

DD2424
Deep Learning in Data Science
Project proposal

Group 9

Franco Ruggeri
Fredrik Danielsson
Milan Jolic
Muhammad Tousif Zaman

1. *Title of the project:* Detection of COVID-19 from Chest X-Ray Images
2. *Paper we want to use as reference:* [1]
3. *Datasets:*
 - COVIDx [1] (possibly extended with other data)
 - ImageNet
 - Skin Cancer MNIST
4. *Description of the problem:* given a chest X-ray image, classify it as positive or negative to the coronavirus.
5. *Methods to solve the problem:*
 - COVID-Net architecture [1].
 - Data augmentation (translation, rotation, horizontal flip, intensity shift).
 - Transfer learning (pre-training on ImageNet or Skin Cancer MNIST).
 - Grad-Cam or GSInquire for explainability.
6. *Skills/knowledge we want to acquire:*
 - Practical skills in TensorFlow.
 - Theory and implementation of an explainability method (Grad-Cam or GSInquire).
 - Application of techniques introduced during the lectures (data augmentation and transfer learning).

7. *DL software package*: TensorFlow.
8. *How much of the software implementation we want to write*: we aim to implement all the points, in case using the open-source code provided by the authors of [1] just for debugging.
9. *Experiments*:
 - Data augmentation: with vs without.
 - Transfer learning I: only pre-training vs pre-training + fine tuning vs training from scratch (no pre-training).
 - Transfer learning II: pre-training on ImageNet vs Skin Cancer MNIST
 - Comparisons using confusion matrix and sensitivity/specificity (due to imbalance dataset).
10. *Measure of the success of the project*:
 - Results similar to [1] (not exactly the same considering the available resources), confirming the correctness of the implementation.
 - Good analysis of the results.
11. *Grade*: we aim for A, please let us know if the algorithmic and experimental ambition is sufficient.

References

- [1] Linda Wang and Alexander Wong. “COVID-Net: A tailored deep convolutional neural network design for detection of COVID-19 cases from chest radiography images”. In: *arXiv preprint arXiv:2003.09871* (2020).