358942
Epoch: 487
Loss on hold-out set: 5.615922501734671e-06
MeanAbsoluteError value on hold-out data: 0.0011730770347639918
Epoch: 488
Loss on hold-out set: 4.889919447000816e-06
MeanAbsoluteError value on hold-out data: 0.0010671578347682953
Epoch: 489

Loss on hold-out set: 4.486747828790472e-06
MeanAbsoluteError value on hold-out data: 0.0010415789438411593
Early stopping at epoch 488
Fold: 9
Epoch: 1

Loss on hold-out set: 0.08763772908311623
MeanAbsoluteError value on hold-out data: 0.2589845657348633
Epoch: 2
```

```
Loss on hold-out set: 0.05169693008065224
MeanAbsoluteError value on hold-out data: 0.18769584596157074
Epoch: 3
Loss on hold-out set: 0.038326685245220475
MeanAbsoluteError value on hold-out data: 0.15445956587791443
Epoch: 4
Loss on hold-out set: 0.03165102535142349
MeanAbsoluteError value on hold-out data: 0.1366712749004364
Epoch: 5
Loss on hold-out set: 0.02927995458818399
MeanAbsoluteError value on hold-out data: 0.12465956807136536
Epoch: 6
Loss on hold-out set: 0.027583681046962738
MeanAbsoluteError value on hold-out data: 0.1188751682639122
Epoch: 7

Loss on hold-out set: 0.02486869929215083
MeanAbsoluteError value on hold-out data: 0.11606641858816147
Epoch: 8

Loss on hold-out set: 0.025163905301059667
MeanAbsoluteError value on hold-out data: 0.11523517966270447
Epoch: 9
Loss on hold-out set: 0.024263779274546184
MeanAbsoluteError value on hold-out data: 0.1148131787776947
Epoch: 10
Loss on hold-out set: 0.024206544559162397
MeanAbsoluteError value on hold-out data: 0.11455471813678741
Epoch: 11
Loss on hold-out set: 0.024012008726668473
MeanAbsoluteError value on hold-out data: 0.11432518810033798
Epoch: 12
Loss on hold-out set: 0.023992262315005064
MeanAbsoluteError value on hold-out data: 0.11393501609563828
Epoch: 13
Loss on hold-out set: 0.023971005486181148
MeanAbsoluteError value on hold-out data: 0.11364789307117462
Epoch: 14

Loss on hold-out set: 0.02440082854949511
MeanAbsoluteError value on hold-out data: 0.11341404169797897
Epoch: 15
```

```
Loss on hold-out set: 0.024008389096707106
MeanAbsoluteError value on hold-out data: 0.1131625548005104
Epoch: 16
Loss on hold-out set: 0.0260573485507988
MeanAbsoluteError value on hold-out data: 0.11293529719114304
Epoch: 17
Loss on hold-out set: 0.02657114087532346
MeanAbsoluteError value on hold-out data: 0.11272022873163223
Epoch: 18
Loss on hold-out set: 0.023849784611509398
MeanAbsoluteError value on hold-out data: 0.11246219277381897
Epoch: 19
Loss on hold-out set: 0.024170817305835392
MeanAbsoluteError value on hold-out data: 0.11222673207521439
Epoch: 20
Loss on hold-out set: 0.02337966153684717
MeanAbsoluteError value on hold-out data: 0.11192638427019119
Epoch: 21


Loss on hold-out set: 0.024277654118262805
MeanAbsoluteError value on hold-out data: 0.11162230372428894
Epoch: 22


Loss on hold-out set: 0.023304810317663047
MeanAbsoluteError value on hold-out data: 0.11134185642004013
Epoch: 23
Loss on hold-out set: 0.023034033938669242
MeanAbsoluteError value on hold-out data: 0.11106621474027634
Epoch: 24
Loss on hold-out set: 0.023399380393899404
MeanAbsoluteError value on hold-out data: 0.11077079176902771
Epoch: 25
Loss on hold-out set: 0.02378111737422072
MeanAbsoluteError value on hold-out data: 0.11050345748662949
Epoch: 26
Loss on hold-out set: 0.022344475719504632
MeanAbsoluteError value on hold-out data: 0.11016280949115753
Epoch: 27
Loss on hold-out set: 0.024405193550942037
MeanAbsoluteError value on hold-out data: 0.10987690091133118
Epoch: 28
```

```
Loss on hold-out set: 0.022747429804160044
MeanAbsoluteError value on hold-out data: 0.10951533913612366
Epoch: 29

Loss on hold-out set: 0.022126282636935894
MeanAbsoluteError value on hold-out data: 0.1091582179069519
Epoch: 30
Loss on hold-out set: 0.023142689301703986
MeanAbsoluteError value on hold-out data: 0.1086200550198555
Epoch: 31
Loss on hold-out set: 0.02268921838213618
MeanAbsoluteError value on hold-out data: 0.10854298621416092
Epoch: 32
Loss on hold-out set: 0.02182196736192474
MeanAbsoluteError value on hold-out data: 0.108118936419487
Epoch: 33
Loss on hold-out set: 0.02133709890767932
MeanAbsoluteError value on hold-out data: 0.10774173587560654
Epoch: 34
Loss on hold-out set: 0.02285297861537681
MeanAbsoluteError value on hold-out data: 0.10742288827896118
Epoch: 35

Loss on hold-out set: 0.021880896690373238
MeanAbsoluteError value on hold-out data: 0.10695871710777283
Epoch: 36

Loss on hold-out set: 0.021296901162713766
MeanAbsoluteError value on hold-out data: 0.10652241110801697
Epoch: 37
Loss on hold-out set: 0.020664595765993
MeanAbsoluteError value on hold-out data: 0.10610426962375641
Epoch: 38
Loss on hold-out set: 0.02067063247355131
MeanAbsoluteError value on hold-out data: 0.10570148378610611
Epoch: 39
Loss on hold-out set: 0.021079593069421556
MeanAbsoluteError value on hold-out data: 0.10523179918527603
Epoch: 40
Loss on hold-out set: 0.02089791178989869
MeanAbsoluteError value on hold-out data: 0.10476779192686081
Epoch: 41
```

```
Loss on hold-out set: 0.020083774597598955
MeanAbsoluteError value on hold-out data: 0.10426082462072372
Epoch: 42

Loss on hold-out set: 0.01971640522018648
MeanAbsoluteError value on hold-out data: 0.10377226769924164
Epoch: 43

Loss on hold-out set: 0.02013098491499057
MeanAbsoluteError value on hold-out data: 0.10326062887907028
Epoch: 44
Loss on hold-out set: 0.019339582381340172
MeanAbsoluteError value on hold-out data: 0.10273539274930954
Epoch: 45
Loss on hold-out set: 0.019051376891394075
MeanAbsoluteError value on hold-out data: 0.10215163975954056
Epoch: 46
Loss on hold-out set: 0.018863172539008353
MeanAbsoluteError value on hold-out data: 0.1016269102692604
Epoch: 47
Loss on hold-out set: 0.02077208674297883
MeanAbsoluteError value on hold-out data: 0.10102906823158264
Epoch: 48
Loss on hold-out set: 0.018978089273262482
MeanAbsoluteError value on hold-out data: 0.1004648506641388
Epoch: 49

Loss on hold-out set: 0.01841418334068014
MeanAbsoluteError value on hold-out data: 0.0998820886015892
Epoch: 50

Loss on hold-out set: 0.019108822139409874
MeanAbsoluteError value on hold-out data: 0.0992875024676323
Epoch: 51
Loss on hold-out set: 0.018192051587483056
MeanAbsoluteError value on hold-out data: 0.09867828339338303
Epoch: 52
Loss on hold-out set: 0.01750866103415879
MeanAbsoluteError value on hold-out data: 0.09807048738002777
Epoch: 53
Loss on hold-out set: 0.018025804373722237
```

```
MeanAbsoluteError value on hold-out data: 0.09741871058940887
Epoch: 54
Loss on hold-out set: 0.01730026938737585
MeanAbsoluteError value on hold-out data: 0.09675966948270798
Epoch: 55
Loss on hold-out set: 0.018964240399117652
MeanAbsoluteError value on hold-out data: 0.09608063101768494
Epoch: 56

Loss on hold-out set: 0.01675908063323452
MeanAbsoluteError value on hold-out data: 0.09539607912302017
Epoch: 57

Loss on hold-out set: 0.016544466874060724
MeanAbsoluteError value on hold-out data: 0.09469114243984222
Epoch: 58
Loss on hold-out set: 0.016054631461604282
MeanAbsoluteError value on hold-out data: 0.09405823051929474
Epoch: 59
Loss on hold-out set: 0.015939638627549775
MeanAbsoluteError value on hold-out data: 0.09324809163808823
Epoch: 60
Loss on hold-out set: 0.01591344869050842
MeanAbsoluteError value on hold-out data: 0.0924835205078125
Epoch: 61
Loss on hold-out set: 0.01709092866915923
MeanAbsoluteError value on hold-out data: 0.09185221791267395
Epoch: 62
Loss on hold-out set: 0.015246796851547865
MeanAbsoluteError value on hold-out data: 0.09105817973613739
Epoch: 63

Loss on hold-out set: 0.016447612272503857
MeanAbsoluteError value on hold-out data: 0.09023509174585342
Epoch: 64

Loss on hold-out set: 0.01466787183800569
MeanAbsoluteError value on hold-out data: 0.08943399786949158
Epoch: 65
Loss on hold-out set: 0.014631494879722595
MeanAbsoluteError value on hold-out data: 0.08869913965463638
```

```
Epoch: 66
Loss on hold-out set: 0.015539624710352374
MeanAbsoluteError value on hold-out data: 0.08789991587400436
Epoch: 67
Loss on hold-out set: 0.014001005078450991
MeanAbsoluteError value on hold-out data: 0.0871296301484108
Epoch: 68
Loss on hold-out set: 0.013516370663777567
MeanAbsoluteError value on hold-out data: 0.08627200871706009
Epoch: 69
Loss on hold-out set: 0.014178416440979792
MeanAbsoluteError value on hold-out data: 0.08547243475914001
Epoch: 70

Loss on hold-out set: 0.015097657630506616
MeanAbsoluteError value on hold-out data: 0.08460266143083572
Epoch: 71

Loss on hold-out set: 0.012598798861010717
MeanAbsoluteError value on hold-out data: 0.08378784358501434
Epoch: 72
Loss on hold-out set: 0.013220662394395242
MeanAbsoluteError value on hold-out data: 0.08298253268003464
Epoch: 73
Loss on hold-out set: 0.012385844790305082
MeanAbsoluteError value on hold-out data: 0.08212994784116745
Epoch: 74
Loss on hold-out set: 0.012075603563481798
MeanAbsoluteError value on hold-out data: 0.08130958676338196
Epoch: 75
Loss on hold-out set: 0.011578002192366581
MeanAbsoluteError value on hold-out data: 0.08058610558509827
Epoch: 76
Loss on hold-out set: 0.011357371355048738
MeanAbsoluteError value on hold-out data: 0.07966290414333344
Epoch: 77

Loss on hold-out set: 0.011441566856004871
MeanAbsoluteError value on hold-out data: 0.0788363516330719
Epoch: 78
```

```
Loss on hold-out set: 0.011142374213355092
MeanAbsoluteError value on hold-out data: 0.07811503112316132
Epoch: 79
Loss on hold-out set: 0.010463474882551683
MeanAbsoluteError value on hold-out data: 0.07729624956846237
Epoch: 80
Loss on hold-out set: 0.01032598176971078
MeanAbsoluteError value on hold-out data: 0.0763288289308548
Epoch: 81
Loss on hold-out set: 0.009938018369631698
MeanAbsoluteError value on hold-out data: 0.07556600123643875
Epoch: 82
Loss on hold-out set: 0.010709381411568476
MeanAbsoluteError value on hold-out data: 0.07629904896020889
Epoch: 83
Loss on hold-out set: 0.009855729778512167
MeanAbsoluteError value on hold-out data: 0.07390300929546356
Epoch: 84

Loss on hold-out set: 0.009595765499398112
MeanAbsoluteError value on hold-out data: 0.0728994831442833
Epoch: 85

Loss on hold-out set: 0.010456013940991117
MeanAbsoluteError value on hold-out data: 0.07213059067726135
Epoch: 86
Loss on hold-out set: 0.008751966918890294
MeanAbsoluteError value on hold-out data: 0.07136222720146179
Epoch: 87
Loss on hold-out set: 0.008517935012395565
MeanAbsoluteError value on hold-out data: 0.07038675993680954
Epoch: 88
Loss on hold-out set: 0.00862741180194112
MeanAbsoluteError value on hold-out data: 0.06976805627346039
Epoch: 89
Loss on hold-out set: 0.008321147304601394
MeanAbsoluteError value on hold-out data: 0.06906615197658539
Epoch: 90
Loss on hold-out set: 0.0085554111462373
MeanAbsoluteError value on hold-out data: 0.06773469597101212
Epoch: 91
```

```
Loss on hold-out set: 0.00782206396643932
MeanAbsoluteError value on hold-out data: 0.0672268345952034
Epoch: 92

Loss on hold-out set: 0.007553931791335344
MeanAbsoluteError value on hold-out data: 0.06640372425317764
Epoch: 93
Loss on hold-out set: 0.007158070838508697
MeanAbsoluteError value on hold-out data: 0.06517044454813004
Epoch: 94
Loss on hold-out set: 0.007033975938191781
MeanAbsoluteError value on hold-out data: 0.06439521908760071
Epoch: 95
Loss on hold-out set: 0.0069056042971519325
MeanAbsoluteError value on hold-out data: 0.06341598182916641
Epoch: 96
Loss on hold-out set: 0.0069175220291631725
MeanAbsoluteError value on hold-out data: 0.06257735192775726
Epoch: 97
Loss on hold-out set: 0.00629668772363892
MeanAbsoluteError value on hold-out data: 0.06170196086168289
Epoch: 98

Loss on hold-out set: 0.006147415699580541
MeanAbsoluteError value on hold-out data: 0.060893215239048004
Epoch: 99

Loss on hold-out set: 0.005968622343901258
MeanAbsoluteError value on hold-out data: 0.060159023851156235
Epoch: 100
Loss on hold-out set: 0.006022305550196996
MeanAbsoluteError value on hold-out data: 0.059117525815963745
Epoch: 101
Loss on hold-out set: 0.005698936364541833
MeanAbsoluteError value on hold-out data: 0.05813603475689888
Epoch: 102
Loss on hold-out set: 0.005513413070450322
MeanAbsoluteError value on hold-out data: 0.05723254755139351
Epoch: 103
Loss on hold-out set: 0.005237467497443924
MeanAbsoluteError value on hold-out data: 0.05635804310441017
Epoch: 104
```

```
Loss on hold-out set: 0.005229908829698196
MeanAbsoluteError value on hold-out data: 0.05547954887151718
Epoch: 105

Loss on hold-out set: 0.005059760995209217
MeanAbsoluteError value on hold-out data: 0.05487629771232605
Epoch: 106

Loss on hold-out set: 0.004709124627809685
MeanAbsoluteError value on hold-out data: 0.0537349171936512
Epoch: 107
Loss on hold-out set: 0.004543107007451069
MeanAbsoluteError value on hold-out data: 0.05297128111124039
Epoch: 108
Loss on hold-out set: 0.0043934609543961976
MeanAbsoluteError value on hold-out data: 0.0519934743642807
Epoch: 109
Loss on hold-out set: 0.004270383210566182
MeanAbsoluteError value on hold-out data: 0.05114172026515007
Epoch: 110
Loss on hold-out set: 0.0040626511550866645
MeanAbsoluteError value on hold-out data: 0.05017685517668724
Epoch: 111
Loss on hold-out set: 0.004068396645239913
MeanAbsoluteError value on hold-out data: 0.04955609142780304
Epoch: 112

Loss on hold-out set: 0.0038401755737140775
MeanAbsoluteError value on hold-out data: 0.048863254487514496
Epoch: 113

Loss on hold-out set: 0.003764624532777816
MeanAbsoluteError value on hold-out data: 0.04758407920598984
Epoch: 114
Loss on hold-out set: 0.0035822631056921985
MeanAbsoluteError value on hold-out data: 0.04729593172669411
Epoch: 115
Loss on hold-out set: 0.0035333186746216738
MeanAbsoluteError value on hold-out data: 0.04647309333086014
Epoch: 116
Loss on hold-out set: 0.0032287347712554038
```

```
MeanAbsoluteError value on hold-out data: 0.0451241172850132
Epoch: 117
Loss on hold-out set: 0.0035276970414158245
MeanAbsoluteError value on hold-out data: 0.044337257742881775
Epoch: 118
Loss on hold-out set: 0.003360291665348296
MeanAbsoluteError value on hold-out data: 0.04443378373980522
Epoch: 119

Loss on hold-out set: 0.0028785295659103072
MeanAbsoluteError value on hold-out data: 0.04273002967238426
Epoch: 120

Loss on hold-out set: 0.0032585888805512627
MeanAbsoluteError value on hold-out data: 0.042431727051734924
Epoch: 121
Loss on hold-out set: 0.002664570642921787
MeanAbsoluteError value on hold-out data: 0.04124447703361511
Epoch: 122
Loss on hold-out set: 0.002560501165974599
MeanAbsoluteError value on hold-out data: 0.04026155546307564
Epoch: 123
Loss on hold-out set: 0.002554946010395025
MeanAbsoluteError value on hold-out data: 0.040177442133426666
Epoch: 124
Loss on hold-out set: 0.002359220955091027
MeanAbsoluteError value on hold-out data: 0.0390687920153141
Epoch: 125
Loss on hold-out set: 0.002250808013531451
MeanAbsoluteError value on hold-out data: 0.03793637081980705
Epoch: 126

Loss on hold-out set: 0.0022038038766298155
MeanAbsoluteError value on hold-out data: 0.03758760169148445
Epoch: 127

Loss on hold-out set: 0.010700179881846102
MeanAbsoluteError value on hold-out data: 0.04280359670519829
Epoch: 128
Loss on hold-out set: 0.0020747950273709227
MeanAbsoluteError value on hold-out data: 0.03611496090888977
```

```
Epoch: 129
Loss on hold-out set: 0.001908342736826923
MeanAbsoluteError value on hold-out data: 0.03488444164395332
Epoch: 130
Loss on hold-out set: 0.0018124238749106342
MeanAbsoluteError value on hold-out data: 0.0337410569190979
Epoch: 131
Loss on hold-out set: 0.0017437255189109307
MeanAbsoluteError value on hold-out data: 0.03344589099287987
Epoch: 132
Loss on hold-out set: 0.0017237015328226755
MeanAbsoluteError value on hold-out data: 0.03353263810276985
Epoch: 133

Loss on hold-out set: 0.0015722059179097414
MeanAbsoluteError value on hold-out data: 0.031555887311697006
Epoch: 134

Loss on hold-out set: 0.001472744692224436
MeanAbsoluteError value on hold-out data: 0.03069319576025009
Epoch: 135
Loss on hold-out set: 0.0014497535571885796
MeanAbsoluteError value on hold-out data: 0.030262527987360954
Epoch: 136
Loss on hold-out set: 0.001314416008356672
MeanAbsoluteError value on hold-out data: 0.02910608984529972
Epoch: 137
Loss on hold-out set: 0.001303451912602983
MeanAbsoluteError value on hold-out data: 0.028888078406453133
Epoch: 138
Loss on hold-out set: 0.001226148749433028
MeanAbsoluteError value on hold-out data: 0.027716293931007385
Epoch: 139
Loss on hold-out set: 0.001188081207846363
MeanAbsoluteError value on hold-out data: 0.027346527203917503
Epoch: 140

Loss on hold-out set: 0.001083315856074198
MeanAbsoluteError value on hold-out data: 0.0265905000269413
Epoch: 141
```

```
Loss on hold-out set: 0.0010275105238319016
MeanAbsoluteError value on hold-out data: 0.02535007894039154
Epoch: 142
Loss on hold-out set: 0.0009583860787992867
MeanAbsoluteError value on hold-out data: 0.02430582232773304
Epoch: 143
Loss on hold-out set: 0.0008927328476252464
MeanAbsoluteError value on hold-out data: 0.023735154420137405
Epoch: 144
Loss on hold-out set: 0.0008329201776247758
MeanAbsoluteError value on hold-out data: 0.023167148232460022
Epoch: 145
Loss on hold-out set: 0.0007649555717272541
MeanAbsoluteError value on hold-out data: 0.02239779382944107
Epoch: 146
Loss on hold-out set: 0.0006369553963080621
MeanAbsoluteError value on hold-out data: 0.020860228687524796
Epoch: 147

Loss on hold-out set: 0.0010151717041690762
MeanAbsoluteError value on hold-out data: 0.022370433434844017
Epoch: 148

Loss on hold-out set: 0.000615833543214159
MeanAbsoluteError value on hold-out data: 0.02004016935825348
Epoch: 149
Loss on hold-out set: 0.0005842474257895866
MeanAbsoluteError value on hold-out data: 0.01921270787715912
Epoch: 150
Loss on hold-out set: 0.0005198825159683251
MeanAbsoluteError value on hold-out data: 0.01845644600689411
Epoch: 151
Loss on hold-out set: 0.0004639777124304181
MeanAbsoluteError value on hold-out data: 0.01731911115348339
Epoch: 152
Loss on hold-out set: 0.00044562068964856176
MeanAbsoluteError value on hold-out data: 0.01717422343790531
Epoch: 153
Loss on hold-out set: 0.00040510059289562586
MeanAbsoluteError value on hold-out data: 0.01614685356616974
Epoch: 154
```

```
Loss on hold-out set: 0.00040649330521074054
MeanAbsoluteError value on hold-out data: 0.015493017621338367
Epoch: 155

Loss on hold-out set: 0.00038028729501932574
MeanAbsoluteError value on hold-out data: 0.015120459720492363
Epoch: 156
Loss on hold-out set: 0.00029818974032353324
MeanAbsoluteError value on hold-out data: 0.013904638588428497
Epoch: 157
Loss on hold-out set: 0.0002947138010103327
MeanAbsoluteError value on hold-out data: 0.013583955354988575
Epoch: 158
Loss on hold-out set: 0.0002472981454607529
MeanAbsoluteError value on hold-out data: 0.01262404303997755
Epoch: 159
Loss on hold-out set: 0.0034301531245896164
MeanAbsoluteError value on hold-out data: 0.017638932913541794
Epoch: 160
Loss on hold-out set: 0.0002307792596044377
MeanAbsoluteError value on hold-out data: 0.011736954562366009
Epoch: 161

Loss on hold-out set: 0.00018686410979940914
MeanAbsoluteError value on hold-out data: 0.011120467446744442
Epoch: 162

Loss on hold-out set: 0.0001586858835742952
MeanAbsoluteError value on hold-out data: 0.010145945474505424
Epoch: 163
Loss on hold-out set: 0.00014864802450084916
MeanAbsoluteError value on hold-out data: 0.009547734633088112
Epoch: 164
Loss on hold-out set: 0.00012737820445461414
MeanAbsoluteError value on hold-out data: 0.009070198982954025
Epoch: 165
Loss on hold-out set: 0.00010717174882302061
MeanAbsoluteError value on hold-out data: 0.008422811515629292
Epoch: 166
Loss on hold-out set: 0.00010439689420029306
MeanAbsoluteError value on hold-out data: 0.007989034987986088
Epoch: 167
```

```
Loss on hold-out set: 8.214640645466995e-05
MeanAbsoluteError value on hold-out data: 0.007393079809844494
Epoch: 168

Loss on hold-out set: 8.274951715765592e-05
MeanAbsoluteError value on hold-out data: 0.007173461839556694
Epoch: 169

Loss on hold-out set: 6.656568761032898e-05
MeanAbsoluteError value on hold-out data: 0.006593789905309677
Epoch: 170
Loss on hold-out set: 5.4048336376301726e-05
MeanAbsoluteError value on hold-out data: 0.005962380673736334
Epoch: 171
Loss on hold-out set: 4.666455151891569e-05
MeanAbsoluteError value on hold-out data: 0.005483964458107948
Epoch: 172
Loss on hold-out set: 4.389978899920467e-05
MeanAbsoluteError value on hold-out data: 0.005370074417442083
Epoch: 173
Loss on hold-out set: 3.3043314733032064e-05
MeanAbsoluteError value on hold-out data: 0.004677259363234043
Epoch: 174
Loss on hold-out set: 2.880554830671127e-05
MeanAbsoluteError value on hold-out data: 0.004214885178953409
Epoch: 175

Loss on hold-out set: 3.840065101730243e-05
MeanAbsoluteError value on hold-out data: 0.004997940734028816
Epoch: 176

Loss on hold-out set: 2.1319129700714257e-05
MeanAbsoluteError value on hold-out data: 0.0036885770969092846
Epoch: 177
Loss on hold-out set: 1.9085271385567747e-05
MeanAbsoluteError value on hold-out data: 0.003502724226564169
Epoch: 178
Loss on hold-out set: 1.4295527360165859e-05
MeanAbsoluteError value on hold-out data: 0.0030539832077920437
Epoch: 179
Loss on hold-out set: 3.966367657645046e-05
```

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MeanAbsoluteError value on hold-out data: 0.0037111775018274784
Epoch: 180
Loss on hold-out set: 1.1714169781603581e-05
MeanAbsoluteError value on hold-out data: 0.0026790108531713486
Epoch: 181
Loss on hold-out set: 8.180931991738851e-06
MeanAbsoluteError value on hold-out data: 0.002324730856344104
Epoch: 182

Loss on hold-out set: 7.564605154514608e-06
MeanAbsoluteError value on hold-out data: 0.002093647373840213
Epoch: 183

Loss on hold-out set: 6.500206898006301e-06
MeanAbsoluteError value on hold-out data: 0.0020413731690496206
Epoch: 184
Loss on hold-out set: 4.368224853561304e-06
MeanAbsoluteError value on hold-out data: 0.001666800118982792
Epoch: 185
Loss on hold-out set: 3.303089259204101e-06
MeanAbsoluteError value on hold-out data: 0.0014571902574971318
Epoch: 186
Loss on hold-out set: 2.8786991886310998e-06
MeanAbsoluteError value on hold-out data: 0.0013408162631094456
Epoch: 187
Loss on hold-out set: 2.3949934302436304e-06
MeanAbsoluteError value on hold-out data: 0.0012195846065878868
Epoch: 188
Loss on hold-out set: 2.3683622491542055e-06
MeanAbsoluteError value on hold-out data: 0.001179470564238727
Epoch: 189

Loss on hold-out set: 1.678288830712168e-06
MeanAbsoluteError value on hold-out data: 0.0010406801011413336
Epoch: 190

Loss on hold-out set: 1.4433571460760784e-06
MeanAbsoluteError value on hold-out data: 0.0009489934309385717
Epoch: 191
Loss on hold-out set: 1.3067521535958804e-06
MeanAbsoluteError value on hold-out data: 0.0008988071931526065
```

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Epoch: 192
Loss on hold-out set: 1.2073912588360913e-06
MeanAbsoluteError value on hold-out data: 0.0008702184422872961
Epoch: 193
Loss on hold-out set: 1.1535853904940898e-06
MeanAbsoluteError value on hold-out data: 0.0008193923276849091
Epoch: 194
Loss on hold-out set: 1.5691683516321903e-06
MeanAbsoluteError value on hold-out data: 0.0009550294489599764
Epoch: 195
Loss on hold-out set: 1.9397720883227103e-06
MeanAbsoluteError value on hold-out data: 0.0010641945991665125
Epoch: 196

Loss on hold-out set: 2.0415083930367054e-06
MeanAbsoluteError value on hold-out data: 0.0011128440964967012
Epoch: 197

Loss on hold-out set: 1.977939686744671e-05
MeanAbsoluteError value on hold-out data: 0.0042868684977293015
Epoch: 198
Loss on hold-out set: 1.6537438664972096e-06
MeanAbsoluteError value on hold-out data: 0.0010342005407437682
Epoch: 199
Loss on hold-out set: 1.9593228968845392e-06
MeanAbsoluteError value on hold-out data: 0.001117122475989163
Epoch: 200
Loss on hold-out set: 1.2987952052648884e-06
MeanAbsoluteError value on hold-out data: 0.0009237830527126789
Epoch: 201
Loss on hold-out set: 2.321818075100824e-06
MeanAbsoluteError value on hold-out data: 0.0012300768867135048
Epoch: 202
Loss on hold-out set: 1.0761470915755267e-06
MeanAbsoluteError value on hold-out data: 0.000824169663246721
Epoch: 203

Loss on hold-out set: 0.0004843606389390341
MeanAbsoluteError value on hold-out data: 0.0041178083047270775
Epoch: 204
```

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Loss on hold-out set: 9.8053214751067e-07
MeanAbsoluteError value on hold-out data: 0.0007769912481307983
Epoch: 205
Loss on hold-out set: 1.3709141626350174e-06
MeanAbsoluteError value on hold-out data: 0.0008864410337992013
Epoch: 206
Loss on hold-out set: 5.037406915037606e-05
MeanAbsoluteError value on hold-out data: 0.007059750147163868
Epoch: 207
Loss on hold-out set: 1.839195778512266e-06
MeanAbsoluteError value on hold-out data: 0.0011223464971408248
Epoch: 208
Loss on hold-out set: 1.3206266854782511e-06
MeanAbsoluteError value on hold-out data: 0.0008280479814857244
Epoch: 209
Loss on hold-out set: 1.4827328326506317e-06
MeanAbsoluteError value on hold-out data: 0.0009073921828530729
Epoch: 210

Loss on hold-out set: 2.645125055795898e-05
MeanAbsoluteError value on hold-out data: 0.0016312943771481514
Epoch: 211

Loss on hold-out set: 1.1618071285878473e-06
MeanAbsoluteError value on hold-out data: 0.0008440464735031128
Epoch: 212
Loss on hold-out set: 1.0317512139688636e-06
MeanAbsoluteError value on hold-out data: 0.0007864510989747941
Epoch: 213
Loss on hold-out set: 0.001522656875480904
MeanAbsoluteError value on hold-out data: 0.004727046936750412
Epoch: 214
Loss on hold-out set: 1.1081025289828317e-06
MeanAbsoluteError value on hold-out data: 0.000797022134065628
Epoch: 215
Loss on hold-out set: 2.4654449405786113e-06
MeanAbsoluteError value on hold-out data: 0.0012574531137943268
Epoch: 216
Loss on hold-out set: 1.8163784934935952e-06
MeanAbsoluteError value on hold-out data: 0.0010542540112510324
Epoch: 217
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Loss on hold-out set: 2.0660887947507526e-06
MeanAbsoluteError value on hold-out data: 0.0010626285802572966
Epoch: 218

Loss on hold-out set: 2.322338642758181e-06
MeanAbsoluteError value on hold-out data: 0.001153207616880536
Epoch: 219
Loss on hold-out set: 2.556165375503602e-06
MeanAbsoluteError value on hold-out data: 0.001306926365941763
Epoch: 220
Loss on hold-out set: 1.2058907565495667e-06
MeanAbsoluteError value on hold-out data: 0.000832038524094969
Epoch: 221
Loss on hold-out set: 1.7563166658454486e-06
MeanAbsoluteError value on hold-out data: 0.0009806102607399225
Epoch: 222
Loss on hold-out set: 1.345331231032805e-06
MeanAbsoluteError value on hold-out data: 0.0008497365051880479
Epoch: 223
Loss on hold-out set: 1.1487926179562726e-06
MeanAbsoluteError value on hold-out data: 0.0008450070163235068
Epoch: 224

Loss on hold-out set: 1.0456112092400033e-06
MeanAbsoluteError value on hold-out data: 0.0007789289811626077
Epoch: 225

Loss on hold-out set: 9.97684034805738e-07
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Epoch: 226
Loss on hold-out set: 9.81240571735935e-07
MeanAbsoluteError value on hold-out data: 0.0007587021682411432
Epoch: 227
Loss on hold-out set: 1.4361563496724837e-06
MeanAbsoluteError value on hold-out data: 0.0009066672646440566
Epoch: 228
Loss on hold-out set: 1.100924035969141e-06
MeanAbsoluteError value on hold-out data: 0.0007591668982058764
Epoch: 229
Loss on hold-out set: 1.0801945200875287e-06
MeanAbsoluteError value on hold-out data: 0.0007719174027442932
Epoch: 230
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Loss on hold-out set: 1.1767862352266652e-06
MeanAbsoluteError value on hold-out data: 0.0008649139781482518
Epoch: 231

Loss on hold-out set: 0.002744149530653973
MeanAbsoluteError value on hold-out data: 0.006124515552073717
Epoch: 232

Loss on hold-out set: 0.004391504542779829
MeanAbsoluteError value on hold-out data: 0.007541081868112087
Epoch: 233
Loss on hold-out set: 1.0386973157822538e-06
MeanAbsoluteError value on hold-out data: 0.0007683836156502366
Epoch: 234
Loss on hold-out set: 1.0213720363830921e-06
MeanAbsoluteError value on hold-out data: 0.0007471376447938383
Epoch: 235
Loss on hold-out set: 1.010225428916993e-06
MeanAbsoluteError value on hold-out data: 0.0007364635239355266
Epoch: 236
Loss on hold-out set: 2.4496055131679055e-05
MeanAbsoluteError value on hold-out data: 0.0012645217357203364
Epoch: 237
Loss on hold-out set: 9.136756833509725e-07
MeanAbsoluteError value on hold-out data: 0.0007426303345710039
Epoch: 238

Loss on hold-out set: 9.109645687361151e-07
MeanAbsoluteError value on hold-out data: 0.0007353721302933991
Epoch: 239

Loss on hold-out set: 1.007026001458983e-06
MeanAbsoluteError value on hold-out data: 0.0007631480693817139
Epoch: 240
Loss on hold-out set: 1.02646738425322e-06
MeanAbsoluteError value on hold-out data: 0.0007492218865081668
Epoch: 241
Loss on hold-out set: 9.76074112202241e-07
MeanAbsoluteError value on hold-out data: 0.0007355491979978979
Epoch: 242
Loss on hold-out set: 9.306184814214738e-07

MeanAbsoluteError value on hold-out data: 0.0007153038750402629
Epoch: 243
Loss on hold-out set: 1.0156765138337785e-06
MeanAbsoluteError value on hold-out data: 0.0007360282470472157
Epoch: 244
Loss on hold-out set: 8.919176891070563e-07
MeanAbsoluteError value on hold-out data: 0.0007106547127477825
Epoch: 245

Loss on hold-out set: 3.3981422732792384e-06
MeanAbsoluteError value on hold-out data: 0.001501013059169054
Epoch: 246

Loss on hold-out set: 1.0482103723811283e-06
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Epoch: 247
Loss on hold-out set: 1.1616448974704185e-06
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Epoch: 248
Loss on hold-out set: 2.1269975762222134e-06
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Epoch: 249
Loss on hold-out set: 1.4750206586401105e-06
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Epoch: 250
Loss on hold-out set: 1.0546644113254354e-06
MeanAbsoluteError value on hold-out data: 0.0007525432156398892
Epoch: 251
Loss on hold-out set: 9.90633955447825e-07
MeanAbsoluteError value on hold-out data: 0.0007255934178829193
Epoch: 252

Loss on hold-out set: 5.7279632244444656e-05
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Epoch: 253

Loss on hold-out set: 1.1564841534331767e-06
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Epoch: 254
Loss on hold-out set: 9.756553341643526e-07
MeanAbsoluteError value on hold-out data: 0.0007194139179773629

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Epoch: 255
Loss on hold-out set: 8.822158205335794e-07
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Epoch: 256
Loss on hold-out set: 2.037419348583241e-06
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Epoch: 257
Loss on hold-out set: 1.0046783059508996e-06
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Epoch: 258
Loss on hold-out set: 9.406523549142338e-07
MeanAbsoluteError value on hold-out data: 0.0007423069910146296
Epoch: 259

Loss on hold-out set: 9.58411400977009e-07
MeanAbsoluteError value on hold-out data: 0.0007604727288708091
Epoch: 260

Loss on hold-out set: 1.2442427357830009e-06
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Epoch: 261
Loss on hold-out set: 9.618168257055424e-07
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Epoch: 262
Loss on hold-out set: 9.35844533299902e-06
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Epoch: 263
Loss on hold-out set: 1.5958179040773337e-06
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Epoch: 264
Loss on hold-out set: 0.0016067682576896493
MeanAbsoluteError value on hold-out data: 0.005019558593630791
Epoch: 265
Loss on hold-out set: 1.932014924932446e-06
MeanAbsoluteError value on hold-out data: 0.0010614586062729359
Epoch: 266

Loss on hold-out set: 1.549133256818235e-06
MeanAbsoluteError value on hold-out data: 0.0009363361168652773
Epoch: 267
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Loss on hold-out set: 1.2699045288837415e-06
MeanAbsoluteError value on hold-out data: 0.000841915316414088
Epoch: 268
Loss on hold-out set: 1.3344055006952588e-06
MeanAbsoluteError value on hold-out data: 0.0009152060956694186
Epoch: 269
Loss on hold-out set: 1.1550842071546167e-06
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Epoch: 270
Loss on hold-out set: 1.971498722223959e-06
MeanAbsoluteError value on hold-out data: 0.0011313920840620995
Epoch: 271
Loss on hold-out set: 0.0018191849950076526
MeanAbsoluteError value on hold-out data: 0.005182245746254921
Epoch: 272
Loss on hold-out set: 1.0167243457404907e-06
MeanAbsoluteError value on hold-out data: 0.0007435980369336903
Epoch: 273

Loss on hold-out set: 9.244870441831993e-07
MeanAbsoluteError value on hold-out data: 0.0007299067219719291
Epoch: 274

Loss on hold-out set: 8.803281795840471e-07
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Epoch: 275
Loss on hold-out set: 1.0464622317403364e-06
MeanAbsoluteError value on hold-out data: 0.0008173324749805033
Epoch: 276
Loss on hold-out set: 1.1836080095515802e-06
MeanAbsoluteError value on hold-out data: 0.0008202369790524244
Epoch: 277
Loss on hold-out set: 1.1919062894951192e-06
MeanAbsoluteError value on hold-out data: 0.0008232423570007086
Epoch: 278
Loss on hold-out set: 9.378666797706851e-07
MeanAbsoluteError value on hold-out data: 0.0007265071617439389
Epoch: 279
Loss on hold-out set: 1.0686452535187877e-06
MeanAbsoluteError value on hold-out data: 0.0008042141562327743
Epoch: 280
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Loss on hold-out set: 1.194843412996796e-06
MeanAbsoluteError value on hold-out data: 0.0008484732243232429
Epoch: 281

Loss on hold-out set: 3.4936466328452716e-06
MeanAbsoluteError value on hold-out data: 0.0016088937409222126
Epoch: 282
Loss on hold-out set: 1.6443586726102064e-06
MeanAbsoluteError value on hold-out data: 0.000976395036559552
Epoch: 283
Loss on hold-out set: 1.4369317070234572e-06
MeanAbsoluteError value on hold-out data: 0.0009323361446149647
Epoch: 284
Loss on hold-out set: 1.2453715498850215e-06
MeanAbsoluteError value on hold-out data: 0.0008471442852169275
Epoch: 285
Loss on hold-out set: 1.2149935698219522e-06
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Epoch: 286
Loss on hold-out set: 6.082520677899503e-06
MeanAbsoluteError value on hold-out data: 0.002228200202807784
Epoch: 287

Loss on hold-out set: 1.7795809421491307e-05
MeanAbsoluteError value on hold-out data: 0.004090954549610615
Epoch: 288

Loss on hold-out set: 2.3303586151366917e-06
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Epoch: 289
Loss on hold-out set: 1.751812668806871e-06
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Epoch: 290
Loss on hold-out set: 1.3675429062669327e-06
MeanAbsoluteError value on hold-out data: 0.000870245392434299
Epoch: 291
Loss on hold-out set: 1.3430352597564565e-06
MeanAbsoluteError value on hold-out data: 0.0008791842265054584
Epoch: 292
Loss on hold-out set: 1.135986825427328e-06
MeanAbsoluteError value on hold-out data: 0.000822883564978838
Epoch: 293
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Loss on hold-out set: 1.8730976701310562e-06
MeanAbsoluteError value on hold-out data: 0.0010688645998016
Epoch: 294

Loss on hold-out set: 1.5547969601706986e-06
MeanAbsoluteError value on hold-out data: 0.0009612281573936343
Epoch: 295

Loss on hold-out set: 1.7193076561083076e-06
MeanAbsoluteError value on hold-out data: 0.0010011999402195215
Epoch: 296
Loss on hold-out set: 1.271843737745607e-06
MeanAbsoluteError value on hold-out data: 0.0008496216032654047
Epoch: 297
Loss on hold-out set: 1.2324610036802578e-06
MeanAbsoluteError value on hold-out data: 0.0008376166224479675
Epoch: 298
Loss on hold-out set: 1.709654043224873e-06
MeanAbsoluteError value on hold-out data: 0.0010332444217056036
Epoch: 299
Loss on hold-out set: 1.1395800378557817e-06
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Epoch: 300
Loss on hold-out set: 1.2384026560469535e-06
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Epoch: 301

Loss on hold-out set: 1.2605256293122343e-06
MeanAbsoluteError value on hold-out data: 0.0008450737805105746
Epoch: 302

Loss on hold-out set: 4.961315454028618e-05
MeanAbsoluteError value on hold-out data: 0.006676397752016783
Epoch: 303
Loss on hold-out set: 8.220176928611741e-06
MeanAbsoluteError value on hold-out data: 0.0025789060164242983
Epoch: 304
Loss on hold-out set: 4.3752639052959585e-06
MeanAbsoluteError value on hold-out data: 0.0017494750209152699
Epoch: 305
Loss on hold-out set: 2.7543266670503585e-06
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MeanAbsoluteError value on hold-out data: 0.001334548112936318
Epoch: 306
Loss on hold-out set: 1.5931519346150499e-06
MeanAbsoluteError value on hold-out data: 0.0009460659930482507
Epoch: 307
Loss on hold-out set: 1.4079637323378008e-06
MeanAbsoluteError value on hold-out data: 0.0009390452760271728
Epoch: 308

Loss on hold-out set: 0.00020657849269739998
MeanAbsoluteError value on hold-out data: 0.008620984852313995
Epoch: 309

Loss on hold-out set: 1.419797666375626e-06
MeanAbsoluteError value on hold-out data: 0.0009125894284807146
Epoch: 310
Loss on hold-out set: 1.1189193527955538e-06
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Epoch: 311
Loss on hold-out set: 1.4685805179117149e-06
MeanAbsoluteError value on hold-out data: 0.000922291714232415
Epoch: 312
Loss on hold-out set: 1.3747247071303439e-06
MeanAbsoluteError value on hold-out data: 0.0008910163305699825
Epoch: 313
Loss on hold-out set: 5.803357648714015e-05
MeanAbsoluteError value on hold-out data: 0.0016310003120452166
Epoch: 314
Loss on hold-out set: 1.1470138824384217e-06
MeanAbsoluteError value on hold-out data: 0.0008377908379770815
Epoch: 315

Loss on hold-out set: 0.0013674650164279439
MeanAbsoluteError value on hold-out data: 0.004954388830810785
Epoch: 316

Loss on hold-out set: 4.215006531292322e-06
MeanAbsoluteError value on hold-out data: 0.0018246930558234453
Epoch: 317
Loss on hold-out set: 1.2312542004075601e-06
MeanAbsoluteError value on hold-out data: 0.0008307535899803042
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Epoch: 318
Loss on hold-out set: 1.7497263098238573e-06
MeanAbsoluteError value on hold-out data: 0.001008619787171483
Epoch: 319
Loss on hold-out set: 1.018704558383923e-06
MeanAbsoluteError value on hold-out data: 0.0007917503826320171
Epoch: 320
Loss on hold-out set: 9.948834645001625e-07
MeanAbsoluteError value on hold-out data: 0.000767114688642323
Epoch: 321
Loss on hold-out set: 1.024954926265309e-06
MeanAbsoluteError value on hold-out data: 0.0007961282390169799
Epoch: 322

Loss on hold-out set: 1.7479693956199928e-06
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Epoch: 323

Loss on hold-out set: 8.997827347474623e-07
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Epoch: 324
Loss on hold-out set: 9.078935450955984e-07
MeanAbsoluteError value on hold-out data: 0.0007203291170299053
Epoch: 325
Loss on hold-out set: 2.8161612572848053e-06
MeanAbsoluteError value on hold-out data: 0.0014373981393873692
Epoch: 326
Loss on hold-out set: 9.687612134712253e-07
MeanAbsoluteError value on hold-out data: 0.0007347221835516393
Epoch: 327
Loss on hold-out set: 1.1412008956968889e-06
MeanAbsoluteError value on hold-out data: 0.0007901136414147913
Epoch: 328
Loss on hold-out set: 0.0022593635407173016
MeanAbsoluteError value on hold-out data: 0.005548113025724888
Epoch: 329

Loss on hold-out set: 1.2465135341699352e-06
MeanAbsoluteError value on hold-out data: 0.0008233346161432564
Epoch: 330
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Loss on hold-out set: 9.053923559594506e-07
MeanAbsoluteError value on hold-out data: 0.000723747827578336
Epoch: 331
Loss on hold-out set: 9.572200044571077e-07
MeanAbsoluteError value on hold-out data: 0.0007411147817038
Epoch: 332
Loss on hold-out set: 9.174227036860079e-07
MeanAbsoluteError value on hold-out data: 0.0007309613865800202
Epoch: 333
Loss on hold-out set: 9.342705770730111e-07
MeanAbsoluteError value on hold-out data: 0.0007175698992796242
Epoch: 334
Loss on hold-out set: 1.064211966413845e-06
MeanAbsoluteError value on hold-out data: 0.0007640940020792186
Epoch: 335
Loss on hold-out set: 9.131068824129985e-07
MeanAbsoluteError value on hold-out data: 0.0007303176680579782
Epoch: 336


Loss on hold-out set: 1.2751299629179323e-06
MeanAbsoluteError value on hold-out data: 0.0008662229520268738
Epoch: 337


Loss on hold-out set: 1.135117860083203e-06
MeanAbsoluteError value on hold-out data: 0.0007763903122395277
Epoch: 338
Loss on hold-out set: 2.904618561125552e-06
MeanAbsoluteError value on hold-out data: 0.0008727036183699965
Epoch: 339
Loss on hold-out set: 2.3718580625707264e-06
MeanAbsoluteError value on hold-out data: 0.0013222560519352555
Epoch: 340
Loss on hold-out set: 1.1088826108964265e-06
MeanAbsoluteError value on hold-out data: 0.000824792543426156
Epoch: 341
Loss on hold-out set: 4.02311704524786e-06
MeanAbsoluteError value on hold-out data: 0.0017811352154240012
Epoch: 342
Loss on hold-out set: 1.1290096652443865e-06
MeanAbsoluteError value on hold-out data: 0.0008080616826191545
Epoch: 343
```

```
Loss on hold-out set: 1.044949132077678e-06
MeanAbsoluteError value on hold-out data: 0.0007678772672079504
Epoch: 344

Loss on hold-out set: 2.6285778744750132e-06
MeanAbsoluteError value on hold-out data: 0.0009904959006235003
Epoch: 345
Loss on hold-out set: 1.0058170359500834e-06
MeanAbsoluteError value on hold-out data: 0.0007260115235112607
Epoch: 346
Loss on hold-out set: 9.72586333930919e-07
MeanAbsoluteError value on hold-out data: 0.0007190906908363104
Epoch: 347
Loss on hold-out set: 2.3016000494198333e-06
MeanAbsoluteError value on hold-out data: 0.0008648288203403354
Epoch: 348
Loss on hold-out set: 9.036643072809406e-07
MeanAbsoluteError value on hold-out data: 0.0007074022432789207
Epoch: 349
Loss on hold-out set: 7.184194880839921e-06
MeanAbsoluteError value on hold-out data: 0.002522761933505535
Epoch: 350

Loss on hold-out set: 1.1631077475508041e-06
MeanAbsoluteError value on hold-out data: 0.0008102040155790746
Epoch: 351

Loss on hold-out set: 9.983717144625468e-07
MeanAbsoluteError value on hold-out data: 0.0007333551184274256
Epoch: 352
Loss on hold-out set: 1.3487645319925762e-06
MeanAbsoluteError value on hold-out data: 0.0008817207999527454
Epoch: 353
Loss on hold-out set: 3.831301193293677e-06
MeanAbsoluteError value on hold-out data: 0.0017659016884863377
Epoch: 354
Loss on hold-out set: 1.7117126669920533e-06
MeanAbsoluteError value on hold-out data: 0.0009876660769805312
Epoch: 355
Loss on hold-out set: 1.0873917517528753e-06
MeanAbsoluteError value on hold-out data: 0.0007862038910388947
Epoch: 356
```

```
Loss on hold-out set: 0.00045955529617531086
MeanAbsoluteError value on hold-out data: 0.0028922485653311014
Epoch: 357

Loss on hold-out set: 9.500179104931633e-07
MeanAbsoluteError value on hold-out data: 0.000719248375389725
Epoch: 358

Loss on hold-out set: 9.756260357545007e-07
MeanAbsoluteError value on hold-out data: 0.0007279738783836365
Epoch: 359
Loss on hold-out set: 0.0017312213553916185
MeanAbsoluteError value on hold-out data: 0.005069120321422815
Epoch: 360
Loss on hold-out set: 1.0232722790813289e-06
MeanAbsoluteError value on hold-out data: 0.0007705640746280551
Epoch: 361
Loss on hold-out set: 1.0061331924869312e-06
MeanAbsoluteError value on hold-out data: 0.0007640801486559212
Epoch: 362
Loss on hold-out set: 9.728956867477862e-07
MeanAbsoluteError value on hold-out data: 0.0007491596043109894
Epoch: 363
Loss on hold-out set: 1.179224594894689e-06
MeanAbsoluteError value on hold-out data: 0.000795627071056515
Epoch: 364

Loss on hold-out set: 1.1390244778270313e-05
MeanAbsoluteError value on hold-out data: 0.0032505709677934647
Epoch: 365

Loss on hold-out set: 1.0110355307146024e-06
MeanAbsoluteError value on hold-out data: 0.0007793621625751257
Epoch: 366
Loss on hold-out set: 1.0810869092927953e-06
MeanAbsoluteError value on hold-out data: 0.0007695512613281608
Epoch: 367
Loss on hold-out set: 1.3847057621555555e-06
MeanAbsoluteError value on hold-out data: 0.0009441620204597712
Epoch: 368
Loss on hold-out set: 1.2375869573588716e-06
```

```
MeanAbsoluteError value on hold-out data: 0.0008419351070187986
Epoch: 369
Loss on hold-out set: 1.3072071239478716e-06
MeanAbsoluteError value on hold-out data: 0.0007956302142702043
Epoch: 370
Loss on hold-out set: 8.87312275210661e-07
MeanAbsoluteError value on hold-out data: 0.0007307250634767115
Epoch: 371

Loss on hold-out set: 8.963838590366672e-07
MeanAbsoluteError value on hold-out data: 0.0007198138628154993
Epoch: 372

Loss on hold-out set: 1.1456393036286709e-06
MeanAbsoluteError value on hold-out data: 0.0007758416468277574
Epoch: 373
Loss on hold-out set: 1.1425179003219034e-06
MeanAbsoluteError value on hold-out data: 0.0008001011447049677
Epoch: 374
Loss on hold-out set: 8.833577217396501e-07
MeanAbsoluteError value on hold-out data: 0.0007162041729316115
Epoch: 375
Loss on hold-out set: 9.077020439900269e-07
MeanAbsoluteError value on hold-out data: 0.000727456237655133
Epoch: 376
Loss on hold-out set: 9.785607466903036e-07
MeanAbsoluteError value on hold-out data: 0.0007316759438253939
Epoch: 377
Loss on hold-out set: 2.3066850050012224e-05
MeanAbsoluteError value on hold-out data: 0.004659802187234163
Epoch: 378

Loss on hold-out set: 1.9143298266918955e-06
MeanAbsoluteError value on hold-out data: 0.0011090891202911735
Epoch: 379

Loss on hold-out set: 1.7802914621475234e-06
MeanAbsoluteError value on hold-out data: 0.0010477160103619099
Epoch: 380
Loss on hold-out set: 1.0124796771238975e-06
MeanAbsoluteError value on hold-out data: 0.0007965692784637213
```

```
Epoch: 381
Loss on hold-out set: 2.0498184522484036e-05
MeanAbsoluteError value on hold-out data: 0.00434545474126935
Epoch: 382
Loss on hold-out set: 1.34185784453131e-06
MeanAbsoluteError value on hold-out data: 0.0008842357783578336
Epoch: 383
Loss on hold-out set: 1.0638685075456613e-06
MeanAbsoluteError value on hold-out data: 0.0007507200352847576
Epoch: 384
Loss on hold-out set: 2.9324320656507134e-05
MeanAbsoluteError value on hold-out data: 0.005305256694555283
Epoch: 385

Loss on hold-out set: 1.1230493310694537e-06
MeanAbsoluteError value on hold-out data: 0.0007803692133165896
Epoch: 386

Loss on hold-out set: 1.061204509019612e-06
MeanAbsoluteError value on hold-out data: 0.0007623832789249718
Epoch: 387
Loss on hold-out set: 9.653937524944922e-07
MeanAbsoluteError value on hold-out data: 0.0007360081654042006
Epoch: 388
Loss on hold-out set: 1.18427572951637e-06
MeanAbsoluteError value on hold-out data: 0.0008039015810936689
Epoch: 389
Loss on hold-out set: 1.3681027352364395e-06
MeanAbsoluteError value on hold-out data: 0.0009137423476204276
Epoch: 390
Loss on hold-out set: 2.0680473784733085e-06
MeanAbsoluteError value on hold-out data: 0.00114038260653615
Epoch: 391
Loss on hold-out set: 5.512880796651678e-06
MeanAbsoluteError value on hold-out data: 0.0021211544517427683
Epoch: 392

Loss on hold-out set: 3.0811674448089502e-06
MeanAbsoluteError value on hold-out data: 0.0014954922953620553
Epoch: 393
```

```
Loss on hold-out set: 2.0115589117827208e-06
MeanAbsoluteError value on hold-out data: 0.0010639550164341927
Epoch: 394
Loss on hold-out set: 1.7365970235844613e-06
MeanAbsoluteError value on hold-out data: 0.0009811923373490572
Epoch: 395
Loss on hold-out set: 1.8750528957193287e-06
MeanAbsoluteError value on hold-out data: 0.0010280716232955456
Epoch: 396
Loss on hold-out set: 2.119067613211183e-06
MeanAbsoluteError value on hold-out data: 0.001045382465235889
Epoch: 397
Loss on hold-out set: 1.7859019119616557e-06
MeanAbsoluteError value on hold-out data: 0.0010354393161833286
Epoch: 398
Loss on hold-out set: 0.0003889214647231781
MeanAbsoluteError value on hold-out data: 0.002967124804854393
Epoch: 399

Loss on hold-out set: 8.096925424839495e-06
MeanAbsoluteError value on hold-out data: 0.0026282763574272394
Epoch: 400

Loss on hold-out set: 1.5669044728383597e-06
MeanAbsoluteError value on hold-out data: 0.000945484614931047
Epoch: 401
Loss on hold-out set: 2.1061193295351517e-05
MeanAbsoluteError value on hold-out data: 0.00444889348000288
Epoch: 402
Loss on hold-out set: 1.4003634043127442e-06
MeanAbsoluteError value on hold-out data: 0.0009231501608155668
Early stopping at epoch 401
Fold: 10
Epoch: 1
Loss on hold-out set: 0.033221063239929766
MeanAbsoluteError value on hold-out data: 0.15238262712955475
Epoch: 2
Loss on hold-out set: 0.0329225563372557
MeanAbsoluteError value on hold-out data: 0.14885291457176208
Epoch: 3
Loss on hold-out set: 0.03394966536703018
MeanAbsoluteError value on hold-out data: 0.1471158266067505
```

```
Epoch: 4

Loss on hold-out set: 0.03438397855139696
MeanAbsoluteError value on hold-out data: 0.14463777840137482
Epoch: 5

Loss on hold-out set: 0.03251147957948538
MeanAbsoluteError value on hold-out data: 0.1430826485157013
Epoch: 6
Loss on hold-out set: 0.031339799698728785
MeanAbsoluteError value on hold-out data: 0.14145222306251526
Epoch: 7
Loss on hold-out set: 0.031490400003699154
MeanAbsoluteError value on hold-out data: 0.14018583297729492
Epoch: 8
Loss on hold-out set: 0.030681819153519776
MeanAbsoluteError value on hold-out data: 0.1392076462507248
Epoch: 9
Loss on hold-out set: 0.03140358755794855
MeanAbsoluteError value on hold-out data: 0.13785390555858612
Epoch: 10
Loss on hold-out set: 0.02969126417659796
MeanAbsoluteError value on hold-out data: 0.13653872907161713
Epoch: 11

Loss on hold-out set: 0.0285252624262984
MeanAbsoluteError value on hold-out data: 0.1354612410068512
Epoch: 12

Loss on hold-out set: 0.028016146953002766
MeanAbsoluteError value on hold-out data: 0.13432349264621735
Epoch: 13
Loss on hold-out set: 0.027746313681396153
MeanAbsoluteError value on hold-out data: 0.13299570977687836
Epoch: 14
Loss on hold-out set: 0.02804537110317212
MeanAbsoluteError value on hold-out data: 0.1320679783821106
Epoch: 15
Loss on hold-out set: 0.027014625043823168
MeanAbsoluteError value on hold-out data: 0.13115759193897247
Epoch: 16
```

```
Loss on hold-out set: 0.026953371384969123
MeanAbsoluteError value on hold-out data: 0.12985116243362427
Epoch: 17
Loss on hold-out set: 0.02629412431269884
MeanAbsoluteError value on hold-out data: 0.12856005132198334
Epoch: 18

Loss on hold-out set: 0.02658627934467334
MeanAbsoluteError value on hold-out data: 0.12747208774089813
Epoch: 19

Loss on hold-out set: 0.02770305424928665
MeanAbsoluteError value on hold-out data: 0.12604960799217224
Epoch: 20
Loss on hold-out set: 0.025621673880288236
MeanAbsoluteError value on hold-out data: 0.12510085105895996
Epoch: 21
Loss on hold-out set: 0.02573713403230963
MeanAbsoluteError value on hold-out data: 0.12415460497140884
Epoch: 22
Loss on hold-out set: 0.024687747900875714
MeanAbsoluteError value on hold-out data: 0.12263951450586319
Epoch: 23
Loss on hold-out set: 0.024667075476967372
MeanAbsoluteError value on hold-out data: 0.12206441909074783
Epoch: 24
Loss on hold-out set: 0.023288159881933376
MeanAbsoluteError value on hold-out data: 0.12019098550081253
Epoch: 25

Loss on hold-out set: 0.023155012275450505
MeanAbsoluteError value on hold-out data: 0.11941629648208618
Epoch: 26

Loss on hold-out set: 0.022253434415548466
MeanAbsoluteError value on hold-out data: 0.11756157875061035
Epoch: 27
Loss on hold-out set: 0.022825295033936318
MeanAbsoluteError value on hold-out data: 0.11657395213842392
Epoch: 28
Loss on hold-out set: 0.022488706458646517
```

```
MeanAbsoluteError value on hold-out data: 0.11570655554533005
Epoch: 29
Loss on hold-out set: 0.0215403031772719
MeanAbsoluteError value on hold-out data: 0.11416824162006378
Epoch: 30
Loss on hold-out set: 0.021841903038036365
MeanAbsoluteError value on hold-out data: 0.11305516213178635
Epoch: 31
Loss on hold-out set: 0.02094927315528576
MeanAbsoluteError value on hold-out data: 0.11192867159843445
Epoch: 32

Loss on hold-out set: 0.020360391300458174
MeanAbsoluteError value on hold-out data: 0.1110292598605156
Epoch: 33

Loss on hold-out set: 0.020088294323963616
MeanAbsoluteError value on hold-out data: 0.10986320674419403
Epoch: 34
Loss on hold-out set: 0.020800495376953713
MeanAbsoluteError value on hold-out data: 0.11093500256538391
Epoch: 35
Loss on hold-out set: 0.019099709291297656
MeanAbsoluteError value on hold-out data: 0.1068682000041008
Epoch: 36
Loss on hold-out set: 0.019779529709082384
MeanAbsoluteError value on hold-out data: 0.10813739895820618
Epoch: 37
Loss on hold-out set: 0.018712406118328754
MeanAbsoluteError value on hold-out data: 0.10502628237009048
Epoch: 38
Loss on hold-out set: 0.018652995618490074
MeanAbsoluteError value on hold-out data: 0.1035940870642662
Epoch: 39

Loss on hold-out set: 0.01828482159628318
MeanAbsoluteError value on hold-out data: 0.10403511673212051
Epoch: 40

Loss on hold-out set: 0.018452203223625056
MeanAbsoluteError value on hold-out data: 0.1015825867652893
```

```
Epoch: 41
Loss on hold-out set: 0.01702525107584034
MeanAbsoluteError value on hold-out data: 0.1004195511341095
Epoch: 42
Loss on hold-out set: 0.018284207845751483
MeanAbsoluteError value on hold-out data: 0.10145184397697449
Epoch: 43
Loss on hold-out set: 0.01727263307055602
MeanAbsoluteError value on hold-out data: 0.09827255457639694
Epoch: 44
Loss on hold-out set: 0.01684257653183662
MeanAbsoluteError value on hold-out data: 0.09684208780527115
Epoch: 45
Loss on hold-out set: 0.01564636629504653
MeanAbsoluteError value on hold-out data: 0.09562426805496216
Epoch: 46

Loss on hold-out set: 0.01676977375665536
MeanAbsoluteError value on hold-out data: 0.0954696461558342
Epoch: 47

Loss on hold-out set: 0.015277158849550268
MeanAbsoluteError value on hold-out data: 0.094643734395504
Epoch: 48
Loss on hold-out set: 0.017808754928410053
MeanAbsoluteError value on hold-out data: 0.09325185418128967
Epoch: 49
Loss on hold-out set: 0.01487150752487091
MeanAbsoluteError value on hold-out data: 0.0919061079621315
Epoch: 50
Loss on hold-out set: 0.014319461985276295
MeanAbsoluteError value on hold-out data: 0.09086304903030396
Epoch: 51
Loss on hold-out set: 0.014502823621464463
MeanAbsoluteError value on hold-out data: 0.09029553085565567
Epoch: 52
Loss on hold-out set: 0.013787146532334961
MeanAbsoluteError value on hold-out data: 0.08896026015281677
Epoch: 53

Loss on hold-out set: 0.013972973755489174
MeanAbsoluteError value on hold-out data: 0.0881495401263237
```

```
Epoch: 54

Loss on hold-out set: 0.013223932232134618
MeanAbsoluteError value on hold-out data: 0.08766304701566696
Epoch: 55
Loss on hold-out set: 0.013904608356264921
MeanAbsoluteError value on hold-out data: 0.08869146555662155
Epoch: 56
Loss on hold-out set: 0.012789246859028935
MeanAbsoluteError value on hold-out data: 0.08552013337612152
Epoch: 57
Loss on hold-out set: 0.012271527451677965
MeanAbsoluteError value on hold-out data: 0.0842721238732338
Epoch: 58
Loss on hold-out set: 0.012170824168536525
MeanAbsoluteError value on hold-out data: 0.08375158905982971
Epoch: 59
Loss on hold-out set: 0.011617177810806494
MeanAbsoluteError value on hold-out data: 0.08194363862276077
Epoch: 60

Loss on hold-out set: 0.011422189489866678
MeanAbsoluteError value on hold-out data: 0.0814690813422203
Epoch: 61

Loss on hold-out set: 0.010951808268705813
MeanAbsoluteError value on hold-out data: 0.08029482513666153
Epoch: 62
Loss on hold-out set: 0.011026291857258631
MeanAbsoluteError value on hold-out data: 0.0789993554353714
Epoch: 63
Loss on hold-out set: 0.010653107301690258
MeanAbsoluteError value on hold-out data: 0.07871563732624054
Epoch: 64
Loss on hold-out set: 0.009890021765246414
MeanAbsoluteError value on hold-out data: 0.07693047821521759
Epoch: 65
Loss on hold-out set: 0.010533308144658804
MeanAbsoluteError value on hold-out data: 0.07622117549180984
Epoch: 66
Loss on hold-out set: 0.010113953039623223
MeanAbsoluteError value on hold-out data: 0.07506192475557327
```

```
Epoch: 67

Loss on hold-out set: 0.009583104867488146
MeanAbsoluteError value on hold-out data: 0.07459662854671478
Epoch: 68

Loss on hold-out set: 0.009431866176712971
MeanAbsoluteError value on hold-out data: 0.07287342101335526
Epoch: 69
Loss on hold-out set: 0.008927730234483114
MeanAbsoluteError value on hold-out data: 0.0712907686829567
Epoch: 70
Loss on hold-out set: 0.008512885811237188
MeanAbsoluteError value on hold-out data: 0.07000207901000977
Epoch: 71
Loss on hold-out set: 0.00824415827026734
MeanAbsoluteError value on hold-out data: 0.06874869018793106
Epoch: 72
Loss on hold-out set: 0.008502574055455625
MeanAbsoluteError value on hold-out data: 0.06788969784975052
Epoch: 73
Loss on hold-out set: 0.007351825774933856
MeanAbsoluteError value on hold-out data: 0.06606213748455048
Epoch: 74

Loss on hold-out set: 0.0073582931699302905
MeanAbsoluteError value on hold-out data: 0.06523624807596207
Epoch: 75

Loss on hold-out set: 0.007221636451924076
MeanAbsoluteError value on hold-out data: 0.06391105055809021
Epoch: 76
Loss on hold-out set: 0.006849059082854252
MeanAbsoluteError value on hold-out data: 0.06271038949489594
Epoch: 77
Loss on hold-out set: 0.0065719223079773095
MeanAbsoluteError value on hold-out data: 0.061952125281095505
Epoch: 78
Loss on hold-out set: 0.006389676154447863
MeanAbsoluteError value on hold-out data: 0.06027941778302193
Epoch: 79
```

```
Loss on hold-out set: 0.006247318475148999
MeanAbsoluteError value on hold-out data: 0.05923765152692795
Epoch: 80
Loss on hold-out set: 0.005700169722191417
MeanAbsoluteError value on hold-out data: 0.05793009325861931
Epoch: 81

Loss on hold-out set: 0.006437713477330713
MeanAbsoluteError value on hold-out data: 0.0566004179418087
Epoch: 82

Loss on hold-out set: 0.005203890023179925
MeanAbsoluteError value on hold-out data: 0.055100712925195694
Epoch: 83
Loss on hold-out set: 0.005106553972627108
MeanAbsoluteError value on hold-out data: 0.05356862023472786
Epoch: 84
Loss on hold-out set: 0.005296340803257548
MeanAbsoluteError value on hold-out data: 0.05434771627187729
Epoch: 85
Loss on hold-out set: 0.004225270021169518
MeanAbsoluteError value on hold-out data: 0.050375357270240784
Epoch: 86
Loss on hold-out set: 0.004161082548447526
MeanAbsoluteError value on hold-out data: 0.04896792396903038
Epoch: 87
Loss on hold-out set: 0.0038283415890943548
MeanAbsoluteError value on hold-out data: 0.047261014580726624
Epoch: 88

Loss on hold-out set: 0.003487303463491396
MeanAbsoluteError value on hold-out data: 0.04567687585949898
Epoch: 89

Loss on hold-out set: 0.003414654969954147
MeanAbsoluteError value on hold-out data: 0.04415632411837578
Epoch: 90
Loss on hold-out set: 0.0030506570698120273
MeanAbsoluteError value on hold-out data: 0.042146340012550354
Epoch: 91
Loss on hold-out set: 0.0028473630798264192
```

```
MeanAbsoluteError value on hold-out data: 0.040518179535865784
Epoch: 92
Loss on hold-out set: 0.00271157935136356
MeanAbsoluteError value on hold-out data: 0.03843594714999199
Epoch: 93
Loss on hold-out set: 0.0036412206066485783
MeanAbsoluteError value on hold-out data: 0.03830587863922119
Epoch: 94
Loss on hold-out set: 0.002121427454627477
MeanAbsoluteError value on hold-out data: 0.03485135734081268
Epoch: 95

Loss on hold-out set: 0.0020017400070523415
MeanAbsoluteError value on hold-out data: 0.03308047354221344
Epoch: 96

Loss on hold-out set: 0.0018595045190662718
MeanAbsoluteError value on hold-out data: 0.03171389922499657
Epoch: 97
Loss on hold-out set: 0.0017324379452754958
MeanAbsoluteError value on hold-out data: 0.030664462596178055
Epoch: 98
Loss on hold-out set: 0.001476098286310354
MeanAbsoluteError value on hold-out data: 0.027924267575144768
Epoch: 99
Loss on hold-out set: 0.0013465897712963992
MeanAbsoluteError value on hold-out data: 0.0263513270765543
Epoch: 100
Loss on hold-out set: 0.0016545625862468465
MeanAbsoluteError value on hold-out data: 0.02719547040760517
Epoch: 101
Loss on hold-out set: 0.0010515516086553151
MeanAbsoluteError value on hold-out data: 0.023794883862137794
Epoch: 102

Loss on hold-out set: 0.0011960381044236084
MeanAbsoluteError value on hold-out data: 0.021785426884889603
Epoch: 103

Loss on hold-out set: 0.0008454242477175564
MeanAbsoluteError value on hold-out data: 0.020401310175657272
```

```
Epoch: 104
Loss on hold-out set: 0.0007725292895114622
MeanAbsoluteError value on hold-out data: 0.019207296893000603
Epoch: 105
Loss on hold-out set: 0.0008492321962526498
MeanAbsoluteError value on hold-out data: 0.01762305200099945
Epoch: 106
Loss on hold-out set: 0.0006690839800285175
MeanAbsoluteError value on hold-out data: 0.01705489680171013
Epoch: 107
Loss on hold-out set: 0.000601904661520026
MeanAbsoluteError value on hold-out data: 0.015152453444898129
Epoch: 108
Loss on hold-out set: 0.0004490975334192626
MeanAbsoluteError value on hold-out data: 0.013921661302447319
Epoch: 109

Loss on hold-out set: 0.0007496516185570867
MeanAbsoluteError value on hold-out data: 0.01441096793860197
Epoch: 110

Loss on hold-out set: 0.00034627255948949966
MeanAbsoluteError value on hold-out data: 0.011666790582239628
Epoch: 111
Loss on hold-out set: 0.00029562509875037137
MeanAbsoluteError value on hold-out data: 0.010777894407510757
Epoch: 112
Loss on hold-out set: 0.00027577122790927
MeanAbsoluteError value on hold-out data: 0.009858107194304466
Epoch: 113
Loss on hold-out set: 0.0002512002437679957
MeanAbsoluteError value on hold-out data: 0.00900174304842949
Epoch: 114
Loss on hold-out set: 0.00020235378003865032
MeanAbsoluteError value on hold-out data: 0.007819789461791515
Epoch: 115
Loss on hold-out set: 0.00018098524070900076
MeanAbsoluteError value on hold-out data: 0.007150623947381973
Epoch: 116

Loss on hold-out set: 0.00015735721143965537
MeanAbsoluteError value on hold-out data: 0.006403029430657625
```

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Epoch: 117

Loss on hold-out set: 0.000140323390881419
MeanAbsoluteError value on hold-out data: 0.005715970415621996
Epoch: 118
Loss on hold-out set: 0.00013039978186777892
MeanAbsoluteError value on hold-out data: 0.005196325946599245
Epoch: 119
Loss on hold-out set: 0.00011271122118089876
MeanAbsoluteError value on hold-out data: 0.004499012604355812
Epoch: 120
Loss on hold-out set: 0.00011978451941383985
MeanAbsoluteError value on hold-out data: 0.00511253671720624
Epoch: 121
Loss on hold-out set: 9.652067067760912e-05
MeanAbsoluteError value on hold-out data: 0.0035984301939606667
Epoch: 122
Loss on hold-out set: 8.760525254449301e-05
MeanAbsoluteError value on hold-out data: 0.0036375808995217085
Epoch: 123

Loss on hold-out set: 0.00011621378339791241
MeanAbsoluteError value on hold-out data: 0.006440918892621994
Epoch: 124

Loss on hold-out set: 8.149274764526545e-05
MeanAbsoluteError value on hold-out data: 0.0030174104031175375
Epoch: 125
Loss on hold-out set: 7.353399785450584e-05
MeanAbsoluteError value on hold-out data: 0.0023466036655008793
Epoch: 126
Loss on hold-out set: 7.20415502585708e-05
MeanAbsoluteError value on hold-out data: 0.0022717625834047794
Epoch: 127
Loss on hold-out set: 7.108670198564281e-05
MeanAbsoluteError value on hold-out data: 0.0023702748585492373
Epoch: 128
Loss on hold-out set: 7.194871123225802e-05
MeanAbsoluteError value on hold-out data: 0.0022220902610570192
Epoch: 129
Loss on hold-out set: 6.868426632203969e-05
MeanAbsoluteError value on hold-out data: 0.002145427977666259
```

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Epoch: 130

Loss on hold-out set: 7.068390505520046e-05
MeanAbsoluteError value on hold-out data: 0.0023859625216573477
Epoch: 131

Loss on hold-out set: 6.571519545034859e-05
MeanAbsoluteError value on hold-out data: 0.002252943115308881
Epoch: 132
Loss on hold-out set: 6.22605630356842e-05
MeanAbsoluteError value on hold-out data: 0.0019673772621899843
Epoch: 133
Loss on hold-out set: 6.25434789404048e-05
MeanAbsoluteError value on hold-out data: 0.0023766306694597006
Epoch: 134
Loss on hold-out set: 6.066206118650651e-05
MeanAbsoluteError value on hold-out data: 0.0020162039436399937
Epoch: 135
Loss on hold-out set: 6.059603732375343e-05
MeanAbsoluteError value on hold-out data: 0.0019291506614536047
Epoch: 136
Loss on hold-out set: 5.9958395232010494e-05
MeanAbsoluteError value on hold-out data: 0.001881487318314612
Epoch: 137

Loss on hold-out set: 6.125806976342574e-05
MeanAbsoluteError value on hold-out data: 0.002651921473443508
Epoch: 138

Loss on hold-out set: 6.044261361309439e-05
MeanAbsoluteError value on hold-out data: 0.0028228526934981346
Epoch: 139
Loss on hold-out set: 5.336864071873256e-05
MeanAbsoluteError value on hold-out data: 0.001960738329216838
Epoch: 140
Loss on hold-out set: 5.475823600748369e-05
MeanAbsoluteError value on hold-out data: 0.0022566099651157856
Epoch: 141
Loss on hold-out set: 5.8478012782905775e-05
MeanAbsoluteError value on hold-out data: 0.0019689700566232204
Epoch: 142
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Loss on hold-out set: 6.337283034204469e-05
MeanAbsoluteError value on hold-out data: 0.00330520560964942
Epoch: 143
Loss on hold-out set: 0.0002819032199917834
MeanAbsoluteError value on hold-out data: 0.003416722407564521
Epoch: 144

Loss on hold-out set: 5.591596521981046e-05
MeanAbsoluteError value on hold-out data: 0.0017814736347645521
Epoch: 145

Loss on hold-out set: 9.556712452999469e-05
MeanAbsoluteError value on hold-out data: 0.003845993196591735
Epoch: 146
Loss on hold-out set: 0.00025722362133907297
MeanAbsoluteError value on hold-out data: 0.0035144896246492863
Epoch: 147
Loss on hold-out set: 5.6906686303101684e-05
MeanAbsoluteError value on hold-out data: 0.002278711646795273
Epoch: 148
Loss on hold-out set: 5.4954813685106695e-05
MeanAbsoluteError value on hold-out data: 0.0018066164338961244
Epoch: 149
Loss on hold-out set: 6.135785235108834e-05
MeanAbsoluteError value on hold-out data: 0.003282574936747551
Epoch: 150
Loss on hold-out set: 5.217749195961775e-05
MeanAbsoluteError value on hold-out data: 0.0018685775576159358
Epoch: 151

Loss on hold-out set: 5.0761948168306284e-05
MeanAbsoluteError value on hold-out data: 0.0017741492483764887
Epoch: 152

Loss on hold-out set: 4.8915463454390054e-05
MeanAbsoluteError value on hold-out data: 0.002303742803633213
Epoch: 153
Loss on hold-out set: 7.12963395108965e-05
MeanAbsoluteError value on hold-out data: 0.0019082194194197655
Epoch: 154
Loss on hold-out set: 4.9579695104722094e-05
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MeanAbsoluteError value on hold-out data: 0.003099563531577587
Epoch: 155
Loss on hold-out set: 4.6085535346334764e-05
MeanAbsoluteError value on hold-out data: 0.0019914901349693537
Epoch: 156
Loss on hold-out set: 0.0001261319476515592
MeanAbsoluteError value on hold-out data: 0.007749623153358698
Epoch: 157
Loss on hold-out set: 4.760082803246545e-05
MeanAbsoluteError value on hold-out data: 0.0021528247743844986
Epoch: 158

Loss on hold-out set: 5.015356269775741e-05
MeanAbsoluteError value on hold-out data: 0.0021228520199656487
Epoch: 159

Loss on hold-out set: 4.762346127598413e-05
MeanAbsoluteError value on hold-out data: 0.0018511703237891197
Epoch: 160
Loss on hold-out set: 4.621867465787615e-05
MeanAbsoluteError value on hold-out data: 0.0017111296765506268
Epoch: 161
Loss on hold-out set: 0.0002804274011269242
MeanAbsoluteError value on hold-out data: 0.0032239325810223818
Epoch: 162
Loss on hold-out set: 4.4899641947127886e-05
MeanAbsoluteError value on hold-out data: 0.0017432566964998841
Epoch: 163
Loss on hold-out set: 4.3056245394049816e-05
MeanAbsoluteError value on hold-out data: 0.0016416852595284581
Epoch: 164
Loss on hold-out set: 4.2743081547331923e-05
MeanAbsoluteError value on hold-out data: 0.001653154962696135
Epoch: 165

Loss on hold-out set: 4.184967575654879e-05
MeanAbsoluteError value on hold-out data: 0.0016955694882199168
Epoch: 166

Loss on hold-out set: 4.9203436761812416e-05
MeanAbsoluteError value on hold-out data: 0.0028175772167742252
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Epoch: 167
Loss on hold-out set: 4.900557144520253e-05
MeanAbsoluteError value on hold-out data: 0.0018590969266369939
Epoch: 168
Loss on hold-out set: 4.9598545138871065e-05
MeanAbsoluteError value on hold-out data: 0.0019971178844571114
Epoch: 169
Loss on hold-out set: 4.685719176660104e-05
MeanAbsoluteError value on hold-out data: 0.00229778909124434
Epoch: 170
Loss on hold-out set: 4.843411263358086e-05
MeanAbsoluteError value on hold-out data: 0.0017538645770400763
Epoch: 171
Loss on hold-out set: 4.7330374256987925e-05
MeanAbsoluteError value on hold-out data: 0.0016569116851314902
Epoch: 172

Loss on hold-out set: 4.664736739265698e-05
MeanAbsoluteError value on hold-out data: 0.0017943322891369462
Epoch: 173

Loss on hold-out set: 4.6126574344585744e-05
MeanAbsoluteError value on hold-out data: 0.001657080021686852
Epoch: 174
Loss on hold-out set: 4.7849639822918384e-05
MeanAbsoluteError value on hold-out data: 0.0018869317136704922
Epoch: 175
Loss on hold-out set: 4.60499851464227e-05
MeanAbsoluteError value on hold-out data: 0.0017162711592391133
Epoch: 176
Loss on hold-out set: 4.582011304749428e-05
MeanAbsoluteError value on hold-out data: 0.0017862576059997082
Epoch: 177
Loss on hold-out set: 4.697322707377575e-05
MeanAbsoluteError value on hold-out data: 0.0017686733044683933
Epoch: 178
Loss on hold-out set: 5.01764460785545e-05
MeanAbsoluteError value on hold-out data: 0.0018901658477261662
Epoch: 179

Loss on hold-out set: 5.0861648164667575e-05
MeanAbsoluteError value on hold-out data: 0.0018500779988244176
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Epoch: 180

Loss on hold-out set: 4.903465158725759e-05
MeanAbsoluteError value on hold-out data: 0.0016797817079350352
Epoch: 181
Loss on hold-out set: 7.252646775249069e-05
MeanAbsoluteError value on hold-out data: 0.005114978644996815
Epoch: 182
Loss on hold-out set: 0.0010946295344463298
MeanAbsoluteError value on hold-out data: 0.00972034689038992
Epoch: 183
Loss on hold-out set: 4.620077280693434e-05
MeanAbsoluteError value on hold-out data: 0.0018667340045794845
Epoch: 184
Loss on hold-out set: 4.489249081766152e-05
MeanAbsoluteError value on hold-out data: 0.001677240594290197
Epoch: 185
Loss on hold-out set: 5.6007237967255955e-05
MeanAbsoluteError value on hold-out data: 0.004411062691360712
Epoch: 186

Loss on hold-out set: 4.8190268646390694e-05
MeanAbsoluteError value on hold-out data: 0.0020258009899407625
Epoch: 187

Loss on hold-out set: 4.744571568857317e-05
MeanAbsoluteError value on hold-out data: 0.0017378241755068302
Epoch: 188
Loss on hold-out set: 7.239290866541873e-05
MeanAbsoluteError value on hold-out data: 0.0017440340016037226
Epoch: 189
Loss on hold-out set: 4.84721994841773e-05
MeanAbsoluteError value on hold-out data: 0.0016683570574969053
Epoch: 190
Loss on hold-out set: 4.8303553989206615e-05
MeanAbsoluteError value on hold-out data: 0.0017391901928931475
Epoch: 191
Loss on hold-out set: 0.0002550143292279035
MeanAbsoluteError value on hold-out data: 0.003800464328378439
Epoch: 192
Loss on hold-out set: 4.7532204829482136e-05
MeanAbsoluteError value on hold-out data: 0.0016465900698676705
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Epoch: 193

Loss on hold-out set: 4.728676882920651e-05
MeanAbsoluteError value on hold-out data: 0.0016394926933571696
Epoch: 194

Loss on hold-out set: 5.0238665892266e-05
MeanAbsoluteError value on hold-out data: 0.0016914926236495376
Epoch: 195
Loss on hold-out set: 5.075196639399319e-05
MeanAbsoluteError value on hold-out data: 0.0020355586893856525
Epoch: 196
Loss on hold-out set: 7.465797604639262e-05
MeanAbsoluteError value on hold-out data: 0.003803837113082409
Epoch: 197
Loss on hold-out set: 4.9467607355451874e-05
MeanAbsoluteError value on hold-out data: 0.0021731171291321516
Epoch: 198
Loss on hold-out set: 4.784087260881838e-05
MeanAbsoluteError value on hold-out data: 0.0018081313464790583
Epoch: 199
Loss on hold-out set: 4.6697655748700454e-05
MeanAbsoluteError value on hold-out data: 0.0018054291140288115
Epoch: 200

Loss on hold-out set: 4.7736056160374574e-05
MeanAbsoluteError value on hold-out data: 0.0018076259875670075
Epoch: 201

Loss on hold-out set: 4.63549502952149e-05
MeanAbsoluteError value on hold-out data: 0.0016596351051703095
Epoch: 202
Loss on hold-out set: 4.489046549757894e-05
MeanAbsoluteError value on hold-out data: 0.0017470266902819276
Epoch: 203
Loss on hold-out set: 4.4917246773715866e-05
MeanAbsoluteError value on hold-out data: 0.0016293409280478954
Epoch: 204
Loss on hold-out set: 4.625500250855251e-05
MeanAbsoluteError value on hold-out data: 0.0017032499890774488
Epoch: 205
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Loss on hold-out set: 5.038549433650657e-05
MeanAbsoluteError value on hold-out data: 0.0024022723082453012
Epoch: 206
Loss on hold-out set: 4.473364223783322e-05
MeanAbsoluteError value on hold-out data: 0.0019179029623046517
Epoch: 207

Loss on hold-out set: 5.010703048705741e-05
MeanAbsoluteError value on hold-out data: 0.0018480265280231833
Epoch: 208

Loss on hold-out set: 5.1004697699961703e-05
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Epoch: 209
Loss on hold-out set: 4.8276827068495826e-05
MeanAbsoluteError value on hold-out data: 0.001861866912804544
Epoch: 210
Loss on hold-out set: 5.473059228769181e-05
MeanAbsoluteError value on hold-out data: 0.0029547489248216152
Epoch: 211
Loss on hold-out set: 8.967284339597917e-05
MeanAbsoluteError value on hold-out data: 0.0024626688100397587
Epoch: 212
Loss on hold-out set: 4.909289152867412e-05
MeanAbsoluteError value on hold-out data: 0.001907863188534975
Epoch: 213
Loss on hold-out set: 7.080975914365039e-05
MeanAbsoluteError value on hold-out data: 0.004873067606240511
Epoch: 214

Loss on hold-out set: 7.771526044017755e-05
MeanAbsoluteError value on hold-out data: 0.00236895983107388
Epoch: 215

Loss on hold-out set: 5.1095273577699955e-05
MeanAbsoluteError value on hold-out data: 0.002009971998631954
Epoch: 216
Loss on hold-out set: 5.0977760788730215e-05
MeanAbsoluteError value on hold-out data: 0.0019584735855460167
Epoch: 217
Loss on hold-out set: 4.955596047405099e-05
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MeanAbsoluteError value on hold-out data: 0.0018229112029075623
Epoch: 218
Loss on hold-out set: 4.7663095765179045e-05
MeanAbsoluteError value on hold-out data: 0.001747984322719276
Epoch: 219
Loss on hold-out set: 4.687989846930717e-05
MeanAbsoluteError value on hold-out data: 0.0018627867102622986
Epoch: 220
Loss on hold-out set: 4.658825076393651e-05
MeanAbsoluteError value on hold-out data: 0.0016513365553691983
Epoch: 221

Loss on hold-out set: 6.698448125392203e-05
MeanAbsoluteError value on hold-out data: 0.001636913395486772
Epoch: 222

Loss on hold-out set: 4.675057593317433e-05
MeanAbsoluteError value on hold-out data: 0.0018380096880719066
Epoch: 223
Loss on hold-out set: 5.010927441599751e-05
MeanAbsoluteError value on hold-out data: 0.002121983328834176
Epoch: 224
Loss on hold-out set: 0.0003935537367042868
MeanAbsoluteError value on hold-out data: 0.0037064531352370977
Epoch: 225
Loss on hold-out set: 4.8009159568297175e-05
MeanAbsoluteError value on hold-out data: 0.0016884113429114223
Epoch: 226
Loss on hold-out set: 4.845060956225867e-05
MeanAbsoluteError value on hold-out data: 0.0017659444129094481
Epoch: 227
Loss on hold-out set: 5.9054251533570306e-05
MeanAbsoluteError value on hold-out data: 0.004517999943345785
Epoch: 228

Loss on hold-out set: 0.0005814024558328759
MeanAbsoluteError value on hold-out data: 0.004133742302656174
Epoch: 229

Loss on hold-out set: 4.8937486200683314e-05
MeanAbsoluteError value on hold-out data: 0.0017273123376071453
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Epoch: 230
Loss on hold-out set: 8.102941011254818e-05
MeanAbsoluteError value on hold-out data: 0.0024373235646635294
Epoch: 231
Loss on hold-out set: 5.181012466419606e-05
MeanAbsoluteError value on hold-out data: 0.0022852171678096056
Epoch: 232
Loss on hold-out set: 5.3513953529405764e-05
MeanAbsoluteError value on hold-out data: 0.002121865516528487
Epoch: 233
Loss on hold-out set: 4.923394785167217e-05
MeanAbsoluteError value on hold-out data: 0.0022775602992624044
Epoch: 234
Loss on hold-out set: 8.104350140806324e-05
MeanAbsoluteError value on hold-out data: 0.005556591786444187
Epoch: 235

Loss on hold-out set: 5.3083872145975874e-05
MeanAbsoluteError value on hold-out data: 0.0020217904821038246
Epoch: 236

Loss on hold-out set: 7.845542131690308e-05
MeanAbsoluteError value on hold-out data: 0.005507024470716715
Epoch: 237
Loss on hold-out set: 5.8992292154541174e-05
MeanAbsoluteError value on hold-out data: 0.002646762179210782
Epoch: 238
Loss on hold-out set: 5.281242127571554e-05
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Epoch: 239
Loss on hold-out set: 5.19155033246604e-05
MeanAbsoluteError value on hold-out data: 0.0024732828605920076
Epoch: 240
Loss on hold-out set: 5.1437169912123165e-05
MeanAbsoluteError value on hold-out data: 0.0019521062495186925
Epoch: 241
Loss on hold-out set: 4.840078059942243e-05
MeanAbsoluteError value on hold-out data: 0.001894208020530641
Epoch: 242

Loss on hold-out set: 4.974352854193197e-05
MeanAbsoluteError value on hold-out data: 0.001891129883006215
```

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Epoch: 243

Loss on hold-out set: 4.968223061916013e-05
MeanAbsoluteError value on hold-out data: 0.0020006459672003984
Epoch: 244
Loss on hold-out set: 4.728002186573996e-05
MeanAbsoluteError value on hold-out data: 0.0017948868917301297
Epoch: 245
Loss on hold-out set: 4.6733683299967546e-05
MeanAbsoluteError value on hold-out data: 0.001661334652453661
Epoch: 246
Loss on hold-out set: 6.942647401003272e-05
MeanAbsoluteError value on hold-out data: 0.0019465020159259439
Epoch: 247
Loss on hold-out set: 4.63399025293781e-05
MeanAbsoluteError value on hold-out data: 0.0017682021716609597
Epoch: 248
Loss on hold-out set: 5.034002159749644e-05
MeanAbsoluteError value on hold-out data: 0.0018698882777243853
Epoch: 249

Loss on hold-out set: 0.00024652418376765593
MeanAbsoluteError value on hold-out data: 0.0032141658011823893
Epoch: 250

Loss on hold-out set: 7.126799219419739e-05
MeanAbsoluteError value on hold-out data: 0.0016944524832069874
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Loss on hold-out set: 4.93246452387771e-05
MeanAbsoluteError value on hold-out data: 0.0016616993816569448
Epoch: 252
Loss on hold-out set: 4.686494734274814e-05
MeanAbsoluteError value on hold-out data: 0.002492504194378853
Epoch: 253
Loss on hold-out set: 4.727057145058867e-05
MeanAbsoluteError value on hold-out data: 0.0023173042573034763
Epoch: 254
Loss on hold-out set: 4.723304670379163e-05
MeanAbsoluteError value on hold-out data: 0.0017158272676169872
Epoch: 255
Loss on hold-out set: 5.066078209053488e-05
MeanAbsoluteError value on hold-out data: 0.0025581885129213333
```

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Epoch: 256

Loss on hold-out set: 4.5714641732257194e-05
MeanAbsoluteError value on hold-out data: 0.0016946328105404973
Epoch: 257

Loss on hold-out set: 4.556757690465929e-05
MeanAbsoluteError value on hold-out data: 0.001691896584816277
Epoch: 258
Loss on hold-out set: 4.589631334266205e-05
MeanAbsoluteError value on hold-out data: 0.002993967616930604
Epoch: 259
Loss on hold-out set: 4.64789702312793e-05
MeanAbsoluteError value on hold-out data: 0.0021140577737241983
Epoch: 260
Loss on hold-out set: 0.0006830496682605022
MeanAbsoluteError value on hold-out data: 0.0042151701636612415
Epoch: 261
Loss on hold-out set: 0.0002167783214107343
MeanAbsoluteError value on hold-out data: 0.003090363461524248
Epoch: 262
Loss on hold-out set: 0.00021876543539397413
MeanAbsoluteError value on hold-out data: 0.00308579602278769
Epoch: 263

Loss on hold-out set: 4.480854514318148e-05
MeanAbsoluteError value on hold-out data: 0.001786614186130464
Epoch: 264

Loss on hold-out set: 4.2369121258135376e-05
MeanAbsoluteError value on hold-out data: 0.0016928210388869047
Epoch: 265
Loss on hold-out set: 4.299897709905473e-05
MeanAbsoluteError value on hold-out data: 0.001706436974927783
Epoch: 266
Loss on hold-out set: 4.2558096857611905e-05
MeanAbsoluteError value on hold-out data: 0.0016685639275237918
Epoch: 267
Loss on hold-out set: 0.0005782814778438723
MeanAbsoluteError value on hold-out data: 0.003963434603065252
Epoch: 268
```

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Loss on hold-out set: 4.0794022855659656e-05
MeanAbsoluteError value on hold-out data: 0.0016000294126570225
Epoch: 269
Loss on hold-out set: 0.0006201775567065992
MeanAbsoluteError value on hold-out data: 0.004005336668342352
Epoch: 270

Loss on hold-out set: 0.0006134316087302347
MeanAbsoluteError value on hold-out data: 0.004890112206339836
Epoch: 271

Loss on hold-out set: 4.8278125514291154e-05
MeanAbsoluteError value on hold-out data: 0.0018700490472838283
Epoch: 272
Loss on hold-out set: 5.020490558011331e-05
MeanAbsoluteError value on hold-out data: 0.0019282359862700105
Epoch: 273
Loss on hold-out set: 5.097435239775905e-05
MeanAbsoluteError value on hold-out data: 0.0018704580143094063
Epoch: 274
Loss on hold-out set: 4.934840429681432e-05
MeanAbsoluteError value on hold-out data: 0.0017454554326832294
Epoch: 275
Loss on hold-out set: 0.0004028286528698398
MeanAbsoluteError value on hold-out data: 0.003756872611120343
Epoch: 276
Loss on hold-out set: 5.568639460088539e-05
MeanAbsoluteError value on hold-out data: 0.0017594997771084309
Epoch: 277

Loss on hold-out set: 0.0007449576050012533
MeanAbsoluteError value on hold-out data: 0.004757991060614586
Epoch: 278

Loss on hold-out set: 6.962961994689137e-05
MeanAbsoluteError value on hold-out data: 0.005214085802435875
Epoch: 279
Loss on hold-out set: 0.0008415201758505366
MeanAbsoluteError value on hold-out data: 0.004724487196654081
Epoch: 280
Loss on hold-out set: 6.24906584745916e-05
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MeanAbsoluteError value on hold-out data: 0.0019264802103862166
Epoch: 281
Loss on hold-out set: 6.062745990220719e-05
MeanAbsoluteError value on hold-out data: 0.001843118341639638
Epoch: 282
Loss on hold-out set: 5.952150738043936e-05
MeanAbsoluteError value on hold-out data: 0.001923250500112772
Epoch: 283
Loss on hold-out set: 9.729566554028679e-05
MeanAbsoluteError value on hold-out data: 0.002495016437023878
Epoch: 284

Loss on hold-out set: 8.725747748774035e-05
MeanAbsoluteError value on hold-out data: 0.0017759588081389666
Epoch: 285

Loss on hold-out set: 5.5588657439478506e-05
MeanAbsoluteError value on hold-out data: 0.001783432555384934
Epoch: 286
Loss on hold-out set: 5.913778673297761e-05
MeanAbsoluteError value on hold-out data: 0.0019211514154449105
Epoch: 287
Loss on hold-out set: 8.575999877043963e-05
MeanAbsoluteError value on hold-out data: 0.0056437039747834206
Epoch: 288
Loss on hold-out set: 5.8293089615255245e-05
MeanAbsoluteError value on hold-out data: 0.001929194200783968
Epoch: 289
Loss on hold-out set: 5.8494297407973e-05
MeanAbsoluteError value on hold-out data: 0.002089184010401368
Epoch: 290
Loss on hold-out set: 5.7311577236873745e-05
MeanAbsoluteError value on hold-out data: 0.0017687578219920397
Epoch: 291

Loss on hold-out set: 6.03681072037104e-05
MeanAbsoluteError value on hold-out data: 0.0025727904867380857
Epoch: 292

Loss on hold-out set: 5.399835573336112e-05
MeanAbsoluteError value on hold-out data: 0.001807909575290978
```

```
Epoch: 293
Loss on hold-out set: 0.00038246219545958236
MeanAbsoluteError value on hold-out data: 0.0035476484335958958
Epoch: 294
Loss on hold-out set: 5.3444558900012525e-05
MeanAbsoluteError value on hold-out data: 0.001762191648595035
Epoch: 295
Loss on hold-out set: 8.102704347178448e-05
MeanAbsoluteError value on hold-out data: 0.005844450555741787
Epoch: 296
Loss on hold-out set: 4.9426335241247005e-05
MeanAbsoluteError value on hold-out data: 0.00165274937171489
Epoch: 297
Loss on hold-out set: 5.326865932777135e-05
MeanAbsoluteError value on hold-out data: 0.002383206970989704
Epoch: 298

Loss on hold-out set: 4.9456190599637644e-05
MeanAbsoluteError value on hold-out data: 0.0016957125626504421
Epoch: 299

Loss on hold-out set: 4.9014047393624285e-05
MeanAbsoluteError value on hold-out data: 0.0016514490125700831
Epoch: 300
Loss on hold-out set: 5.064598053212858e-05
MeanAbsoluteError value on hold-out data: 0.00204264628700912
Epoch: 301
Loss on hold-out set: 5.2911484335009634e-05
MeanAbsoluteError value on hold-out data: 0.0025780070573091507
Epoch: 302
Loss on hold-out set: 0.00010761153820427493
MeanAbsoluteError value on hold-out data: 0.008011072874069214
Epoch: 303
Loss on hold-out set: 5.059964391526032e-05
MeanAbsoluteError value on hold-out data: 0.003197787329554558
Epoch: 304
Loss on hold-out set: 4.8016282112082714e-05
MeanAbsoluteError value on hold-out data: 0.0017554330406710505
Epoch: 305

Loss on hold-out set: 4.655944551446877e-05
MeanAbsoluteError value on hold-out data: 0.0016795379342511296
```

```
Epoch: 306

Loss on hold-out set: 4.712130086659272e-05
MeanAbsoluteError value on hold-out data: 0.0017752042040228844
Epoch: 307
Loss on hold-out set: 4.79951581925119e-05
MeanAbsoluteError value on hold-out data: 0.0023000710643827915
Epoch: 308
Loss on hold-out set: 4.8360809299853056e-05
MeanAbsoluteError value on hold-out data: 0.002894241828471422
Epoch: 309
Loss on hold-out set: 0.0009487916732316884
MeanAbsoluteError value on hold-out data: 0.004334236495196819
Epoch: 310
Loss on hold-out set: 4.602887907896484e-05
MeanAbsoluteError value on hold-out data: 0.0016766332555562258
Epoch: 311
Loss on hold-out set: 9.132492134365468e-05
MeanAbsoluteError value on hold-out data: 0.008140914142131805
Epoch: 312

Loss on hold-out set: 4.966126034735051e-05
MeanAbsoluteError value on hold-out data: 0.002511845901608467
Epoch: 313

Loss on hold-out set: 4.4518348892972004e-05
MeanAbsoluteError value on hold-out data: 0.0017310291295871139
Epoch: 314
Loss on hold-out set: 4.462985906719461e-05
MeanAbsoluteError value on hold-out data: 0.001789198024198413
Epoch: 315
Loss on hold-out set: 5.388262679144436e-05
MeanAbsoluteError value on hold-out data: 0.0027260344941169024
Epoch: 316
Loss on hold-out set: 4.7451704587659224e-05
MeanAbsoluteError value on hold-out data: 0.0019130349392071366
Epoch: 317
Loss on hold-out set: 6.009589620029706e-05
MeanAbsoluteError value on hold-out data: 0.0032278362195938826
Epoch: 318
Loss on hold-out set: 5.1647517243334456e-05
MeanAbsoluteError value on hold-out data: 0.0020047263242304325
```

Epoch: 319

Loss on hold-out set: 5.2497319503485276e-05
MeanAbsoluteError value on hold-out data: 0.0019517168402671814
Epoch: 320

Loss on hold-out set: 5.1416288539048066e-05
MeanAbsoluteError value on hold-out data: 0.0017570087220519781
Epoch: 321
Loss on hold-out set: 5.58075664160312e-05
MeanAbsoluteError value on hold-out data: 0.0036016812082380056
Epoch: 322
Loss on hold-out set: 5.1561786891013e-05
MeanAbsoluteError value on hold-out data: 0.0019145883852615952
Epoch: 323
Loss on hold-out set: 0.00019000006589591905
MeanAbsoluteError value on hold-out data: 0.0036093585658818483
Epoch: 324
Loss on hold-out set: 5.4345229115754664e-05
MeanAbsoluteError value on hold-out data: 0.0029680905863642693
Epoch: 325
Loss on hold-out set: 5.270585986986239e-05
MeanAbsoluteError value on hold-out data: 0.0019320233259350061
Epoch: 326

Loss on hold-out set: 5.653160384938998e-05
MeanAbsoluteError value on hold-out data: 0.001961830770596862
Epoch: 327

Loss on hold-out set: 5.3251703583065624e-05
MeanAbsoluteError value on hold-out data: 0.0017608675407245755
Epoch: 328
Loss on hold-out set: 5.205225223046629e-05
MeanAbsoluteError value on hold-out data: 0.0016801718156784773
Epoch: 329
Loss on hold-out set: 5.513790687945612e-05
MeanAbsoluteError value on hold-out data: 0.002001837594434619
Epoch: 330
Loss on hold-out set: 0.00019703514424170758
MeanAbsoluteError value on hold-out data: 0.002951584989205003
Epoch: 331

```
Loss on hold-out set: 5.0297047732346284e-05
MeanAbsoluteError value on hold-out data: 0.0017399400239810348
Epoch: 332
Loss on hold-out set: 5.0039848632038156e-05
MeanAbsoluteError value on hold-out data: 0.0017958779353648424
Epoch: 333

Loss on hold-out set: 0.0002336041837972621
MeanAbsoluteError value on hold-out data: 0.0031796065159142017
Epoch: 334

Loss on hold-out set: 0.0016992593706412697
MeanAbsoluteError value on hold-out data: 0.005797796417027712
Epoch: 335
Loss on hold-out set: 7.719463243915925e-05
MeanAbsoluteError value on hold-out data: 0.002276198472827673
Epoch: 336
Loss on hold-out set: 5.4770625288606076e-05
MeanAbsoluteError value on hold-out data: 0.001957792555913329
Epoch: 337
Loss on hold-out set: 5.812389734781111e-05
MeanAbsoluteError value on hold-out data: 0.002056637778878212
Epoch: 338
Loss on hold-out set: 5.687500526855379e-05
MeanAbsoluteError value on hold-out data: 0.0018054315587505698
Epoch: 339
Loss on hold-out set: 6.159830176189783e-05
MeanAbsoluteError value on hold-out data: 0.002698561642318964
Epoch: 340

Loss on hold-out set: 9.145642645828153e-05
MeanAbsoluteError value on hold-out data: 0.0018943658797070384
Epoch: 341

Loss on hold-out set: 5.7299339905861976e-05
MeanAbsoluteError value on hold-out data: 0.001946265809237957
Epoch: 342
Loss on hold-out set: 6.164897228499145e-05
MeanAbsoluteError value on hold-out data: 0.0019207133445888758
Epoch: 343
Loss on hold-out set: 6.24768144042229e-05
```

```
MeanAbsoluteError value on hold-out data: 0.0019549319986253977
Epoch: 344
Loss on hold-out set: 6.50949822329494e-05
MeanAbsoluteError value on hold-out data: 0.002901035826653242
Epoch: 345

Loss on hold-out set: 9.121470143852023e-05
MeanAbsoluteError value on hold-out data: 0.0018981675384566188
Epoch: 346

Loss on hold-out set: 6.284391518490268e-05
MeanAbsoluteError value on hold-out data: 0.0019223307026550174
Epoch: 347
Loss on hold-out set: 9.19974088228278e-05
MeanAbsoluteError value on hold-out data: 0.0017905753338709474
Epoch: 348
Loss on hold-out set: 6.452720691203677e-05
MeanAbsoluteError value on hold-out data: 0.003784655127674341
Epoch: 349
Loss on hold-out set: 6.126070493687272e-05
MeanAbsoluteError value on hold-out data: 0.00197986769489944
Epoch: 350
Loss on hold-out set: 6.0375846015421514e-05
MeanAbsoluteError value on hold-out data: 0.002004491863772273
Epoch: 351
Loss on hold-out set: 5.7801585447018275e-05
MeanAbsoluteError value on hold-out data: 0.0018079939763993025
Epoch: 352

Loss on hold-out set: 5.6536939715976165e-05
MeanAbsoluteError value on hold-out data: 0.0018147481605410576
Epoch: 353

Loss on hold-out set: 6.384473267819255e-05
MeanAbsoluteError value on hold-out data: 0.002231073100119829
Epoch: 354
Loss on hold-out set: 0.0001680204912260636
MeanAbsoluteError value on hold-out data: 0.0035569893661886454
Epoch: 355
Loss on hold-out set: 5.925264224187616e-05
MeanAbsoluteError value on hold-out data: 0.001757521298713982
```

```
Epoch: 356
Loss on hold-out set: 5.9106479669096116e-05
MeanAbsoluteError value on hold-out data: 0.001784865977242589
Epoch: 357
Loss on hold-out set: 5.577310341427969e-05
MeanAbsoluteError value on hold-out data: 0.002447723876684904
Epoch: 358
Loss on hold-out set: 9.941252233584937e-05
MeanAbsoluteError value on hold-out data: 0.0024750293232500553
Epoch: 359

Loss on hold-out set: 5.5630639744427193e-05
MeanAbsoluteError value on hold-out data: 0.0021412144415080547
Epoch: 360

Loss on hold-out set: 8.416743935413251e-05
MeanAbsoluteError value on hold-out data: 0.0025955575983971357
Epoch: 361
Loss on hold-out set: 8.05437689100822e-05
MeanAbsoluteError value on hold-out data: 0.005711960606276989
Epoch: 362
Loss on hold-out set: 5.604782707170951e-05
MeanAbsoluteError value on hold-out data: 0.0024019700940698385
Epoch: 363
Loss on hold-out set: 8.552363145169623e-05
MeanAbsoluteError value on hold-out data: 0.0052124131470918655
Epoch: 364
Loss on hold-out set: 6.957315019043072e-05
MeanAbsoluteError value on hold-out data: 0.004598261322826147
Epoch: 365
Loss on hold-out set: 7.71509727035034e-05
MeanAbsoluteError value on hold-out data: 0.001863778568804264
Epoch: 366

Loss on hold-out set: 5.5532737755689035e-05
MeanAbsoluteError value on hold-out data: 0.004010250326246023
Epoch: 367

Loss on hold-out set: 5.0559207072463046e-05
MeanAbsoluteError value on hold-out data: 0.0017732236301526427
Epoch: 368
```

```
Loss on hold-out set: 7.598139458982936e-05
MeanAbsoluteError value on hold-out data: 0.0017522997222840786
Epoch: 369
Loss on hold-out set: 7.210494848445356e-05
MeanAbsoluteError value on hold-out data: 0.0016738042468205094
Epoch: 370
Loss on hold-out set: 8.099356420223977e-05
MeanAbsoluteError value on hold-out data: 0.0032003307715058327
Epoch: 371
Loss on hold-out set: 6.907249315610478e-05
MeanAbsoluteError value on hold-out data: 0.005520002916455269
Epoch: 372
Loss on hold-out set: 8.631431163490351e-05
MeanAbsoluteError value on hold-out data: 0.002001789165660739
Epoch: 373

Loss on hold-out set: 5.399025982692015e-05
MeanAbsoluteError value on hold-out data: 0.0017585087334737182
Epoch: 374

Loss on hold-out set: 5.2605131529048776e-05
MeanAbsoluteError value on hold-out data: 0.0018276035552844405
Epoch: 375
Loss on hold-out set: 7.712143941227204e-05
MeanAbsoluteError value on hold-out data: 0.0065854634158313274
Epoch: 376
Loss on hold-out set: 5.2279350895262796e-05
MeanAbsoluteError value on hold-out data: 0.0020128563046455383
Epoch: 377
Loss on hold-out set: 0.0012077920831577908
MeanAbsoluteError value on hold-out data: 0.005194840021431446
Epoch: 378
Loss on hold-out set: 5.17907361698305e-05
MeanAbsoluteError value on hold-out data: 0.0018782130209729075
Epoch: 379
Loss on hold-out set: 5.0841324154432114e-05
MeanAbsoluteError value on hold-out data: 0.0017818164778873324
Epoch: 380

Loss on hold-out set: 0.0004754517064913426
MeanAbsoluteError value on hold-out data: 0.003979752771556377
Epoch: 381
```

```
Loss on hold-out set: 5.155873086528992e-05
MeanAbsoluteError value on hold-out data: 0.0017709024250507355
Epoch: 382
Loss on hold-out set: 6.052763676332408e-05
MeanAbsoluteError value on hold-out data: 0.0036782044917345047
Epoch: 383
Loss on hold-out set: 5.054351548385337e-05
MeanAbsoluteError value on hold-out data: 0.001771260634995997
Epoch: 384
Loss on hold-out set: 4.9394502914660385e-05
MeanAbsoluteError value on hold-out data: 0.001742424676194787
Epoch: 385
Loss on hold-out set: 7.174213927258349e-05
MeanAbsoluteError value on hold-out data: 0.0017177296103909612
Epoch: 386
Loss on hold-out set: 4.888674108262701e-05
MeanAbsoluteError value on hold-out data: 0.0018694245954975486
Epoch: 387

Loss on hold-out set: 4.685048966079054e-05
MeanAbsoluteError value on hold-out data: 0.00174587476067245
Epoch: 388

Loss on hold-out set: 4.606017864388762e-05
MeanAbsoluteError value on hold-out data: 0.0019560237415134907
Epoch: 389
Loss on hold-out set: 4.543269330471188e-05
MeanAbsoluteError value on hold-out data: 0.0016744108870625496
Epoch: 390
Loss on hold-out set: 4.6783791307146974e-05
MeanAbsoluteError value on hold-out data: 0.0017729582032188773
Epoch: 391
Loss on hold-out set: 4.611750189881674e-05
MeanAbsoluteError value on hold-out data: 0.0017858465434983373
Epoch: 392
Loss on hold-out set: 4.689008334187642e-05
MeanAbsoluteError value on hold-out data: 0.0017486937576904893
Epoch: 393
Loss on hold-out set: 4.548926059792043e-05
MeanAbsoluteError value on hold-out data: 0.0016232866328209639
Epoch: 394
```

```
Loss on hold-out set: 6.67577277795317e-05
MeanAbsoluteError value on hold-out data: 0.0022900544572621584
Epoch: 395

Loss on hold-out set: 4.401491903886031e-05
MeanAbsoluteError value on hold-out data: 0.0016968640265986323
Epoch: 396
Loss on hold-out set: 0.0005744944094793972
MeanAbsoluteError value on hold-out data: 0.0039396462962031364
Early stopping at epoch 395
```

```
metric_name = type(fun_control["metric_torch"]).__name__
print(f"loss: {df_eval}, Cross-validated {metric_name}: {df_metrics}")
```

```
loss: 0.00019111411371262383, Cross-validated MeanAbsoluteError: 0.0016208995366469026
```

25.18 Detailed Hyperparameter Plots

```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

```
dropout_prob:  17.156313349504078
batch_size:  99.99999999999999
patience:  22.67082049754885
optimizer:  0.0819282483075864
```

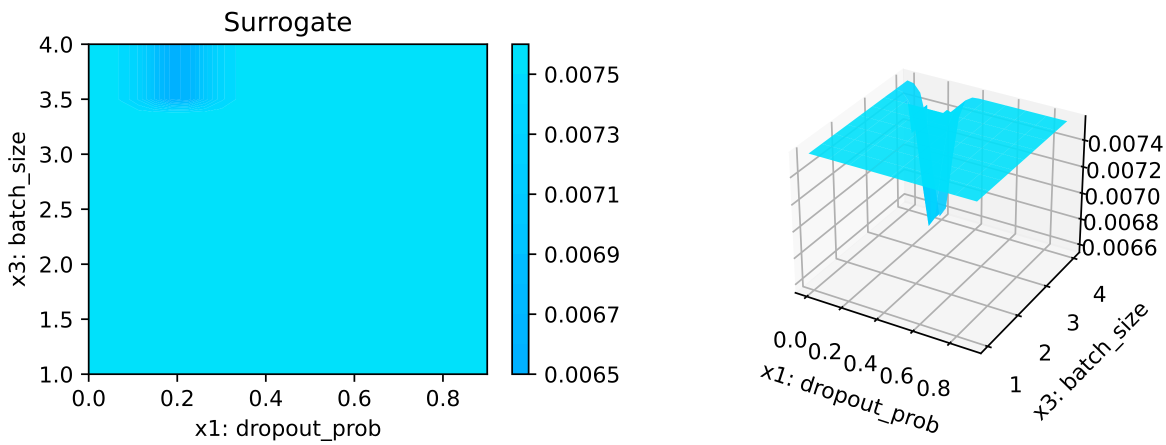
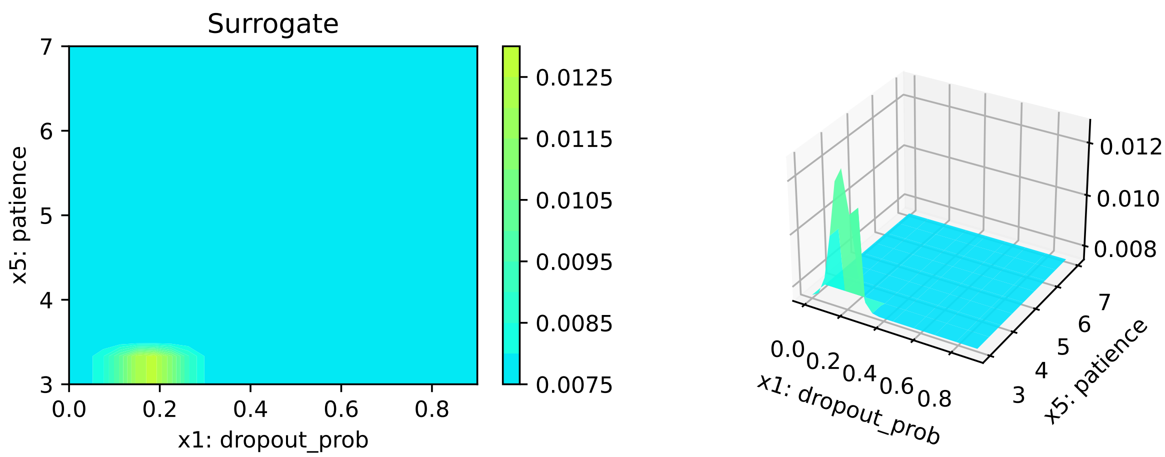
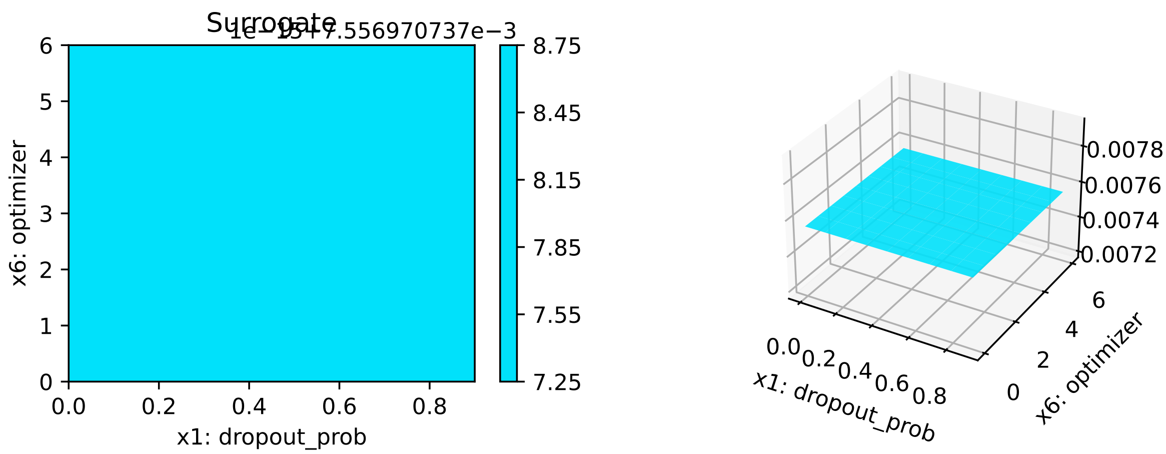
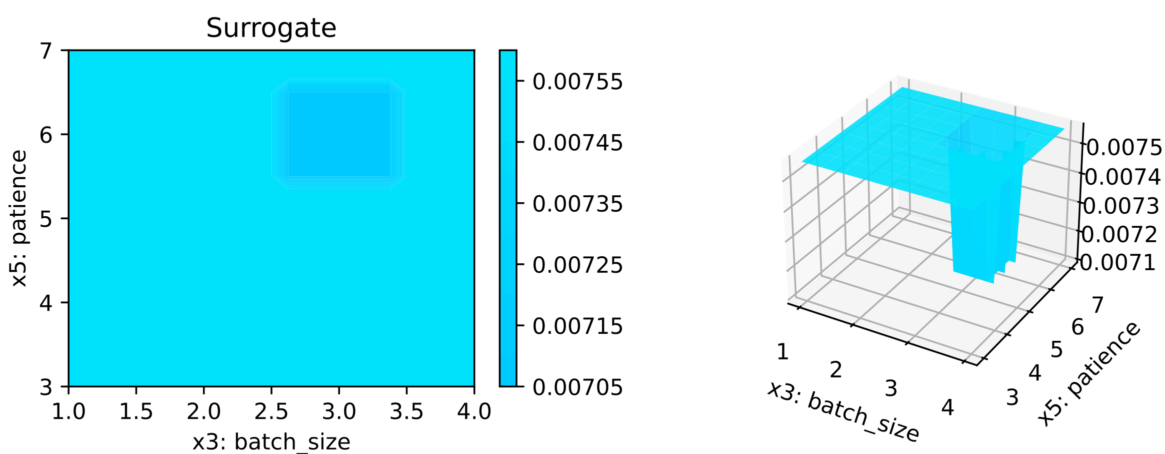


Figure 25.3: Contour plots.

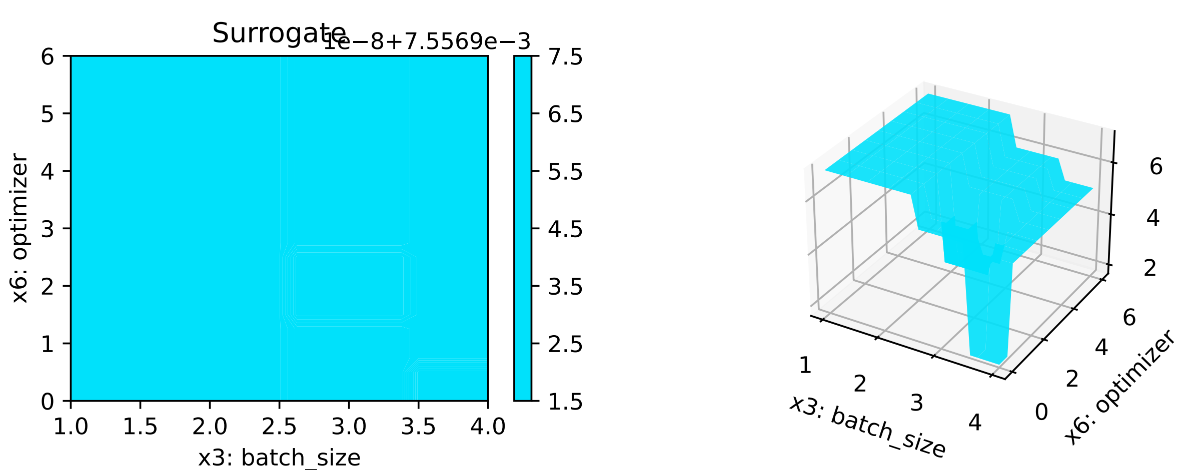




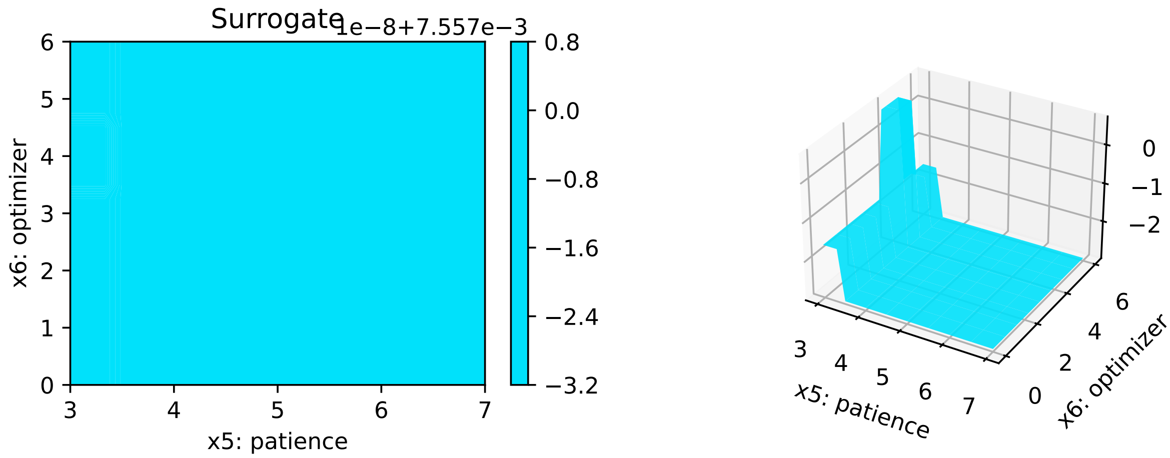
Surrogate
1e−15+7.556970737e−3
x1: dropout_prob
x6: optimizer



Surrogate
x3: batch_size
x5: patience



Surrogate
1e−8+7.5569e−3
x3: batch_size
x6: optimizer



25.19 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

Parallel coordinates plots

```
Unable to display output for mime type(s): text/html
```

25.20 Summary and Outlook

This tutorial presents the hyperparameter tuning open source software `spotPython` for `PyTorch`. Some of the advantages of `spotPython` are:

- Numerical and categorical hyperparameters.
- Powerful surrogate models.
- Flexible approach and easy to use.
- Simple JSON files for the specification of the hyperparameters.
- Extension of default and user specified network classes.
- Noise handling techniques.
- Online visualization of the hyperparameter tuning process with `tensorboard`.

Currently, only rudimentary parallel and distributed neural network training is possible, but these capabilities will be extended in the future. The next version of `spotPython` will also include a more detailed documentation and more examples.

> **! Important**
>
> Important: This tutorial does not present a complete benchmarking study (Bartz-Beielstein et al. 2020). The results are only preliminary and highly dependent on the local configuration (hard- and software). Our goal is to provide a first impression of the performance of the hyperparameter tuning package `spotPython`. The results should be interpreted with care.

26 Hyperparameter Tuning: VBDP

In this tutorial, we will show how `spotPython` can be integrated into the `PyTorch` training workflow for a classifiaction task.

> **Note**
>
> Ensure that the correspondiing data is available as `./data/VBDP/train.csv`.

This document refers to the following software versions:

- `python`: 3.10.10
- `torch`: 2.0.1
- `torchvision`: 0.15.0

```
pip list | grep  "spot[RiverPython]"
```

```
spotPython                    0.2.31

spotRiver                     0.0.93

Note: you may need to restart the kernel to use updated packages.
```

`spotPython` can be installed via pip. Alternatively, the source code can be downloaded from gitHub: https://github.com/sequential-parameter-optimization/spotPython.

```
!pip install spotPython
```

- Uncomment the following lines if you want to for (re-)installation the latest version of `spotPython` from gitHub.

```
# import sys
# !{sys.executable} -m pip install --upgrade build
# !{sys.executable} -m pip install --upgrade --force-reinstall spotPython
```

26.1 Setup

Before we consider the detailed experimental setup, we select the parameters that affect run time, initial design size and the device that is used.

```
MAX_TIME = 60
INIT_SIZE = 10
DEVICE = None # "cpu" # "cuda:0"
```

```
from spotPython.utils.device import getDevice
DEVICE = getDevice(DEVICE)
print(DEVICE)
```

```
mps
```

```
import os
import copy
import socket
from datetime import datetime
from dateutil.tz import tzlocal
start_time = datetime.now(tzlocal())
HOSTNAME = socket.gethostname().split(".")[0]
experiment_name = '25-torch' + "_" + HOSTNAME + "_" + str(MAX_TIME) + "min_" + str(INIT_SI
experiment_name = experiment_name.replace(':', '-')
print(experiment_name)
if not os.path.exists('./figures'):
    os.makedirs('./figures')
```

```
25-torch_p040025_60min_10init_2023-06-16_16-49-33
```

26.2 Initialization of the `fun_control` Dictionary

`spotPython` uses a Python dictionary for storing the information required for the hyperparameter tuning process, which was described in Section 20.2.

```
from spotPython.utils.init import fun_control_init
fun_control = fun_control_init(task="classification",
    tensorboard_path="runs/25_spot_torch_vbdp",
```

```
    device=DEVICE)
```

27 PyTorch Data Loading

27.1 1. Load VBDP Data

```
import pandas as pd
from sklearn.preprocessing import OrdinalEncoder
train_df = pd.read_csv('./data/VBDP/train.csv')
# remove the id column
train_df = train_df.drop(columns=['id'])
n_samples = train_df.shape[0]
n_features = train_df.shape[1] - 1
target_column = "prognosis"
# # Encoder our prognosis labels as integers for easier decoding later
enc = OrdinalEncoder()
train_df[target_column] = enc.fit_transform(train_df[[target_column]])
train_df.head()

# convert all entries to int for faster processing
train_df = train_df.astype(int)
```

```
from spotPython.data.vbdp import combine_features
df_new = train_df.copy()
# save the target column using "target_column" as the column name
target = train_df[target_column]
# remove the target column
df_new = df_new.drop(columns=[target_column])
train_df = combine_features(df_new)
# add the target column back
train_df[target_column] = target
train_df.head()
```

	sudden_fever	headache	mouth_bleed	nose_bleed	muscle_pain	joint_pain	vomiting	rash	diar
0	1	1	0	1	1	1	1	0	1
1	0	0	0	0	0	0	1	0	1

	sudden_fever	headache	mouth_bleed	nose_bleed	muscle_pain	joint_pain	vomiting	rash	diar
2	0	1	1	1	0	1	1	1	1
3	0	0	1	1	1	1	0	1	0
4	0	0	0	0	0	0	0	0	1

- feature engineering: 6112 features

```
from sklearn.model_selection import train_test_split
import numpy as np

n_samples = train_df.shape[0]
n_features = train_df.shape[1] - 1
train_df.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
X_train, X_test, y_train, y_test = train_test_split(train_df.drop(target_column, axis=1),
                                                    random_state=42,
                                                    test_size=0.25,
                                                    stratify=train_df[target_column])
trainset = pd.DataFrame(np.hstack((X_train, np.array(y_train).reshape(-1, 1))))
testset = pd.DataFrame(np.hstack((X_test, np.array(y_test).reshape(-1, 1))))
trainset.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
testset.columns = [f"x{i}" for i in range(1, n_features+1)] + [target_column]
print(train_df.shape)
print(trainset.shape)
print(testset.shape)
```

```
(707, 6113)
(530, 6113)
(177, 6113)
```

```
import torch
from sklearn.model_selection import train_test_split
from spotPython.torch.dataframedataset import DataFrameDataset
dtype_x = torch.float32
dtype_y = torch.long
train_df = DataFrameDataset(train_df, target_column=target_column, dtype_x=dtype_x, dtype_
train = DataFrameDataset(trainset, target_column=target_column, dtype_x=dtype_x, dtype_y=d
test = DataFrameDataset(testset, target_column=target_column, dtype_x=dtype_x, dtype_y=dty
n_samples = len(train)
```

```
# add the dataset to the fun_control
fun_control.update({"data": train_df, # full dataset,
               "train": train,
               "test": test,
               "n_samples": n_samples,
               "target_column": target_column})
```

27.2 The Model (Algorithm) to be Tuned

27.3 Specification of the Preprocessing Model

After the training and test data are specified and added to the `fun_control` dictionary, `spotPython` allows the specification of a data preprocessing pipeline, e.g., for the scaling of the data or for the one-hot encoding of categorical variables, see Section 20.4.1. This feature is not used here, so we do not change the default value (which is `None`).

27.4 Select `algorithm` and `core_model_hyper_dict`

27.4.1 Implementing a Configurable Neural Network With spotPython

`spotPython` includes the `Net_vbdp` class which is implemented in the file `netvbdp.py`. The class is imported here.

This class inherits from the class `Net_Core` which is implemented in the file `netcore.py`, see **?@sec-the-net-core-class-24**.

28 add the nn model to the fun_control dictionary

```
from spotPython.torch.netvbdp import Net_vbdp
from spotPython.data.torch_hyper_dict import TorchHyperDict
from spotPython.hyperparameters.values import add_core_model_to_fun_control
fun_control = add_core_model_to_fun_control(core_model=Net_vbdp,
                              fun_control=fun_control,
                              hyper_dict=TorchHyperDict)
```

28.1 Modifying the Hyperparameters

`spotPython` provides functions for modifying the hyperparameters, their bounds and factors as well as for activating and de-activating hyperparameters without re-compilation of the Python source code. These functions were described in Section 20.5.3.

Small number of epochs for demonstration purposes

- `epochs` is set to 2 and 3 for demonstration purposes. These values are too small for a real application.

```
from spotPython.hyperparameters.values import modify_hyper_parameter_bounds

fun_control = modify_hyper_parameter_bounds(fun_control, "_L0", bounds=[n_features, n_feat
fun_control = modify_hyper_parameter_bounds(fun_control, "l1", bounds=[6, 13])
fun_control = modify_hyper_parameter_bounds(fun_control, "epochs", bounds=[2, 2])
fun_control = modify_hyper_parameter_bounds(fun_control, "patience", bounds=[2, 6])
fun_control = modify_hyper_parameter_bounds(fun_control, "lr_mult", bounds=[1e-3, 1e-3])
fun_control = modify_hyper_parameter_bounds(fun_control, "sgd_momentum", bounds=[0.9, 0.9]
```

```
from spotPython.hyperparameters.values import modify_hyper_parameter_levels
fun_control = modify_hyper_parameter_levels(fun_control, "optimizer",["Adam", "AdamW", "Ad
```

```
# fun_control = modify_hyper_parameter_levels(fun_control, "optimizer", ["Adam"])
# fun_control = modify_hyper_parameter_levels(fun_control, "leaf_model", ["LinearRegressio
# fun_control["core_model_hyper_dict"]
```

```
fun_control = modify_hyper_parameter_bounds(fun_control,
    "lr_mult", bounds=[1e-3, 1e-3])
fun_control = modify_hyper_parameter_bounds(fun_control,
    "sgd_momentum", bounds=[0.9, 0.9])
```

28.1.1 Optimizers

Optimizers are described in Section 20.6.

28.2 Evaluation

The evaluation procedure requires the specification of two elements:

1. the way how the data is split into a train and a test set (see Section 20.7)
2. the loss function (and a metric).

28.2.1 Loss Functions and Metrics

The loss function is specified by the key `"loss_function"`. We will use CrossEntropy loss for the multiclass-classification task.

```
from torch.nn import CrossEntropyLoss
loss_function = CrossEntropyLoss()
fun_control.update({"loss_function": loss_function})
```

28.2.2 Metric

- We will use the MAP@k metric for the evaluation of the model. Here is an example how this metric is calculated.

```
from spotPython.torch.mapk import MAPK
import torch
mapk = MAPK(k=2)
```

```python
target = torch.tensor([0, 1, 2, 2])
preds = torch.tensor(
    [
        [0.5, 0.2, 0.2],  # 0 is in top 2
        [0.3, 0.4, 0.2],  # 1 is in top 2
        [0.2, 0.4, 0.3],  # 2 is in top 2
        [0.7, 0.2, 0.1],  # 2 isn't in top 2
    ]
)
mapk.update(preds, target)
print(mapk.compute()) # tensor(0.6250)
```

```
tensor(0.6250)
```

```python
from spotPython.torch.mapk import MAPK
import torchmetrics
metric_torch = MAPK(k=3)
fun_control.update({"metric_torch": metric_torch})
```

28.3 Preparing the SPOT Call

The following code passes the information about the parameter ranges and bounds to `spot`.

```python
# extract the variable types, names, and bounds
from spotPython.hyperparameters.values import (get_bound_values,
    get_var_name,
    get_var_type,)
var_type = get_var_type(fun_control)
var_name = get_var_name(fun_control)
fun_control.update({"var_type": var_type,
                    "var_name": var_name})
lower = get_bound_values(fun_control, "lower")
upper = get_bound_values(fun_control, "upper")
```

Now, the dictionary `fun_control` contains all information needed for the hyperparameter tuning. Before the hyperparameter tuning is started, it is recommended to take a look at the experimental design. The method `gen_design_table` generates a design table as follows:

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control))
```

```
| name         | type   | default   |    lower |    upper | transform             |
|--------------|--------|-----------|----------|----------|-----------------------|
| _L0          | int    | 64        | 6112     | 6112     | None                  |
| l1           | int    | 8         |    6     |   13     | transform_power_2_int |
| dropout_prob | float  | 0.01      |    0     |    0.9   | None                  |
| lr_mult      | float  | 1.0       |    0.001 |    0.001 | None                  |
| batch_size   | int    | 4         |    1     |    4     | transform_power_2_int |
| epochs       | int    | 4         |    2     |    2     | transform_power_2_int |
| k_folds      | int    | 1         |    1     |    1     | None                  |
| patience     | int    | 2         |    2     |    6     | transform_power_2_int |
| optimizer    | factor | SGD       |    0     |    3     | None                  |
| sgd_momentum | float  | 0.0       |    0.9   |    0.9   | None                  |
```

This allows to check if all information is available and if the information is correct.

28.4 The Objective Function `fun_torch`

The objective function `fun_torch` is selected next. It implements an interface from `PyTorch`'s training, validation, and testing methods to `spotPython`.

```
from spotPython.fun.hypertorch import HyperTorch
fun = HyperTorch().fun_torch
```

```
from spotPython.hyperparameters.values import get_default_hyperparameters_as_array
hyper_dict=TorchHyperDict().load()
X_start = get_default_hyperparameters_as_array(fun_control, hyper_dict)
```

28.5 Starting the Hyperparameter Tuning

The `spotPython` hyperparameter tuning is started by calling the `Spot` function as described in Section 20.12.

```
import numpy as np
from spotPython.spot import spot
from math import inf
```

```python
spot_tuner = spot.Spot(fun=fun,
                   lower = lower,
                   upper = upper,
                   fun_evals = inf,
                   fun_repeats = 1,
                   max_time = MAX_TIME,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type = var_type,
                   var_name = var_name,
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models= False,
                   show_progress= True,
                   fun_control = fun_control,
                   design_control={"init_size": INIT_SIZE,
                                   "repeats": 1},
                   surrogate_control={"noise": True,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": len(var_name),
                                      "model_fun_evals": 10_000,
                                      "log_level": 50
                                      })
spot_tuner.run(X_start=X_start)
```

```
config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.26515610830779995, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.3984749846988254
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.15509261190891266
Epoch: 2

Loss on hold-out set: 2.398470128024066
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1527777910232544
Epoch: 3
```

```
Loss on hold-out set: 2.398444484781336
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.15740740299224854
Epoch: 4

Loss on hold-out set: 2.3984496416868986
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1527777910232544
Returned to Spot: Validation loss: 2.3984496416868986
----------------------------------------------

config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.6368989501775649, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.3977162163212613
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1525157392024994
Epoch: 2

Loss on hold-out set: 2.3977872560609064
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.16273584961891174
Epoch: 3

Loss on hold-out set: 2.39770249150834
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.16823901236057281
Epoch: 4

Loss on hold-out set: 2.3979803346238047
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1525157392024994
Returned to Spot: Validation loss: 2.3979803346238047
----------------------------------------------

config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.06795318590380832, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397800913396871
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.18160377442836761
Epoch: 2
```

```
Loss on hold-out set: 2.3977704632957026
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.17610062658786774
Epoch: 3

Loss on hold-out set: 2.3977367338144555
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.16902515292167664
Epoch: 4

Loss on hold-out set: 2.39767790740391
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1808175891637802
Returned to Spot: Validation loss: 2.39767790740391
----------------------------------------------

config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.456533346732735, 'lr_mult': 0.001, 'batch
Epoch: 1

Loss on hold-out set: 2.3959148874822653
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.2012578248977661
Epoch: 2

Loss on hold-out set: 2.395951419506433
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.20440249145030975
Epoch: 3

Loss on hold-out set: 2.3960011905094363
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.2012578696012497
Epoch: 4

Loss on hold-out set: 2.3959170062586947
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.19654086232185364
Returned to Spot: Validation loss: 2.3959170062586947
----------------------------------------------

config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.435068640608333, 'lr_mult': 0.001, 'batc
Epoch: 1
```

```
Loss on hold-out set: 2.3976364224045366
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.2013888955116272
Epoch: 2

Loss on hold-out set: 2.397552066379123
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.20679013431072235
Epoch: 3

Loss on hold-out set: 2.3975142814494945
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.20987653732299805
Epoch: 4

Loss on hold-out set: 2.3974341551462808
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20910495519638062
Returned to Spot: Validation loss: 2.3974341551462808
----------------------------------------------

config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.3175980093998585, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3976478171798417
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.21776728332042694
Epoch: 2

Loss on hold-out set: 2.397093305047953
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.2413521707057953
Epoch: 3

Loss on hold-out set: 2.39643520679114
Accuracy on hold-out set: 0.16981132075471697
MAPK value on hold-out data: 0.23584900796413422
Epoch: 4
```

```
Loss on hold-out set: 2.395316591802633
Accuracy on hold-out set: 0.15566037735849056
MAPK value on hold-out data: 0.20990563929080963
Returned to Spot: Validation loss: 2.395316591802633
----------------------------------------------

config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.10217787740156026, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3972278700934515
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.16126543283462524
Epoch: 2

Loss on hold-out set: 2.3972197903527155
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1628086417913437
Epoch: 3

Loss on hold-out set: 2.3972151102843107
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1628086417913437
Epoch: 4

Loss on hold-out set: 2.3971975909339056
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1628086417913437
Returned to Spot: Validation loss: 2.3971975909339056
----------------------------------------------

config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.5582660802134882, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3977556935063116
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1697530746459961
Epoch: 2

Loss on hold-out set: 2.397471065874453
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18595676124095917
Epoch: 3
```

```
Loss on hold-out set: 2.397463427649604
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.1836419701576233
Epoch: 4

Loss on hold-out set: 2.397366276493779
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.18672841787338257
Returned to Spot: Validation loss: 2.397366276493779
----------------------------------------------

config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.8475085430864048, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397850936313845
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.14544029533863068
Epoch: 2

Loss on hold-out set: 2.3978837278653993
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.15723273158073425
Epoch: 3

Loss on hold-out set: 2.39770279065618
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.1745283156633377
Epoch: 4

Loss on hold-out set: 2.3976617961559654
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.16902516782283783
Returned to Spot: Validation loss: 2.3976617961559654
----------------------------------------------

config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.8086972970888939, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.396379198346819
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1897321194410324
```

```
Epoch: 2
Loss on hold-out set: 2.396181191716875
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1875
Epoch: 3

Loss on hold-out set: 2.3963338306971957
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1889880746603012
Epoch: 4
Loss on hold-out set: 2.3966206993375505
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1875
Returned to Spot: Validation loss: 2.3966206993375505
----------------------------------------------


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.050007493376037604, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397300517783975
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.17610064148902893
Epoch: 2

Loss on hold-out set: 2.3966974357389055
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.17059749364852905
Epoch: 3

Loss on hold-out set: 2.3960545737788363
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.15566037595272064
Epoch: 4

Loss on hold-out set: 2.397054280874864
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.14858490228652954
Returned to Spot: Validation loss: 2.397054280874864
----------------------------------------------
spotPython tuning: 2.395316591802633 [----------] 0.33%
```

```
config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.40349195704422475, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.3977503731565655
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.16430819034576416
Epoch: 2

Loss on hold-out set: 2.3977532566718334
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.15566037595272064
Epoch: 3

Loss on hold-out set: 2.3975829988155724
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1674528270959854
Epoch: 4

Loss on hold-out set: 2.397568995097898
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.17924530804157257
Returned to Spot: Validation loss: 2.397568995097898
----------------------------------------------
spotPython tuning: 2.395316591802633 [----------] 0.42%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.4483689823709421, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.399680398545175
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.14150944352149963
Epoch: 2

Loss on hold-out set: 2.3996977941045223
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1454402655363083
Epoch: 3
```

```
Loss on hold-out set: 2.399574617169938
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.14465411007404327
Epoch: 4

Loss on hold-out set: 2.399542381178658
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.14308176934719086
Returned to Spot: Validation loss: 2.399542381178658
----------------------------------------------
spotPython tuning: 2.395316591802633 [----------] 0.50%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.4573339944532009, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.3994004284894026
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1604938507080078
Epoch: 2

Loss on hold-out set: 2.3994949835318105
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.15586420893669128
Epoch: 3

Loss on hold-out set: 2.3994496133592396
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.15509261190891266
Epoch: 4

Loss on hold-out set: 2.3994269989154957
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.16435186564922333
Returned to Spot: Validation loss: 2.3994269989154957
----------------------------------------------
spotPython tuning: 2.395316591802633 [----------] 0.54%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.4566588032335605, 'lr_mult': 0.001, 'batcl
Epoch: 1
```

```
Loss on hold-out set: 2.3992842818206213
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.15015725791454315
Epoch: 2

Loss on hold-out set: 2.399296081291055
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.15172958374023438
Epoch: 3

Loss on hold-out set: 2.3993614259755836
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.14858493208885193
Epoch: 4

Loss on hold-out set: 2.399370643327821
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.14858491718769073
Returned to Spot: Validation loss: 2.399370643327821
----------------------------------------------
spotPython tuning: 2.395316591802633 [----------] 0.62%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.4275102787693773, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.397078349905194
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.23977988958358765
Epoch: 2

Loss on hold-out set: 2.3965612402502097
Accuracy on hold-out set: 0.15566037735849056
MAPK value on hold-out data: 0.23427671194076538
Epoch: 3

Loss on hold-out set: 2.3955252755363032
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1729559749364853
Epoch: 4
```

```
Loss on hold-out set: 2.393982086541518
Accuracy on hold-out set: 0.04716981132075472
MAPK value on hold-out data: 0.14386792480945587
Returned to Spot: Validation loss: 2.393982086541518
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 1.25%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.882235167481709, 'lr_mult': 0.001, 'batcl

Epoch: 1

Loss on hold-out set: 2.3973463323881044
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.19103771448135376
Epoch: 2

Loss on hold-out set: 2.397046979868187
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.1878930628299713
Epoch: 3

Loss on hold-out set: 2.3967539476898483
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.17767293751239777
Epoch: 4

Loss on hold-out set: 2.396553927997373
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17688679695129395
Returned to Spot: Validation loss: 2.396553927997373
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 1.87%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.856772479725372, 'lr_mult': 0.001, 'batcl

Epoch: 1
```

```
Loss on hold-out set: 2.3979914975616166
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.16823898255825043
Epoch: 2

Loss on hold-out set: 2.3974671048938103
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.17295600473880768
Epoch: 3

Loss on hold-out set: 2.3972333129846826
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.18238992989063263
Epoch: 4

Loss on hold-out set: 2.3965112960563517
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1941823959350586
Returned to Spot: Validation loss: 2.3965112960563517
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 2.51%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.002373071484783551, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.3978753089904785
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1599702388048172
Epoch: 2

Loss on hold-out set: 2.397862536566598
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1651785522699356
Epoch: 3
Loss on hold-out set: 2.3978628431047713
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.162946417927742
Epoch: 4
```

```
Loss on hold-out set: 2.397859913962228
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1614583283662796
Returned to Spot: Validation loss: 2.397859913962228
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 2.54%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.8032579717749374, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3977433330607862
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18946535885334015
Epoch: 2

Loss on hold-out set: 2.397694799135316
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19732703268527985
Epoch: 3

Loss on hold-out set: 2.397734007745419
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.17924527823925018
Epoch: 4

Loss on hold-out set: 2.3977056989129983
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.18632076680660248
Returned to Spot: Validation loss: 2.3977056989129983
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 2.87%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.02088710954248223, 'lr_mult': 0.001, 'ba
Epoch: 1
```

```
Loss on hold-out set: 2.398044482716974
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.16588054597377777
Epoch: 2

Loss on hold-out set: 2.397992395005136
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.16666670143604279
Epoch: 3

Loss on hold-out set: 2.3979392591512427
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.16666670143604279
Epoch: 4

Loss on hold-out set: 2.3978831138250962
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.16902518272399902
Returned to Spot: Validation loss: 2.3978831138250962
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 2.96%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.8462813701054609, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.3992217823311135
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12422841787338257
Epoch: 2

Loss on hold-out set: 2.3992471959855823
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.138888880610466
Epoch: 3

Loss on hold-out set: 2.3991090809857405
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.13734568655490875
Epoch: 4
```

```
Loss on hold-out set: 2.399004989200168
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.13348765671253204
Returned to Spot: Validation loss: 2.399004989200168
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 3.01%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.6582591659263604, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.3972800475246503
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.1933962106704712
Epoch: 2

Loss on hold-out set: 2.397081579802171
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.18632076680660248
Epoch: 3

Loss on hold-out set: 2.39717416718321
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18946540355682373
Epoch: 4

Loss on hold-out set: 2.3973052726601654
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.19025155901908875
Returned to Spot: Validation loss: 2.3973052726601654
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 3.17%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.5588589317567859, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.398490967573943
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.17438271641731262
Epoch: 2
```

```
Loss on hold-out set: 2.3984752584386757
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1766975373029709
Epoch: 3

Loss on hold-out set: 2.3983974280180753
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1766975373029709
Epoch: 4

Loss on hold-out set: 2.3985665197725647
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1697530895471573
Returned to Spot: Validation loss: 2.3985665197725647
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 3.21%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.19609283422959659, 'lr_mult': 0.001, 'batc

Epoch: 1

Loss on hold-out set: 2.3984083814441033
Accuracy on hold-out set: 0.05188679245283019
MAPK value on hold-out data: 0.1462264209985733
Epoch: 2

Loss on hold-out set: 2.3983944586987764
Accuracy on hold-out set: 0.05188679245283019
MAPK value on hold-out data: 0.14779874682426453
Epoch: 3

Loss on hold-out set: 2.3984988905348867
Accuracy on hold-out set: 0.05188679245283019
MAPK value on hold-out data: 0.138364776968956
Epoch: 4

Loss on hold-out set: 2.398386168030073
Accuracy on hold-out set: 0.05188679245283019
MAPK value on hold-out data: 0.14308176934719086
Returned to Spot: Validation loss: 2.398386168030073
----------------------------------------------
```

```
spotPython tuning: 2.393982086541518 [----------] 3.30%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.4050295724771694, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3983628344985672
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.14858491718769073
Epoch: 2

Loss on hold-out set: 2.398317777885581
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.12185535579919815
Epoch: 3

Loss on hold-out set: 2.3983205714315736
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.1399371325969696
Epoch: 4

Loss on hold-out set: 2.3981481633096373
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.13600631058216095
Returned to Spot: Validation loss: 2.3981481633096373
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 3.39%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.6650020573427289, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3980890998133906
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.17129629850387573
Epoch: 2

Loss on hold-out set: 2.398187858087045
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.14660495519638062
Epoch: 3
```

```
Loss on hold-out set: 2.3980157905154758
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1604938507080078
Epoch: 4

Loss on hold-out set: 2.3980369214658386
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.16898149251937866
Returned to Spot: Validation loss: 2.3980369214658386
----------------------------------------------
spotPython tuning: 2.393982086541518 [----------] 3.47%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0622916840670704, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3974993003989167
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1949685662984848
Epoch: 2

Loss on hold-out set: 2.397108158975277
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.20204399526119232
Epoch: 3

Loss on hold-out set: 2.396666220898898
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.21619494259357452
Epoch: 4

Loss on hold-out set: 2.396160948951289
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.21776729822158813
Returned to Spot: Validation loss: 2.396160948951289
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 3.80%
```

```
config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.5758726471619317, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3973926688140295
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.21069182455539703
Epoch: 2

Loss on hold-out set: 2.3973828891538225
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.18632075190544128
Epoch: 3

Loss on hold-out set: 2.3974201364337273
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.19339622557163239
Epoch: 4

Loss on hold-out set: 2.39737535422703
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.19339622557163239
Returned to Spot: Validation loss: 2.39737535422703
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 3.89%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.6654739007524466, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.398298144340515
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1227678582072258
Epoch: 2

Loss on hold-out set: 2.3981994560786655
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1443452537059784
Epoch: 3
```

```
Loss on hold-out set: 2.3981486218316213
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.1264881044626236
Epoch: 4

Loss on hold-out set: 2.3980626378740584
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.1450892835855484
Returned to Spot: Validation loss: 2.3980626378740584
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 3.93%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.4103563756313545, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.396789159093584
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1800595372915268
Epoch: 2
Loss on hold-out set: 2.3967047929763794
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1755952388048172
Epoch: 3

Loss on hold-out set: 2.396728447505406
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.181547611951828
Epoch: 4
Loss on hold-out set: 2.3967669180461337
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1793154776096344
Returned to Spot: Validation loss: 2.3967669180461337
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 3.96%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.30647708216906094, 'lr_mult': 0.001, 'batc
Epoch: 1
```

```
Loss on hold-out set: 2.398080269495646
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.16126546263694763
Epoch: 2

Loss on hold-out set: 2.3980767373685485
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.15586420893669128
Epoch: 3

Loss on hold-out set: 2.3981191140634044
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.15046297013759613
Epoch: 4

Loss on hold-out set: 2.3980162055404097
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.15586422383785248
Returned to Spot: Validation loss: 2.3980162055404097
----------------------------------------------

spotPython tuning: 2.393982086541518 [----------] 4.01%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.13432222501302687, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.396865286917057
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2641509175300598
Epoch: 2

Loss on hold-out set: 2.3952096633191378
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2979559302330017
Epoch: 3
```

```
Loss on hold-out set: 2.392144596801614
Accuracy on hold-out set: 0.18396226415094338
MAPK value on hold-out data: 0.32861635088920593
Epoch: 4

Loss on hold-out set: 2.385729384872149
Accuracy on hold-out set: 0.22641509433962265
MAPK value on hold-out data: 0.33805030584335327
Returned to Spot: Validation loss: 2.385729384872149
----------------------------------------------

spotPython tuning: 2.385729384872149 [----------] 4.65%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.053463082478508284, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.398099516922573
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.1399371176958084
Epoch: 2

Loss on hold-out set: 2.3979349788629785
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.1399371176958084
Epoch: 3

Loss on hold-out set: 2.3978073641938984
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.14072328805923462
Epoch: 4

Loss on hold-out set: 2.3976930357375235
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.14229562878608704
Returned to Spot: Validation loss: 2.3976930357375235
----------------------------------------------

spotPython tuning: 2.385729384872149 [----------] 4.83%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10536759170495845, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.39691590812971
Accuracy on hold-out set: 0.20754716981132076
MAPK value on hold-out data: 0.2963836193084717
Epoch: 2

Loss on hold-out set: 2.3953377458284484
Accuracy on hold-out set: 0.22641509433962265
MAPK value on hold-out data: 0.33490562438964844
Epoch: 3

Loss on hold-out set: 2.3923863982254603
Accuracy on hold-out set: 0.2358490566037736
MAPK value on hold-out data: 0.3372640907764435
Epoch: 4

Loss on hold-out set: 2.3866240618363865
Accuracy on hold-out set: 0.24056603773584906
MAPK value on hold-out data: 0.3404088020324707
Returned to Spot: Validation loss: 2.3866240618363865
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 5.47%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10701892566228684, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3973376323591986
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.1666666716337204
Epoch: 2
```

```
Loss on hold-out set: 2.396176869014524
Accuracy on hold-out set: 0.04245283018867924
MAPK value on hold-out data: 0.14229562878608704
Epoch: 3

Loss on hold-out set: 2.393778040723981
Accuracy on hold-out set: 0.04245283018867924
MAPK value on hold-out data: 0.1407233029603958
Epoch: 4

Loss on hold-out set: 2.3889248483585863
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.20518866181373596
Returned to Spot: Validation loss: 2.3889248483585863
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 6.12%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.11245665311074035, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397287474488312
Accuracy on hold-out set: 0.16981132075471697
MAPK value on hold-out data: 0.24056601524353027
Epoch: 2

Loss on hold-out set: 2.3963258288941294
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.2287735641002655
Epoch: 3

Loss on hold-out set: 2.3940999462919414
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.23349057137966156
Epoch: 4
```

```
Loss on hold-out set: 2.3893637859596395
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.23742137849330902
Returned to Spot: Validation loss: 2.3893637859596395
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 6.76%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10581684480132023, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.39698730099876
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.20283019542694092
Epoch: 2

Loss on hold-out set: 2.3954890786476857
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.2146226167678833
Epoch: 3

Loss on hold-out set: 2.3925673984131723
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.2216980904340744
Epoch: 4

Loss on hold-out set: 2.388768749416999
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2358490377664566
Returned to Spot: Validation loss: 2.388768749416999
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 7.41%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.11205539208679452, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.397236797044862
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.19496853649616241
Epoch: 2

Loss on hold-out set: 2.3960006551922493
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.19732701778411865
Epoch: 3

Loss on hold-out set: 2.394157976474402
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.19968554377555847
Epoch: 4

Loss on hold-out set: 2.3914773014356507
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.2004716992378235
Returned to Spot: Validation loss: 2.3914773014356507
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 8.07%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09906771259800279, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397020441181255
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.14937108755111694
Epoch: 2

Loss on hold-out set: 2.3955283974701502
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.17531448602676392
Epoch: 3
```

```
Loss on hold-out set: 2.3924600605694755
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.18632075190544128
Epoch: 4

Loss on hold-out set: 2.3880896253405877
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.23899367451667786
Returned to Spot: Validation loss: 2.3880896253405877
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 8.72%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09712011059313501, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397091085056089
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18238995969295502
Epoch: 2

Loss on hold-out set: 2.3955636631767705
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20676100254058838
Epoch: 3

Loss on hold-out set: 2.39274888443497
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.20833329856395721
Epoch: 4

Loss on hold-out set: 2.3879715923993095
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.23663517832756042
Returned to Spot: Validation loss: 2.3879715923993095
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 9.37%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0947150149183354, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.396979091302404
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.20597484707832336
Epoch: 2

Loss on hold-out set: 2.3953436230713465
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.2429245263338089
Epoch: 3

Loss on hold-out set: 2.3920822211031645
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.2625785768032074
Epoch: 4

Loss on hold-out set: 2.385798748934044
Accuracy on hold-out set: 0.1650943396226415
MAPK value on hold-out data: 0.28852197527885437
Returned to Spot: Validation loss: 2.385798748934044
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 10.03%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.08936068988188921, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3972115629124193
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.2641509175300598
Epoch: 2
```

```
Loss on hold-out set: 2.396566440474312
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.2838050127029419
Epoch: 3

Loss on hold-out set: 2.395565964140982
Accuracy on hold-out set: 0.17452830188679244
MAPK value on hold-out data: 0.2900942265987396
Epoch: 4

Loss on hold-out set: 2.3940307351778136
Accuracy on hold-out set: 0.19339622641509435
MAPK value on hold-out data: 0.2830187678337097
Returned to Spot: Validation loss: 2.3940307351778136
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 10.36%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09771568367262776, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3976708718065947
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19654086232185364
Epoch: 2

Loss on hold-out set: 2.397279458225898
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.19654086232185364
Epoch: 3

Loss on hold-out set: 2.396678755868156
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.20283019542694092
Epoch: 4
```

```
Loss on hold-out set: 2.395890625017994
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.2075471580028534
Returned to Spot: Validation loss: 2.395890625017994
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 10.98%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0948591188396132, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3975294333583905
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.22169813513755798
Epoch: 2

Loss on hold-out set: 2.397023360684233
Accuracy on hold-out set: 0.1650943396226415
MAPK value on hold-out data: 0.2484276294708252
Epoch: 3

Loss on hold-out set: 2.3964621840782887
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2421383410692215
Epoch: 4

Loss on hold-out set: 2.3955426441048675
Accuracy on hold-out set: 0.1650943396226415
MAPK value on hold-out data: 0.25864776968955994
Returned to Spot: Validation loss: 2.3955426441048675
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 11.60%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09926105920543771, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.3974099856502606
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2146226465702057
Epoch: 2

Loss on hold-out set: 2.3968973812067285
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.23742137849330902
Epoch: 3

Loss on hold-out set: 2.396084785461426
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.22327040135860443
Epoch: 4

Loss on hold-out set: 2.3950486880428388
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.2209119200706482
Returned to Spot: Validation loss: 2.3950486880428388
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 12.22%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10001429049208418, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397201322159677
Accuracy on hold-out set: 0.15566037735849056
MAPK value on hold-out data: 0.26179239153862
Epoch: 2

Loss on hold-out set: 2.3965553967457898
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.277515709400177
Epoch: 3
```

```
Loss on hold-out set: 2.395803021934797
Accuracy on hold-out set: 0.19811320754716982
MAPK value on hold-out data: 0.30031442642211914
Epoch: 4

Loss on hold-out set: 2.39479705297722
Accuracy on hold-out set: 0.16981132075471697
MAPK value on hold-out data: 0.2822326421737671
Returned to Spot: Validation loss: 2.39479705297722
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 12.85%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09763044248562373, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397172615213214
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.234276682138443
Epoch: 2

Loss on hold-out set: 2.396633323633446
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.23349051177501678
Epoch: 3

Loss on hold-out set: 2.3958538860644936
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.2429245114326477
Epoch: 4

Loss on hold-out set: 2.394904480790192
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.22405658662319183
Returned to Spot: Validation loss: 2.394904480790192
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 13.46%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09776828059942083, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3974706924186564
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.19811320304870605
Epoch: 2

Loss on hold-out set: 2.396867956755296
Accuracy on hold-out set: 0.2028301886792453
MAPK value on hold-out data: 0.2759433686733246
Epoch: 3

Loss on hold-out set: 2.3961715023472623
Accuracy on hold-out set: 0.21226415094339623
MAPK value on hold-out data: 0.3042452931404114
Epoch: 4

Loss on hold-out set: 2.395130346406181
Accuracy on hold-out set: 0.2169811320754717
MAPK value on hold-out data: 0.3396226763725281
Returned to Spot: Validation loss: 2.395130346406181
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 14.09%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09790668943518958, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.39754648478526
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.21540877223014832
Epoch: 2
```

```
Loss on hold-out set: 2.3970329311658753
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.22327038645744324
Epoch: 3

Loss on hold-out set: 2.3963431952134617
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.22484275698661804
Epoch: 4

Loss on hold-out set: 2.3953555327541425
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.2279874086380005
Returned to Spot: Validation loss: 2.3953555327541425
----------------------------------------------

spotPython tuning: 2.385729384872149 [#---------] 14.72%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10175077071331433, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397523234475334
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2555031180381775
Epoch: 2

Loss on hold-out set: 2.396986444041414
Accuracy on hold-out set: 0.2028301886792453
MAPK value on hold-out data: 0.2916666567325592
Epoch: 3

Loss on hold-out set: 2.3962527648457943
Accuracy on hold-out set: 0.22641509433962265
MAPK value on hold-out data: 0.30738988518714905
Epoch: 4
```

```
Loss on hold-out set: 2.395201323167333
Accuracy on hold-out set: 0.2169811320754717
MAPK value on hold-out data: 0.31525155901908875
Returned to Spot: Validation loss: 2.395201323167333
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 15.34%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10184629377597414, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3974059775190533
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.2004716694355011
Epoch: 2

Loss on hold-out set: 2.3969048261642456
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.207547128200531
Epoch: 3

Loss on hold-out set: 2.3962309697888933
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.22484275698661804
Epoch: 4

Loss on hold-out set: 2.3953211667402736
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.23584900796413422
Returned to Spot: Validation loss: 2.3953211667402736
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 16.00%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10143706333513494, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.397383730366545
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17610062658786774
Epoch: 2

Loss on hold-out set: 2.3968478013884345
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.18238995969295502
Epoch: 3

Loss on hold-out set: 2.396104443748042
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.18160377442836761
Epoch: 4

Loss on hold-out set: 2.39499354587411
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17924530804157257
Returned to Spot: Validation loss: 2.39499354587411
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 16.62%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10221523820656639, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397528571902581
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.20518867671489716
Epoch: 2

Loss on hold-out set: 2.397140916788353
Accuracy on hold-out set: 0.16981132075471697
MAPK value on hold-out data: 0.24449683725833893
Epoch: 3
```

```
Loss on hold-out set: 2.3966216636153885
Accuracy on hold-out set: 0.18396226415094338
MAPK value on hold-out data: 0.26022011041641235
Epoch: 4

Loss on hold-out set: 2.395742953948255
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.25157231092453003
Returned to Spot: Validation loss: 2.395742953948255
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 17.27%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10029250871961028, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3975194512673146
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.17059747874736786
Epoch: 2

Loss on hold-out set: 2.3969659625359303
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.20911945402622223
Epoch: 3

Loss on hold-out set: 2.396280488877926
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.2146226167678833
Epoch: 4

Loss on hold-out set: 2.395194073892989
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.22405660152435303
Returned to Spot: Validation loss: 2.395194073892989
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 17.92%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10049053176097776, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3973841442252106
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.17924527823925018
Epoch: 2

Loss on hold-out set: 2.396951081617823
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1878930628299713
Epoch: 3

Loss on hold-out set: 2.396355284834808
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.19811317324638367
Epoch: 4

Loss on hold-out set: 2.395499728760629
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.21069177985191345
Returned to Spot: Validation loss: 2.395499728760629
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 18.54%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10029986783787145, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397578925456641
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.21776726841926575
Epoch: 2
```

```
Loss on hold-out set: 2.3971295446719765
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.19654089212417603
Epoch: 3

Loss on hold-out set: 2.3964153213321038
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.19811320304870605
Epoch: 4

Loss on hold-out set: 2.395462780628564
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.20518866181373596
Returned to Spot: Validation loss: 2.395462780628564
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 19.18%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10015525432688308, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3972159759053646
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.18946537375450134
Epoch: 2

Loss on hold-out set: 2.3966528064799757
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.19103771448135376
Epoch: 3

Loss on hold-out set: 2.395916704861623
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.19654089212417603
Epoch: 4
```

```
Loss on hold-out set: 2.394768440498496
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.2075471729040146
Returned to Spot: Validation loss: 2.394768440498496
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 19.80%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09666252421838194, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.39721143245697
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.24606916308403015
Epoch: 2

Loss on hold-out set: 2.396462861097084
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.26493704319000244
Epoch: 3

Loss on hold-out set: 2.3954333854171463
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.2759433388710022
Epoch: 4

Loss on hold-out set: 2.394091878297194
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2814464867115021
Returned to Spot: Validation loss: 2.394091878297194
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 20.43%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09246027396381049, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.3974926809094987
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1745283007621765
Epoch: 2

Loss on hold-out set: 2.39685953113268
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.2004716843366623
Epoch: 3

Loss on hold-out set: 2.3960037366399227
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.22012574970722198
Epoch: 4

Loss on hold-out set: 2.3948583063089623
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.24764147400856018
Returned to Spot: Validation loss: 2.3948583063089623
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 21.05%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.08977692580792282, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3973185791159577
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.23034587502479553
Epoch: 2

Loss on hold-out set: 2.3966759375806124
Accuracy on hold-out set: 0.18867924528301888
MAPK value on hold-out data: 0.2853773534297943
Epoch: 3
```

```
Loss on hold-out set: 2.3958729393077345
Accuracy on hold-out set: 0.19339622641509435
MAPK value on hold-out data: 0.3097483813762665
Epoch: 4

Loss on hold-out set: 2.3947641647086955
Accuracy on hold-out set: 0.19339622641509435
MAPK value on hold-out data: 0.3121068775653839
Returned to Spot: Validation loss: 2.3947641647086955
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 21.68%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.08927606435535648, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397298122352024
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2161949872970581
Epoch: 2

Loss on hold-out set: 2.396837686592678
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.20361632108688354
Epoch: 3

Loss on hold-out set: 2.3962389860513076
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.20990563929080963
Epoch: 4

Loss on hold-out set: 2.3954001507669127
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.2012578248977661
Returned to Spot: Validation loss: 2.3954001507669127
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 22.30%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09256944632208315, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397469864701325
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.21069179475307465
Epoch: 2

Loss on hold-out set: 2.396929342791719
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.21855345368385315
Epoch: 3

Loss on hold-out set: 2.396196390097996
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.22327041625976562
Epoch: 4

Loss on hold-out set: 2.395305536827951
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.24056600034236908
Returned to Spot: Validation loss: 2.395305536827951
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 22.93%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.08959514781378194, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3973476504379847
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.18160380423069
Epoch: 2
```

```
Loss on hold-out set: 2.3967386551623076
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.22405652701854706
Epoch: 3

Loss on hold-out set: 2.396048606566663
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.24685528874397278
Epoch: 4

Loss on hold-out set: 2.395044171585227
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2751571536064148
Returned to Spot: Validation loss: 2.395044171585227
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 23.58%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.08833011834933767, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397500474497957
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.18317611515522003
Epoch: 2

Loss on hold-out set: 2.3970093007357614
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.20676098763942719
Epoch: 3

Loss on hold-out set: 2.3963388631928644
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.2413521558046341
Epoch: 4
```

```
Loss on hold-out set: 2.395389736823316
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2704401910305023
Returned to Spot: Validation loss: 2.395389736823316
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 24.24%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09559145591366684, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3971852693917617
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.23663519322872162
Epoch: 2

Loss on hold-out set: 2.3966115173303857
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.23191818594932556
Epoch: 3

Loss on hold-out set: 2.395975504281386
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.2216980904340744
Epoch: 4

Loss on hold-out set: 2.3947973588727556
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.2138364613056183
Returned to Spot: Validation loss: 2.3947973588727556
----------------------------------------------

spotPython tuning: 2.385729384872149 [##--------] 24.90%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09495425085932185, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.397751421298621
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.19575472176074982
Epoch: 2

Loss on hold-out set: 2.397257701405939
Accuracy on hold-out set: 0.1650943396226415
MAPK value on hold-out data: 0.2279874086380005
Epoch: 3

Loss on hold-out set: 2.396693303899945
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.23191823065280914
Epoch: 4

Loss on hold-out set: 2.3958773388052887
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.2154087871313095
Returned to Spot: Validation loss: 2.3958773388052887
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 25.56%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09700169563855483, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397332679550603
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.21619494259357452
Epoch: 2

Loss on hold-out set: 2.396717458401086
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.26493701338768005
Epoch: 3
```

```
Loss on hold-out set: 2.3958634048138023
Accuracy on hold-out set: 0.19339622641509435
MAPK value on hold-out data: 0.2987420856952667
Epoch: 4

Loss on hold-out set: 2.3948834167336517
Accuracy on hold-out set: 0.21226415094339623
MAPK value on hold-out data: 0.3191823661327362
Returned to Spot: Validation loss: 2.3948834167336517
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 26.26%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0928307854353682, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3975462936005503
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.2350628674030304
Epoch: 2

Loss on hold-out set: 2.397023727309029
Accuracy on hold-out set: 0.18396226415094338
MAPK value on hold-out data: 0.24764148890972137
Epoch: 3

Loss on hold-out set: 2.396347738661856
Accuracy on hold-out set: 0.1792452830188679
MAPK value on hold-out data: 0.24921377003192902
Epoch: 4

Loss on hold-out set: 2.3954479626889498
Accuracy on hold-out set: 0.15566037735849056
MAPK value on hold-out data: 0.24056600034236908
Returned to Spot: Validation loss: 2.3954479626889498
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 26.95%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09461475892822313, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397458425107992
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.19968551397323608
Epoch: 2

Loss on hold-out set: 2.396933328430608
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.22562888264656067
Epoch: 3

Loss on hold-out set: 2.396247982978821
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.23034587502479553
Epoch: 4

Loss on hold-out set: 2.395194204348438
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.25157228112220764
Returned to Spot: Validation loss: 2.395194204348438
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 27.63%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09471572402915533, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397209680305337
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.2570754289627075
Epoch: 2
```

```
Loss on hold-out set: 2.3966291940437174
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.24764148890972137
Epoch: 3

Loss on hold-out set: 2.3959262258601637
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.23820750415325165
Epoch: 4

Loss on hold-out set: 2.3950506493730366
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2499999850988388
Returned to Spot: Validation loss: 2.3950506493730366
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 28.32%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09438254864730357, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3971472258837716
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2570754289627075
Epoch: 2

Loss on hold-out set: 2.396687476140148
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2641508877277374
Epoch: 3

Loss on hold-out set: 2.3959464352085904
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2570754289627075
Epoch: 4
```

```
Loss on hold-out set: 2.394840323700095
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.2555030882358551
Returned to Spot: Validation loss: 2.394840323700095
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 28.99%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09750651382391493, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3974899885789402
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.2004716992378235
Epoch: 2

Loss on hold-out set: 2.3970379581991232
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.21540877223014832
Epoch: 3

Loss on hold-out set: 2.396269456395563
Accuracy on hold-out set: 0.15566037735849056
MAPK value on hold-out data: 0.24135218560695648
Epoch: 4

Loss on hold-out set: 2.395233835814134
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.22641505300998688
Returned to Spot: Validation loss: 2.395233835814134
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 29.68%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09743834322314916, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.397506241528493
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1745283305644989
Epoch: 2

Loss on hold-out set: 2.3969382160114794
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.21305032074451447
Epoch: 3

Loss on hold-out set: 2.396337479915259
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.20990562438964844
Epoch: 4

Loss on hold-out set: 2.3953352131933534
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.2146226167678833
Returned to Spot: Validation loss: 2.3953352131933534
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 30.38%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09711623486330663, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397343592823676
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1729559749364853
Epoch: 2

Loss on hold-out set: 2.3968523875722347
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.2130502611398697
Epoch: 3
```

```
Loss on hold-out set: 2.3962538894617333
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.23820753395557404
Epoch: 4

Loss on hold-out set: 2.395340139011167
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.2625785768032074
Returned to Spot: Validation loss: 2.395340139011167
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 31.09%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09670296004139732, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3975050089494236
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.17845910787582397
Epoch: 2

Loss on hold-out set: 2.3970576952088556
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.1933962106704712
Epoch: 3

Loss on hold-out set: 2.3964173208992436
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20283019542694092
Epoch: 4

Loss on hold-out set: 2.3955847564733252
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.21069179475307465
Returned to Spot: Validation loss: 2.3955847564733252
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 31.76%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09675199584138752, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3975986129832716
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.18867920339107513
Epoch: 2

Loss on hold-out set: 2.397161218355287
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.20283015072345734
Epoch: 3

Loss on hold-out set: 2.3964602227480905
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.20676098763942719
Epoch: 4

Loss on hold-out set: 2.395541823135232
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.20597481727600098
Returned to Spot: Validation loss: 2.395541823135232
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 32.45%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09647893395259428, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397203155283658
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2696540355682373
Epoch: 2
```

```
Loss on hold-out set: 2.396587572007809
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2838049530982971
Epoch: 3

Loss on hold-out set: 2.3958140701617836
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.2838049530982971
Epoch: 4

Loss on hold-out set: 2.394748179417736
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.26650938391685486
Returned to Spot: Validation loss: 2.394748179417736
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 33.18%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09651747554053189, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397498774078657
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.21855343878269196
Epoch: 2

Loss on hold-out set: 2.3968688609465114
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.23113206028938293
Epoch: 3

Loss on hold-out set: 2.396093116616303
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.22720125317573547
Epoch: 4
```

```
Loss on hold-out set: 2.3949748097725636
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.22955971956253052
Returned to Spot: Validation loss: 2.3949748097725636
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 33.87%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09640090666007961, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397468497168343
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.14937108755111694
Epoch: 2

Loss on hold-out set: 2.3969218168618545
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.17688679695129395
Epoch: 3

Loss on hold-out set: 2.396249053613195
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.17845910787582397
Epoch: 4

Loss on hold-out set: 2.3952933302465476
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.17688679695129395
Returned to Spot: Validation loss: 2.3952933302465476
----------------------------------------------

spotPython tuning: 2.385729384872149 [###-------] 34.60%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.09673455720430216, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.3974084381787284
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1878930926322937
Epoch: 2

Loss on hold-out set: 2.396894691125402
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.19811320304870605
Epoch: 3

Loss on hold-out set: 2.396205728908755
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.20597484707832336
Epoch: 4

Loss on hold-out set: 2.3951323099856108
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.20204399526119232
Returned to Spot: Validation loss: 2.3951323099856108
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 35.25%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.10508672678386433, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397588477944428
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1674528270959854
Epoch: 2

Loss on hold-out set: 2.3972133510517626
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.15487422049045563
Epoch: 3
```

```
Loss on hold-out set: 2.396669866903773
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.15408805012702942
Epoch: 4

Loss on hold-out set: 2.3959990267483695
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.15723271667957306
Returned to Spot: Validation loss: 2.3959990267483695
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 35.89%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.08967956287041796, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.39719454747326
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.23034588992595673
Epoch: 2

Loss on hold-out set: 2.3965547354716175
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.24449680745601654
Epoch: 3

Loss on hold-out set: 2.395808611276015
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.2507861256599426
Epoch: 4

Loss on hold-out set: 2.3947323403268492
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.28616347908973694
Returned to Spot: Validation loss: 2.3947323403268492
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 36.58%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.08388728387784045, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3973992860542155
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2146226465702057
Epoch: 2

Loss on hold-out set: 2.3969123183556325
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.21619494259357452
Epoch: 3

Loss on hold-out set: 2.3961992691148004
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.23899367451667786
Epoch: 4

Loss on hold-out set: 2.395245367625974
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.25235846638679504
Returned to Spot: Validation loss: 2.395245367625974
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 37.33%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.07846906182942504, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3973086667510697
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.22405655682086945
Epoch: 2
```

```
Loss on hold-out set: 2.3966794486315743
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.22484275698661804
Epoch: 3

Loss on hold-out set: 2.395837441930231
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.23349052667617798
Epoch: 4

Loss on hold-out set: 2.394653542986456
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.23270435631275177
Returned to Spot: Validation loss: 2.394653542986456
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 38.08%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.05935270870989725, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3974544439675674
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.18238990008831024
Epoch: 2

Loss on hold-out set: 2.3968566048820064
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.23270437121391296
Epoch: 3

Loss on hold-out set: 2.3961112409267784
Accuracy on hold-out set: 0.19811320754716982
MAPK value on hold-out data: 0.2971697449684143
Epoch: 4
```

```
Loss on hold-out set: 2.395068922132816
Accuracy on hold-out set: 0.25943396226415094
MAPK value on hold-out data: 0.3482704162597656
Returned to Spot: Validation loss: 2.395068922132816
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 38.84%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0529341594100696, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3972787272255376
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.18632075190544128
Epoch: 2

Loss on hold-out set: 2.3966412026927157
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.22405660152435303
Epoch: 3

Loss on hold-out set: 2.3958687242471948
Accuracy on hold-out set: 0.1792452830188679
MAPK value on hold-out data: 0.26179239153862
Epoch: 4

Loss on hold-out set: 2.394663390123619
Accuracy on hold-out set: 0.18867924528301888
MAPK value on hold-out data: 0.2822326719760895
Returned to Spot: Validation loss: 2.394663390123619
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 39.57%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.020772152200392344, 'lr_mult': 0.001, 'ba

Epoch: 1
```

```
Loss on hold-out set: 2.397404576247593
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.23427671194076538
Epoch: 2

Loss on hold-out set: 2.396763990510185
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.22562891244888306
Epoch: 3

Loss on hold-out set: 2.395962062871681
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.21540875732898712
Epoch: 4

Loss on hold-out set: 2.3947811846463187
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.22327043116092682
Returned to Spot: Validation loss: 2.3947811846463187
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 40.27%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0, 'lr_mult': 0.001, 'batch_size': 2, 'e

Epoch: 1

Loss on hold-out set: 2.397426477018392
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.15015725791454315
Epoch: 2

Loss on hold-out set: 2.3969412479760512
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1666666716337204
Epoch: 3
```

```
Loss on hold-out set: 2.396288703072746
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.18396227061748505
Epoch: 4

Loss on hold-out set: 2.395447758008849
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.2012578248977661
Returned to Spot: Validation loss: 2.395447758008849
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 41.03%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.03471706986007369, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.397556588334857
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.14858493208885193
Epoch: 2

Loss on hold-out set: 2.396899218829173
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.19732701778411865
Epoch: 3

Loss on hold-out set: 2.3960958989161365
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.22641511261463165
Epoch: 4

Loss on hold-out set: 2.3949857252948688
Accuracy on hold-out set: 0.16981132075471697
MAPK value on hold-out data: 0.27358490228652954
Returned to Spot: Validation loss: 2.3949857252948688
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 41.75%
```

```
config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.029941771468439786, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3971260808548838
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.2209119200706482
Epoch: 2

Loss on hold-out set: 2.396376033998885
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.22720126807689667
Epoch: 3

Loss on hold-out set: 2.395480839711315
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.25235843658447266
Epoch: 4

Loss on hold-out set: 2.394273483528281
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.27908802032470703
Returned to Spot: Validation loss: 2.394273483528281
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 42.47%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.5209544887449145, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.397766981806074
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.1956845223903656
Epoch: 2

Loss on hold-out set: 2.3977473293031966
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2157738208770752
Epoch: 3
```

```
Loss on hold-out set: 2.397688559123448
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.2061011791229248
Epoch: 4

Loss on hold-out set: 2.3976776940482005
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.21875
Returned to Spot: Validation loss: 2.3976776940482005
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 42.61%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0002864508616918339, 'lr_mult': 0.001, 'b

Epoch: 1

Loss on hold-out set: 2.3972438483868004
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1871069073677063
Epoch: 2

Loss on hold-out set: 2.3966439017709695
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.2138364613056183
Epoch: 3

Loss on hold-out set: 2.395832525109345
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.23742136359214783
Epoch: 4

Loss on hold-out set: 2.394713086901971
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2704401910305023
Returned to Spot: Validation loss: 2.394713086901971
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 43.31%
```

```
config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.24290493766298485, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3973434854436806
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1388889104127884
Epoch: 2

Loss on hold-out set: 2.397427055570814
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1388889104127884
Epoch: 3

Loss on hold-out set: 2.397404838491369
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1388889104127884
Epoch: 4

Loss on hold-out set: 2.3974000612894693
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1388889104127884
Returned to Spot: Validation loss: 2.3974000612894693
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 43.45%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.24744039117570946, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.397934279351864
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17138366401195526
Epoch: 2

Loss on hold-out set: 2.397993659073452
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.16273586452007294
Epoch: 3
```

```
Loss on hold-out set: 2.39799505809568
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1729559749364853
Epoch: 4

Loss on hold-out set: 2.3978526457300724
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17138364911079407
Returned to Spot: Validation loss: 2.3978526457300724
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 43.64%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.36166713512245846, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3986149419028804
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.21226416528224945
Epoch: 2

Loss on hold-out set: 2.398620794404228
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.2146226018667221
Epoch: 3

Loss on hold-out set: 2.3986095797340825
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.21933960914611816
Epoch: 4

Loss on hold-out set: 2.398594761794468
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19968552887439728
Returned to Spot: Validation loss: 2.398594761794468
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 43.88%
```

```
config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.635876752247523, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.3971871699926988
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.18396228551864624
Epoch: 2

Loss on hold-out set: 2.3973289525733805
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.19339622557163239
Epoch: 3

Loss on hold-out set: 2.3972822000395575
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.18396228551864624
Epoch: 4

Loss on hold-out set: 2.3972597437084846
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.1871069222688675
Returned to Spot: Validation loss: 2.3972597437084846
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 44.12%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.7375228404052402, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.3969375457403794
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.18553459644317627
Epoch: 2

Loss on hold-out set: 2.3970802932415367
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.17767298221588135
Epoch: 3
```

```
Loss on hold-out set: 2.3969285083266922
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.18317610025405884
Epoch: 4

Loss on hold-out set: 2.3969020078767023
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.18317611515522003
Returned to Spot: Validation loss: 2.3969020078767023
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 44.41%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.6636720624894283, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3985315133940497
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.12893082201480865
Epoch: 2

Loss on hold-out set: 2.398456533000154
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1328616589307785
Epoch: 3

Loss on hold-out set: 2.398409715238607
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.13836480677127838
Epoch: 4

Loss on hold-out set: 2.3984555455873595
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.13757863640785217
Returned to Spot: Validation loss: 2.3984555455873595
----------------------------------------------

spotPython tuning: 2.385729384872149 [####------] 44.72%
```

```
config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.26672173915176056, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.397419907012076
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.1878930777311325
Epoch: 2

Loss on hold-out set: 2.3973902621359193
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20361638069152832
Epoch: 3

Loss on hold-out set: 2.3973833884832993
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.2075471729040146
Epoch: 4

Loss on hold-out set: 2.397279253545797
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.21305030584335327
Returned to Spot: Validation loss: 2.397279253545797
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 45.01%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.5311666261240556, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.397956407295083
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.17138366401195526
Epoch: 2

Loss on hold-out set: 2.397922893740096
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.17138366401195526
Epoch: 3
```

```
Loss on hold-out set: 2.397828475484308
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.17138366401195526
Epoch: 4

Loss on hold-out set: 2.3979897499084473
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.17138366401195526
Returned to Spot: Validation loss: 2.3979897499084473
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 45.29%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.6720642722540953, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3975119860667102
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19575469195842743
Epoch: 2

Loss on hold-out set: 2.397497501013414
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.20440250635147095
Epoch: 3

Loss on hold-out set: 2.3975600206627035
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.17767296731472015
Epoch: 4

Loss on hold-out set: 2.3974704967354827
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19261005520820618
Returned to Spot: Validation loss: 2.3974704967354827
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 45.53%
```

```
config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.5106081473860101, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3979706066959308
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.16273584961891174
Epoch: 2

Loss on hold-out set: 2.3978655878103003
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.16273584961891174
Epoch: 3

Loss on hold-out set: 2.397837906513574
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1737421452999115
Epoch: 4

Loss on hold-out set: 2.3979201519264364
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.16273584961891174
Returned to Spot: Validation loss: 2.3979201519264364
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 45.87%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.26866001434299325, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3967574384977235
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.17924527823925018
Epoch: 2

Loss on hold-out set: 2.3966913470682107
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.17688679695129395
Epoch: 3
```

```
Loss on hold-out set: 2.3966990371920027
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1721697896718979
Epoch: 4

Loss on hold-out set: 2.3966774760552174
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18160375952720642
Returned to Spot: Validation loss: 2.3966774760552174
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 46.22%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.4588211163113285, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3981228404574924
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.16820986568927765
Epoch: 2

Loss on hold-out set: 2.39803436950401
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1774691343307495
Epoch: 3

Loss on hold-out set: 2.3979799482557507
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1736110895872116
Epoch: 4

Loss on hold-out set: 2.3979795773824057
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.18595679104328156
Returned to Spot: Validation loss: 2.3979795773824057
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 46.48%
```

```
config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.4939890315481321, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3976339978991814
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.18632075190544128
Epoch: 2

Loss on hold-out set: 2.397615374259229
Accuracy on hold-out set: 0.1650943396226415
MAPK value on hold-out data: 0.20676101744174957
Epoch: 3

Loss on hold-out set: 2.397594928741455
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.20440249145030975
Epoch: 4

Loss on hold-out set: 2.397506646390231
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.20597486197948456
Returned to Spot: Validation loss: 2.397506646390231
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 46.73%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.07515077793269308, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.399496470178877
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1458333283662796
Epoch: 2

Loss on hold-out set: 2.3995145048413957
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1361607015132904
Epoch: 3
```

```
Loss on hold-out set: 2.3994940519332886
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.137648805975914
Epoch: 4
Loss on hold-out set: 2.3994593790599277
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.140625
Returned to Spot: Validation loss: 2.3994593790599277
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 46.98%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.4355605400650228, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3978110799249612
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.17452828586101532
Epoch: 2

Loss on hold-out set: 2.3977001815472008
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.2146226018667221
Epoch: 3

Loss on hold-out set: 2.3975971757241017
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.21855343878269196
Epoch: 4

Loss on hold-out set: 2.3974604314228274
Accuracy on hold-out set: 0.14622641509433962
MAPK value on hold-out data: 0.23820750415325165
Returned to Spot: Validation loss: 2.3974604314228274
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 47.86%
```

```
config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.11654668035810149, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3973511457443237
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.2254464477300644
Epoch: 2

Loss on hold-out set: 2.397323489189148
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2269345372915268
Epoch: 3

Loss on hold-out set: 2.3972777128219604
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.2261904776096344
Epoch: 4

Loss on hold-out set: 2.397331850869315
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2254464328289032
Returned to Spot: Validation loss: 2.397331850869315
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 48.13%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.29882397975966435, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397138483119461
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19732706248760223
Epoch: 2

Loss on hold-out set: 2.3971356760780766
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19732706248760223
Epoch: 3
```

```
Loss on hold-out set: 2.3970784286283098
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19732706248760223
Epoch: 4

Loss on hold-out set: 2.397091474173204
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19732706248760223
Returned to Spot: Validation loss: 2.397091474173204
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 48.43%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.3789121100285406, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397937979016985
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.174851194024086
Epoch: 2

Loss on hold-out set: 2.3978400571005687
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.1793154776096344
Epoch: 3

Loss on hold-out set: 2.3977579729897633
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.18824402987957
Epoch: 4

Loss on hold-out set: 2.397567323275975
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.2008928507566452
Returned to Spot: Validation loss: 2.397567323275975
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 48.68%
```

```
config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.4942477208150857, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3960118470368563
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.208333358168602
Epoch: 2

Loss on hold-out set: 2.395950096624869
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.20679013431072235
Epoch: 3

Loss on hold-out set: 2.3959295219845242
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.20679013431072235
Epoch: 4

Loss on hold-out set: 2.396033172254209
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.208333358168602
Returned to Spot: Validation loss: 2.396033172254209
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 48.91%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.8368900341925468, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397839205605643
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1599702388048172
Epoch: 2
Loss on hold-out set: 2.397525668144226
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1808035671710968
Epoch: 3
```

```
Loss on hold-out set: 2.3975102390561784
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1748511791229248
Epoch: 4
Loss on hold-out set: 2.397828919546945
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1465773731470108
Returned to Spot: Validation loss: 2.397828919546945
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 49.15%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.6167127713201095, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3982373273597575
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17059749364852905
Epoch: 2

Loss on hold-out set: 2.3981227132509337
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.16902516782283783
Epoch: 3

Loss on hold-out set: 2.3982527660873703
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17059749364852905
Epoch: 4

Loss on hold-out set: 2.3980949802218743
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.16902516782283783
Returned to Spot: Validation loss: 2.3980949802218743
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 49.56%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.00028868383823269487, 'lr_mult': 0.001,
```

```
Epoch: 1

Loss on hold-out set: 2.39744832830609
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.17531447112560272
Epoch: 2

Loss on hold-out set: 2.3968255339928395
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.19261005520820618
Epoch: 3

Loss on hold-out set: 2.396018676038058
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.20518866181373596
Epoch: 4

Loss on hold-out set: 2.3949301895105615
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.24292445182800293
Returned to Spot: Validation loss: 2.3949301895105615
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 50.46%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.13156632137109295, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.3975558798268155
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.19339624047279358
Epoch: 2

Loss on hold-out set: 2.3974388410460272
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.1949685662984848
Epoch: 3
```

```
Loss on hold-out set: 2.397360918656835
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.1949685662984848
Epoch: 4

Loss on hold-out set: 2.3972221770376527
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.19811320304870605
Returned to Spot: Validation loss: 2.3972221770376527
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 50.84%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.6812460730725531, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.3976572504583396
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.18238994479179382
Epoch: 2

Loss on hold-out set: 2.397515116997485
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.18867923319339752
Epoch: 3

Loss on hold-out set: 2.3974086878434666
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.19889935851097107
Epoch: 4

Loss on hold-out set: 2.397225744319412
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.19732703268527985
Returned to Spot: Validation loss: 2.397225744319412
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 51.39%
```

```
config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.8867448701875924, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.399517960018582
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.14737655222415924
Epoch: 2

Loss on hold-out set: 2.3994112456286394
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.1875
Epoch: 3

Loss on hold-out set: 2.3996852503882513
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1527777761220932
Epoch: 4

Loss on hold-out set: 2.399383297672978
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.15509259700775146
Returned to Spot: Validation loss: 2.399383297672978
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 51.64%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.0023612231600317014, 'lr_mult': 0.001, 'l

Epoch: 1

Loss on hold-out set: 2.397086926226346
Accuracy on hold-out set: 0.1792452830188679
MAPK value on hold-out data: 0.25864776968955994
Epoch: 2

Loss on hold-out set: 2.396416664123535
Accuracy on hold-out set: 0.1509433962264151
MAPK value on hold-out data: 0.2727987468242645
Epoch: 3
```

```
Loss on hold-out set: 2.3955475114426523
Accuracy on hold-out set: 0.16037735849056603
MAPK value on hold-out data: 0.2963836193084717
Epoch: 4

Loss on hold-out set: 2.3943263967082187
Accuracy on hold-out set: 0.18396226415094338
MAPK value on hold-out data: 0.32468554377555847
Returned to Spot: Validation loss: 2.3943263967082187
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 52.46%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.11548907270294066, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.397814256173593
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.16820986568927765
Epoch: 2

Loss on hold-out set: 2.3976432747311063
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.166666641831398
Epoch: 3

Loss on hold-out set: 2.397565656238132
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.17438271641731262
Epoch: 4

Loss on hold-out set: 2.397406163039031
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18132716417312622
Returned to Spot: Validation loss: 2.397406163039031
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 52.76%
```

```
config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.1094005407566867, 'lr_mult': 0.001, 'bat

Epoch: 1

Loss on hold-out set: 2.397396461018976
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.19339622557163239
Epoch: 2

Loss on hold-out set: 2.3973508735872664
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.21383647620677948
Epoch: 3

Loss on hold-out set: 2.3973327402798636
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1941823959350586
Epoch: 4

Loss on hold-out set: 2.397311862909569
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.19811320304870605
Returned to Spot: Validation loss: 2.397311862909569
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 53.17%

config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.02675109574854474, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3979248843103087
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.12342765927314758
Epoch: 2
```

```
Loss on hold-out set: 2.3976795605893404
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.15015724301338196
Epoch: 3

Loss on hold-out set: 2.3974520395386896
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1808176040649414
Epoch: 4

Loss on hold-out set: 2.397190827243733
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.22405657172203064
Returned to Spot: Validation loss: 2.397190827243733
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 54.02%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.478245760294912, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.3979707786015103
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.1808035671710968
Epoch: 2
Loss on hold-out set: 2.398043598447527
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.1845237910747528

Epoch: 3
Loss on hold-out set: 2.3980756316866194
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.1770833283662796
Epoch: 4

Loss on hold-out set: 2.398045301437378
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.1800595223903656
Returned to Spot: Validation loss: 2.398045301437378
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [#####-----] 54.28%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.6132967326351793, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3980256791384713
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.16902516782283783
Epoch: 2

Loss on hold-out set: 2.397969898187889
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1745283007621765
Epoch: 3

Loss on hold-out set: 2.3979331772282437
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.16509434580802917
Epoch: 4

Loss on hold-out set: 2.397962552196575
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.16430817544460297
Returned to Spot: Validation loss: 2.397962552196575
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 54.62%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.23276754880203154, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3975533809301988
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.18317611515522003
Epoch: 2
```

```
Loss on hold-out set: 2.397515373409919
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.19261007010936737
Epoch: 3

Loss on hold-out set: 2.397579161625988
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19025158882141113
Epoch: 4

Loss on hold-out set: 2.3975954055786133
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19025155901908875
Returned to Spot: Validation loss: 2.3975954055786133
----------------------------------------------

spotPython tuning: 2.385729384872149 [#####-----] 54.97%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.2431173831408648, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3977683441979543
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1577381044626236
Epoch: 2

Loss on hold-out set: 2.3977097272872925
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1577381044626236
Epoch: 3

Loss on hold-out set: 2.397731968334743
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1577381044626236
Epoch: 4

Loss on hold-out set: 2.397730725152152
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1577381044626236
Returned to Spot: Validation loss: 2.397730725152152
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [######----] 55.25%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.01513589825644096, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.4002398207502544
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.13364781439304352
Epoch: 2

Loss on hold-out set: 2.400174118437857
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.13364781439304352
Epoch: 3

Loss on hold-out set: 2.400123285797407
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.13364781439304352
Epoch: 4

Loss on hold-out set: 2.4000451249896355
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.13364781439304352
Returned to Spot: Validation loss: 2.4000451249896355
----------------------------------------------


spotPython tuning: 2.385729384872149 [######----] 55.61%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.31016441943384926, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.3975565092904225
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1964285671710968
Epoch: 2
```

```
Loss on hold-out set: 2.397432735988072
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.2120535671710968
Epoch: 3

Loss on hold-out set: 2.397365553038461
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.2224702537059784
Epoch: 4

Loss on hold-out set: 2.397125380379813
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.2433035671710968
Returned to Spot: Validation loss: 2.397125380379813
----------------------------------------------

spotPython tuning: 2.385729384872149 [######----] 55.94%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.10123541888783366, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3975518191302263
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.18132716417312622
Epoch: 2

Loss on hold-out set: 2.397473185150712
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18827161192893982
Epoch: 3

Loss on hold-out set: 2.3974202385655157
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.20061729848384857
Epoch: 4

Loss on hold-out set: 2.3973984011897334
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.19212962687015533
Returned to Spot: Validation loss: 2.3973984011897334
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [######----] 57.11%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.42913010110548067, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3972582997016185
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.19103769958019257
Epoch: 2

Loss on hold-out set: 2.3973814091592467
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.19418233633041382
Epoch: 3

Loss on hold-out set: 2.397433334926389
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.18867920339107513
Epoch: 4

Loss on hold-out set: 2.397324409124986
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.20125780999660492
Returned to Spot: Validation loss: 2.397324409124986
----------------------------------------------

spotPython tuning: 2.385729384872149 [######----] 58.14%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.3275022803848954, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3979147161756242
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1629464328289032
Epoch: 2
```

```
Loss on hold-out set: 2.397881899561201
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.159226194024086
Epoch: 3

Loss on hold-out set: 2.3978560822350636
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1436012089252472
Epoch: 4

Loss on hold-out set: 2.3977945361818587
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.1696428507566452
Returned to Spot: Validation loss: 2.3977945361818587
----------------------------------------------

spotPython tuning: 2.385729384872149 [######----] 59.19%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.42897294251890355, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.397827143939036
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18317610025405884
Epoch: 2

Loss on hold-out set: 2.3978121865470454
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1800314486026764
Epoch: 3

Loss on hold-out set: 2.397817706162075
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.18946540355682373
Epoch: 4

Loss on hold-out set: 2.3977712235360777
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1878930628299713
Returned to Spot: Validation loss: 2.3977712235360777
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [######----] 60.50%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.46996641442364834, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.398325024910693
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1533018797636032
Epoch: 2

Loss on hold-out set: 2.3984430690981307
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.15172956883907318
Epoch: 3

Loss on hold-out set: 2.398390239139773
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.15172958374023438
Epoch: 4

Loss on hold-out set: 2.3983814446431286
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.15172958374023438
Returned to Spot: Validation loss: 2.3983814446431286
----------------------------------------------


spotPython tuning: 2.385729384872149 [######----] 61.80%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.009699514739187665, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.397459720665554
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20833329856395721
Epoch: 2
```

```
Loss on hold-out set: 2.397318554374407
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20518866181373596
Epoch: 3

Loss on hold-out set: 2.397165354692711
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20204399526119232
Epoch: 4

Loss on hold-out set: 2.396917023748722
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20361632108688354
Returned to Spot: Validation loss: 2.396917023748722
----------------------------------------------

spotPython tuning: 2.385729384872149 [######----] 63.34%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.1397217765002243, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.396810900490239
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.19968552887439728
Epoch: 2

Loss on hold-out set: 2.3967863973581567
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.19968552887439728
Epoch: 3

Loss on hold-out set: 2.3967023165720813
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.20283016562461853
Epoch: 4

Loss on hold-out set: 2.396651461439313
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.19968552887439728
Returned to Spot: Validation loss: 2.396651461439313
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [######----] 64.81%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.11001746050022188, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.397920032717147
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.1320754736661911
Epoch: 2

Loss on hold-out set: 2.3978293121985668
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.1462264209985733
Epoch: 3

Loss on hold-out set: 2.3977025904745424
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.14858491718769073
Epoch: 4

Loss on hold-out set: 2.397626723883287
Accuracy on hold-out set: 0.07547169811320754
MAPK value on hold-out data: 0.14308178424835205
Returned to Spot: Validation loss: 2.397626723883287
----------------------------------------------

spotPython tuning: 2.385729384872149 [#######---] 66.16%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.4172288580201352, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.3983490062209794
Accuracy on hold-out set: 0.04716981132075472
MAPK value on hold-out data: 0.1312893182039261
Epoch: 2
```

```
Loss on hold-out set: 2.3983066037016094
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.1383647918701172
Epoch: 3

Loss on hold-out set: 2.3983804459841744
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.15172958374023438
Epoch: 4

Loss on hold-out set: 2.3983186595844774
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.14308176934719086
Returned to Spot: Validation loss: 2.3983186595844774
----------------------------------------------

spotPython tuning: 2.385729384872149 [#######---] 67.36%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.27704058285336897, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.397936240682062
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.13679246604442596
Epoch: 2

Loss on hold-out set: 2.397915376807159
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.13679246604442596
Epoch: 3

Loss on hold-out set: 2.3979197448154665
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.13679246604442596
Epoch: 4

Loss on hold-out set: 2.397915349816376
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.138364776968956
Returned to Spot: Validation loss: 2.397915349816376
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [#######---] 68.72%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.3881890452915246, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397735373029169
Accuracy on hold-out set: 0.09905660377358491
MAPK value on hold-out data: 0.16194969415664673
Epoch: 2

Loss on hold-out set: 2.3976949970677213
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18317610025405884
Epoch: 3

Loss on hold-out set: 2.397581743744184
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.20361635088920593
Epoch: 4

Loss on hold-out set: 2.3975410034071722
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.18003146350383759
Returned to Spot: Validation loss: 2.3975410034071722
----------------------------------------------

spotPython tuning: 2.385729384872149 [#######---] 70.28%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.36895509123433334, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.399386804058867
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12106918543577194
Epoch: 2
```

```
Loss on hold-out set: 2.399351992697086
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12106918543577194
Epoch: 3

Loss on hold-out set: 2.3993158160515553
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12106918543577194
Epoch: 4

Loss on hold-out set: 2.3993514506322033
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12106918543577194
Returned to Spot: Validation loss: 2.3993514506322033
----------------------------------------------

spotPython tuning: 2.385729384872149 [#######---] 71.66%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.7935318995459109, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397802710533142
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1540178507566452
Epoch: 2

Loss on hold-out set: 2.3978031192507063
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1800595223903656
Epoch: 3

Loss on hold-out set: 2.397866521562849
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1577381044626236
Epoch: 4

Loss on hold-out set: 2.3978135074887956
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.17113097012043
Returned to Spot: Validation loss: 2.3978135074887956
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [#######---] 72.79%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.4710472795678196, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.398005794595789
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1635802835226059
Epoch: 2

Loss on hold-out set: 2.39808546172248
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1604938507080078
Epoch: 3

Loss on hold-out set: 2.3979731842323586
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1705247163772583
Epoch: 4

Loss on hold-out set: 2.397944344414605
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1566358208656311
Returned to Spot: Validation loss: 2.397944344414605
----------------------------------------------

spotPython tuning: 2.385729384872149 [#######---] 73.72%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.8195974031663599, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3976190809933646
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.16981132328510284
Epoch: 2
```

```
Loss on hold-out set: 2.3977548041433656
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1737421303987503
Epoch: 3

Loss on hold-out set: 2.3977456227788387
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1863207221031189
Epoch: 4

Loss on hold-out set: 2.3979313913381324
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1525157392024994
Returned to Spot: Validation loss: 2.3979313913381324
----------------------------------------------

spotPython tuning: 2.385729384872149 [#######---] 74.74%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.485316841383955, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.397696112686733
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1949685513973236
Epoch: 2

Loss on hold-out set: 2.3977137714062096
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.20440250635147095
Epoch: 3

Loss on hold-out set: 2.3975901693668007
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.22091194987297058
Epoch: 4

Loss on hold-out set: 2.3975895980619035
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1949685662984848
Returned to Spot: Validation loss: 2.3975895980619035
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [########--] 76.17%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.5521541276635835, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.398178554930777
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.14937108755111694
Epoch: 2

Loss on hold-out set: 2.3981194856031887
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1533018797636032
Epoch: 3

Loss on hold-out set: 2.3982308630673392
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.13679246604442596
Epoch: 4

Loss on hold-out set: 2.398087978363037
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1454402655363083
Returned to Spot: Validation loss: 2.398087978363037
----------------------------------------------


spotPython tuning: 2.385729384872149 [########--] 77.38%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.4286259094831192, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.399998017077176
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12735849618911743
Epoch: 2
```

```
Loss on hold-out set: 2.3999178432068735
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12735849618911743
Epoch: 3

Loss on hold-out set: 2.3999297281481184
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12735849618911743
Epoch: 4

Loss on hold-out set: 2.3998838280731776
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.12735849618911743
Returned to Spot: Validation loss: 2.3998838280731776
----------------------------------------------

spotPython tuning: 2.385729384872149 [########--] 78.69%


config: {'_L0': 6112, 'l1': 2048, 'dropout_prob': 0.4976005796813294, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397419487988507
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1975308656692505
Epoch: 2

Loss on hold-out set: 2.397305303149753
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.19753088057041168
Epoch: 3

Loss on hold-out set: 2.3973559980039245
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.20061729848384857
Epoch: 4

Loss on hold-out set: 2.3973434501224093
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.2052469104528427
Returned to Spot: Validation loss: 2.3973434501224093
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [########--] 79.92%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.14496135146071007, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.398605735213668
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.16049382090568542
Epoch: 2

Loss on hold-out set: 2.398502296871609
Accuracy on hold-out set: 0.12735849056603774
MAPK value on hold-out data: 0.1805555671453476
Epoch: 3

Loss on hold-out set: 2.398522624263057
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.18827159702777863
Epoch: 4

Loss on hold-out set: 2.398382548932676
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.1805555522441864
Returned to Spot: Validation loss: 2.398382548932676
----------------------------------------------

spotPython tuning: 2.385729384872149 [########--] 81.19%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.13836940708432457, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3977683175284907
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.1666666716337204
Epoch: 2
```

```
Loss on hold-out set: 2.39776104801106
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.16981130838394165
Epoch: 3

Loss on hold-out set: 2.3977792308015644
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.16823899745941162
Epoch: 4

Loss on hold-out set: 2.397737682990308
Accuracy on hold-out set: 0.08018867924528301
MAPK value on hold-out data: 0.17138364911079407
Returned to Spot: Validation loss: 2.397737682990308
----------------------------------------------

spotPython tuning: 2.385729384872149 [########--] 82.46%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.5801902947427491, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.3978645666590275
Accuracy on hold-out set: 0.10377358490566038
MAPK value on hold-out data: 0.17216983437538147
Epoch: 2

Loss on hold-out set: 2.3978795915279747
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.18474841117858887
Epoch: 3

Loss on hold-out set: 2.397845632625076
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18003146350383759
Epoch: 4

Loss on hold-out set: 2.397796923259519
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.18317610025405884
Returned to Spot: Validation loss: 2.397796923259519
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [########--] 83.67%


config: {'_L0': 6112, 'l1': 4096, 'dropout_prob': 0.17042327589486472, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.39777461537775
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1886792629957199
Epoch: 2

Loss on hold-out set: 2.3975523147942885
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.2083333432674408
Epoch: 3

Loss on hold-out set: 2.39732189898221
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.22091196477413177
Epoch: 4

Loss on hold-out set: 2.397146521874194
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.23113207519054413
Returned to Spot: Validation loss: 2.397146521874194
----------------------------------------------


spotPython tuning: 2.385729384872149 [########--] 84.95%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.6944080618643941, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.3972248236338296
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1805555522441864
Epoch: 2
```

```
Loss on hold-out set: 2.3972255565502025
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.18518516421318054
Epoch: 3

Loss on hold-out set: 2.3971754621576378
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.19212962687015533
Epoch: 4

Loss on hold-out set: 2.397162428608647
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.18209879100322723
Returned to Spot: Validation loss: 2.397162428608647
----------------------------------------------

spotPython tuning: 2.385729384872149 [#########-] 86.14%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.18151742556849865, 'lr_mult': 0.001, 'bat
Epoch: 1

Loss on hold-out set: 2.397596103804452
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.1413690447807312
Epoch: 2
Loss on hold-out set: 2.3975482838494435
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.153273805975914
Epoch: 3

Loss on hold-out set: 2.397590858595712
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.1488095223903656
Epoch: 4
Loss on hold-out set: 2.397543157849993
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.1577380895614624
Returned to Spot: Validation loss: 2.397543157849993
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [#########-] 87.38%


config: {'_L0': 6112, 'l1': 128, 'dropout_prob': 0.845806549101736, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.3969844888757774
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.19598767161369324
Epoch: 2

Loss on hold-out set: 2.397265628532127
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.1844135969877243
Epoch: 3

Loss on hold-out set: 2.3969828199457237
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.19367283582687378
Epoch: 4

Loss on hold-out set: 2.3969367256870977
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.1774691492319107
Returned to Spot: Validation loss: 2.3969367256870977
----------------------------------------------

spotPython tuning: 2.385729384872149 [#########-] 88.63%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.6819098090533308, 'lr_mult': 0.001, 'batch
Epoch: 1

Loss on hold-out set: 2.3982381379162825
Accuracy on hold-out set: 0.05188679245283019
MAPK value on hold-out data: 0.10956789553165436
Epoch: 2
```

```
Loss on hold-out set: 2.3981193171607122
Accuracy on hold-out set: 0.03773584905660377
MAPK value on hold-out data: 0.10030864179134369
Epoch: 3

Loss on hold-out set: 2.3981931651080095
Accuracy on hold-out set: 0.05660377358490566
MAPK value on hold-out data: 0.11959876865148544
Epoch: 4

Loss on hold-out set: 2.3980828567787453
Accuracy on hold-out set: 0.07075471698113207
MAPK value on hold-out data: 0.1388888955116272
Returned to Spot: Validation loss: 2.3980828567787453
----------------------------------------------

spotPython tuning: 2.385729384872149 [#########-] 89.89%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.7823474508265778, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.397782970357824
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.1975308656692505
Epoch: 2

Loss on hold-out set: 2.3977675437927246
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.19367285072803497
Epoch: 3

Loss on hold-out set: 2.3978244022086814
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.1844135969877243
Epoch: 4

Loss on hold-out set: 2.3977647622426352
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.20061728358268738
Returned to Spot: Validation loss: 2.3977647622426352
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [#########-] 91.14%


config: {'_L0': 6112, 'l1': 8192, 'dropout_prob': 0.13146501575689384, 'lr_mult': 0.001, 'ba

Epoch: 1

Loss on hold-out set: 2.3975718191691806
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1979166567325592
Epoch: 2

Loss on hold-out set: 2.397370457649231
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.2142857015132904
Epoch: 3

Loss on hold-out set: 2.3972768783569336
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.2113095223903656
Epoch: 4

Loss on hold-out set: 2.3971302679606845
Accuracy on hold-out set: 0.1179245283018868
MAPK value on hold-out data: 0.2150297462940216
Returned to Spot: Validation loss: 2.3971302679606845
----------------------------------------------

spotPython tuning: 2.385729384872149 [#########-] 92.46%


config: {'_L0': 6112, 'l1': 64, 'dropout_prob': 0.2446977986186115, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.397536385734126
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18474841117858887
Epoch: 2
```

```
Loss on hold-out set: 2.397557883892419
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18474841117858887
Epoch: 3

Loss on hold-out set: 2.397535544521404
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.18474841117858887
Epoch: 4

Loss on hold-out set: 2.397586071266318
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.1863207370042801
Returned to Spot: Validation loss: 2.397586071266318
----------------------------------------------

spotPython tuning: 2.385729384872149 [#########-] 93.79%


config: {'_L0': 6112, 'l1': 1024, 'dropout_prob': 0.08398712704828415, 'lr_mult': 0.001, 'ba
Epoch: 1

Loss on hold-out set: 2.3977167959566468
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.1736111342906952
Epoch: 2

Loss on hold-out set: 2.39768350565875
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17283952236175537
Epoch: 3

Loss on hold-out set: 2.3976118211393005
Accuracy on hold-out set: 0.09433962264150944
MAPK value on hold-out data: 0.17824074625968933
Epoch: 4

Loss on hold-out set: 2.397618284931889
Accuracy on hold-out set: 0.08962264150943396
MAPK value on hold-out data: 0.17206791043281555
Returned to Spot: Validation loss: 2.397618284931889
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [##########] 95.16%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.741680944794142, 'lr_mult': 0.001, 'batch_
Epoch: 1

Loss on hold-out set: 2.397046093670827
Accuracy on hold-out set: 0.14150943396226415
MAPK value on hold-out data: 0.21540877223014832
Epoch: 2

Loss on hold-out set: 2.3970284686898284
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.22405658662319183
Epoch: 3

Loss on hold-out set: 2.397090106640222
Accuracy on hold-out set: 0.13679245283018868
MAPK value on hold-out data: 0.22012574970722198
Epoch: 4

Loss on hold-out set: 2.3971847588161252
Accuracy on hold-out set: 0.12264150943396226
MAPK value on hold-out data: 0.20990565419197083
Returned to Spot: Validation loss: 2.3971847588161252
----------------------------------------------

spotPython tuning: 2.385729384872149 [##########] 96.48%


config: {'_L0': 6112, 'l1': 256, 'dropout_prob': 0.6118972948552678, 'lr_mult': 0.001, 'batcl
Epoch: 1

Loss on hold-out set: 2.3990813714486583
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.12808643281459808
Epoch: 2
```

```
Loss on hold-out set: 2.399136225382487
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.13117283582687378
Epoch: 3

Loss on hold-out set: 2.3991010983784995
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.13271604478359222
Epoch: 4

Loss on hold-out set: 2.399062430417096
Accuracy on hold-out set: 0.06132075471698113
MAPK value on hold-out data: 0.13271604478359222
Returned to Spot: Validation loss: 2.399062430417096
----------------------------------------------

spotPython tuning: 2.385729384872149 [##########] 98.72%


config: {'_L0': 6112, 'l1': 512, 'dropout_prob': 0.8836040809557936, 'lr_mult': 0.001, 'batc
Epoch: 1

Loss on hold-out set: 2.397571455757573
Accuracy on hold-out set: 0.0660377358490566
MAPK value on hold-out data: 0.16745281219482422
Epoch: 2

Loss on hold-out set: 2.3971498912235476
Accuracy on hold-out set: 0.10849056603773585
MAPK value on hold-out data: 0.21147799491882324
Epoch: 3

Loss on hold-out set: 2.397565373834574
Accuracy on hold-out set: 0.08490566037735849
MAPK value on hold-out data: 0.1674528419971466
Epoch: 4

Loss on hold-out set: 2.39759158188442
Accuracy on hold-out set: 0.11320754716981132
MAPK value on hold-out data: 0.19811317324638367
Returned to Spot: Validation loss: 2.39759158188442
----------------------------------------------
```

```
spotPython tuning: 2.385729384872149 [##########] 100.00% Done...
```

```
<spotPython.spot.spot.Spot at 0x2b7b17700>
```

28.6 Tensorboard

The textual output shown in the console (or code cell) can be visualized with Tensorboard as described in Section 20.13.

28.7 Results

After the hyperparameter tuning run is finished, the results can be analyzed as described in Section 20.14.

```
spot_tuner.plot_progress(log_y=False,
    filename="./figures/" + experiment_name+"_progress.png")
```

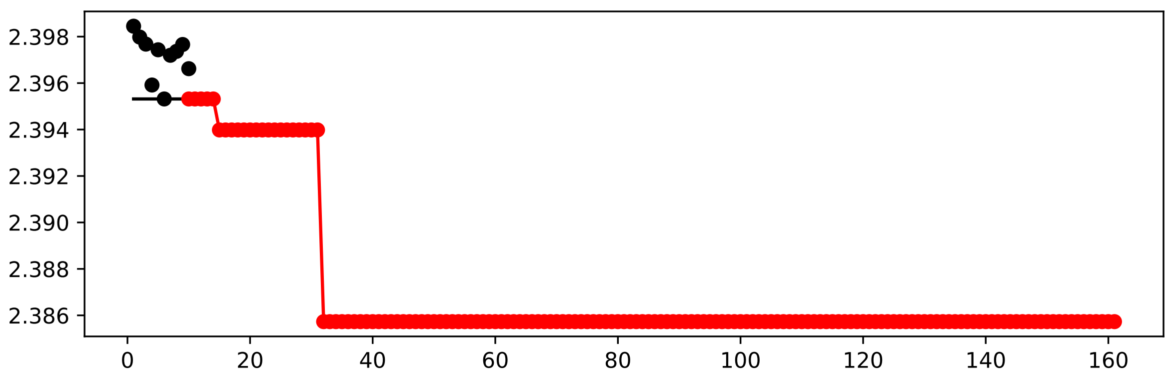


Figure 28.1: Progress plot. *Black* dots denote results from the initial design. *Red* dots illustrate the improvement found by the surrogate model based optimization.

```
from spotPython.utils.eda import gen_design_table
print(gen_design_table(fun_control=fun_control, spot=spot_tuner))
```

```
| name          | type    | default    |    lower |    upper |                  tuned | transform
|---------------|---------|------------|----------|----------|----------------------|-------------
| _L0           | int     | 64         |   6112.0 |   6112.0 |                 6112.0 | None
```

```
| l1           | int    | 8          |     6.0 |    13.0 |                13.0 | transform_pow
| dropout_prob | float  | 0.01       |     0.0 |     0.9 | 0.13432222501302687 | None
| lr_mult      | float  | 1.0        |   0.001 |   0.001 |               0.001 | None
| batch_size   | int    | 4          |     1.0 |     4.0 |                 1.0 | transform_pow
| epochs       | int    | 4          |     2.0 |     2.0 |                 2.0 | transform_pow
| k_folds      | int    | 1          |     1.0 |     1.0 |                 1.0 | None
| patience     | int    | 2          |     2.0 |     6.0 |                 5.0 | transform_pow
| optimizer    | factor | SGD        |     0.0 |     3.0 |                 3.0 | None
| sgd_momentum | float  | 0.0        |     0.9 |     0.9 |                 0.9 | None
```

```python
spot_tuner.plot_importance(threshold=0.025,
    filename="./figures/" + experiment_name+"_importance.png")
```

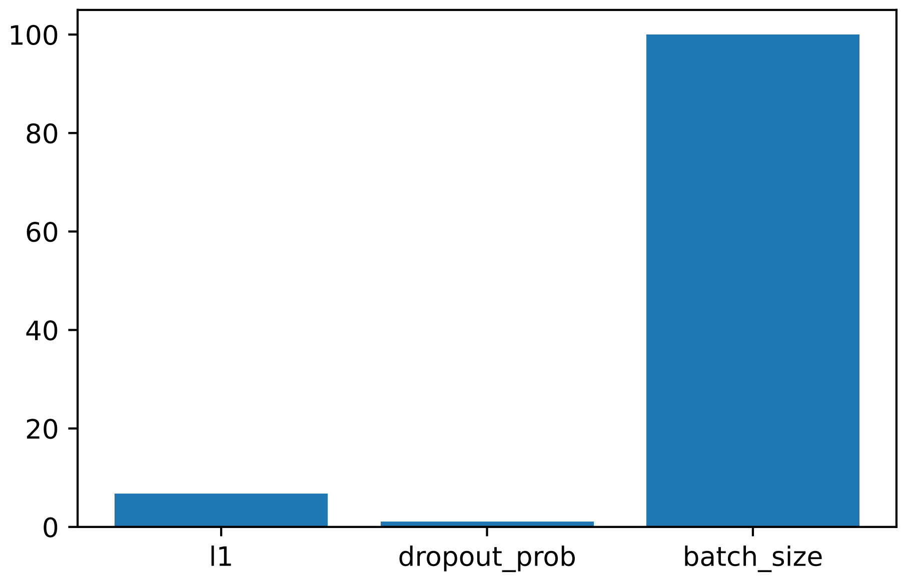


Figure 28.2: Variable importance plot, threshold 0.025.

28.8 Get the Tuned Architecture

```python
from spotPython.hyperparameters.values import get_one_core_model_from_X
X = spot_tuner.to_all_dim(spot_tuner.min_X.reshape(1,-1))
model_spot = get_one_core_model_from_X(X, fun_control)
model_spot
```

```
Net_vbdp(
  (fc1): Linear(in_features=6112, out_features=8192, bias=True)
  (fc2): Linear(in_features=8192, out_features=4096, bias=True)
  (fc3): Linear(in_features=4096, out_features=2048, bias=True)
  (fc4): Linear(in_features=2048, out_features=1024, bias=True)
  (fc5): Linear(in_features=1024, out_features=11, bias=True)
  (relu): ReLU()
  (softmax): Softmax(dim=1)
  (dropout1): Dropout(p=0.13432222501302687, inplace=False)
  (dropout2): Dropout(p=0.06716111250651344, inplace=False)
)
```

28.9 Evaluation of the Tuned Architecture

```python
from spotPython.torch.traintest import (
    train_tuned,
    test_tuned,
    )
train_tuned(net=model_spot, train_dataset=train,
        loss_function=fun_control["loss_function"],
        metric=fun_control["metric_torch"],
        shuffle=True,
        device = fun_control["device"],
        path=None,
        task=fun_control["task"],)
```

```
Epoch: 1

Loss on hold-out set: 2.39733557431203
Accuracy on hold-out set: 0.1320754716981132
MAPK value on hold-out data: 0.2020440250635147
Epoch: 2

Loss on hold-out set: 2.396424316010385
Accuracy on hold-out set: 0.16981132075471697
MAPK value on hold-out data: 0.2358490526676178
Epoch: 3
```

```
Loss on hold-out set: 2.394588247785028
Accuracy on hold-out set: 0.16981132075471697
MAPK value on hold-out data: 0.25864776968955994
Epoch: 4

Loss on hold-out set: 2.3916824358814166
Accuracy on hold-out set: 0.1650943396226415
MAPK value on hold-out data: 0.2594339847564697
Returned to Spot: Validation loss: 2.3916824358814166
----------------------------------------------
```

If `path` is set to a filename, e.g., `path = "model_spot_trained.pt"`, the weights of the trained model will be loaded from this file.

```
test_tuned(net=model_spot, test_dataset=test,
            shuffle=False,
            loss_function=fun_control["loss_function"],
            metric=fun_control["metric_torch"],
            device = fun_control["device"],
            task=fun_control["task"],)
```

```
Loss on hold-out set: 2.3869854466298994
Accuracy on hold-out set: 0.1807909604519774
MAPK value on hold-out data: 0.3061797320842743
Final evaluation: Validation loss: 2.3869854466298994
Final evaluation: Validation metric: 0.3061797320842743
----------------------------------------------
```

```
(2.3869854466298994, nan, tensor(0.3062))
```

28.10 Cross-validated Evaluations

- This is the evaluation that will be used in the comparison (evaluatecv has to be updated before, to get metric vlaues!):

```
from spotPython.torch.traintest import evaluate_cv
# modify k-kolds:
setattr(model_spot, "k_folds",  10)
df_eval, df_preds, df_metrics = evaluate_cv(net=model_spot,
```

```
    dataset=fun_control["data"],
    loss_function=fun_control["loss_function"],
    metric=fun_control["metric_torch"],
    task=fun_control["task"],
    writer=fun_control["writer"],
    writerId="model_spot_cv",
    device = fun_control["device"])
```

```
Fold: 1
Epoch: 1

Loss on hold-out set: 2.39596297343572
Accuracy on hold-out set: 0.1267605633802817
MAPK value on hold-out data: 0.2222222089767456
Epoch: 2

Loss on hold-out set: 2.389375242922041
Accuracy on hold-out set: 0.15492957746478872
MAPK value on hold-out data: 0.30324074625968933
Epoch: 3

Loss on hold-out set: 2.3696448736720614
Accuracy on hold-out set: 0.28169014084507044
MAPK value on hold-out data: 0.3796296715736389
Epoch: 4

Loss on hold-out set: 2.315064893828498
Accuracy on hold-out set: 0.29577464788732394
MAPK value on hold-out data: 0.41203704476356506
Fold: 2
Epoch: 1

Loss on hold-out set: 2.3952008022202387
Accuracy on hold-out set: 0.11267605633802817
MAPK value on hold-out data: 0.22685183584690094
Epoch: 2

Loss on hold-out set: 2.3892093433274164
Accuracy on hold-out set: 0.1267605633802817
MAPK value on hold-out data: 0.28240740299224854
Epoch: 3
```

```
Loss on hold-out set: 2.3804163800345526
Accuracy on hold-out set: 0.18309859154929578
MAPK value on hold-out data: 0.30787035822868347
Epoch: 4

Loss on hold-out set: 2.3609541389677258
Accuracy on hold-out set: 0.18309859154929578
MAPK value on hold-out data: 0.3379629850387573
Fold: 3
Epoch: 1

Loss on hold-out set: 2.395045902993944
Accuracy on hold-out set: 0.15492957746478872
MAPK value on hold-out data: 0.3055555820465088
Epoch: 2

Loss on hold-out set: 2.388733638657464
Accuracy on hold-out set: 0.19718309859154928
MAPK value on hold-out data: 0.32407402992248535
Epoch: 3

Loss on hold-out set: 2.3724497821595936
Accuracy on hold-out set: 0.2535211267605634
MAPK value on hold-out data: 0.3888889253139496
Epoch: 4

Loss on hold-out set: 2.352414495415158
Accuracy on hold-out set: 0.29577464788732394
MAPK value on hold-out data: 0.40740740299224854
Fold: 4
Epoch: 1

Loss on hold-out set: 2.3964231146706476
Accuracy on hold-out set: 0.15492957746478872
MAPK value on hold-out data: 0.23842591047286987
Epoch: 2

Loss on hold-out set: 2.391209681828817
Accuracy on hold-out set: 0.15492957746478872
MAPK value on hold-out data: 0.25
Epoch: 3
```

```
Loss on hold-out set: 2.382947107156118
Accuracy on hold-out set: 0.15492957746478872
MAPK value on hold-out data: 0.26157405972480774
Epoch: 4

Loss on hold-out set: 2.3687255448765225
Accuracy on hold-out set: 0.18309859154929578
MAPK value on hold-out data: 0.2847222089767456
Fold: 5
Epoch: 1

Loss on hold-out set: 2.3970152735710144
Accuracy on hold-out set: 0.08450704225352113
MAPK value on hold-out data: 0.14120370149612427
Epoch: 2

Loss on hold-out set: 2.394955184724596
Accuracy on hold-out set: 0.04225352112676056
MAPK value on hold-out data: 0.1388888955116272
Epoch: 3

Loss on hold-out set: 2.3872277537981668
Accuracy on hold-out set: 0.18309859154929578
MAPK value on hold-out data: 0.26157405972480774
Epoch: 4

Loss on hold-out set: 2.3741793036460876
Accuracy on hold-out set: 0.19718309859154928
MAPK value on hold-out data: 0.3032407760620117
Fold: 6
Epoch: 1

Loss on hold-out set: 2.396030399534437
Accuracy on hold-out set: 0.09859154929577464
MAPK value on hold-out data: 0.21990738809108734
Epoch: 2

Loss on hold-out set: 2.392727149857415
Accuracy on hold-out set: 0.09859154929577464
MAPK value on hold-out data: 0.24074071645736694
Epoch: 3
```

```
Loss on hold-out set: 2.388086862034268
Accuracy on hold-out set: 0.1267605633802817
MAPK value on hold-out data: 0.2754629850387573
Epoch: 4

Loss on hold-out set: 2.3670257329940796
Accuracy on hold-out set: 0.23943661971830985
MAPK value on hold-out data: 0.3541666567325592
Fold: 7
Epoch: 1

Loss on hold-out set: 2.3957682185702853
Accuracy on hold-out set: 0.09859154929577464
MAPK value on hold-out data: 0.22685183584690094
Epoch: 2

Loss on hold-out set: 2.389611005783081
Accuracy on hold-out set: 0.09859154929577464
MAPK value on hold-out data: 0.2291666716337204
Epoch: 3

Loss on hold-out set: 2.3789495494630604
Accuracy on hold-out set: 0.18309859154929578
MAPK value on hold-out data: 0.27546295523643494
Epoch: 4

Loss on hold-out set: 2.355272193749746
Accuracy on hold-out set: 0.2676056338028169
MAPK value on hold-out data: 0.347222238779068
Fold: 8
Epoch: 1

Loss on hold-out set: 2.396096624646868
Accuracy on hold-out set: 0.07142857142857142
MAPK value on hold-out data: 0.18095235526561737
Epoch: 2

Loss on hold-out set: 2.391937017440796
Accuracy on hold-out set: 0.07142857142857142
MAPK value on hold-out data: 0.20714282989501953
Epoch: 3
```

```
Loss on hold-out set: 2.383143779209682
Accuracy on hold-out set: 0.11428571428571428
MAPK value on hold-out data: 0.25476187467575073
Epoch: 4

Loss on hold-out set: 2.3631844656808036
Accuracy on hold-out set: 0.2714285714285714
MAPK value on hold-out data: 0.3761904537677765
Fold: 9
Epoch: 1

Loss on hold-out set: 2.3958762305123464
Accuracy on hold-out set: 0.15714285714285714
MAPK value on hold-out data: 0.2785714268684387
Epoch: 2

Loss on hold-out set: 2.3903513159070697
Accuracy on hold-out set: 0.14285714285714285
MAPK value on hold-out data: 0.23333331942558289
Epoch: 3

Loss on hold-out set: 2.379271936416626
Accuracy on hold-out set: 0.15714285714285714
MAPK value on hold-out data: 0.261904776096344
Epoch: 4

Loss on hold-out set: 2.353264113834926
Accuracy on hold-out set: 0.22857142857142856
MAPK value on hold-out data: 0.3380952477455139
Fold: 10
Epoch: 1

Loss on hold-out set: 2.3953690120152067
Accuracy on hold-out set: 0.15714285714285714
MAPK value on hold-out data: 0.24761903285980225
Epoch: 2

Loss on hold-out set: 2.3882984501974924
Accuracy on hold-out set: 0.14285714285714285
MAPK value on hold-out data: 0.25
Epoch: 3
```

```
Loss on hold-out set: 2.3725359984806604
Accuracy on hold-out set: 0.24285714285714285
MAPK value on hold-out data: 0.36428573727607727
Epoch: 4

Loss on hold-out set: 2.361921971184867
Accuracy on hold-out set: 0.3
MAPK value on hold-out data: 0.4095238149166107
```

```
metric_name = type(fun_control["metric_torch"]).__name__
print(f"loss: {df_eval}, Cross-validated {metric_name}: {df_metrics}")
```

```
loss: 2.3572006854178413, Cross-validated MAPK: 0.3570568859577179
```

28.11 Detailed Hyperparameter Plots

```
filename = "./figures/" + experiment_name
spot_tuner.plot_important_hyperparameter_contour(filename=filename)
```

```
l1:  6.720650462868978
dropout_prob:  1.04935901454783
batch_size:  100.0
```

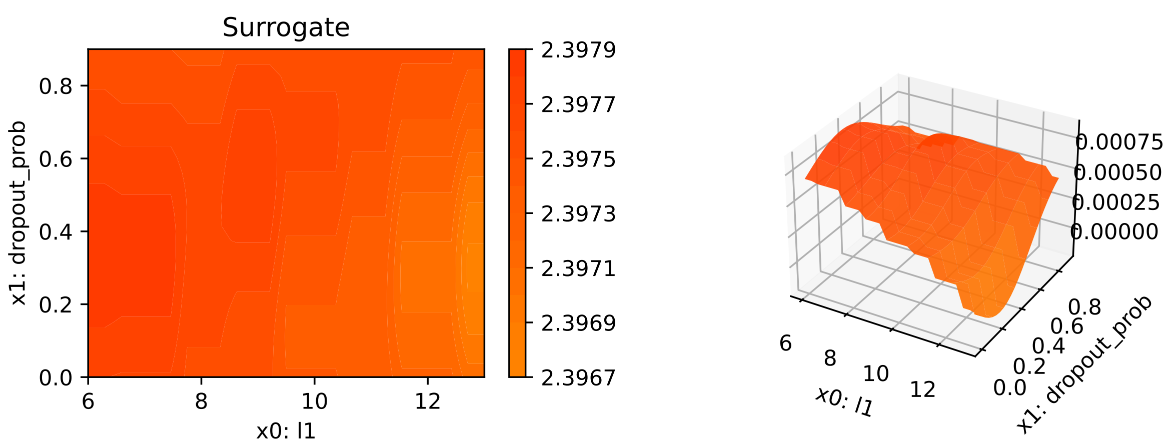
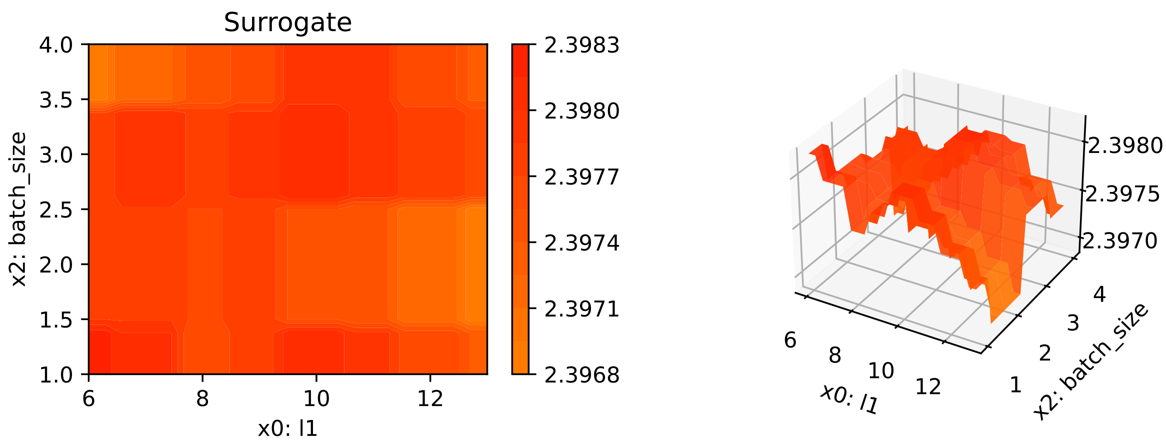
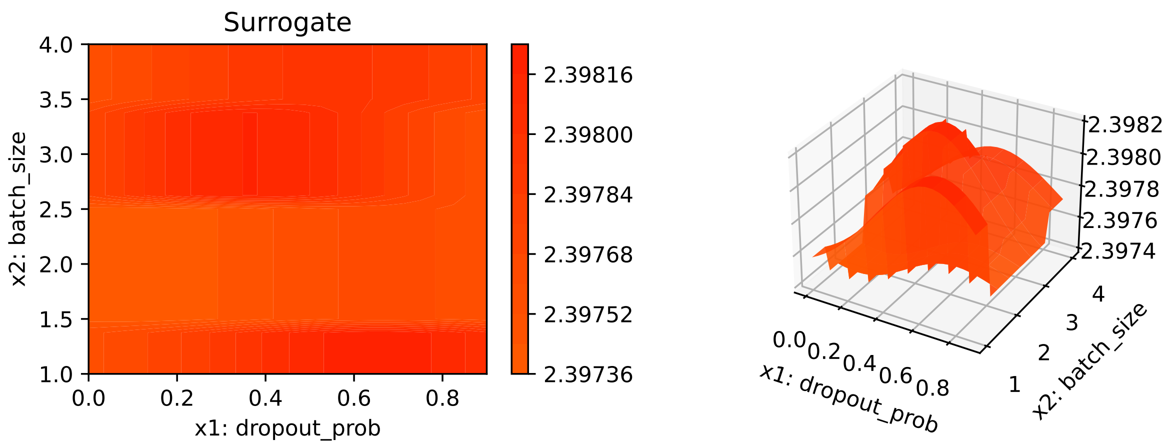


Figure 28.3: Contour plots.





28.12 Parallel Coordinates Plot

```
spot_tuner.parallel_plot()
```

```
Unable to display output for mime type(s): text/html
```

Parallel coordinates plots

```
Unable to display output for mime type(s): text/html
```

```
# close tensorbaoard writer
if fun_control["writer"] is not None:
    fun_control["writer"].close()
```

28.13 Plot all Combinations of Hyperparameters

- Warning: this may take a while.

```
PLOT_ALL = False
if PLOT_ALL:
    n = spot_tuner.k
    for i in range(n-1):
        for j in range(i+1, n):
            spot_tuner.plot_contour(i=i, j=j, min_z=min_z, max_z = max_z)
```

29 Documentation of the Sequential Parameter Optimization

This document describes the `Spot` features.

29.1 Example: spot

```
import numpy as np
from math import inf
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
from scipy.optimize import shgo
from scipy.optimize import direct
from scipy.optimize import differential_evolution
import matplotlib.pyplot as plt
```

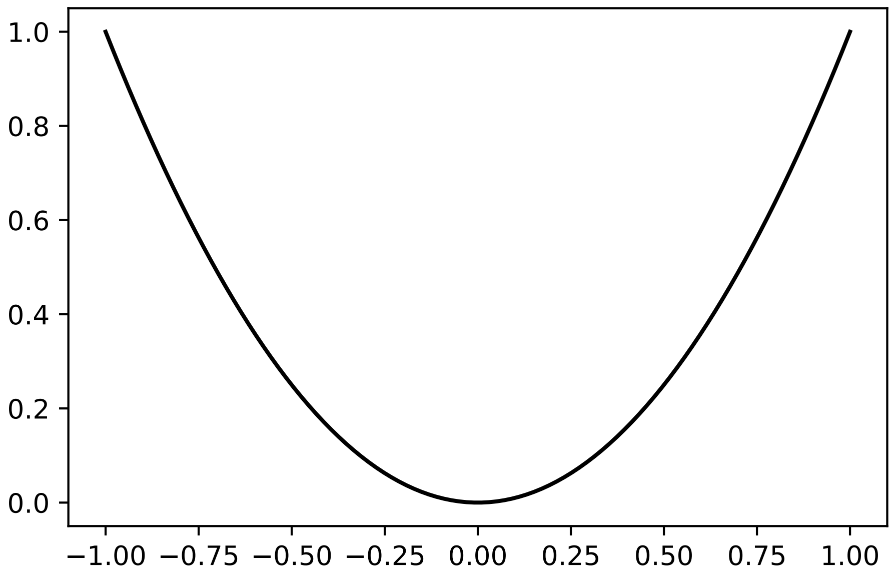
29.1.1 The Objective Function

The `spotPython` package provides several classes of objective functions. We will use an analytical objective function, i.e., a function that can be described by a (closed) formula:

$$f(x) = x^2$$

```
fun = analytical().fun_sphere
```

```
x = np.linspace(-1,1,100).reshape(-1,1)
y = fun(x)
plt.figure()
plt.plot(x,y, "k")
plt.show()
```




```
spot_1 = spot.Spot(fun=fun,
                   lower = np.array([-10]),
                   upper = np.array([100]),
                   fun_evals = 7,
                   fun_repeats = 1,
                   max_time = inf,
                   noise = False,
                   tolerance_x = np.sqrt(np.spacing(1)),
                   var_type=["num"],
                   infill_criterion = "y",
                   n_points = 1,
                   seed=123,
                   log_level = 50,
                   show_models=True,
                   fun_control = {},
                   design_control={"init_size": 5,
                                   "repeats": 1},
                   surrogate_control={"noise": False,
                                      "cod_type": "norm",
                                      "min_theta": -4,
                                      "max_theta": 3,
                                      "n_theta": 1,
                                      "model_optimizer": differential_evolution,
                                      "model_fun_evals": 1000,
```

```
})
```

`spot`'s `__init__` method sets the control parameters. There are two parameter groups:

1. external parameters can be specified by the user
2. internal parameters, which are handled by `spot`.

29.1.2 External Parameters

external parameter	type	description	default	mandatory
`fun`	object	objective function		yes
`lower`	array	lower bound		yes
`upper`	array	upper bound		yes
`fun_evals`	int	number of function evaluations	15	no
`fun_evals`	int	number of function evaluations	15	no
`fun_control`	dict	noise etc.	{}	n
`max_time`	int	max run time budget	`inf`	no
`noise`	bool	if repeated evaluations of `fun` results in different values, then `noise` should be set to `True`.	`False`	no

external parameter	type	description	default	mandatory
`tolerance_x`	float	tolerance for new x solutions. Minimum distance of new solutions, generated by `suggest_new_X`, to already existing solutions. If zero (which is the default), every new solution is accepted.	`0`	no
`var_type`	list	list of type information, can be either `"num"` or `"factor"`	`["num"]`	no
`infill_criterion`	string	Can be `"y"`, `"s"`, `"ei"` (negative expected improvement), or `"all"`	`"y"`	no
`n_points`	int	number of infill points	1	no
`seed`	int	initial seed. If `Spot.run()` is called twice, different results will be generated. To reproduce results, the `seed` can be used.	`123`	no

external parameter	type	description	default	mandatory
`log_level`	int	log level with the following settings: `NOTSET` (`0`), `DEBUG` (`10`: Detailed information, typically of interest only when diagnosing problems.), `INFO` (`20`: Confirmation that things are working as expected.), `WARNING` (`30`: An indication that something unexpected happened, or indicative of some problem in the near future (e.g. 'disk space low'). The software is still working as expected.), `ERROR` (`40`: Due to a more serious problem, the software has not been able to perform some function.), and `CRITICAL` (`50`: A serious error, indicating that the program itself may be unable to continue running.)	`50`	no

external parameter	type	description	default	mandatory
`show_models`	bool	Plot model. Currently only 1-dim functions are supported	`False`	no
`design`	object	experimental design	`None`	no
`design_control`	dict	control parameters	see below	no
`surrogate`		surrogate model	`kriging`	no
`surrogate_control`	dict	control parameters	see below	no
`optimizer`	object	optimizer	see below	no
`optimizer_control`	dict	control parameters	see below	no

- Besides these single parameters, the following parameter dictionaries can be specified by the user:
  - `fun_control`
  - `design_control`
  - `surrogate_control`
  - `optimizer_control`

29.2 The `fun_control` Dictionary

external parameter	type	description	default	mandatory
`sigma`	float	noise: standard deviation	`0`	yes
`seed`	int	seed for rng	`124`	yes

29.3 The `design_control` Dictionary

external parameter	type	description	default	mandatory
`init_size`	int	initial sample size	`10`	yes

external parameter	type	description	default	mandatory
`repeats`	int	number of repeats of the initial sammples	1	yes

29.4 The `surrogate_control` Dictionary

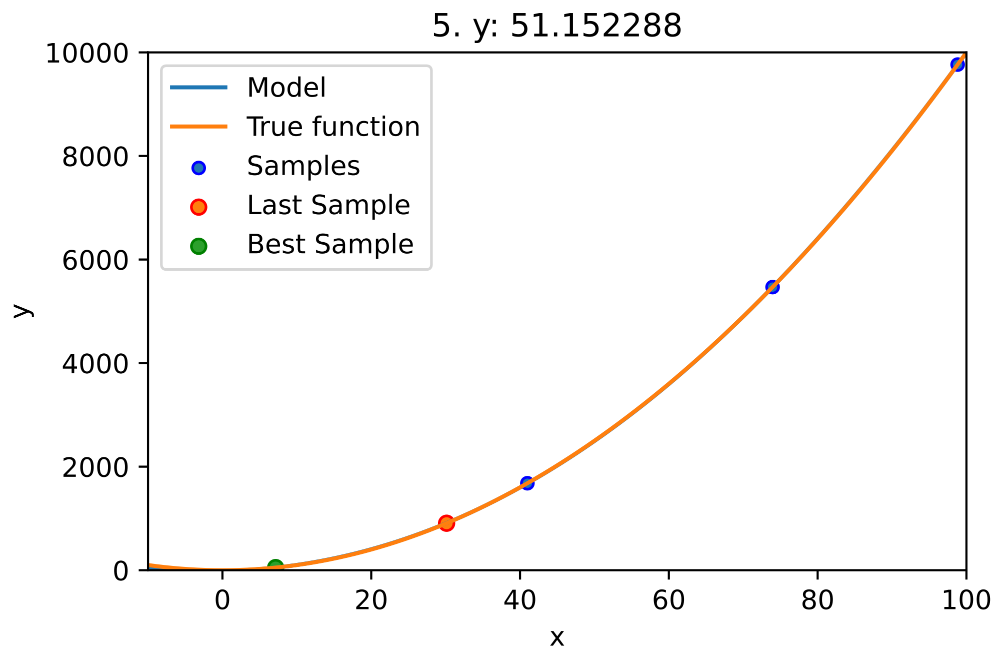
external parameter	type	description	default	mandatory
`noise`				
`model_optimizer`	object	optimizer	`differential_evolution`	
`model_fun_evals`				
`min_theta`			`-3.`	
`max_theta`			`3.`	
`n_theta`			`1`	
`n_p`			`1`	
`optim_p`			`False`	
`cod_type`			`"norm"`	
`var_type`				
`use_cod_y`	bool		`False`	

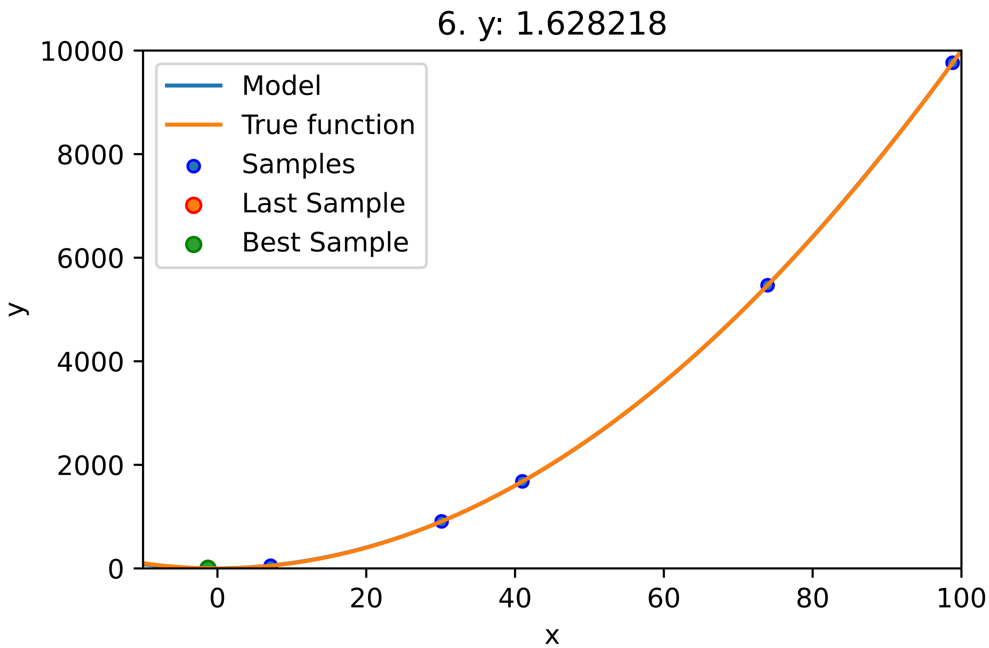
29.5 The `optimizer_control` Dictionary

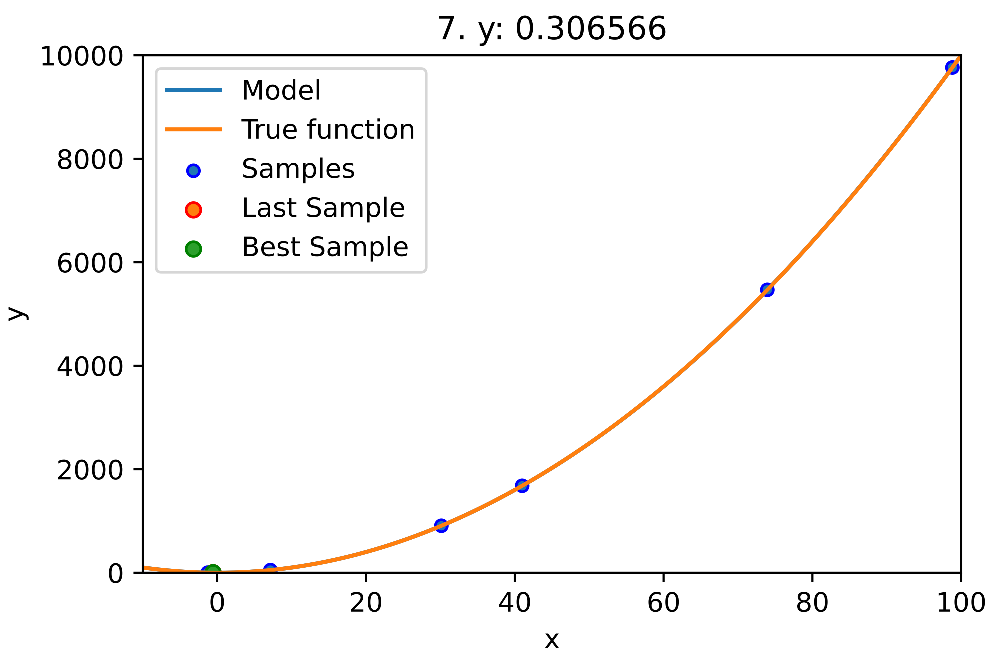
external parameter	type	description	default	mandatory
`max_iter`	int	max number of iterations. Note: these are the cheap evaluations on the surrogate.	`1000`	no

29.6 Run

```
spot_1.run()
```








```
<spotPython.spot.spot.Spot at 0x168886770>
```

29.7 Print the Results

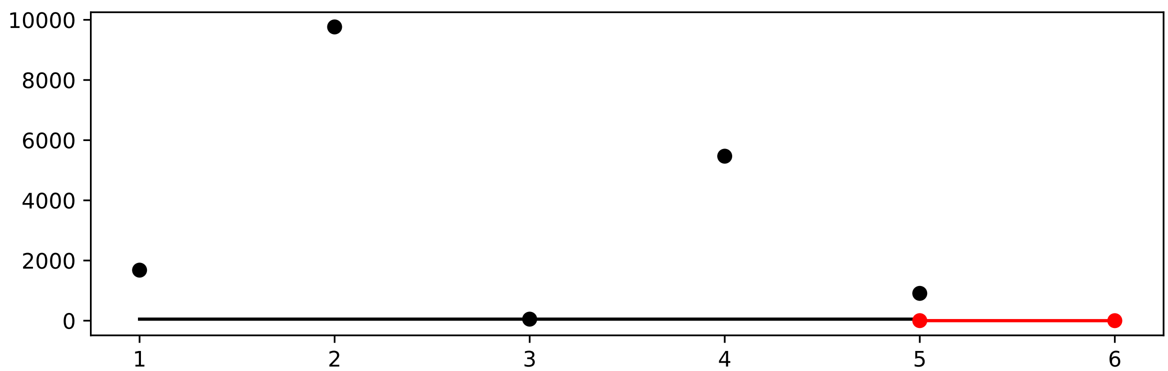
```
spot_1.print_results()
```

```
min y: 0.30656551286610595
x0: -0.5536835855126157
```

```
[['x0', -0.5536835855126157]]
```

29.8 Show the Progress

```
spot_1.plot_progress()
```

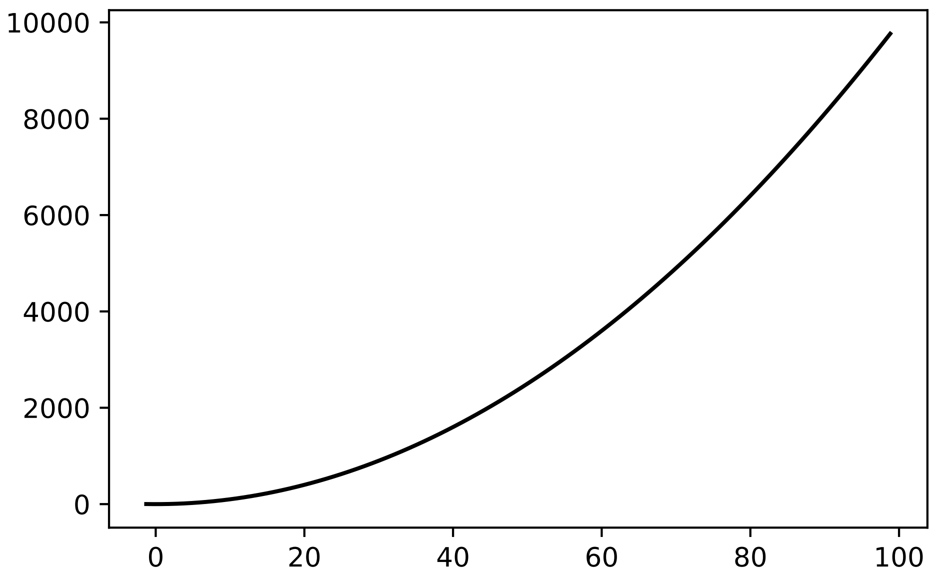


29.9 Visualize the Surrogate

- The plot method of the `kriging` surrogate is used.
- Note: the plot uses the interval defined by the ranges of the natural variables.

```
spot_1.surrogate.plot()
```

```
<Figure size 2700x1800 with 0 Axes>
```



29.10 Init: Build Initial Design

```
from spotPython.design.spacefilling import spacefilling
from spotPython.build.kriging import Kriging
from spotPython.fun.objectivefunctions import analytical
gen = spacefilling(2)
rng = np.random.RandomState(1)
lower = np.array([-5,-0])
upper = np.array([10,15])
fun = analytical().fun_branin
fun_control = {"sigma": 0,
               "seed": 123}

X = gen.scipy_lhd(10, lower=lower, upper = upper)
print(X)
y = fun(X, fun_control=fun_control)
print(y)
```

```
[[ 8.97647221 13.41926847]
 [ 0.66946019  1.22344228]
 [ 5.23614115 13.78185824]
 [ 5.6149825  11.5851384 ]
```

```
 [-1.72963184  1.66516096]
 [-4.26945568  7.1325531 ]
 [ 1.26363761 10.17935555]
 [ 2.88779942  8.05508969]
 [-3.39111089  4.15213772]
 [ 7.30131231  5.22275244]]
[128.95676449  31.73474356 172.89678121 126.71295908  64.34349975
  70.16178611  48.71407916  31.77322887  76.91788181  30.69410529]
```

29.11 Replicability

Seed

```
gen = spacefilling(2, seed=123)
X0 = gen.scipy_lhd(3)
gen = spacefilling(2, seed=345)
X1 = gen.scipy_lhd(3)
X2 = gen.scipy_lhd(3)
gen = spacefilling(2, seed=123)
X3 = gen.scipy_lhd(3)
X0, X1, X2, X3
```

```
(array([[0.77254938, 0.31539299],
        [0.59321338, 0.93854273],
        [0.27469803, 0.3959685 ]]),
 array([[0.78373509, 0.86811887],
        [0.06692621, 0.6058029 ],
        [0.41374778, 0.00525456]]),
 array([[0.121357  , 0.69043832],
        [0.41906219, 0.32838498],
        [0.86742658, 0.52910374]]),
 array([[0.77254938, 0.31539299],
        [0.59321338, 0.93854273],
        [0.27469803, 0.3959685 ]]))
```

29.12 Surrogates

29.12.1 A Simple Predictor

The code below shows how to use a simple model for prediction. Assume that only two (very costly) measurements are available:

1. f(0) = 0.5
2. f(2) = 2.5

We are interested in the value at $x_0 = 1$, i.e., $f(x_0 = 1)$, but cannot run an additional, third experiment.

```
from sklearn import linear_model
X = np.array([[0], [2]])
y = np.array([0.5, 2.5])
S_lm = linear_model.LinearRegression()
S_lm = S_lm.fit(X, y)
X0 = np.array([[1]])
y0 = S_lm.predict(X0)
print(y0)
```

```
[1.5]
```

Central Idea: Evaluation of the surrogate model `S_lm` is much cheaper (or / and much faster) than running the real-world experiment f.

29.13 Demo/Test: Objective Function Fails

SPOT expects `np.nan` values from failed objective function values. These are handled. Note: SPOT's counter considers only successful executions of the objective function.

```
import numpy as np
from spotPython.fun.objectivefunctions import analytical
from spotPython.spot import spot
import numpy as np
from math import inf
# number of initial points:
ni = 20
# number of points
n = 30
```

```python
fun = analytical().fun_random_error
lower = np.array([-1])
upper = np.array([1])
design_control={"init_size": ni}

spot_1 = spot.Spot(fun=fun,
            lower = lower,
            upper= upper,
            fun_evals = n,
            show_progress=False,
            design_control=design_control,)
spot_1.run()
# To check whether the run was successfully completed,
# we compare the number of evaluated points to the specified
# number of points.
assert spot_1.y.shape[0] == n
```

```
[ 0.53176481 -0.9053821          nan -0.21843718  0.78240941 -0.58120945
 -0.3923345   0.67234256  0.31802454 -0.68898927 -0.75129705         nan
  0.41757584  0.0786237   0.82585329  0.23700598 -0.49274073 -0.82319082
 -0.17991251  0.1481835 ]
[-1.]

[0.95541987]


[0.17335968]
[-0.58552368]

[-0.20126111]
[-0.60100809]

[-0.97897336]
[-0.2748985]

[nan]
[0.8359486]

[0.99035591]
[0.01641232]
```

```
[0.5629346]
```

29.14 PyTorch: Detailed Description of the Data Splitting

29.14.1 Description of the "train_hold_out" Setting

The "train_hold_out" setting is used by default. It uses the loss function specfied in fun_control and the metric specified in fun_control.

1. First, the method HyperTorch().fun_torch is called.
2. fun_torc(), which is implemented in the file hypertorch.py, calls evaluate_hold_out() as follows:

```
df_eval, _ = evaluate_hold_out(
    model,
    train_dataset=fun_control["train"],
    shuffle=self.fun_control["shuffle"],
    loss_function=self.fun_control["loss_function"],
    metric=self.fun_control["metric_torch"],
    device=self.fun_control["device"],
    show_batch_interval=self.fun_control["show_batch_interval"],
    path=self.fun_control["path"],
    task=self.fun_control["task"],
    writer=self.fun_control["writer"],
    writerId=config_id,
)
```

Note: Only the data set fun_control["train"] is used for training and validation. It is used in evaluate_hold_out as follows:

```
trainloader, valloader = create_train_val_data_loaders(
                dataset=train_dataset, batch_size=batch_size_instance, shuffle=shuffle
            )
```

create_train_val_data_loaders() splits the train_dataset into trainloader and valloader using torch.utils.data.random_split() as follows:

```
def create_train_val_data_loaders(dataset, batch_size, shuffle, num_workers=0):
    test_abs = int(len(dataset) * 0.6)
    train_subset, val_subset = random_split(dataset, [test_abs, len(dataset) - test_abs])
    trainloader = torch.utils.data.DataLoader(
        train_subset, batch_size=int(batch_size), shuffle=shuffle, num_workers=num_workers
    )
    valloader = torch.utils.data.DataLoader(
```

```
        val_subset, batch_size=int(batch_size), shuffle=shuffle, num_workers=num_workers
    )
    return trainloader, valloader
```

The optimizer is set up as follows:

```
optimizer_instance = net.optimizer
lr_mult_instance = net.lr_mult
sgd_momentum_instance = net.sgd_momentum
optimizer = optimizer_handler(
    optimizer_name=optimizer_instance,
    params=net.parameters(),
    lr_mult=lr_mult_instance,
    sgd_momentum=sgd_momentum_instance,
)
```

3. `evaluate_hold_out()` sets the `net` attributes such as `epochs`, `batch_size`, `optimizer`, and `patience`. For each epoch, the methods `train_one_epoch()` and `validate_one_epoch()` are called, the former for training and the latter for validation and early stopping. The validation loss from the last epoch (not the best validation loss) is returned from `evaluate_hold_out`.
4. The method `train_one_epoch()` is implemented as follows:

```
def train_one_epoch(
    net,
    trainloader,
    batch_size,
    loss_function,
    optimizer,
    device,
    show_batch_interval=10_000,
    task=None,
):
    running_loss = 0.0
    epoch_steps = 0
    for batch_nr, data in enumerate(trainloader, 0):
        input, target = data
        input, target = input.to(device), target.to(device)
        optimizer.zero_grad()
        output = net(input)
        if task == "regression":
```

```
            target = target.unsqueeze(1)
            if target.shape == output.shape:
                loss = loss_function(output, target)
            else:
                raise ValueError(f"Shapes of target and output do not match:
                 {target.shape} vs {output.shape}")
        elif task == "classification":
            loss = loss_function(output, target)
        else:
            raise ValueError(f"Unknown task: {task}")
        loss.backward()
        torch.nn.utils.clip_grad_norm_(net.parameters(), max_norm=1.0)
        optimizer.step()
        running_loss += loss.item()
        epoch_steps += 1
        if batch_nr % show_batch_interval == (show_batch_interval - 1):
            print(
                "Batch: %5d. Batch Size: %d. Training Loss (running): %.3f"
                % (batch_nr + 1, int(batch_size), running_loss / epoch_steps)
            )
            running_loss = 0.0
    return loss.item()
```

5. The method `validate_one_epoch()` is implemented as follows:

```
def validate_one_epoch(net, valloader, loss_function, metric, device, task):
    val_loss = 0.0
    val_steps = 0
    total = 0
    correct = 0
    metric.reset()
    for i, data in enumerate(valloader, 0):
        # get batches
        with torch.no_grad():
            input, target = data
            input, target = input.to(device), target.to(device)
            output = net(input)
            # print(f"target: {target}")
            # print(f"output: {output}")
            if task == "regression":
                target = target.unsqueeze(1)
```

```
                if target.shape == output.shape:
                    loss = loss_function(output, target)
                else:
                    raise ValueError(f"Shapes of target and output
                        do not match: {target.shape} vs {output.shape}")
                metric_value = metric.update(output, target)
            elif task == "classification":
                loss = loss_function(output, target)
                metric_value = metric.update(output, target)
                _, predicted = torch.max(output.data, 1)
                total += target.size(0)
                correct += (predicted == target).sum().item()
            else:
                raise ValueError(f"Unknown task: {task}")
            val_loss += loss.cpu().numpy()
            val_steps += 1
    loss = val_loss / val_steps
    print(f"Loss on hold-out set: {loss}")
    if task == "classification":
        accuracy = correct / total
        print(f"Accuracy on hold-out set: {accuracy}")
    # metric on all batches using custom accumulation
    metric_value = metric.compute()
    metric_name = type(metric).__name__
    print(f"{metric_name} value on hold-out data: {metric_value}")
    return metric_value, loss
```

29.14.1.1 Description of the `"test_hold_out"` Setting

It uses the loss function specfied in `fun_control` and the metric specified in `fun_control`.

1. First, the method `HyperTorch().fun_torch` is called.
2. `fun_torc()` calls `spotPython.torch.traintest.evaluate_hold_out()` similar to the `"train_hold_out"` setting with one exception: It passes an additional `test` data set to `evaluate_hold_out()` as follows:

```
test_dataset=fun_control["test"]
```

`evaluate_hold_out()` calls `create_train_test_data_loaders` instead of `create_train_val_data_loaders`: The two data sets are used in `create_train_test_data_loaders` as follows:

```
def create_train_test_data_loaders(dataset, batch_size, shuffle, test_dataset,
        num_workers=0):
    trainloader = torch.utils.data.DataLoader(
        dataset, batch_size=int(batch_size), shuffle=shuffle,
        num_workers=num_workers
    )
    testloader = torch.utils.data.DataLoader(
        test_dataset, batch_size=int(batch_size), shuffle=shuffle,
        num_workers=num_workers
    )
    return trainloader, testloader
```

3. The following steps are identical to the `"train_hold_out"` setting. Only a different data loader is used for testing.

29.14.1.2 Detailed Description of the `"train_cv"` Setting

It uses the loss function specfied in `fun_control` and the metric specified in `fun_control`.

1. First, the method `HyperTorch().fun_torch` is called.
2. `fun_torc()` calls `spotPython.torch.traintest.evaluate_cv()` as follows (Note: Only the data set `fun_control["train"]` is used for CV.):

```
df_eval, _ = evaluate_cv(
    model,
    dataset=fun_control["train"],
    shuffle=self.fun_control["shuffle"],
    device=self.fun_control["device"],
    show_batch_interval=self.fun_control["show_batch_interval"],
    task=self.fun_control["task"],
    writer=self.fun_control["writer"],
    writerId=config_id,
)
```

3. In ‘evaluate_cv(), the following steps are performed: The optimizer is set up as follows:

```
optimizer_instance = net.optimizer
lr_instance = net.lr
sgd_momentum_instance = net.sgd_momentum
optimizer = optimizer_handler(optimizer_name=optimizer_instance,
     params=net.parameters(), lr_mult=lr_mult_instance)
```

`evaluate_cv()` sets the `net` attributes such as `epochs`, `batch_size`, `optimizer`, and `patience`. CV is implemented as follows:

```
def evaluate_cv(
    net,
    dataset,
    shuffle=False,
    loss_function=None,
    num_workers=0,
    device=None,
    show_batch_interval=10_000,
    metric=None,
    path=None,
    task=None,
    writer=None,
    writerId=None,
):
    lr_mult_instance = net.lr_mult
    epochs_instance = net.epochs
    batch_size_instance = net.batch_size
    k_folds_instance = net.k_folds
    optimizer_instance = net.optimizer
    patience_instance = net.patience
    sgd_momentum_instance = net.sgd_momentum
    removed_attributes, net = get_removed_attributes_and_base_net(net)
    metric_values = {}
    loss_values = {}
    try:
        device = getDevice(device=device)
        if torch.cuda.is_available():
            device = "cuda:0"
            if torch.cuda.device_count() > 1:
                print("We will use", torch.cuda.device_count(), "GPUs!")
                net = nn.DataParallel(net)
        net.to(device)
        optimizer = optimizer_handler(
            optimizer_name=optimizer_instance,
            params=net.parameters(),
            lr_mult=lr_mult_instance,
            sgd_momentum=sgd_momentum_instance,
        )
        kfold = KFold(n_splits=k_folds_instance, shuffle=shuffle)
```

```python
for fold, (train_ids, val_ids) in enumerate(kfold.split(dataset)):
    print(f"Fold: {fold + 1}")
    train_subsampler = torch.utils.data.SubsetRandomSampler(train_ids)
    val_subsampler = torch.utils.data.SubsetRandomSampler(val_ids)
    trainloader = torch.utils.data.DataLoader(
        dataset, batch_size=batch_size_instance,
        sampler=train_subsampler, num_workers=num_workers
    )
    valloader = torch.utils.data.DataLoader(
        dataset, batch_size=batch_size_instance,
        sampler=val_subsampler, num_workers=num_workers
    )
    # each fold starts with new weights:
    reset_weights(net)
    # Early stopping parameters
    best_val_loss = float("inf")
    counter = 0
    for epoch in range(epochs_instance):
        print(f"Epoch: {epoch + 1}")
        # training loss from one epoch:
        training_loss = train_one_epoch(
            net=net,
            trainloader=trainloader,
            batch_size=batch_size_instance,
            loss_function=loss_function,
            optimizer=optimizer,
            device=device,
            show_batch_interval=show_batch_interval,
            task=task,
        )
        # Early stopping check. Calculate validation loss from one epoch:
        metric_values[fold], loss_values[fold] = validate_one_epoch(
            net, valloader=valloader, loss_function=loss_function,
            metric=metric, device=device, task=task
        )
        # Log the running loss averaged per batch
        metric_name = "Metric"
        if metric is None:
            metric_name = type(metric).__name__
            print(f"{metric_name} value on hold-out data:
                {metric_values[fold]}")
```

```
                if writer is not None:
                    writer.add_scalars(
                        "evaluate_cv fold:" + str(fold + 1) +
                        ". Train & Val Loss and Val Metric" + writerId,
                        {"Train loss": training_loss, "Val loss":
                        loss_values[fold], metric_name: metric_values[fold]},
                        epoch + 1,
                    )
                    writer.flush()
                if loss_values[fold] < best_val_loss:
                    best_val_loss = loss_values[fold]
                    counter = 0
                    # save model:
                    if path is not None:
                        torch.save(net.state_dict(), path)
                else:
                    counter += 1
                    if counter >= patience_instance:
                        print(f"Early stopping at epoch {epoch}")
                        break
        df_eval = sum(loss_values.values()) / len(loss_values.values())
        df_metrics = sum(metric_values.values()) / len(metric_values.values())
        df_preds = np.nan
    except Exception as err:
        print(f"Error in Net_Core. Call to evaluate_cv() failed. {err=},
            {type(err)=}")
        df_eval = np.nan
        df_preds = np.nan
    add_attributes(net, removed_attributes)
    if writer is not None:
        metric_name = "Metric"
        if metric is None:
            metric_name = type(metric).__name__
        writer.add_scalars(
            "CV: Val Loss and Val Metric" + writerId,
            {"CV-loss": df_eval, metric_name: df_metrics},
            epoch + 1,
        )
        writer.flush()
    return df_eval, df_preds, df_metrics
```

4. The method `train_fold()` is implemented as shown above.

5. The method `validate_one_epoch()` is implemented as shown above. In contrast to the hold-out setting, it is called for each of the k folds. The results are stored in a dictionaries `metric_values` and `loss_values`. The results are averaged over the k folds and returned as `df_eval`.

29.14.1.3 Detailed Description of the "test_cv" Setting

It uses the loss function specfied in `fun_control` and the metric specified in `fun_control`.

1. First, the method `HyperTorch().fun_torch` is called.
2. `fun_torc()` calls `spotPython.torch.traintest.evaluate_cv()` as follows:

```
df_eval, _ = evaluate_cv(
    model,
    dataset=fun_control["test"],
    shuffle=self.fun_control["shuffle"],
    device=self.fun_control["device"],
    show_batch_interval=self.fun_control["show_batch_interval"],
    task=self.fun_control["task"],
    writer=self.fun_control["writer"],
    writerId=config_id,
)
```

Note: The data set `fun_control["test"]` is used for CV. The rest is the same as for the `"train_cv"` setting.

29.14.1.4 Detailed Description of the Final Model Training and Evaluation

There are two methods that can be used for the final evaluation of a Pytorch model:

1. `"train_tuned` and
2. `"test_tuned"`.

`train_tuned()` is just a wrapper to `evaluate_hold_out` using the `train` data set. It is implemented as follows:

```
def train_tuned(
    net,
    train_dataset,
    shuffle,
    loss_function,
    metric,
```

```
    device=None,
    show_batch_interval=10_000,
    path=None,
    task=None,
    writer=None,
):
    evaluate_hold_out(
        net=net,
        train_dataset=train_dataset,
        shuffle=shuffle,
        test_dataset=None,
        loss_function=loss_function,
        metric=metric,
        device=device,
        show_batch_interval=show_batch_interval,
        path=path,
        task=task,
        writer=writer,
    )
```

The `test_tuned()` procedure is implemented as follows:

```
def test_tuned(net, shuffle, test_dataset=None, loss_function=None,
    metric=None, device=None, path=None, task=None):
    batch_size_instance = net.batch_size
    removed_attributes, net = get_removed_attributes_and_base_net(net)
    if path is not None:
        net.load_state_dict(torch.load(path))
        net.eval()
    try:
        device = getDevice(device=device)
        if torch.cuda.is_available():
            device = "cuda:0"
            if torch.cuda.device_count() > 1:
                print("We will use", torch.cuda.device_count(), "GPUs!")
                net = nn.DataParallel(net)
        net.to(device)
        valloader = torch.utils.data.DataLoader(
            test_dataset, batch_size=int(batch_size_instance),
            shuffle=shuffle,
            num_workers=0
        )
```

```
            metric_value, loss = validate_one_epoch(
                net, valloader=valloader, loss_function=loss_function,
                metric=metric, device=device, task=task
            )
            df_eval = loss
            df_metric = metric_value
            df_preds = np.nan
        except Exception as err:
            print(f"Error in Net_Core. Call to test_tuned() failed. {err=},
                {type(err)=}")
            df_eval = np.nan
            df_metric = np.nan
            df_preds = np.nan
        add_attributes(net, removed_attributes)
        print(f"Final evaluation: Validation loss: {df_eval}")
        print(f"Final evaluation: Validation metric: {df_metric}")
        print("----------------------------------------------")
        return df_eval, df_preds, df_metric
```

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