INDEX

Practical 1

Creating Data Model using Cassandra.

Cassandra Data Model

Step-1:

- Open a folder Datascience\apache-cassandra-3.11.4-bin\apache-cassandra-3.11.4\bin\cassandra.bat
- now open IDLE (PYTHON GUI)
- go to file -> open -> select (Datascience\apache-cassandra-3.11.4-bin\apache-cassandra-3.11.4\bin\select-cqlsh.py inside sqlsh.py -> run -> run module

Step-2: command to Create keyspace:

```
create keyspace DATASCI WITH replication={'class':'SimpleStrategy','replication_factor':3};
```

Step – 3: command to use keyspace run this command

```
cqlsh> use datasci;
```

Step – 4: command to create a new table

```
cqlsh:datasci> create table
  student( student_id int
  PRIMARY KEY, student_name
  text,
  student_city text,
  student_fees varint,
  student_phone varin
```

Step – 5: command to display created keyspace list

```
Desc keyspace;
```

Step – 6: command to alter keyspace

```
alter keyspace datasci with replication={'class':'SimpleStrategy','replication_factor':2};
```

Step – 7 : command to display all the tables of the keyspaces

```
cqlsh:datasci> desc tables;
```

Step- 8: command to alter table

```
cqlsh:datasci>
alter table
student
   add student_gender text;
```

Step- 9: command to insert data into table

```
insert into student(student_id,student_city,student_fees,student_name,student_phone)
values(1,'Bhy',5000,'pooja',0939293939);
```

(you can only add one value at a time)

Step – 10: command to show the table cqlsh:datasci> select * from student;

Step – 11: command to update table

```
cqlsh:datasci> update student set student_fees=200000,student_name='hima' where student_id=2;
```

Step – 12: command to refresh the table

cqlsh:datasci> truncate student;**step – 13: command to delete the specific column data from the table**

```
cqlsh:datasci> delete student_city from student where student_id=2;
```

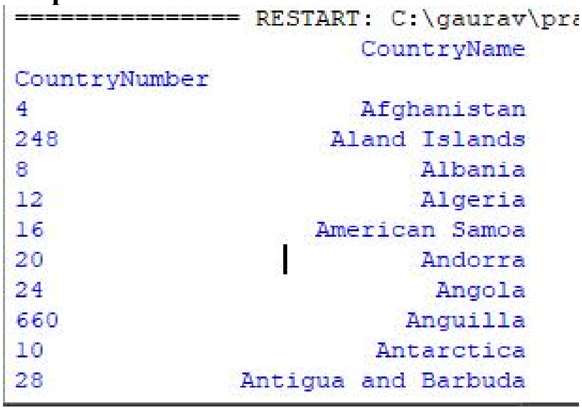
Practical No 2

A. Text delimited CSV to HORUS format

Code :

```
import pandas as pd
sInputFileName='C:/VKHCG/05-DS/9999-
Data/Country_Code.csv'
InputData=pd.read_csv(sInputFileName,encoding="latin-1")
ProcessData=InputData
ProcessData.drop(['ISO-3-Code', 'ISO-2-CODE'], axis=1,inplace=True)
ProcessData.rename(columns={'ISO-M49': 'CountryNumber', 'Country': 'CountryName'},
inplace=True) ProcessData.set_index('CountryNumber', inplace=True)
ProcessData.sort_values('CountryName', axis=0, ascending=True, inplace=True)
print(ProcessData.head(10))
```

Output :



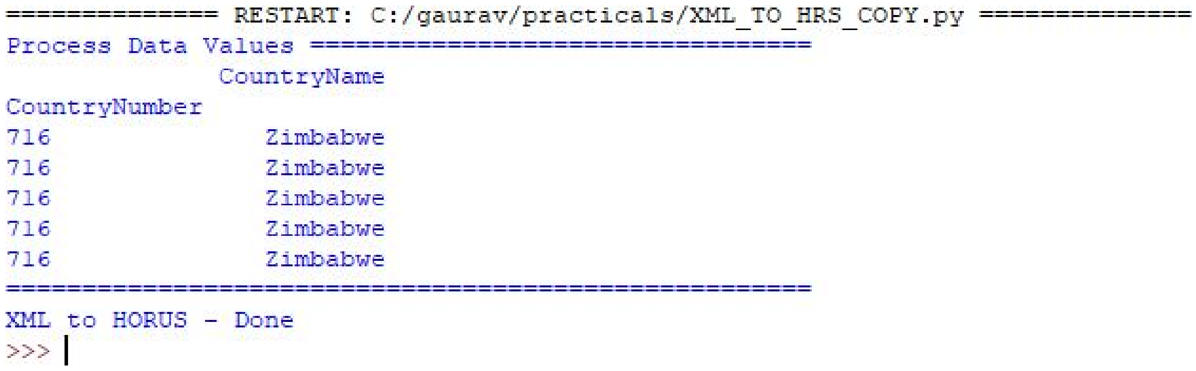
```
=============== RESTART: C:\gaurav\pr
                            CountryName
CountryNumber
4                           Afghanistan
248                       Aland Islands
8                               Albania
12                              Algeria
16                       American Samoa
20                              Andorra
24                               Angola
660                            Anguilla
10                           Antarctica
28                  Antigua and Barbuda
```

B. XML to HORUS Format

Code :

```
# Utility Start XML to HORUS =================================
# Standard Tools
import pandas as
pd
import xml.etree.ElementTree as
ET def df2xml(data):
   header = data.columns
   root =
   ET.Element('root')
   for row in range(data.shape[0]):
      entry =
      ET.SubElement(root,'entry') for
      index in range(data.shape[1]):
         schild=str(header[index])
         child = ET.SubElementlement(entry,
         schild) if str(data[schild][row]) != 'nan':
            child.text =
         str(data[schild][row]) else:
            child.text = 'n/a'
            entry.append(child)
   result = ET.tostring(root)
   return result
def xml2df(xml_data):
   root = ET.XML(xml_data)
   all_records = []
   for i, child in enumerate(root):
            record = {}
            for subchild in child:
               record[subchild.tag] = subchild.text
               all_records.append(record)
   return pd.DataFrame(all_records)
sInputFileName='C:/VKHCG/05-DS/9999-
Data/Country_Code.xml' InputData =
open(sInputFileName).read()

print('Input Data Values ===================================')
ProcessDataXML=InputData
ProcessData=xml2df(ProcessDataXML
)

ProcessData.drop('ISO-2-CODE', axis=1,inplace=True)
ProcessData.drop('ISO-3-Code', axis=1,inplace=True)
ProcessData.rename(columns={'Country': 'CountryName'},
inplace=True) ProcessData.rename(columns={'ISO-M49':
'CountryNumber'}, inplace=True)
ProcessData.set_index('CountryNumber', inplace=True)
ProcessData.sort_values('CountryName', axis=0, ascending=False, inplace=True)
print('Process Data Values =================================')
print(ProcessData.head(5))
print('=====================================================')
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-XML-
Country.csv' OutputData.to_csv(sOutputFileName, index = False,
encoding="latin-1") print('XML to HORUS - Done')
```

Output:

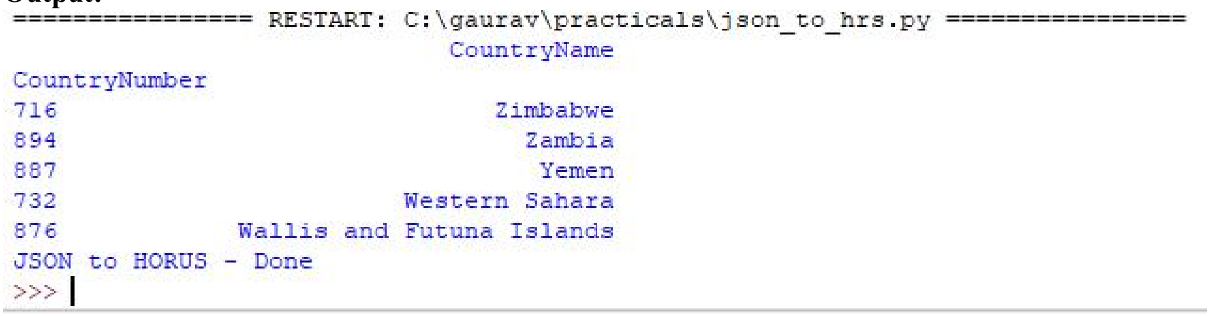


```
============== RESTART: C:/gaurav/practicals/XML_TO_HRS_COPY.py ==============
Process Data Values =================================
              CountryName
CountryNumber
716              Zimbabwe
716              Zimbabwe
716              Zimbabwe
716              Zimbabwe
716              Zimbabwe
=====================================================
XML to HORUS - Done
>>> |
```

C. JSON to HORUS Format

```
import pandas as pd
sInputFileName='C:/VKHCG/05-DS/9999-Data/Country_Code.json'
InputData=pd.read_json(sInputFileName, orient='index',
encoding="latin-1") ProcessData=InputData
ProcessData.drop(['ISO-3-Code', 'ISO-2-CODE'], axis=1,inplace=True)
ProcessData.rename(columns={'ISO-M49': 'CountryNumber', 'Country': 'CountryName'},
inplace=True) ProcessData.set_index('CountryNumber', inplace=True)
ProcessData.sort_values('CountryName', axis=0, ascending=False, inplace=True)
print(ProcessData.head(5))
OutputData=ProcessData
sOutputFileName='c:/VKHCG/05-DS/9999-Data/HORUS-JSON-
Country.csv' OutputData.to_csv(sOutputFileName, index = False,
encoding="latin-1") print('JSON to HORUS - Done')
```

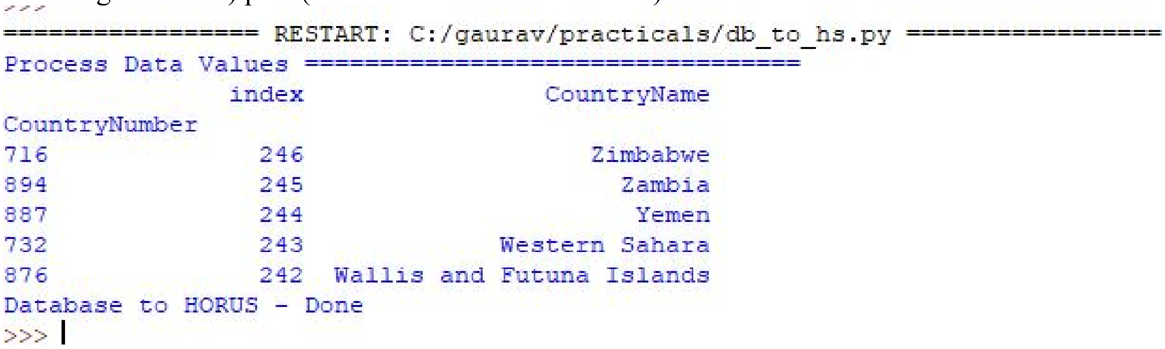
Output:



```
================ RESTART: C:\gaurav\practicals\json_to_hrs.py ================
                             CountryName
CountryNumber
716                             Zimbabwe
894                               Zambia
887                                Yemen
732                       Western Sahara
876            Wallis and Futuna Islands
JSON to HORUS - Done
>>> 
```

D. MySql Database to HORUS Format

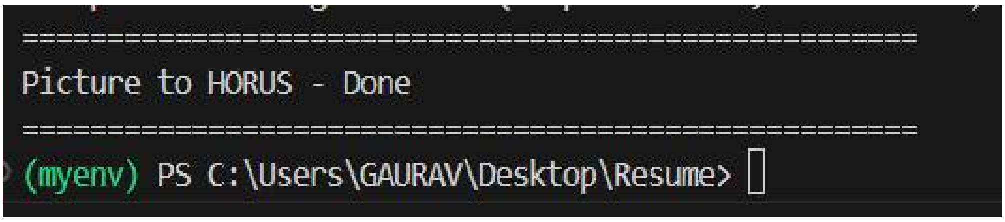
```
import pandas as
pd import sqlite3
as sq
conn = sq.connect('C:/VKHCG/05-DS/9999-
Data/utility.db') sSQL='select * FROM ' +
'Country_Code' + ';'
InputData=pd.read_sql_query(sSQL, conn)
ProcessData=InputData
ProcessData.drop(['ISO-3-Code', 'ISO-2-CODE'], axis=1,inplace=True)
ProcessData.rename(columns={'ISO-M49': 'CountryNumber', 'Country': 'CountryName'},
inplace=True) ProcessData.set_index('CountryNumber', inplace=True)
ProcessData.sort_values('CountryName', axis=0, ascending=False, inplace=True)
print('Process Data Values ===================================')
print(ProcessData.head(5))
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-CSV-
Country.csv' OutputData.to_csv(sOutputFileName, index = False,
encoding="latin-1") print('Database to HORUS - Done')
```



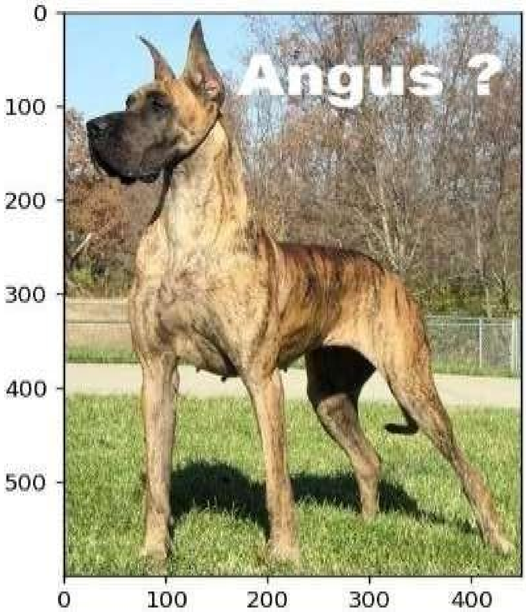
```
================= RESTART: C:/gaurav/practicals/db_to_hs.py =================
Process Data Values =================================
               index                CountryName
CountryNumber
716              246                   Zimbabwe
894              245                     Zambia
887              244                      Yemen
732              243             Western Sahara
876              242  Wallis and Futuna Islands
Database to HORUS - Done
>>> 
```

E. Picture (JPEG) to HORUS Format

```
import pandas as pd
import matplotlib.pyplot as
plt import numpy as np
import imageio

sInputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-
Data/Angus.jpg' InputData = imageio.imread(sInputFileName, mode='RGBA')
ProcessRawData=InputData.flatten()
y=InputData.shape[2] + 2
x=int(ProcessRawData.shape[0]/y
)
ProcessData=pd.DataFrame(np.reshape(ProcessRawData, (x,
y))) sColumns= ['XAxis','YAxis','Red', 'Green', 'Blue','Alpha']
ProcessData.columns=sColumns
ProcessData.index.names
=['ID'] plt.imshow(InputData) plt.show()
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-Picture.csv'
OutputData.to_csv(sOutputFileName, index = False)
print('==============================================================')
print('Picture to HORUS - Done')
print('==============================================================')
```



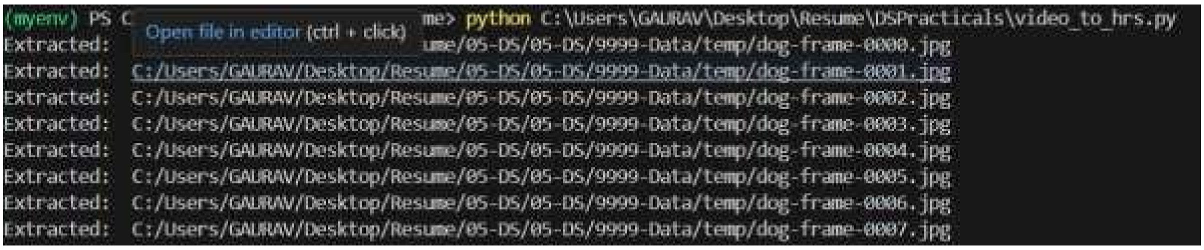
```
=====================================================
Picture to HORUS - Done
=====================================================
(myenv) PS C:\Users\GAURAV\Desktop\Resume>
```



F. Video to HORUS Format

Code :

```
1st ========================================
import os
import shutil
import cv2
sInputFileName = 'C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/dog.mp4'
sDataBaseDir = 'C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp'
if
   os.path.exists(sDataBaseD
   ir):
   shutil.rmtree(sDataBaseDir
   )
if not
   os.path.exists(sDataBaseDir):
   os.makedirs(sDataBaseDir)
vidcap =
cv2.VideoCapture(sInputFileName) if not
vidcap.isOpened():
   print('Error: Could not open video
   file') exit()
count = 0
while True:
   success, image =
   vidcap.read() if not success:
      break
   sFrame = sDataBaseDir + '/dog-frame-' + str(format(count, '04d')) +
   '.jpg' print('Extracted: ', sFrame)
   cv2.imwrite(sFrame, image)
   if os.path.getsize(sFrame) == 0:
      os.remove(sFrame)
      print('Removed: ',
      sFrame) continue
   count += 1
   if cv2.waitKey(10) == 27:
      break
print('Generated: ', count, ' Frames')
print('============================================================')
print('Movie to Frames HORUS - Done')
print('============================================================')
```

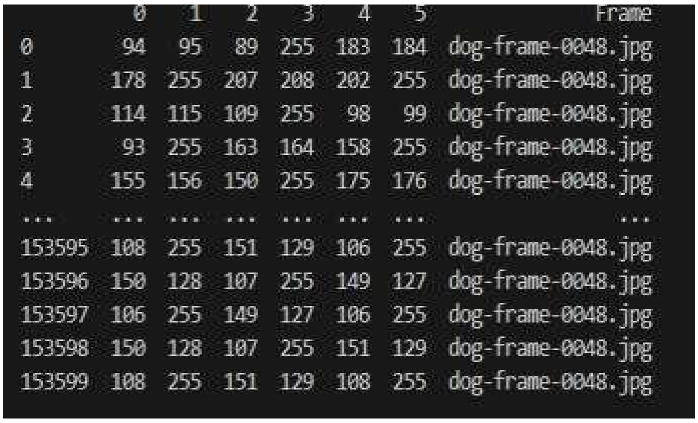


```
(myenv) PS C                              me> python C:\Users\GAURAV\Desktop\Resume\DSPracticals\video_to_hrs.py
Extracted:                                ume/05-DS/05-DS/9999-Data/temp/dog-frame-0000.jpg
Extracted:  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp/dog-frame-0001.jpg
Extracted:  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp/dog-frame-0002.jpg
Extracted:  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp/dog-frame-0003.jpg
Extracted:  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp/dog-frame-0004.jpg
Extracted:  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp/dog-frame-0005.jpg
Extracted:  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp/dog-frame-0006.jpg
Extracted:  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/temp/dog-frame-0007.jpg
```

```
2nd part ================================
import imageio
import pandas as
pd
import matplotlib.pyplot as
plt import numpy as np
import os
```

```
sDataBaseDir='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-
Data/temp' f=0
for file in
   os.listdir(sDataBaseDir): if
   file.endswith(".jpg"):
      f += 1
sInputFileName=os.path.join(sDataBaseDir,  file)
InputData = imageio.imread(sInputFileName, mode='RGBA')
ProcessRawData=InputData.flatten()
y=InputData.shape[2] + 2
x=int(ProcessRawData.shape[0]/y
)
ProcessFrameData=pd.DataFrame(np.reshape(ProcessRawData, (x, y)))
ProcessFrameData['Frame']=f
ile

plt.imshow(InputData)
plt.show()
ProcessData =
[] if f == 1:

   ProcessData=ProcessFrameDat
a else:
   ProcessData=ProcessData.append(ProcessFrame
Data) if f > 0:
   # ProcessData = pd.DataFrame(ProcessFrameData)
   print(ProcessData)
   sColumns= ['XAxis','YAxis','Red', 'Green', 'Blue','Alpha','FrameName']
   ProcessData.columns=sColumns
   ProcessFrameData.index.names
   =['ID'] print('Rows:
   ',ProcessData.shape[0])
   print('Columns
   :',ProcessData.shape[1])
ProcessData.to_csv('C:/VKHCG/05-DS/9999-Data/HORUS-Movie-Frame.csv' , index = False)
print('Processed ; ', f,' frames')
```

Output :



```
          0    1    2    3    4    5               Frame
0        94   95   89  255  183  184  dog-frame-0048.jpg
1       178  255  207  208  202  255  dog-frame-0048.jpg
2       114  115  109  255   98   99  dog-frame-0048.jpg
3        93  255  163  164  158  255  dog-frame-0048.jpg
4       155  156  150  255  175  176  dog-frame-0048.jpg
...     ...  ...  ...  ...  ...  ...                 ...
153595  108  255  151  129  106  255  dog-frame-0048.jpg
153596  150  128  107  255  149  127  dog-frame-0048.jpg
153597  106  255  149  127  106  255  dog-frame-0048.jpg
153598  150  128  107  255  151  129  dog-frame-0048.jpg
153599  108  255  151  129  108  255  dog-frame-0048.jpg
```

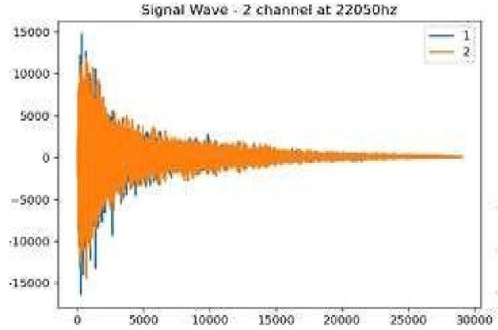
G. Audio to HORUS Format

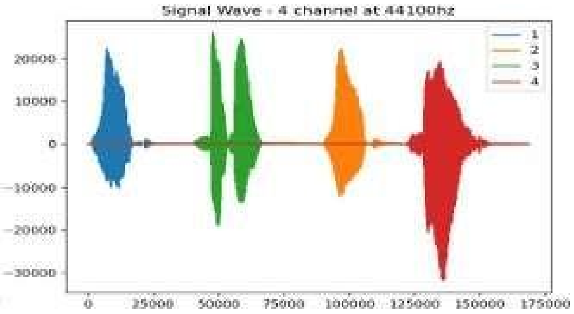
Code :

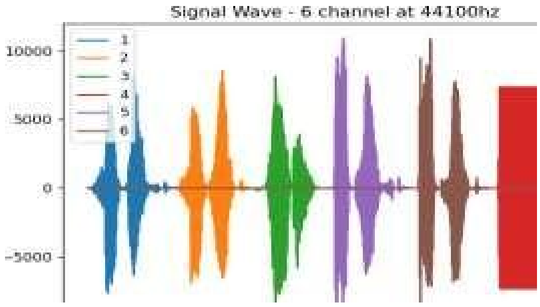
```
from scipy.io import wavfile
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
def show_info(aname,
    a,r): print ('  ')
    print ("Audio:",
    aname) print ('
                ')
    print ("Rate:",
    r) print ('       ')
    print ("shape:", a.shape)
    print ("dtype:", a.dtype)
    print ("min, max:", a.min(),
    a.max()) print ('         ')
    plot_info(aname, a,r)
def plot_info(aname,
a,r):
    sTitle= 'Signal Wave - '+ aname + ' at ' + str(r) +
    'hz' plt.title(sTitle)
    sLegend=[]
    for c in range(a.shape[1]):
        sLabel = 'Ch' + str(c+1)

        sLegend=sLegend+[str(c+1)]
        plt.plot(a[:,c], label=sLabel)
    plt.legend(sLegend)
    plt.show()
#=============================================================
sInputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/2ch-
sound.wav' InputRate, InputData = wavfile.read(sInputFileName)
show_info("2 channel",
InputData,InputRate)
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2']
ProcessData.columns=sColumns
OutputData=ProcessData
sOutputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/HORUS-Audio-
2ch.csv' OutputData.to_csv(sOutputFileName, index = False)
sInputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/4ch-sound.wav'
InputRate, InputData = wavfile.read(sInputFileName)
show_info("4 channel",
InputData,InputRate)
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2','Ch3', 'Ch4']
ProcessData.columns=sColumns
OutputData=ProcessData
sOutputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/HORUS-Audio-
4ch.csv' OutputData.to_csv(sOutputFileName, index = False)
sInputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/6ch-sound.wav'
print('=====================================================')
print('Processing : ', sInputFileName)
print('================================================
=====')
```

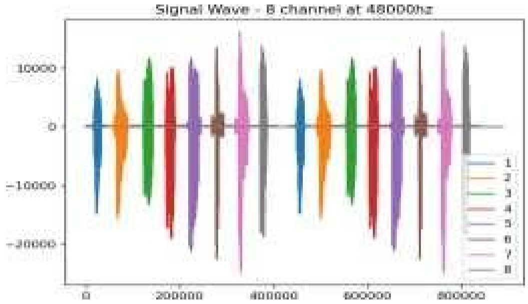
```
InputRate, InputData =
wavfile.read(sInputFileName) show_info("6
channel", InputData,InputRate)
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2','Ch3', 'Ch4', 'Ch5','Ch6']
ProcessData.columns=sColumns
OutputData=ProcessData
    sOutputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/HORUS-Audio-6ch.csv'
    OutputData.to_csv(sOutputFileName, index = False

#============================================================
sInputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/8ch-sound.wav'
print('========================================================')
print('Processing : ', sInputFileName)
print('==================================================
=====')
InputRate, InputData =
wavfile.read(sInputFileName) show_info("8
channel", InputData,InputRate)
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2','Ch3', 'Ch4', 'Ch5','Ch6','Ch7','Ch8']
ProcessData.columns=sColumns
OutputData=ProcessData
sOutputFileName='C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/HORUS-Audio-8ch.csv'
OutputData.to_csv(sOutputFileName, index = False)
print('========================================================')
print('Audio to HORUS - Done')
```

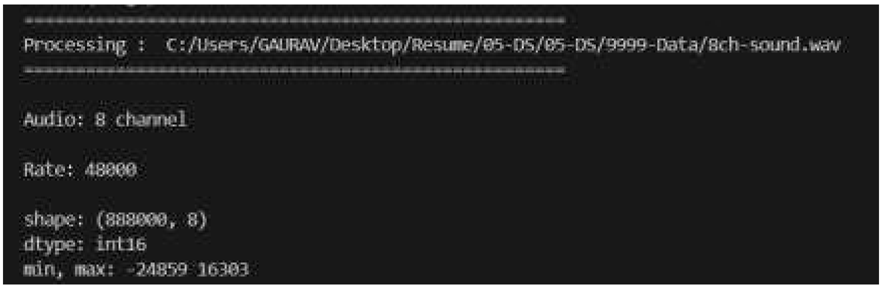
Output :











```
========================================================
Processing :  C:/Users/GAURAV/Desktop/Resume/05-DS/05-DS/9999-Data/8ch-sound.wav
========================================================

Audio: 8 channel

Rate: 48000

shape: (888000, 8)
dtype: int16
min, max: -24859 16303
```

Practical No 3

Aim : Utilities and Auditing

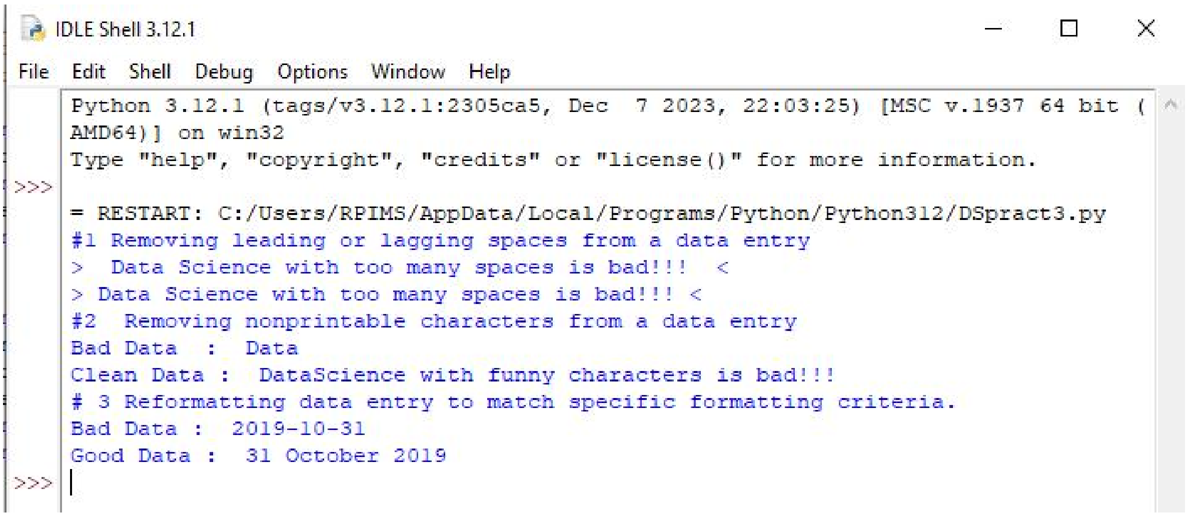
Basic Utility Design

A. Fixers Utilities:

Fixers enable your solution to take your existing data and fix a specific quality issue.

```
import string
import datetime as dt
# 1 Removing leading or lagging spaces from a data entry
print('#1 Removing leading or lagging spaces from a data entry');
 baddata = " Data Science with too many spaces is bad!!! " print('>',baddata,'<')
cleandata=baddata.strip()  print('>',cleandata,'<')


# 2 Removing nonprintable characters from a data
entry print('#2  Removing nonprintable characters from a
data entry') printable = set(string.printable)
baddata = "Data\x00Science with\x02 funny characters is \x10bad!!!"
cleandata=".join(filter(lambda x: x in string.printable,baddata))
print('Bad Data  : ',baddata);
print('Clean Data : ',cleandata)

# 3 Reformatting data entry to match specific formatting criteria.
#  Convert YYYY/MM/DD to DD Month YYYY
print('# 3 Reformatting data entry to match specific formatting
criteria.') baddate = dt.date(2019, 10, 31)
baddata=format(baddate,'%Y-%m-%d')
gooddate = dt.datetime.strptime(baddata,'%Y-%m-%d')
gooddata=format(gooddate,'%d %B %Y')
print('Bad Data : ',baddata)
print('Good Data : ',gooddata)
```

Output :



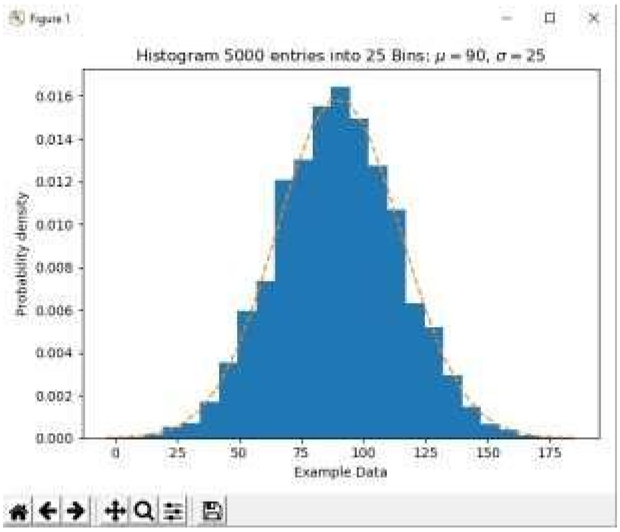
```
Python 3.12.1 (tags/v3.12.1:2305ca5, Dec  7 2023, 22:03:25) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:/Users/RPIMS/AppData/Local/Programs/Python/Python312/DSpract3.py
#1 Removing leading or lagging spaces from a data entry
>  Data Science with too many spaces is bad!!!  <
> Data Science with too many spaces is bad!!! <
#2  Removing nonprintable characters from a data entry
Bad Data  :  Data
Clean Data :  DataScience with funny characters is bad!!!
# 3 Reformatting data entry to match specific formatting criteria.
Bad Data :  2019-10-31
Good Data :  31 October 2019
>>> |
```

B. Data Binning or Bucketing

Code :

```
import numpy as np
import matplotlib.mlab as mlab
import matplotlib.pyplot as plt
np.random.seed(0)
# example data
mu = 90  # mean of distribution

sigma = 25  # standard deviation of
distribution x = mu + sigma *
np.random.randn(5000) num_bins = 25
fig, ax = plt.subplots()
# the histogram of the data
n, bins, patches = ax.hist(x, num_bins,
normed=1) # add a 'best fit' line
y = mlab.normpdf(bins, mu, sigma)
ax.plot(bins, y, '--')
ax.set_xlabel('Example Data')
ax.set_ylabel('Probability density')
sTitle=r'Histogram ' + str(len(x)) + ' entries into ' + str(num_bins) + ' Bins: $\mu=' + str(mu) + '$, $\sigma=' +
str(sigma) + '$' ax.set_title(sTitle)
fig.tight_layout()
sPathFig='C:/VKHCG/05-DS/4000-UL/0200-DU/DU-Histogram.png'
fig.savefig(sPathFig)
plt.show()
```

Output:

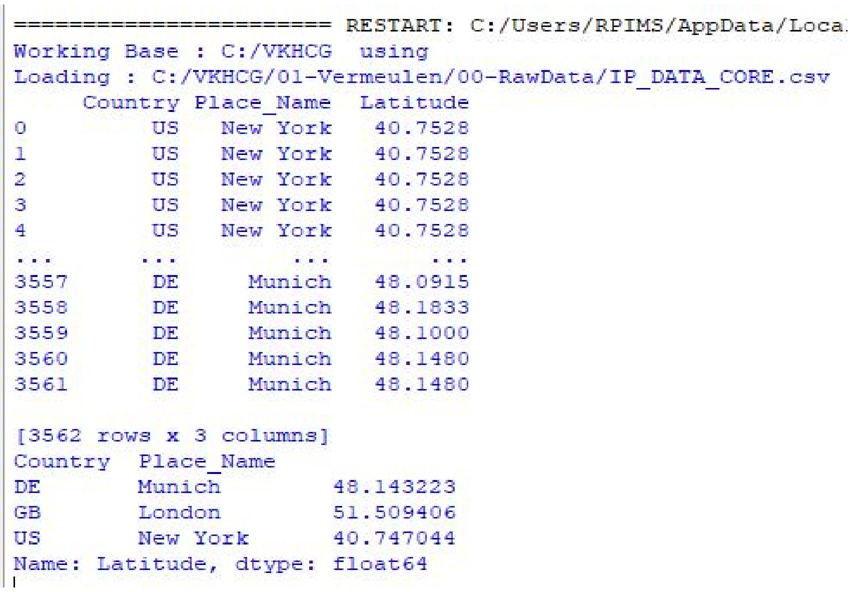


C. Averaging of Data

Input:

```
import pandas as pd
InputFileName='IP_DATA_CORE.csv'
OutputFileName='Retrieve_Router_Location.cs
v' Base='C:/VKHCG'
print('Working Base :',Base, ' using ')
sFileName=Base + '/01-Vermeulen/00-RawData/' + InputFileName
print('Loading :',sFileName)
IP_DATA_ALL=pd.read_csv(sFileName,header=0,low_memory=False, usecols=['Country','Place
Name','Latitude','Longitude'], encoding="latin-1")
IP_DATA_ALL.rename(columns={'Place Name': 'Place_Name'},
inplace=True) AllData=IP_DATA_ALL[['Country',
'Place_Name','Latitude']]
print(AllData)
MeanData=AllData.groupby(['Country',
'Place_Name'])['Latitude'].mean() print(MeanData)
```

Output:



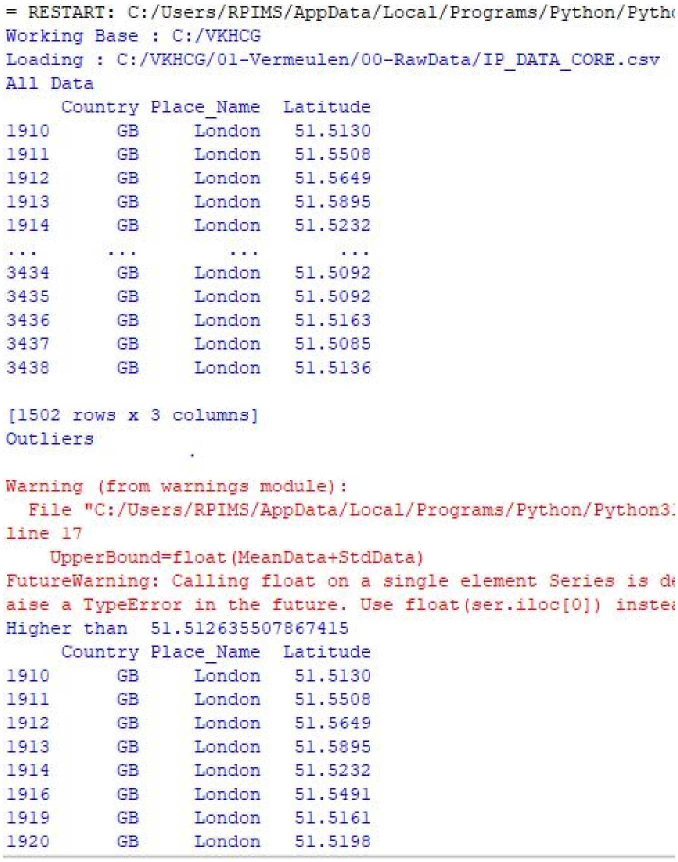
```
======================== RESTART: C:/Users/RPIMS/AppData/Loca
Working Base : C:/VKHCG  using
Loading : C:/VKHCG/01-Vermeulen/00-RawData/IP_DATA_CORE.csv
     Country Place_Name  Latitude
0         US   New York   40.7528
1         US   New York   40.7528
2         US   New York   40.7528
3         US   New York   40.7528
4         US   New York   40.7528
...      ...        ...       ...
3557      DE     Munich   48.0915
3558      DE     Munich   48.1833
3559      DE     Munich   48.1000
3560      DE     Munich   48.1480
3561      DE     Munich   48.1480

[3562 rows x 3 columns]
Country  Place_Name
DE       Munich        48.143223
GB       London        51.509406
US       New York      40.747044
Name: Latitude, dtype: float64
```

D. Outlier Detection

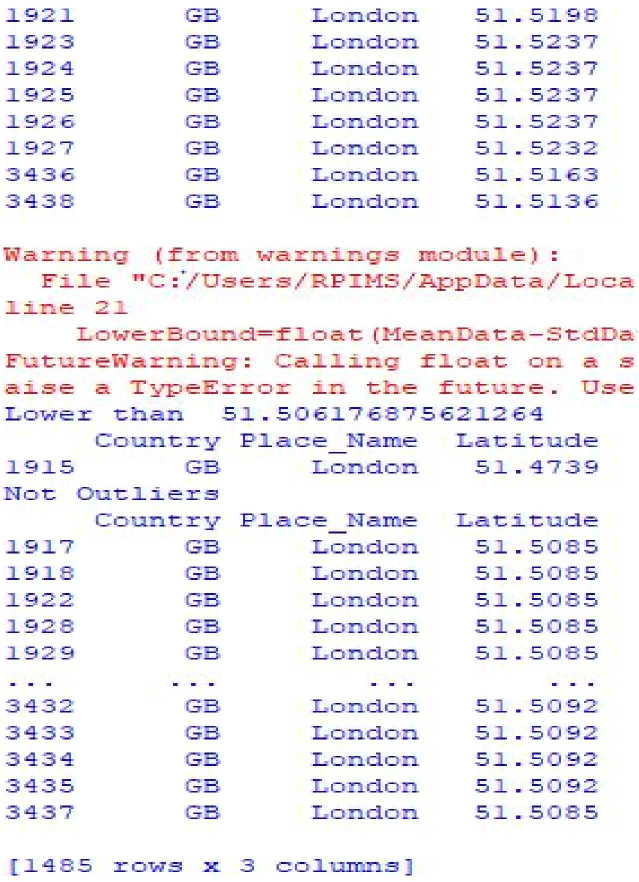
Code :

```
import pandas as pd
InputFileName='IP_DATA_COR
E.csv'
OutputFileName='Retrieve_Router_Location.cs
v' Base='C:/VKHCG'
print('Working Base :',Base)
sFileName=Base + '/01-Vermeulen/00-RawData/' + InputFileName
print('Loading :',sFileName)
IP_DATA_ALL=pd.read_csv(sFileName,header=0,low_memory=False, usecols=['Country','Place
Name','Latitude','Longitude'], encoding="latin-1")
IP_DATA_ALL.rename(columns={'Place Name': 'Place_Name'},
inplace=True)
LondonData=IP_DATA_ALL.loc[IP_DATA_ALL['Place_Name']=='L
ondon'] AllData=LondonData[['Country', 'Place_Name','Latitude']]
print('All Data')
print(AllData)
MeanData=AllData.groupby(['Country',
'Place_Name'])['Latitude'].mean()
StdData=AllData.groupby(['Country',
'Place_Name'])['Latitude'].std() print('Outliers')
UpperBound=float(MeanData+StdDa
ta) print('Higher than ', UpperBound)
OutliersHigher=AllData[AllData.Latitude>UpperBound
] print(OutliersHigher)
LowerBound=float(MeanData-
StdData) print('Lower than ',
LowerBound)
OutliersLower=AllData[AllData.Latitude<LowerBound
] print(OutliersLower)
print('Not Outliers')
OutliersNot=AllData[(AllData.Latitude>=LowerBound) &
(AllData.Latitude<=UpperBound)] print(OutliersNot)
```

Output:



```
= RESTART: C:/Users/RPIMS/AppData/Local/Programs/Python/Pyth
Working Base : C:/VKHCG
Loading : C:/VKHCG/01-Vermeulen/00-RawData/IP_DATA_CORE.csv
All Data
     Country Place_Name  Latitude
1910      GB     London   51.5130
1911      GB     London   51.5508
1912      GB     London   51.5649
1913      GB     London   51.5895
1914      GB     London   51.5232
...      ...        ...       ...
3434      GB     London   51.5092
3435      GB     London   51.5092
3436      GB     London   51.5163
3437      GB     London   51.5085
3438      GB     London   51.5136

[1502 rows x 3 columns]
Outliers

Warning (from warnings module):
  File "C:/Users/RPIMS/AppData/Local/Programs/Python/Python3
line 17
    UpperBound=float(MeanData+StdData)
FutureWarning: Calling float on a single element Series is de
aise a TypeError in the future. Use float(ser.iloc[0]) inste
Higher than  51.512635507867415
     Country Place_Name  Latitude
1910      GB     London   51.5130
1911      GB     London   51.5508
1912      GB     London   51.5649
1913      GB     London   51.5895
1914      GB     London   51.5232
1916      GB     London   51.5491
1919      GB     London   51.5161
1920      GB     London   51.5198
```



```
1921      GB     London   51.5198
1923      GB     London   51.5237
1924      GB     London   51.5237
1925      GB     London   51.5237
1926      GB     London   51.5237
1927      GB     London   51.5232
3436      GB     London   51.5163
3438      GB     London   51.5136

Warning (from warnings module):
  File "C:/Users/RPIMS/AppData/Loca
line 21
    LowerBound=float(MeanData-StdDa
FutureWarning: Calling float on a s
aise a TypeError in the future. Use
Lower than  51.506176875621264
     Country Place_Name  Latitude
1915      GB     London   51.4739
Not Outliers
     Country Place_Name  Latitude
1917      GB     London   51.5085
1918      GB     London   51.5085
1922      GB     London   51.5085
1928      GB     London   51.5085
1929      GB     London   51.5085
...      ...        ...       ...
3432      GB     London   51.5092
3433      GB     London   51.5092
3434      GB     London   51.5092
3435      GB     London   51.5092
3437      GB     London   51.5085

[1485 rows x 3 columns]
```

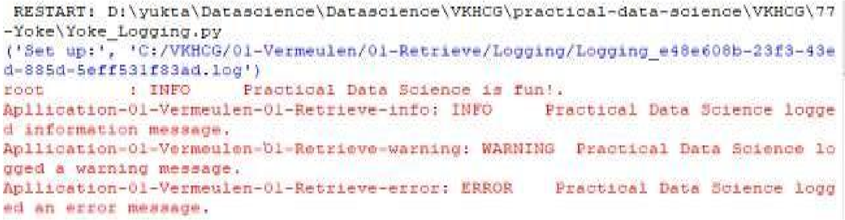
E. Audit Logging

Code :

```
import sys
import os
import logging
import uuid
import shutil
import time
  if sys.platform == 'linux':
       Base=os.path.expanduser('~')
 +'/VKHCG'
 else:
Base='C:/VKHC
sCompanies=['01-Vermeulen','02-Krennwallner','03-Hillman','04-Clark']
sLayers=['01-Retrieve','02-Assess','03-Process','04-Transform','05-Organise','06-Report']
sLevels=['debug','info','warning','error']

for sCompany in sCompanies:
  sFileDir=Base + '/' +
  sCompany if not
  os.path.exists(sFileDir):
    os.makedirs(sFileD
  ir) for sLayer in
  sLayers:
    log =
    logging.getLogger() for
    hdlr in log.handlers[:]:
      log.removeHandler(hdlr)
    sFileDir=Base + '/' + sCompany + '/' + sLayer +
    '/Logging' if os.path.exists(sFileDir):
      shutil.rmtree(sFileDir)
    time.sleep(2)
    if not os.path.exists(sFileDir):
      os.makedirs(sFileDir)
    skey=str(uuid.uuid4())
    sLogFile=Base + '/' + sCompany + '/' + sLayer +
    '/Logging/Logging_'+skey+'.log' print('Set up:',sLogFile)
    logging.basicConfig(level=logging.DEBUG,
                format='%(asctime)s %(name)-12s %(levelname)-8s
                %(message)s', datefmt='%m-%d %H:%M',
                filename=sLogFile,
                filemode='w')
    console =
    logging.StreamHandler()
    console.setLevel(logging.INFO)
    formatter = logging.Formatter('%(name)-12s: %(levelname)-8s %(message)s')
    console.setFormatter(formatter)
    logging.getLogger('').addHandler(console)
    logging.info('Practical Data Science is
    fun!.') for sLevel in sLevels:
      sApp='Apllication-'+ sCompany + '-' + sLayer + '-' +
      sLevel logger = logging.getLogger(sApp)
      if sLevel == 'debug':
        logger.debug('Practical Data Science logged a debugging
      message.') if sLevel == 'info':
        logger.info('Practical Data Science logged information
      message.') if sLevel == 'warning':
```

```
    logger.warning('Practical Data Science logged a warning
message.') if sLevel == 'error':
    logger.error('Practical Data Science logged an error message.')
```

Output:



```
 RESTART: D:\yukta\Datascience\Datascience\VKHCG\practical-data-science\VKHCG\77
-Yoke\Yoke_Logging.py
('Set up:', 'C:/VKHCG/01-Vermeulen/01-Retrieve/Logging/Logging_e48e608b-23f3-43e
d-885d-5eff531f83ad.log')
root          : INFO     Practical Data Science is fun!.
Apllication-01-Vermeulen-01-Retrieve-info: INFO     Practical Data Science logge
d information message.
Apllication-01-Vermeulen-01-Retrieve-warning: WARNING  Practical Data Science lo
gged a warning message.
Apllication-01-Vermeulen-01-Retrieve-error: ERROR    Practical Data Science logg
ed an error message.
```

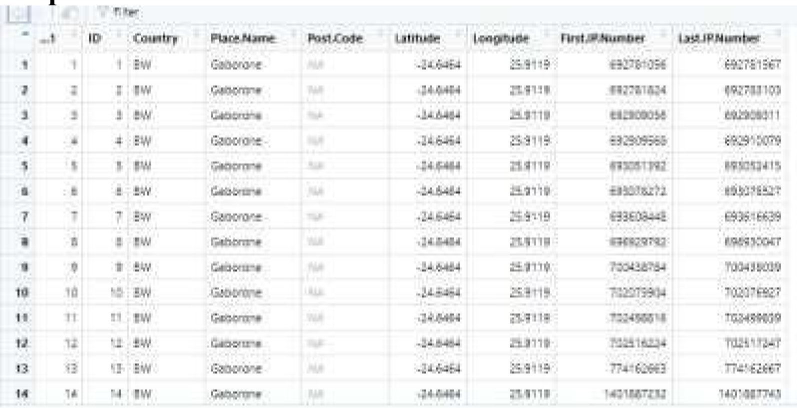
Practical No 4

A. Perform the following data processing using R.

Code:

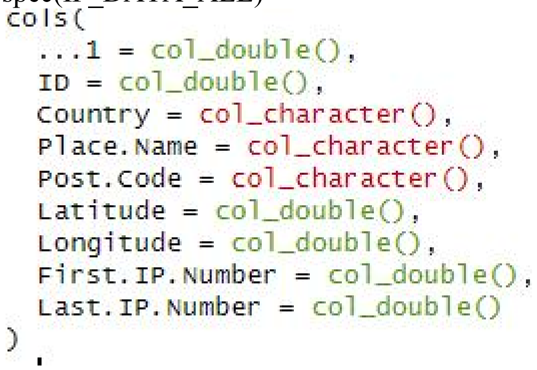
```
library(readr)
IP_DATA_ALL <- read_csv("E:/NIKHILESH/VKHCG/01-Vermeulen/00-RawData/IP_DATA_ALL.csv")
View(IP_DATA_ALL)
```

Output:



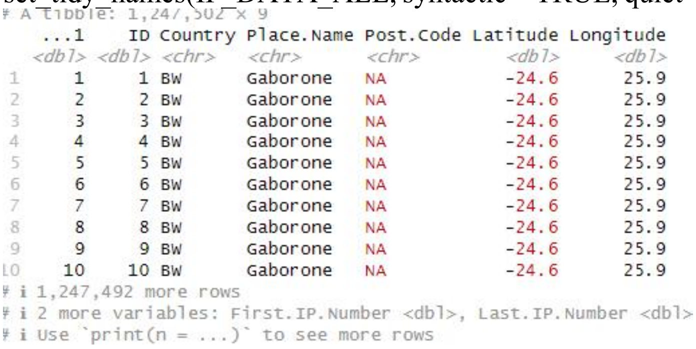
	...1	ID	Country	Place.Name	Post.Code	Latitude	Longitude	First.IP.Number	Last.IP.Number
1	1	1	BW	Gaborone	NA	-24.6464	25.9119	692781056	692781567
2	2	2	BW	Gaborone	NA	-24.6464	25.9119	692781824	692783103
3	3	3	BW	Gaborone	NA	-24.6464	25.9119	692808056	692808011
4	4	4	BW	Gaborone	NA	-24.6464	25.9119	692909566	692910079
5	5	5	BW	Gaborone	NA	-24.6464	25.9119	693051392	693052415
6	6	6	BW	Gaborone	NA	-24.6464	25.9119	693076272	693076527
7	7	7	BW	Gaborone	NA	-24.6464	25.9119	693608448	693616639
8	8	8	BW	Gaborone	NA	-24.6464	25.9119	696929792	696930047
9	9	9	BW	Gaborone	NA	-24.6464	25.9119	700438784	700438039
10	10	10	BW	Gaborone	NA	-24.6464	25.9119	702073904	702076927
11	11	11	BW	Gaborone	NA	-24.6464	25.9119	702488616	702489039
12	12	12	BW	Gaborone	NA	-24.6464	25.9119	702516224	702517247
13	13	13	BW	Gaborone	NA	-24.6464	25.9119	774162663	774162667
14	14	14	BW	Gaborone	NA	-24.6464	25.9119	1401887232	1401887743

```
spec(IP_DATA_ALL)
```



```
cols(
  ...1 = col_double(),
  ID = col_double(),
  Country = col_character(),
  Place.Name = col_character(),
  Post.Code = col_character(),
  Latitude = col_double(),
  Longitude = col_double(),
  First.IP.Number = col_double(),
  Last.IP.Number = col_double()
)
```

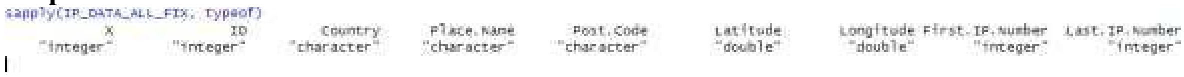
```
set_tidy_names(IP_DATA_ALL, syntactic = TRUE, quiet = FALSE)
```



```
# A tibble: 1,247,502 x 9
     ...1    ID Country Place.Name Post.Code Latitude Longitude
    <dbl> <dbl> <chr>   <chr>      <chr>        <dbl>     <dbl>
 1      1     1 BW      Gaborone   NA           -24.6      25.9
 2      2     2 BW      Gaborone   NA           -24.6      25.9
 3      3     3 BW      Gaborone   NA           -24.6      25.9
 4      4     4 BW      Gaborone   NA           -24.6      25.9
 5      5     5 BW      Gaborone   NA           -24.6      25.9
 6      6     6 BW      Gaborone   NA           -24.6      25.9
 7      7     7 BW      Gaborone   NA           -24.6      25.9
 8      8     8 BW      Gaborone   NA           -24.6      25.9
 9      9     9 BW      Gaborone   NA           -24.6      25.9
10     10    10 BW      Gaborone   NA           -24.6      25.9
# i 1,247,492 more rows
# i 2 more variables: First.IP.Number <dbl>, Last.IP.Number <dbl>
# i Use `print(n = ...)` to see more rows
```

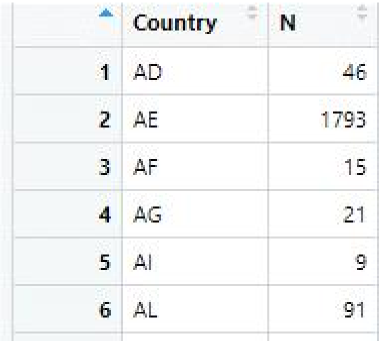
```
IP_DATA_ALL_FIX <- read.csv("E:/NIKHILESH/VKHCG/01-Vermeulen/01-Retrieve/01-EDS/01-R/IP_DATA_ALL_FIX.csv")
sapply(IP_DATA_ALL_FIX, typeof)
```

Output:



```
sapply(IP_DATA_ALL_FIX, typeof)
          X          ID     Country  Place.Name   Post.Code    Latitude   Longitude First.IP.Number  Last.IP.Number
  "integer"   "integer" "character" "character" "character"    "double"    "double"       "integer"       "integer"
```

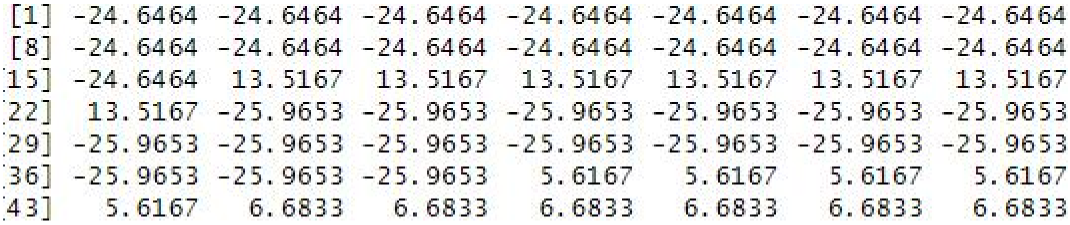
```
library(data.table)
hist_country=data.table(Country=unique(IP_DATA_ALL_FIX[is.na(IP_DATA_ALL_FIX ['Country']) == 0, ]$Country))
setorder(hist_country,'Country')
hist_country_with_id=rowid_to_column(hist_country, var = "RowIDCountry")
View(hist_country_fix)
IP_DATA_COUNTRY_FREQ=data.table(with(IP_DATA_ALL_FIX, table(Country)))
View(IP_DATA_COUNTRY_FREQ)
```



	Country	N
1	AD	46
2	AE	1793
3	AF	15
4	AG	21
5	AI	9
6	AL	91

sapply(IP_DATA_ALL_FIX[,'Latitude'], min, na.rm=TRUE)

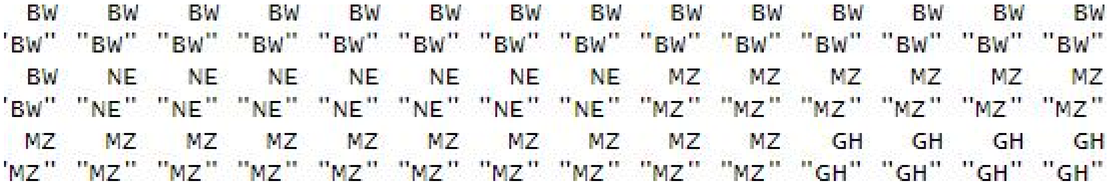
Output:



```
 [1] -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464
 [8] -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464
 15] -24.6464  13.5167  13.5167  13.5167  13.5167  13.5167  13.5167
 22]  13.5167 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653
 29] -25.9653 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653
 36] -25.9653 -25.9653 -25.9653   5.6167   5.6167   5.6167   5.6167
 43]   5.6167   6.6833   6.6833   6.6833   6.6833   6.6833   6.6833
```

sapply(IP_DATA_ALL_FIX[,'Country'], min, na.rm=TRUE)

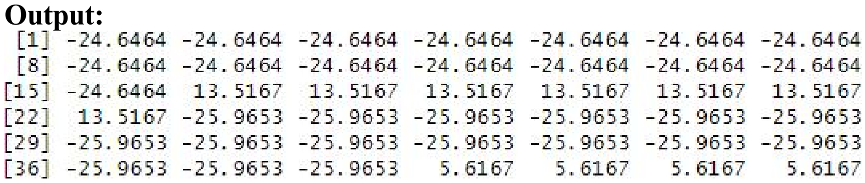
Output:



```
  BW   BW   BW   BW   BW   BW   BW   BW   BW   BW   BW   BW   BW   BW
'BW" "BW" "BW" "BW" "BW" "BW" "BW" "BW" "BW" "BW" "BW" "BW" "BW" "BW"
  BW   NE   NE   NE   NE   NE   NE   NE   MZ   MZ   MZ   MZ   MZ   MZ
'BW" "NE" "NE" "NE" "NE" "NE" "NE" "NE" "MZ" "MZ" "MZ" "MZ" "MZ" "MZ"
  MZ   MZ   MZ   MZ   MZ   MZ   MZ   MZ   MZ   MZ   GH   GH   GH   GH
'MZ" "MZ" "MZ" "MZ" "MZ" "MZ" "MZ" "MZ" "MZ" "MZ" "GH" "GH" "GH" "GH"
```

sapply(IP_DATA_ALL_FIX[,'Latitude'], max, na.rm=TRUE)

Output:



```
 [1] -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464
 [8] -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464 -24.6464
[15] -24.6464  13.5167  13.5167  13.5167  13.5167  13.5167  13.5167
[22]  13.5167 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653
[29] -25.9653 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653 -25.9653
[36] -25.9653 -25.9653 -25.9653   5.6167   5.6167   5.6167   5.6167
```

Finding mean median range and quantile following are the commands are used-

```
sapply(IP_DATA_ALL_FIX[,'Country'], max, na.rm=TRUE)
sapply(IP_DATA_ALL_FIX [,'Latitude'], mean, na.rm=TRUE)
sapply(IP_DATA_ALL_FIX [,'Latitude'], median, na.rm=TRUE)
sapply(IP_DATA_ALL_FIX [,'Latitude'], range, na.rm=TRUE)
sapply(IP_DATA_ALL_FIX [,'Latitude'], quantile, na.rm=TRUE)
```

Finding the standard deviation of any column in table the commands will be –

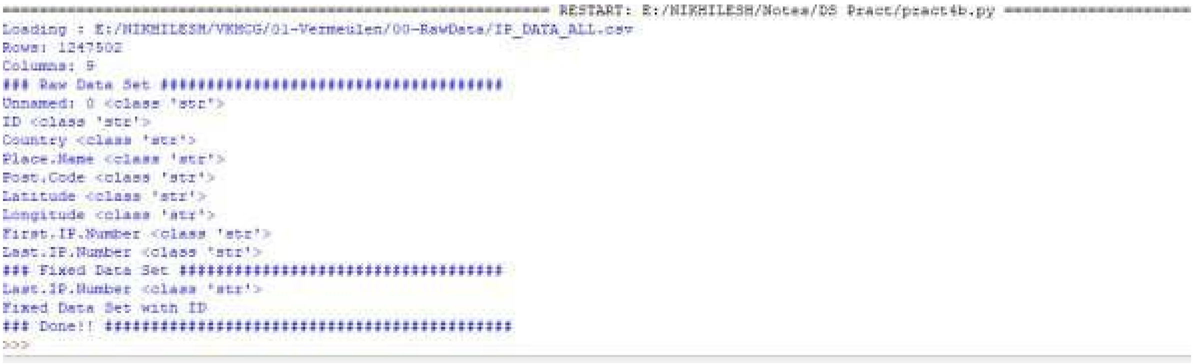
```
sapply(IP_DATA_ALL_FIX [,'Latitude'], sd, na.rm=TRUE)
```

B. Program to retrieve different attributes of data.

Code-

```
import sys
import os
import pandas as pd

sFileName='E:/NIKHILESH/VKHCG/01-Vermeulen/00-RawData/IP_DATA_ALL.csv'
print('Loading :',sFileName)
IP_DATA_ALL=pd.read_csv(sFileName,header=0,low_memory=False, encoding="latin-1")
sFileDir='E:/NIKHILESH/VKHCG/01-Vermeulen/01-Retrieve/01-EDS/02-Python'
if not os.path.exists(sFileDir):
 os.makedirs(sFileDir)
print('Rows:', IP_DATA_ALL.shape[0])
print('Columns:', IP_DATA_ALL.shape[1])
print('### Raw Data Set ###')
for i in range(0,len(IP_DATA_ALL.columns)):
 print(IP_DATA_ALL.columns[i],type(IP_DATA_ALL.columns[i]))
print('### Fixed Data Set ###')
IP_DATA_ALL_FIX=IP_DATA_ALL
for i in range(0,len(IP_DATA_ALL.columns)):
cNameOld=IP_DATA_ALL_FIX.columns[i] + ' '
cNameNew=cNameOld.strip().replace(" ", ".")
IP_DATA_ALL_FIX.columns.values[i] = cNameNew
print(IP_DATA_ALL.columns[i],type(IP_DATA_ALL.columns[i]))
print('Fixed Data Set with ID')
IP_DATA_ALL_with_ID=IP_DATA_ALL_FIX
IP_DATA_ALL_with_ID.index.names = ['RowID']
sFileName2=sFileDir + '/Retrieve_IP_DATA.csv'
IP_DATA_ALL_with_ID.to_csv(sFileName2, index = True, encoding="latin-1")
print('### Done!! ###')
```

Output:



```
============================================================ RESTART: E:/NIKHILESH/Notes/DS Pract/pract4b.py ====================
Loading : E:/NIKHILESH/VKHCG/01-Vermeulen/00-RawData/IP_DATA_ALL.csv
Rows: 1247502
Columns: 9
### Raw Data Set ######################################
Unnamed: 0 <class 'str'>
ID <class 'str'>
Country <class 'str'>
Place.Name <class 'str'>
Post.Code <class 'str'>
Latitude <class 'str'>
Longitude <class 'str'>
First.IP.Number <class 'str'>
Last.IP.Number <class 'str'>
### Fixed Data Set ####################################
Last.IP.Number <class 'str'>
Fixed Data Set with ID
### Done!! ############################################
>>>
```

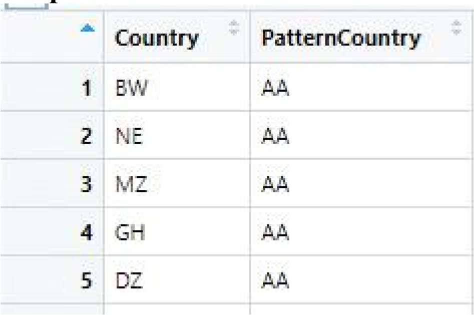
C. Data Pattern

Code :

Write the program using r Studio

```
library(readr)
library(data.table)
FileName=paste0('c:/VKHCG/01-Vermeulen/00-RawData/IP_DATA_ALL.csv')
IP_DATA_ALL <- read_csv(FileName)
hist_country=data.table(Country=unique(IP_DATA_ALL$Country))
pattern_country=data.table(Country=hist_country$Country,
PatternCountry=hist_country$Country)
oldchar=c(letters,LETTERS)
newchar=replicate(length(oldchar),"A")
for (r in seq(nrow(pattern_country)))
{
s=pattern_country[r,]$PatternCountry;
for (c in seq(length(oldchar)))
{
s=chartr(oldchar[c],newchar[c],s)
};
for (n in
seq(0,9,1)){ s=chartr(as.character(n),"N",s)
};
s=chartr(" ","b",s)
s=chartr(".","u",s)
pattern_country[r,]$PatternCountry=s;
};
View(pattern_country)
```

Output:



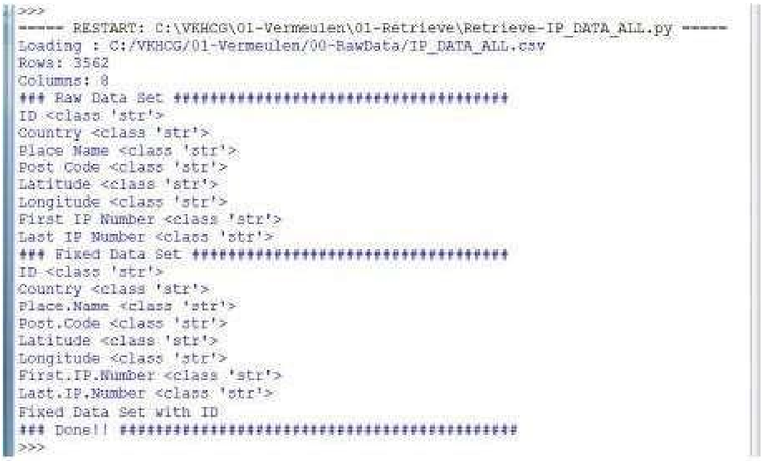
	Country	PatternCountry
1	BW	AA
2	NE	AA
3	MZ	AA
4	GH	AA
5	DZ	AA

D. Loading IP_DATA_ALL:

Code

```
import sys
import os
import pandas as pd
Base='C:/VKHCG'
sFileName=Base + '/01-Vermeulen/00-RawData/IP_DATA_ALL.csv'
print('Loading :',sFileName)
IP_DATA_ALL=pd.read_csv(sFileName,header=0,low_memory=False, encoding="latin-1")
sFileDir=Base + '/01-Vermeulen/01-Retrieve/01-EDS/02-Python'
if not os.path.exists(sFileDir):
os.makedirs(sFileDir)
print('Rows:', IP_DATA_ALL.shape[0])
print('Columns:', IP_DATA_ALL.shape[1])
print('### Raw Data Set ##################')
for i in range(0,len(IP_DATA_ALL.columns)):
print(IP_DATA_ALL.columns[i],type(IP_DATA_ALL.columns[i]))
print('### Fixed Data Set ###################################')
IP_DATA_ALL_FIX=IP_DATA_ALL
for i in range(0,len(IP_DATA_ALL.columns)):
cNameOld=IP_DATA_ALL_FIX.columns[i] + ' '
cNameNew=cNameOld.strip().replace(" ", ".")
IP_DATA_ALL_FIX.columns.values[i] = cNameNew
print(IP_DATA_ALL.columns[i],type(IP_DATA_ALL.columns[i]))
#print(IP_DATA_ALL_FIX.head())
print('Fixed Data Set with ID')
IP_DATA_ALL_with_ID=IP_DATA_ALL_FIX
IP_DATA_ALL_with_ID.index.names = ['RowID']
#print(IP_DATA_ALL_with_ID.head())
sFileName2=sFileDir + '/Retrieve_IP_DATA.csv'
IP_DATA_ALL_with_ID.to_csv(sFileName2, index = True, encoding="latin-1")
print('### Done!! ############################################')
```

Output:



```
>>>
===== RESTART: C:\VKHCG\01-Vermeulen\01-Retrieve\Retrieve-IP_DATA_ALL.py =====
Loading : C:/VKHCG/01-Vermeulen/00-RawData/IP_DATA_ALL.csv
Rows: 3562
Columns: 8
### Raw Data Set #####################################
ID <class 'str'>
Country <class 'str'>
Place Name <class 'str'>
Post Code <class 'str'>
Latitude <class 'str'>
Longitude <class 'str'>
First IP Number <class 'str'>
Last IP Number <class 'str'>
### Fixed Data Set ###################################
ID <class 'str'>
Country <class 'str'>
Place.Name <class 'str'>
Post.Code <class 'str'>
Latitude <class 'str'>
Longitude <class 'str'>
First.IP.Number <class 'str'>
Last.IP.Number <class 'str'>
Fixed Data Set with ID
### Done!! ############################################
>>>
```

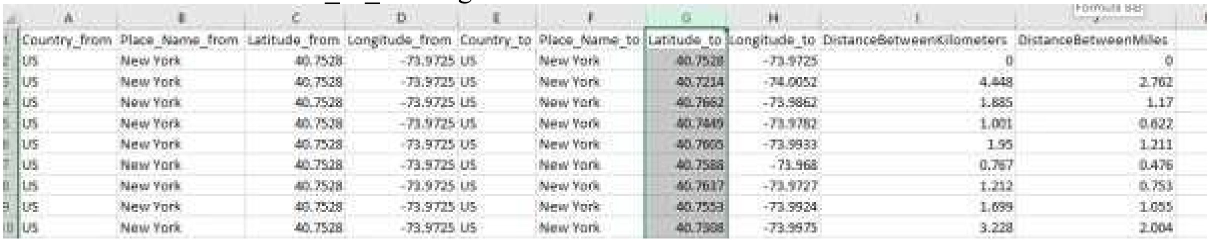
Vermeulen PLC
Code

```
import sys
import os
import pandas as pd
from math import radians, cos, sin, asin, sqrt
# Function to calculate haversine distance
def haversine(lon1, lat1, lon2, lat2, stype):
    # Convert decimal degrees to radians
    lon1, lat1, lon2, lat2 = map(radians, [lon1, lat1, lon2, lat2])
    dlon = lon2 - lon1
    dlat = lat2 - lat1
    a = sin(dlat / 2)**2 + cos(lat1) * cos(lat2) * sin(dlon / 2)**2
    c = 2 * asin(sqrt(a))
    # Determine the radius of Earth based on the unit type
    if stype == 'km':
        r = 6371  # Radius of Earth in kilometers
    else:
        r = 3956  # Radius of Earth in miles
    # Calculate and return the distance
    d = round(c * r, 3)
    return d
# File paths
sFileName = 'E:/NIKHILESH/VKHCG/01-Vermeulen/00-RawData/IP_DATA_CORE.csv'
sFileDir = 'E:/NIKHILESH/VKHCG/01-Vermeulen/01-Retrieve/01-EDS/02-Python'
# Check if output directory exists; create if not
if not os.path.exists(sFileDir):
    os.makedirs(sFileDir)
# Load the CSV file
print('Loading:', sFileName)
IP_DATA_ALL = pd.read_csv(sFileName, header=0, low_memory=False,usecols=['Country', 'Place Name', 'Latitude',
'Longitude'],encoding="latin-1")
# Process the data
IP_DATA = IP_DATA_ALL.drop_duplicates(subset=None, keep='first', inplace=False)
IP_DATA.rename(columns={'Place Name': 'Place_Name'}, inplace=True)
IP_DATA1 = IP_DATA.copy()
IP_DATA1.insert(0, 'K', 1)
IP_DATA2 = IP_DATA1.copy()
# Cross-join to calculate pairwise distances
IP_CROSS = pd.merge(right=IP_DATA1, left=IP_DATA2, on='K')
IP_CROSS.drop('K', axis=1, inplace=True)
# Rename columns for clarity
```

```
IP_CROSS.rename(columns={
    'Longitude_x': 'Longitude_from', 'Longitude_y': 'Longitude_to',
    'Latitude_x': 'Latitude_from', 'Latitude_y': 'Latitude_to', 'Place_Name_x':
    'Place_Name_from', 'Place_Name_y': 'Place_Name_to', 'Country_x':
    'Country_from', 'Country_y': 'Country_to'
}, inplace=True)
# Calculate distances in kilometers and miles
IP_CROSS['DistanceBetweenKilometers'] = IP_CROSS.apply(
    lambda row:
        haversine( row['Longitude_from'],
        row['Latitude_from'],
        row['Longitude_to'],
        row['Latitude_to'],
        'km'
    ),
    axis=1
)
IP_CROSS['DistanceBetweenMiles'] =
    IP_CROSS.apply( lambda row: haversine(
        row['Longitude_from'],
        row['Latitude_from'],
        row['Longitude_to'],
        row['Latitude_to'],
        'miles'
    ),axis=1
)
# Save the result to a CSV file
print('Saving results...')
sFileName2 = os.path.join(sFileDir, 'Retrieve_IP_Routing.csv')
IP_CROSS.to_csv(sFileName2, index=False, encoding="latin-1")
print('### Done!! ################################################')
```

Output :

See the file named Retrieve_IP_Routing.csv in C:\VKHCG\01-Vermeulen\01-Retrieve\01-EDS\02-



Country_from	Place_Name_from	Latitude_from	Longitude_from	Country_to	Place_Name_to	Latitude_to	Longitude_to	DistanceBetweenKilometers	DistanceBetweenMiles
US	New York	40.7528	-73.9725	US	New York	40.7528	-73.9725	0	0
US	New York	40.7528	-73.9725	US	New York	40.7214	-74.0052	4.448	2.762
US	New York	40.7528	-73.9725	US	New York	40.7662	-73.9862	1.885	1.17
US	New York	40.7528	-73.9725	US	New York	40.7449	-73.9782	1.001	0.622
US	New York	40.7528	-73.9725	US	New York	40.7605	-73.9933	1.95	1.211
US	New York	40.7528	-73.9725	US	New York	40.7588	-73.968	0.767	0.476
US	New York	40.7528	-73.9725	US	New York	40.7617	-73.9727	1.212	0.753
US	New York	40.7528	-73.9725	US	New York	40.7559	-73.9924	1.699	1.055
US	New York	40.7528	-73.9725	US	New York	40.7988	-73.9975	3.228	2.004

Total Records: 22501

So, the distance between a router in New York (40.7528, -73.9725) to anoher router in New York (40.7214, -74.0052) is 4.448 kilometers, or 2.762 miles.

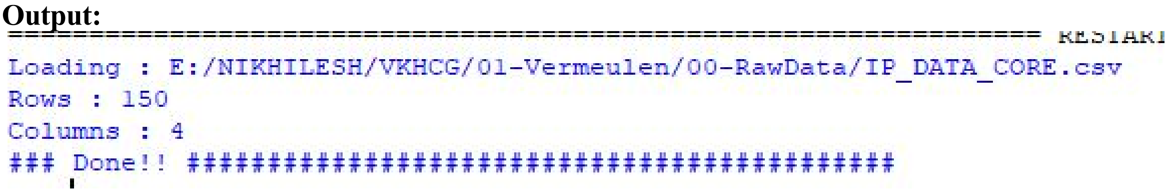
Building a Diagram for the Scheduling of Jobs

Code :

```
import sys
import os
import pandas as pd
InputFileName='IP_DATA_CORE.csv'
OutputFileName='Retrieve_Router_Location.csv'
sFileName='E:/NIKHILESH/VKHCG/01-Vermeulen/00-RawData/' + InputFileName
print('Loading :',sFileName)
IP_DATA_ALL=pd.read_csv(sFileName,header=0,low_memory=False,
usecols=['Country','Place Name','Latitude','Longitude'], encoding="latin-1")
IP_DATA_ALL.rename(columns={'Place Name': 'Place_Name'}, inplace=True)
sFileDir='E:/NIKHILESH/VKHCG/01-Vermeulen/01-Retrieve/01-EDS/02-Python'
if not os.path.exists(sFileDir):
   os.makedirs(sFileDir)
```

```
ROUTERLOC = IP_DATA_ALL.drop_duplicates(subset=None, keep='first', inplace=False)
print('Rows :',ROUTERLOC.shape[0])
print('Columns :',ROUTERLOC.shape[1])
sFileName2=sFileDir + '/' + OutputFileName
ROUTERLOC.to_csv(sFileName2, index = False, encoding="latin-1")
print('### Done!! ############################################')
```

Output:



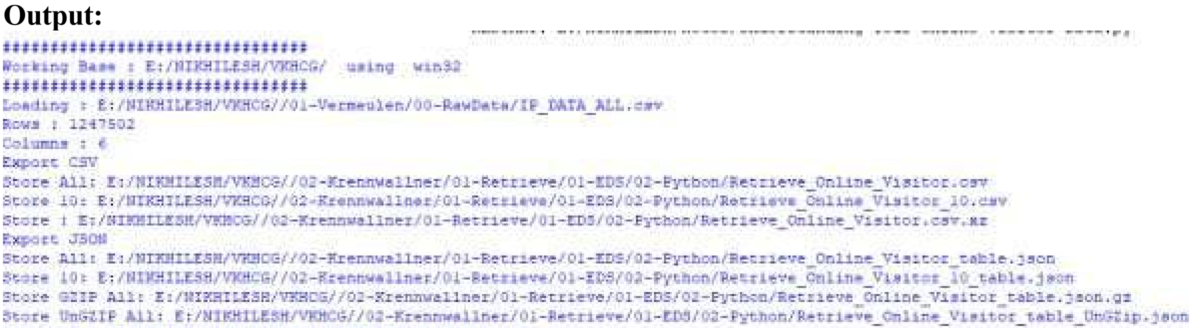
```
============================================================ RESTART
Loading : E:/NIKHILESH/VKHCG/01-Vermeulen/00-RawData/IP_DATA_CORE.csv
Rows : 150
Columns : 4
### Done!! ############################################
```

Understanding Your Online Visitor Data

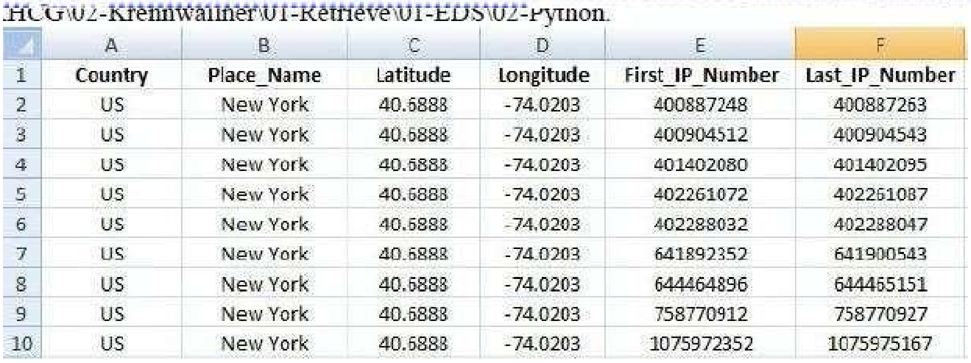
Code

```
import sys
import os
import pandas as pd
import gzip as gz

InputFileName='IP_DATA_ALL.csv'
OutputFileName='Retrieve_Online_Visitor'
CompanyIn= '01-Vermeulen'
CompanyOut= '02-Krennwallner'
Base='E:/NIKHILESH/VKHCG/'
print('################################')
print('Working Base :',Base, ' using ', sys.platform)
print('################################')
Base='E:/NIKHILESH/VKHCG/'
sFileName=Base + '/' + CompanyIn + '/00-RawData/' + InputFileName
print('Loading :',sFileName)
IP_DATA_ALL=pd.read_csv(sFileName,header=0,low_memory=False,usecols=['Country','Place.Name','Latitude','Longitude','First.IP.Number','Last.IP.Number'])
IP_DATA_ALL.rename(columns={'Place Name': 'Place_Name'}, inplace=True)
IP_DATA_ALL.rename(columns={'First IP Number': 'First_IP_Number'}, inplace=True)
IP_DATA_ALL.rename(columns={'Last IP Number': 'Last_IP_Number'}, inplace=True)
sFileDir=Base + '/' + CompanyOut + '/01-Retrieve/01-EDS/02-Python'
if not os.path.exists(sFileDir):
   os.makedirs(sFileDir)
visitordata = IP_DATA_ALL.drop_duplicates(subset=None, keep='first', inplace=False)
visitordata10=visitordata.head(10)
print('Rows :',visitordata.shape[0])
print('Columns :',visitordata.shape[1])
print('Export CSV')
sFileName2=sFileDir + '/' + OutputFileName + '.csv'
visitordata.to_csv(sFileName2, index = False)
print('Store All:',sFileName2)
sFileName3=sFileDir + '/' + OutputFileName + '_10.csv'
visitordata10.to_csv(sFileName3, index = False)
print('Store 10:',sFileName3)
for z in ['gzip', 'bz2', 'xz']:
   if z == 'gzip':
   sFileName4=sFileName2 + '.gz'
   else:
    sFileName4=sFileName2 + '.' + z
visitordata.to_csv(sFileName4, index = False, compression=z)
print('Store :',sFileName4)
print('Export JSON')
for sOrient in ['split','records','index', 'columns','values','table']:
  sFileName2=sFileDir + '/' + OutputFileName + '_' + sOrient + '.json'
visitordata.to_json(sFileName2,orient=sOrient,force_ascii=True)
print('Store All:',sFileName2)
sFileName3=sFileDir + '/' + OutputFileName + '_10_' + sOrient + '.json'
visitordata10.to_json(sFileName3,orient=sOrient,force_ascii=True)
print('Store 10:',sFileName3)
sFileName4=sFileName2 + '.gz'
file_in = open(sFileName2, 'rb')
file_out = gz.open(sFileName4, 'wb')
file_out.writelines(file_in)
file_in.close()
file_out.close()
print('Store GZIP All:',sFileName4)
sFileName5=sFileDir + '/' + OutputFileName + '_' + sOrient + '_UnGZip.json'
file_in = gz.open(sFileName4, 'rb')
file_out = open(sFileName5, 'wb')
file_out.writelines(file_in)
file_in.close()
file_out.close()
print('Store UnGZIP All:',sFileName5)
print('### Done!! ################################################')
```

Output:



```
##################################
Working Base : E:/NIKHILESH/VKHCG/  using  win32
##################################
Loading : E:/NIKHILESH/VKHCG//01-Vermeulen/00-RawData/IP_DATA_ALL.csv
Rows : 1247502
Columns : 6
Export CSV
Store All: E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor.csv
Store 10: E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor_10.csv
Store : E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor.csv.xz
Export JSON
Store All: E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor_table.json
Store 10: E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor_10_table.json
Store GZIP All: E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor_table.json.gz
Store UnGZIP All: E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor_table_UnGZip.json
```



HCG\02-Krennwallner\01-Retrieve\01-EDS\02-Python.

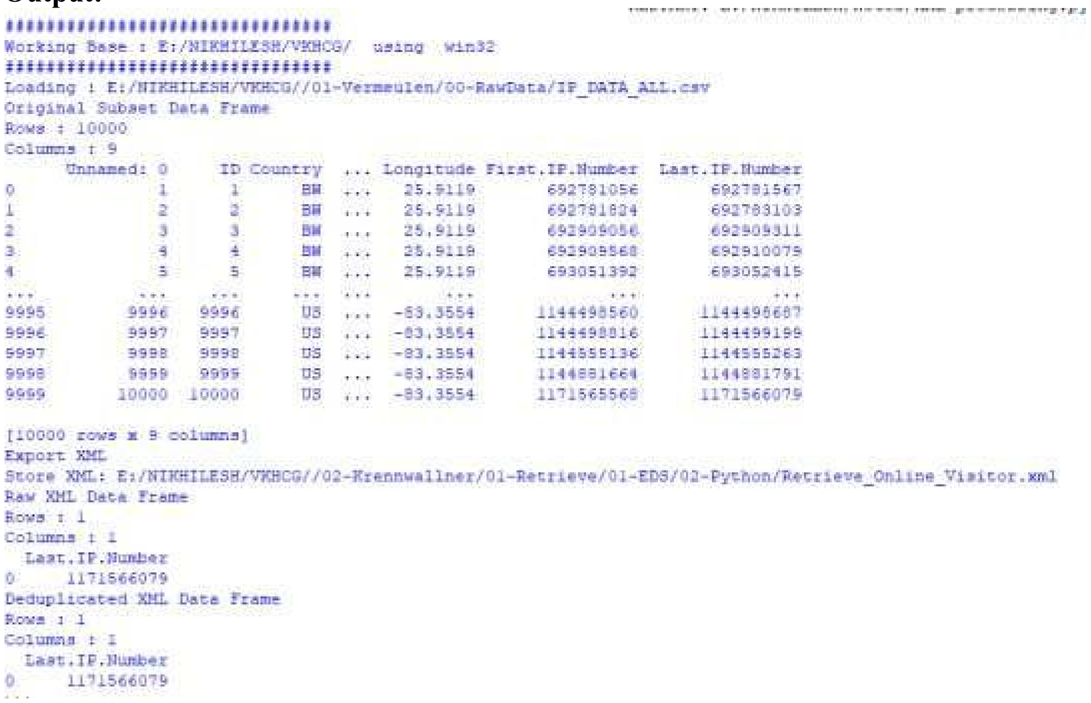
	A	B	C	D	E	F
1	Country	Place_Name	Latitude	Longitude	First_IP_Number	Last_IP_Number
2	US	New York	40.6888	-74.0203	400887248	400887263
3	US	New York	40.6888	-74.0203	400904512	400904543
4	US	New York	40.6888	-74.0203	401402080	401402095
5	US	New York	40.6888	-74.0203	402261072	402261087
6	US	New York	40.6888	-74.0203	402288032	402288047
7	US	New York	40.6888	-74.0203	641892352	641900543
8	US	New York	40.6888	-74.0203	644464896	644465151
9	US	New York	40.6888	-74.0203	758770912	758770927
10	US	New York	40.6888	-74.0203	1075972352	1075975167

XML processing

Code:

```
import sys
import os
import pandas as pd
import xml.etree.ElementTree as ET
def df2xml(data):
  header = data.columns
  root = ET.Element('root')
  for row in range(data.shape[0]):
    entry = ET.SubElement(root,'entry')
  for index in range(data.shape[1]):
    schild=str(header[index])
  child = ET.SubElement(entry, schild)
  if str(data[schild][row]) != 'nan':
    child.text = str(data[schild][row])
  else:
    child.text = 'n/a'
  entry.append(child)
  result = ET.tostring(root)
  return result
def xml2df(xml_data):
  root = ET.XML(xml_data)
  all_records = []
  for i, child in enumerate(root):
    record = {}
  for subchild in child:
    record[subchild.tag] = subchild.text
  all_records.append(record)
  return pd.DataFrame(all_records)
InputFileName='IP_DATA_ALL.csv'
OutputFileName='Retrieve_Online_Visitor.xml'
CompanyIn= '01-Vermeulen'
CompanyOut= '02-Krennwallner'
if sys.platform == 'linux':
  Base=os.path.expanduser('~') + '/VKHCG'
else:
  Base='E:/NIKHILESH/VKHCG/'

print('Working Base :',Base, ' using ', sys.platform)
sFileName=Base + '/' + CompanyIn + '/00-RawData/' + InputFileName
print('Loading :',sFileName)
IP_DATA_ALL=pd.read_csv(sFileName,header=0,low_memory=False)
IP_DATA_ALL.rename(columns={'Place Name': 'Place_Name'}, inplace=True)
IP_DATA_ALL.rename(columns={'First IP Number': 'First_IP_Number'}, inplace=True)
IP_DATA_ALL.rename(columns={'Last IP Number': 'Last_IP_Number'}, inplace=True)
IP_DATA_ALL.rename(columns={'Post Code': 'Post_Code'}, inplace=True)
sFileDir=Base + '/' + CompanyOut + '/01-Retrieve/01-EDS/02-Python'
if not os.path.exists(sFileDir):
  os.makedirs(sFileDir)
visitordata = IP_DATA_ALL.head(10000)
print('Original Subset Data Frame')
print('Rows :',visitordata.shape[0])
print('Columns :',visitordata.shape[1])
print(visitordata)
print('Export XML')
sXML=df2xml(visitordata)
sFileName=sFileDir + '/' + OutputFileName
file_out = open(sFileName, 'wb')
file_out.write(sXML)
file_out.close()
print('Store XML:',sFileName)
xml_data = open(sFileName).read()
unxmlrawdata=xml2df(xml_data)
print('Raw XML Data Frame')
print('Rows :',unxmlrawdata.shape[0])
print('Columns :',unxmlrawdata.shape[1])
print(unxmlrawdata)
unxmldata = unxmlrawdata.drop_duplicates(subset=None, keep='first', inplace=False)
print('Deduplicated XML Data Frame')
print('Rows :',unxmldata.shape[0])
print('Columns :',unxmldata.shape[1])
print(unxmldata)
#print('### Done!!#########')
```

Output:



```
##################################
Working Base : E:/NIKHILESH/VKHCG/  using  win32
##################################
Loading : E:/NIKHILESH/VKHCG//01-Vermeulen/00-RawData/IP_DATA_ALL.csv
Original Subset Data Frame
Rows : 10000
Columns : 9
      Unnamed: 0     ID Country  ... Longitude First.IP.Number  Last.IP.Number
0              1      1      BW  ...   25.9119       692781056       692781567
1              2      2      BW  ...   25.9119       692781824       692783103
2              3      3      BW  ...   25.9119       692909056       692909311
3              4      4      BW  ...   25.9119       692909568       692910079
4              5      5      BW  ...   25.9119       693051392       693052415
...          ...    ...     ...  ...       ...             ...             ...
9995        9996   9996      US  ...  -83.3554      1144498560      1144495687
9996        9997   9997      US  ...  -83.3554      1144498816      1144499199
9997        9998   9998      US  ...  -83.3554      1144555136      1144555263
9998        9999   9999      US  ...  -83.3554      1144881664      1144881791
9999       10000  10000      US  ...  -83.3554      1171565568      1171566079

[10000 rows x 9 columns]
Export XML
Store XML: E:/NIKHILESH/VKHCG//02-Krennwallner/01-Retrieve/01-EDS/02-Python/Retrieve_Online_Visitor.xml
Raw XML Data Frame
Rows : 1
Columns : 1
  Last.IP.Number
0     1171566079
Deduplicated XML Data Frame
Rows : 1
Columns : 1
  Last.IP.Number
0     1171566079
...
```

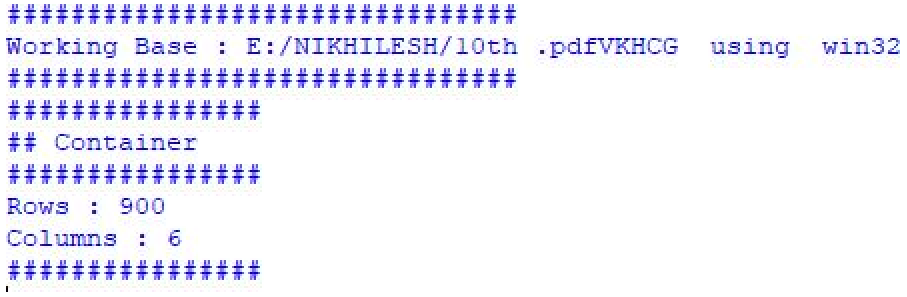
Adopt New Shipping Containers

Code :

```
import sys
import os
import pandas as pd
ContainerFileName = 'Retrieve_Container.csv'
BoxFileName = 'Retrieve_Box.csv'
ProductFileName = 'Retrieve_Product.csv'
Company = '03-Hillman'
Base = 'E:/NIKHILESH/10th .pdfVKHCG'
print('Working Base :', Base, ' using ', sys.platform)
sFileDir = Base + '/' + Company + '/01-Retrieve/01-EDS/02-Python'
if not os.path.exists(sFileDir):
    os.makedirs(sFileDir)
containerLength = range(1, 21)
containerWidth = range(1, 10)
containerHeigth = range(1, 6)
containerStep = 1
c = 0
# Initialize an empty DataFrame for containers
ContainerFrame = pd.DataFrame()
for l in containerLength:
    for w in containerWidth:
        for h in containerHeigth:
            containerVolume = (l / containerStep) * (w / containerStep) * (h / containerStep)
            c += 1
            ContainerLine =
                { 'ShipType': 'Container',
                'UnitNumber': 'C' + format(c, "06d"),
                'Length': round(l, 4),
                'Width': round(w, 4),
                'Height': round(h, 4),
                'ContainerVolume': round(containerVolume, 6)
            }
            ContainerRow = pd.DataFrame([ContainerLine])
            ContainerFrame = pd.concat([ContainerFrame, ContainerRow], ignore_index=True)

ContainerFrame.index.name = 'IDNumber'
print('################')
print('## Container')
print('################')
print('Rows :', ContainerFrame.shape[0])
print('Columns :', ContainerFrame.shape[1])

sFileContainerName = sFileDir + '/' + ContainerFileName
ContainerFrame.to_csv(sFileContainerName, index=False)
boxLength = range(1, 21)
boxWidth = range(1, 21)
boxHeigth = range(1, 21)
packThick = range(0, 6)
boxStep = 10
b = 0
# Initialize an empty DataFrame for boxes
BoxFrame = pd.DataFrame()
for l in boxLength:
    for w in boxWidth:
        for h in boxHeigth:
            for t in packThick:
                boxVolume = round((l / boxStep) * (w / boxStep) * (h / boxStep), 6)
                productVolume = round(((l - t) / boxStep) * ((w - t) / boxStep) * ((h - t) / boxStep), 6)
                if productVolume > 0:
                    b += 1
                    BoxLine =
                        { 'ShipType': 'Box',
                        'UnitNumber': 'B' + format(b, "06d"),
                        'Length': round(l / 10, 6),
                        'Width': round(w / 10, 6),
                        'Height': round(h / 10, 6),
                        'Thickness': round(t / 5, 6),
                        'BoxVolume': round(boxVolume, 9),
                        'ProductVolume': round(productVolume, 9)
                    }
                    BoxRow = pd.DataFrame([BoxLine])
                    BoxFrame = pd.concat([BoxFrame, BoxRow], ignore_index=True)

BoxFrame.index.name = 'IDNumber'
print('## Box####')
print('Rows :', BoxFrame.shape[0])
print('Columns :', BoxFrame.shape[1])

sFileBoxName = sFileDir + '/' + BoxFileName
BoxFrame.to_csv(sFileBoxName, index=False)
productLength = range(1, 21)
productWidth = range(1, 21)
productHeigth = range(1, 21)
productStep = 10
p = 0
# Initialize an empty DataFrame for products
ProductFrame = pd.DataFrame()
for l in productLength:
    for w in productWidth:
        for h in productHeigth:
            productVolume = round((l / productStep) * (w / productStep) * (h / productStep), 6)
            if productVolume > 0:
```

```
            p += 1
            ProductLine =
                { 'ShipType': 'Product',
                'UnitNumber': 'P' + format(p, "06d"),
                'Length': round(l / 10, 6),
                'Width': round(w / 10, 6),
                'Height': round(h / 10, 6),
                'ProductVolume': round(productVolume, 9)
            }
            ProductRow = pd.DataFrame([ProductLine])
            ProductFrame = pd.concat([ProductFrame, ProductRow], ignore_index=True)

ProductFrame.index.name = 'IDNumber'
print('## Product')
print('Rows :', ProductFrame.shape[0])
print('Columns :', ProductFrame.shape[1])

sFileProductName = sFileDir + '/' + ProductFileName
ProductFrame.to_csv(sFileProductName, index=False)
print('### Done!! ##############')
```

output:



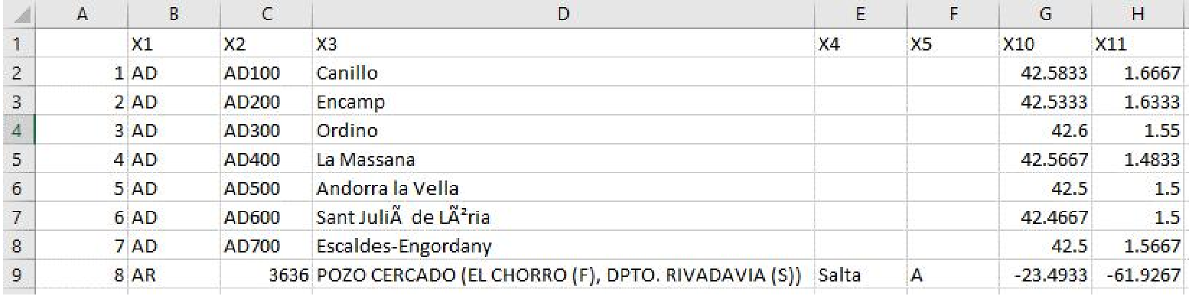
```
################################
Working Base : E:/NIKHILESH/10th .pdfVKHCG  using  win32
################################
################
## Container
################
Rows : 900
Columns : 6
################
```

Global Post Codes in r studio

```
library(readr)
All_Countries <- read_delim("C:/VKHCG/03-Hillman/00-RawData/All_Countries.txt",
"\t", col_names = FALSE,
col_types =
cols( X12 =
col_skip(), X6 =
col_skip(), X7 =
col_skip(), X8 =
col_skip(), X9 =
col_skip()),
na = "null", trim_ws = TRUE)
write.csv(All_Countries,
file = "C:/VKHCG/03-Hillman/01-Retrieve/01-EDS/01-R/Retrieve_All_Countries.csv")
```

Output:

The program will successfully uploaded a new file named Retrieve_All_Countries.csv, after removing column No. 6, 7, 8, 9 and 12 from All_Countries.txt



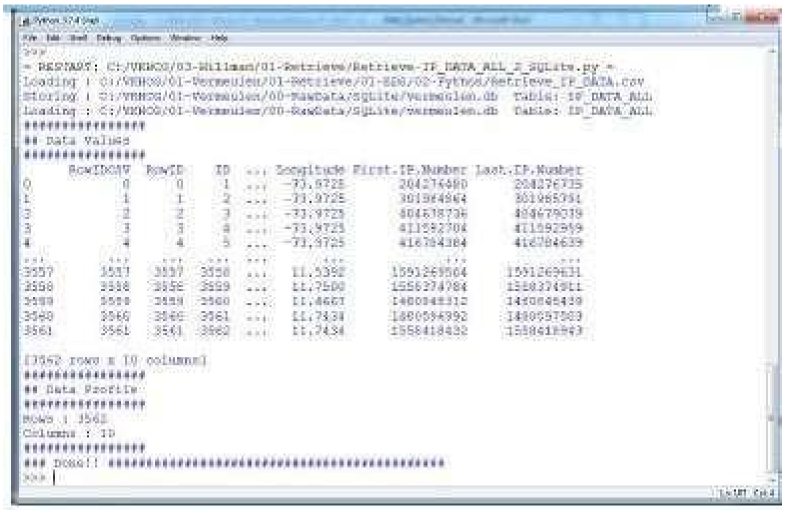
	A	B	C	D	E	F	G	H
1		X1	X2	X3	X4	X5	X10	X11
2	1	AD	AD100	Canillo			42.5833	1.6667
3	2	AD	AD200	Encamp			42.5333	1.6333
4	3	AD	AD300	Ordino			42.6	1.55
5	4	AD	AD400	La Massana			42.5667	1.4833
6	5	AD	AD500	Andorra la Vella			42.5	1.5
7	6	AD	AD600	Sant JuliÃ de LÃ²ria			42.4667	1.5
8	7	AD	AD700	Escaldes-Engordany			42.5	1.5667
9	8	AR	3636	POZO CERCADO (EL CHORRO (F), DPTO. RIVADAVIA (S))	Salta	A	-23.4933	-61.9267

Program to connect to different data sources.

Code:

```
import sqlite3 as sq
import pandas as pd
Base='C:/VKHCG'
sDatabaseName=Base + '/01-Vermeulen/00-RawData/SQLite/vermeulen.db'
conn = sq.connect(sDatabaseName)
sFileName='C:/VKHCG/01-Vermeulen/01-Retrieve/01-EDS/02-Python/Retrieve_IP_DATA.csv'
print('Loading :',sFileName)
IP_DATA_ALL_FIX=pd.read_csv(sFileName,header=0,low_memory=False)
IP_DATA_ALL_FIX.index.names = ['RowIDCSV']
sTable='IP_DATA_ALL'
print('Storing :',sDatabaseName,' Table:',sTable)
IP_DATA_ALL_FIX.to_sql(sTable, conn, if_exists="replace")
print('Loading :',sDatabaseName,' Table:',sTable)
TestData=pd.read_sql_query("select * from IP_DATA_ALL;", conn)
print('## Data Values')
print(TestData)
print('## Data Profile')
print('Rows :',TestData.shape[0])
print('Columns :',TestData.shape[1])
print('### Done!! ################')
```

Output:



```
>>>
= RESTART: C:/VKHCG/03-Hillman/01-Retrieve/Retrieve-IP_DATA_ALL_2_SQLite.py =
Loading : C:/VKHCG/01-Vermeulen/01-Retrieve/01-EDS/02-Python/Retrieve_IP_DATA.csv
Storing : C:/VKHCG/01-Vermeulen/00-RawData/SQLite/vermeulen.db  Table: IP_DATA_ALL
Loading : C:/VKHCG/01-Vermeulen/00-RawData/SQLite/vermeulen.db  Table: IP_DATA_ALL
################
## Data Values
################
      RowIDCSV  RowID    ID  ...  Longitude First.IP.Number Last.IP.Number
0            0      0     1  ...   -73.9725       204276480      204276735
1            1      1     2  ...   -73.9725       301984864      301985791
2            2      2     3  ...   -73.9725       404678736      404679039
3            3      3     4  ...   -73.9725       411592704      411592959
4            4      4     5  ...   -73.9725       416784384      416784639
...        ...    ...   ...  ...        ...             ...            ...
3557      3557   3557  3558  ...    11.5392      1551269504     1551269631
3558      3558   3558  3559  ...    11.7500      1556274784     1556274911
3559      3559   3559  3560  ...    11.4667      1480048312     1480048439
3560      3560   3560  3561  ...    11.7434      1480594392     1480597503
3561      3561   3561  3562  ...    11.7434      1558418432     1558418943

[3562 rows x 10 columns]
################
## Data Profile
################
Rows : 3562
Columns : 10
################
### Done!! ########################################
>>> |
```

MySQL:

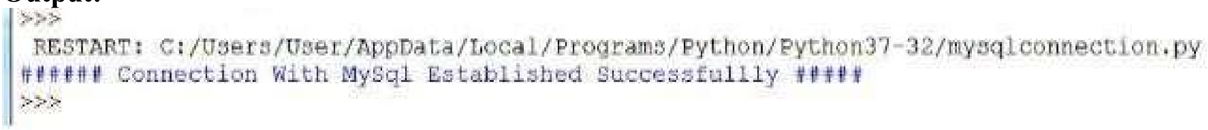
Open MySql

Create a database “DataScience”

Create a python file and add the following code:

```
################ Connection With MySQL ######################
import mysql.connector
conn = mysql.connector.connect(host='localhost',
database='DataScience',
user='root',
password='root')
conn.connect
if(conn.is_connected):
print('###### Connection With MySql Established Successfullly ##### ')
else:
print('Not Connected -- Check Connection Properites')
```

Output:



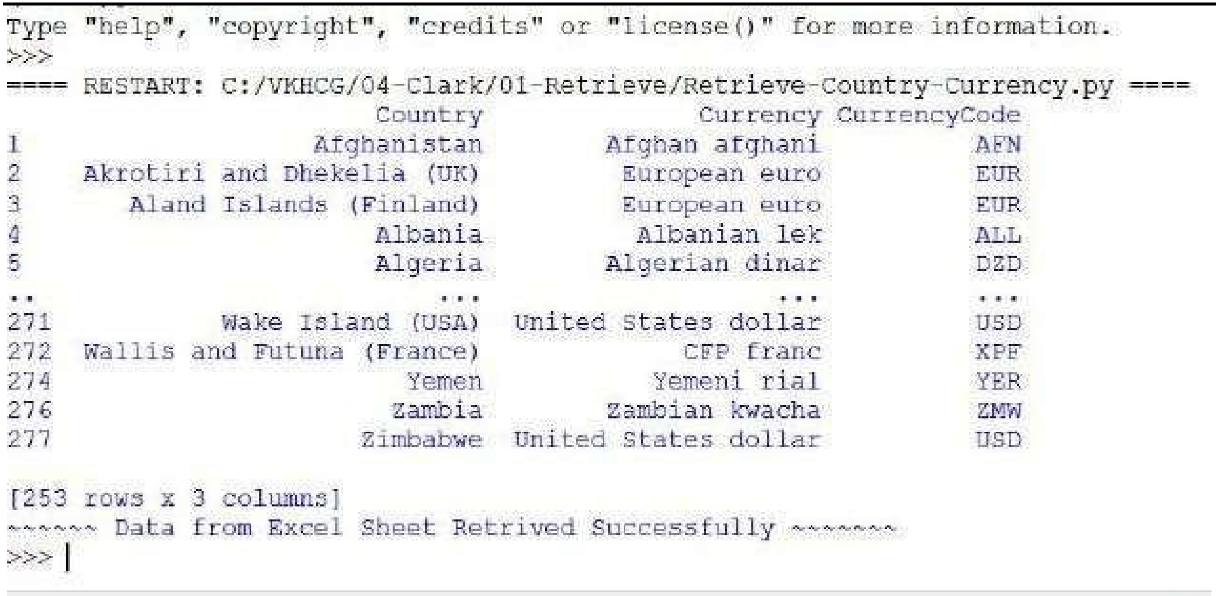
```
>>>
 RESTART: C:/Users/User/AppData/Local/Programs/Python/Python37-32/mysqlconnection.py
###### Connection With MySql Established Successfully #####
>>>
```

Microsoft Excel

Code :

```
import os
import pandas as pd
############################################################################
Base='E:/Nikhilesh/VKHCG'
############################################################################
sFileDir=Base + '/01-Vermeulen/01-Retrieve/01-EDS/02-Python'
#if not os.path.exists(sFileDir):
#os.makedirs(sFileDir)
############################################################################
CurrencyRawData = pd.read_excel('E:/NIKHILESH/VKHCG/01-Vermeulen/00-RawData/Country_Currency.xlsx')
sColumns = ['Country or territory', 'Currency', 'ISO-4217']
CurrencyData = CurrencyRawData[sColumns]
CurrencyData.rename(columns={'Country or territory': 'Country', 'ISO-4217':
'CurrencyCode'}, inplace=True)
CurrencyData.dropna(subset=['Currency'],inplace=True)
CurrencyData['Country'] = CurrencyData['Country'].map(lambda x: x.strip())
CurrencyData['Currency'] = CurrencyData['Currency'].map(lambda x:
x.strip())
CurrencyData['CurrencyCode'] = CurrencyData['CurrencyCode'].map(lambda x:
x.strip())
print(CurrencyData)
print('~~~~~~ Data from Excel Sheet Retrived Successfully ~~~~~~~ ')
sFileName=sFileDir + '/Retrieve-Country-Currency.csv'
CurrencyData.to_csv(sFileName, index = False)
```

Output:



```
Type "help", "copyright", "credits" or "license()" for more information.
>>>
==== RESTART: C:/VKHCG/04-Clark/01-Retrieve/Retrieve-Country-Currency.py ====
                         Country             Currency CurrencyCode
1                    Afghanistan       Afghan afghani          AFN
2    Akrotiri and Dhekelia (UK)        European euro          EUR
3       Aland Islands (Finland)        European euro          EUR
4                        Albania          Albanian lek          ALL
5                        Algeria       Algerian dinar          DZD
..                           ...                  ...          ...
271           Wake Island (USA)  United States dollar          USD
272  Wallis and Futuna (France)            CFP franc          XPF
274                        Yemen          Yemeni rial          YER
276                       Zambia        Zambian kwacha          ZMW
277                     Zimbabwe  United States dollar          USD

[253 rows x 3 columns]
~~~~~~ Data from Excel Sheet Retrived Successfully ~~~~~~~
>>> |
```

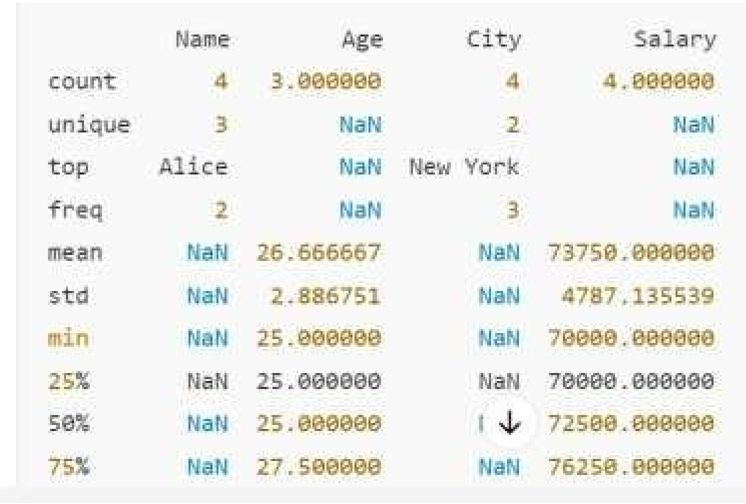
Practical No 5

Aim : Assessing Data

Code :

```
import pandas as pd

def assess_data_quality(df):
    """
    Function to assess data quality of a pandas DataFrame.
    Outputs summary statistics, missing values, duplicates, and data types.
    """
    print("\n--- Data Summary ---")
    print(df.describe(include='all'))
    print("\n--- Missing Values ---")
    missing_values = df.isnull().sum()
    print(missing_values[missing_values > 0])
    print("\n--- Duplicates ---")
    duplicate_count = df.duplicated().sum()
    print(f"Number of duplicate rows: {duplicate_count}")
    print("\n--- Data Types ---")
    print(df.dtypes)
    print("\n--- Unique Values per Column ---")
    for col in df.columns:
        print(f"{col}: {df[col].nunique()} unique values")
    print("\n--- Potential Inconsistencies (Categorical Columns) ---")
    for col in df.select_dtypes(include='object').columns:
        print(f"\nColumn '{col}' unique values:")
        print(df[col].value_counts())
# Example usage:
# Load sample data (replace with your dataset)
df = pd.DataFrame({
    'Name': ['Alice', 'Bob', 'Charlie', 'Alice'],
    'Age': [25, 30, None, 25],
    'City': ['New York', 'Los Angeles', 'New York', 'New York'],
    'Salary': [70000, 80000, 75000, 70000]
})
assess_data_quality(df)
```

Output:



```
         Name        Age      City        Salary
count       4   3.000000         4      4.000000
unique      3        NaN         2           NaN
top     Alice        NaN  New York           NaN
freq        2        NaN         3           NaN
mean      NaN  26.666667       NaN  73750.000000
std       NaN   2.886751       NaN   4787.135539
min       NaN  25.000000       NaN  70000.000000
25%       NaN  25.000000       NaN  70000.000000
50%       NaN  25.000000       NaN  72500.000000
75%       NaN  27.500000       NaN  76250.000000
```

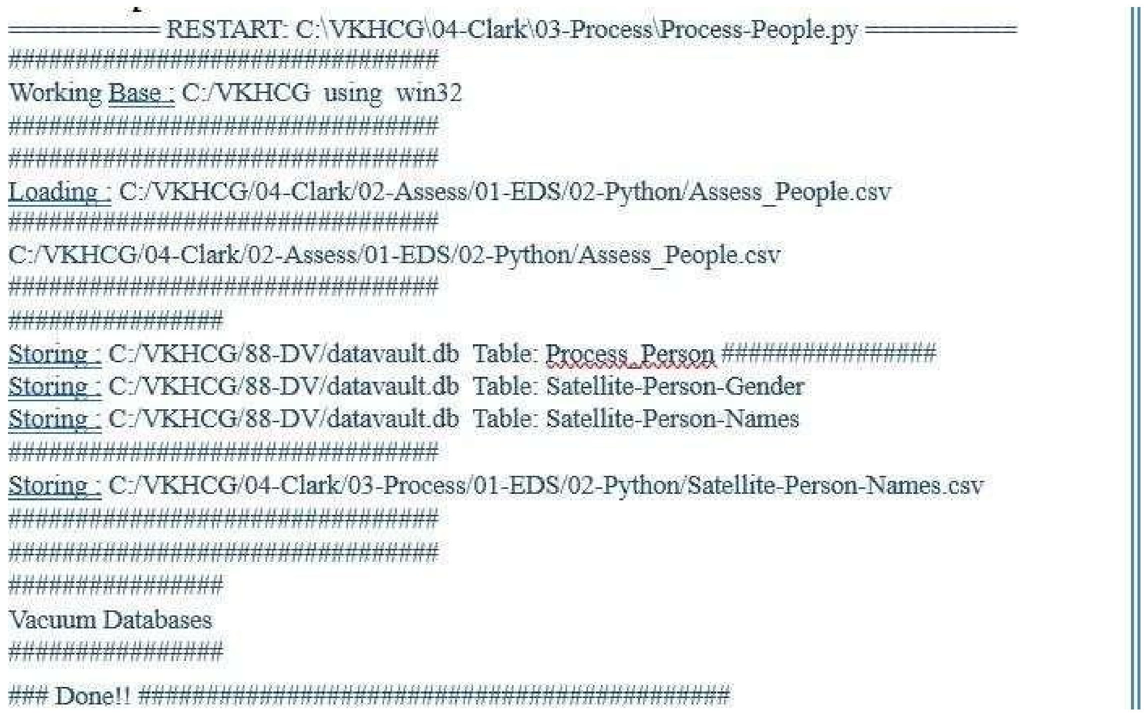
Practical No 6

Aim : Build the time hub ,links , and satelites.

Code:

```
import datetime
import time
import threading

class TimeHub:
   def     init     (self):
      self.time_links = []
   def add_time_link(self, link):
      self.time_links.append(link)
   def distribute_time(self):
      current_time = datetime.datetime.utcnow()
      for link in self.time_links:
         link.receive_time(current_time)
class TimeLink:
   def     init     (self, satellite):
      self.satellite = satellite
   def      receive_time(self,       current_time):
      self.satellite.update_time(current_time)
class Satellite:
   def     init     (self, name):
      self.name        =        name
      self.current_time = None
   def update_time(self,  current_time):
      self.current_time = current_time
   def get_time(self):
      return  self.current_time
def main():
   time_hub = TimeHub()
   satellite1 = Satellite("Satellite_1")
   satellite2 = Satellite("Satellite_2")
   link1 = TimeLink(satellite1)
   link2 = TimeLink(satellite2)
   time_hub.add_time_link(link1)
   time_hub.add_time_link(link2)
   def sync_time():
      while True:
         time_hub.distribute_time()
         time.sleep(1)
   sync_thread = threading.Thread(target=sync_time)
   sync_thread.daemon = True
   sync_thread.start()

   time.sleep(5)
   print(f"{satellite1.name} Time: {satellite1.get_time()}")
   print(f"{satellite2.name} Time: {satellite2.get_time()}")

if     name     == "     main     ":
 main()
```

Output:



```
========== RESTART: C:\VKHCG\04-Clark\03-Process\Process-People.py ==========
#################################
Working Base : C:/VKHCG  using  win32
#################################
#################################
Loading : C:/VKHCG/04-Clark/02-Assess/01-EDS/02-Python/Assess_People.csv
#################################
C:/VKHCG/04-Clark/02-Assess/01-EDS/02-Python/Assess_People.csv
#################################
################
Storing : C:/VKHCG/88-DV/datavault.db  Table: Process_Person ################
Storing : C:/VKHCG/88-DV/datavault.db  Table: Satellite-Person-Gender
Storing : C:/VKHCG/88-DV/datavault.db  Table: Satellite-Person-Names
#################################
Storing : C:/VKHCG/04-Clark/03-Process/01-EDS/02-Python/Satellite-Person-Names.csv
#################################
#################################
################
Vacuum Databases
################
### Done!! #############################################
```

Practical No 7

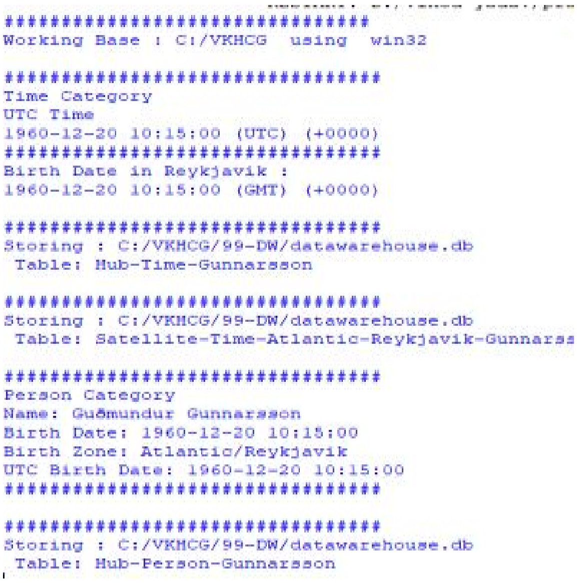
Aim : Transform-Gunnarsson_is_Born.py

Code:

```
import sys import os
from datetime import datetime from
pytz import timezone import pandas
as pd import sqlite3 as sq import uuid
pd.options.mode.chained_assignment = None
if sys.platform == 'linux':
   Base=os.path.expanduser('~') +
'/VKHCG' else:
   Base='C:/VKHCG'
print('Working Base :',Base, ' using ',
sys.platform) Company='01-Vermeulen'
InputDir='00-  RawData'
InputFileName='VehicleData.csv'
sDataBaseDir=Base + '/' + Company + '/04-Transform/SQLite' if not
os.path.exists(sDataBaseDir):
   os.makedirs(sDataBaseDir)
sDatabaseName=sDataBaseDir + '/Vermeulen.db'
conn1 = sq.connect(sDatabaseName)
sDataVaultDir=Base + '/88-DV'
if not os.path.exists(sDataVaultDir):
   os.makedirs(sDataVaultDir)
sDatabaseName=sDataVaultDir + '/datavault.db' conn2
= sq.connect(sDatabaseName)
sDataWarehouseDir=Base + '/99-DW'
if not
   os.path.exists(sDataWarehouseDir):
   os.makedirs(sDataWarehouseDir)
sDatabaseName=sDataWarehouseDir + '/datawarehouse.db' conn3 =
sq.connect(sDatabaseName)
print('Time Category') print('UTC Time')
BirthDateUTC = datetime(1960,12,20,10,15,0)
BirthDateZoneUTC=BirthDateUTC.replace(tzinfo=timezone('UTC'))
BirthDateZoneStr=BirthDateZoneUTC.strftime("%Y-%m-%d %H:%M:%S")
BirthDateZoneUTCStr=BirthDateZoneUTC.strftime("%Y-%m-%d %H:%M:%S
(%Z) (%z)") print(BirthDateZoneUTCStr)
print('Birth Date in Reykjavik :')
BirthZone = 'Atlantic/Reykjavik'
BirthDate = BirthDateZoneUTC.astimezone(timezone(BirthZone))
BirthDateStr=BirthDate.strftime("%Y-%m-%d %H:%M:%S (%Z)
(%z)") BirthDateLocal=BirthDate.strftime("%Y-%m-%d
%H:%M:%S") print(BirthDateStr)
IDZoneNumber=str(uuid.uuid4())
sDateTimeKey=BirthDateZoneStr.replace(' ','-').replace(':','-')
TimeLine=[('ZoneBaseKey', ['UTC']),
        ('IDNumber', [IDZoneNumber]),

        ('DateTimeKey', [sDateTimeKey]),
        ('UTCDateTimeValue', [BirthDateZoneUTC]), ('Zone',
        [BirthZone]), ('DateTimeValue', [BirthDateStr])]
TimeFrame = pd.DataFrame.from_dict(dict(TimeLine))
TimeHub=TimeFrame[['IDNumber','ZoneBaseKey','DateTimeKey','DateTimeValue']]
```

```
TimeHubIndex=TimeHub.set_index(['IDNumber'],inplace=False)
sTable = 'Hub-Time-Gunnarsson'
print('Storing :',sDatabaseName,'\n Table:',sTable)
TimeHubIndex.to_sql(sTable, conn2, if_exists="replace")
sTable = 'Dim-Time-Gunnarsson'
TimeHubIndex.to_sql(sTable, conn3,
if_exists="replace")
TimeSatellite=TimeFrame[['IDNumber','DateTimeKey','Zone','DateTimeValue'
]] TimeSatelliteIndex=TimeSatellite.set_index(['IDNumber'],inplace=False)
BirthZoneFix=BirthZone.replace(' ','-').replace('/','-')
sTable = 'Satellite-Time-' + BirthZoneFix + '-Gunnarsson'
print('Storing :',sDatabaseName,'\n Table:',sTable)
TimeSatelliteIndex.to_sql(sTable, conn2, if_exists="replace")
sTable = 'Dim-Time-' + BirthZoneFix + '-Gunnarsson'
TimeSatelliteIndex.to_sql(sTable, conn3, if_exists="replace")
print('Person Category') FirstName =
'Guðmundur' LastName = 'Gunnarsson'
print('Name:',FirstName,LastName)
print('Birth Date:',BirthDateLocal)
print('Birth Zone:',BirthZone)
print('UTC Birth Date:',BirthDateZoneStr)
IDPersonNumber=str(uuid.uuid4())
PersonLine=[('IDNumber',
[IDPersonNumber]),
        ('FirstName', [FirstName]),
        ('LastName', [LastName]),
        ('Zone', ['UTC']),
        ('DateTimeValue', [BirthDateZoneStr])]
PersonFrame = pd.DataFrame.from_dict(dict(PersonLine))
TimeHub=PersonFrame
TimeHubIndex=TimeHub.set_index(['IDNumber'],inplace=
False)

sTable = 'Hub-Person-Gunnarsson'
print('Storing :',sDatabaseName,'\n Table:',sTable)
TimeHubIndex.to_sql(sTable, conn2, if_exists="replace")
sTable = 'Dim-Person-Gunnarsson'
TimeHubIndex.to_sql(sTable, conn3, if_exists="replace")
```

Output :



```
################################
Working Base : C:/VKHCG  using  win32

#################################
Time Category
UTC Time
1960-12-20 10:15:00 (UTC) (+0000)
#################################
Birth Date in Reykjavik :
1960-12-20 10:15:00 (GMT) (+0000)

#################################
Storing : C:/VKHCG/99-DW/datawarehouse.db
 Table: Hub-Time-Gunnarsson

#################################
Storing : C:/VKHCG/99-DW/datawarehouse.db
 Table: Satellite-Time-Atlantic-Reykjavik-Gunnarss

#################################
Person Category
Name: Guðmundur Gunnarsson
Birth Date: 1960-12-20 10:15:00
Birth Zone: Atlantic/Reykjavik
UTC Birth Date: 1960-12-20 10:15:00
#################################

#################################
Storing : C:/VKHCG/99-DW/datawarehouse.db
 Table: Hub-Person-Gunnarsson
```

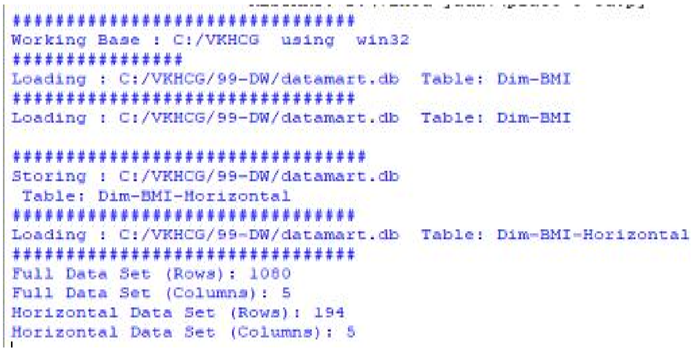
Practical No 8

A. Organize-Horizontal

Code:

```
import sys import os
import pandas as pd import sqlite3 as sq
 if sys.platform == 'linux': Base=os.path.expanduser('~') +
'/VKHCG' else:
    Base='C:/VKHCG'
print('Working Base :',Base, ' using ', sys.platform)
Company='01-Vermeulen' sDataWarehouseDir=Base +
'/99-DW' if not os.path.exists(sDataWarehouseDir):
    os.makedirs(sDataWarehouseDir)
sDatabaseName=sDataWarehouseDir + '/datawarehouse.db' conn1 =
sq.connect(sDatabaseName)
sDatabaseName=sDataWarehouseDir + '/datamart.db' conn2 =
sq.connect(sDatabaseName)
sTable = 'Dim-BMI'
print('Loading :',sDatabaseName,' Table:',sTable)
sSQL="SELECT * FROM [Dim-BMI];"
PersonFrame0=pd.read_sql_query(sSQL,
conn1) sTable = 'Dim-BMI'
print('Loading :',sDatabaseName,' Table:',sTable) sSQL="SELECT
PersonID,\
       Height,\ Weight,\
       bmi,\ Indicator\
  FROM [Dim-BMI]\ WHERE \
  Height > 1.5 \ and Indicator = 1\
  ORDER BY \
       Height,\ Weight;"
PersonFrame1=pd.read_sql_query(sSQL,
conn1) DimPerson=PersonFrame1
DimPersonIndex=DimPerson.set_index(['PersonID'],inplace=False)
sTable = 'Dim-BMI-Horizontal'
print('Storing :',sDatabaseName,'\n Table:',sTable)
DimPersonIndex.to_sql(sTable, conn2,
if_exists="replace") sTable = 'Dim-BMI-Horizontal'
print('Loading :',sDatabaseName,' Table:',sTable) sSQL="SELECT *
FROM [Dim-BMI];"
PersonFrame2=pd.read_sql_query(sSQL,  conn2)
print('Full Data Set (Rows):', PersonFrame0.shape[0]) print('Full Data Set (Columns):',
PersonFrame0.shape[1]) print('Horizontal Data Set (Rows):', PersonFrame2.shape[0])
print('Horizontal Data Set (Columns):', PersonFrame2.shape[1])
```

Output:



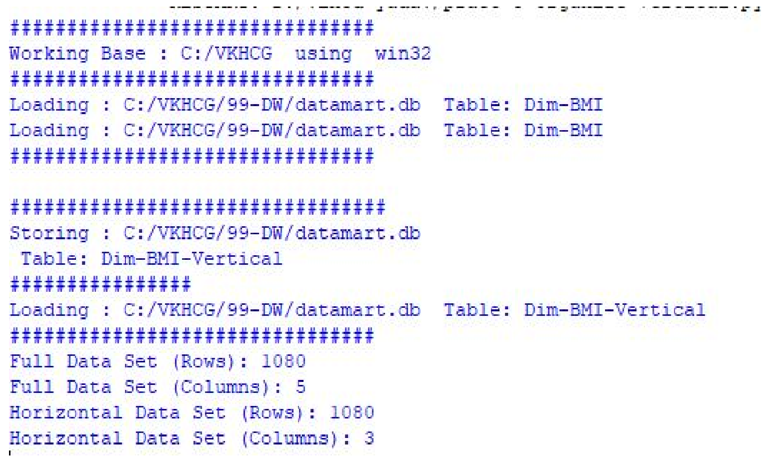
```
################################
Working Base : C:/VKHCG  using  win32
################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI
################################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI

#################################
Storing : C:/VKHCG/99-DW/datamart.db
 Table: Dim-BMI-Horizontal
################################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI-Horizontal
################################
Full Data Set (Rows): 1080
Full Data Set (Columns): 5
Horizontal Data Set (Rows): 194
Horizontal Data Set (Columns): 5
```

B. Organize-Vertical

Code:

```
import sys import os
import pandas as pd import sqlite3 as sq
 if sys.platform == 'linux': Base=os.path.expanduser('~') +
'/VKHCG' else:
    Base='C:/VKHCG'
print('Working Base :',Base, ' using ', sys.platform)
Company='01-Vermeulen' sDataWarehouseDir=Base +
'/99-DW' if not os.path.exists(sDataWarehouseDir):
    os.makedirs(sDataWarehouseDir)
sDatabaseName=sDataWarehouseDir + '/datawarehouse.db'
conn1 = sq.connect(sDatabaseName)
sDatabaseName=sDataWarehouseDir + '/datamart.db' conn2 =
sq.connect(sDatabaseName)
sTable = 'Dim-BMI'
print('Loading :',sDatabaseName,' Table:',sTable)
sSQL="SELECT * FROM [Dim-BMI];"
PersonFrame0=pd.read_sql_query(sSQL,
conn1) sTable = 'Dim-BMI'
print('Loading :',sDatabaseName,'
Table:',sTable) sSQL="SELECT \
       Height,\ Weight,\ Indicator\
  FROM [Dim-BMI];"
PersonFrame1=pd.read_sql_query(sSQL, conn1)
DimPerson=PersonFrame1
DimPersonIndex=DimPerson.set_index(['Indicator'],inplace=Fal
se) sTable = 'Dim-BMI-Vertical')
print('Storing :',sDatabaseName,'\n Table:',sTable)
DimPersonIndex.to_sql(sTable, conn2,
if_exists="replace") sTable = 'Dim-BMI-Vertical'
print('Loading :',sDatabaseName,' Table:',sTable)
sSQL="SELECT * FROM [Dim-BMI-Vertical];"
PersonFrame2=pd.read_sql_query(sSQL, conn2)
print('Full Data Set (Rows):', PersonFrame0.shape[0]) print('Full Data
Set (Columns):', PersonFrame0.shape[1])
print('Horizontal Data Set (Rows):', PersonFrame2.shape[0]) print('Horizontal Data
Set (Columns):', PersonFrame2.shape[1])
```

Output :



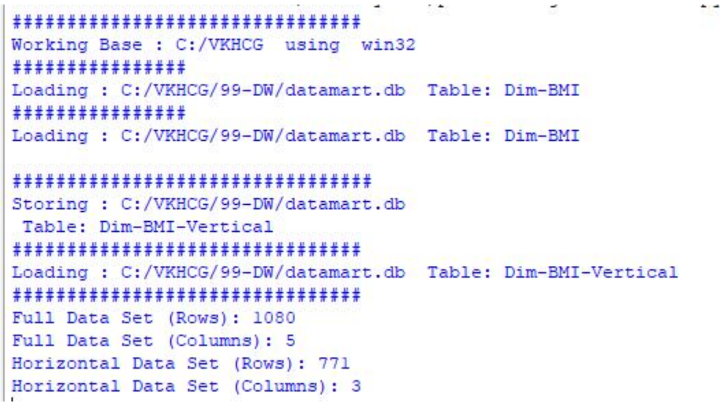
```
################################
Working Base : C:/VKHCG  using  win32
################################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI
################################

#################################
Storing : C:/VKHCG/99-DW/datamart.db
 Table: Dim-BMI-Vertical
################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI-Vertical
################################
Full Data Set (Rows): 1080
Full Data Set (Columns): 5
Horizontal Data Set (Rows): 1080
Horizontal Data Set (Columns): 3
```

C. Organize-island

Code :

```
import sys import os
import pandas as pd import sqlite3 as sq
 if sys.platform == 'linux': Base=os.path.expanduser('~') +
'/VKHCG' else:
    Base='C:/VKHCG'
print('Working Base :',Base, ' using ', sys.platform)
Company='01-Vermeulen sDataWarehouseDir=Base +
'/99-DW' if not os.path.exists(sDataWarehouseDir):
    os.makedirs(sDataWarehouseDir)
sDatabaseName=sDataWarehouseDir + '/datawarehouse.db' conn1 =
sq.connect(sDatabaseName)
sDatabaseName=sDataWarehouseDir + '/datamart.db' conn2 =
sq.connect(sDatabaseName)
sTable = 'Dim-BMI'
print('Loading :',sDatabaseName,' Table:',sTable)
sSQL="SELECT * FROM [Dim-BMI];"
PersonFrame0=pd.read_sql_query(sSQL,
conn1) sTable = 'Dim-BMI'
print('Loading :',sDatabaseName,'
Table:',sTable) sSQL="SELECT \
       Height,\ Weight,\ Indicator\
  FROM [Dim-BMI]\
  WHERE Indicator > 2\ ORDER
       BY \ Height,\ Weight;"
PersonFrame1=pd.read_sql_query(sSQL, conn1)
DimPerson=PersonFrame1
DimPersonIndex=DimPerson.set_index(['Indicator'],inplace=Fal
se) sTable = 'Dim-BMI-Vertical'
print('Storing :',sDatabaseName,'\n Table:',sTable)
DimPersonIndex.to_sql(sTable, conn2,
if_exists="replace") sTable = 'Dim-BMI-Vertical'
print('Loading :',sDatabaseName,'
Table:',sTable) sSQL="SELECT * FROM
[Dim-BMI-Vertical];"
PersonFrame2=pd.read_sql_query(sSQL,  conn2)
print('Full Data Set (Rows):', PersonFrame0.shape[0]) print('Full Data

Set (Columns):', PersonFrame0.shape[1])
print('Horizontal Data Set (Rows):', PersonFrame2.shape[0]) print('Horizontal Data
Set (Columns):', PersonFrame2.shape[1])
```

Output :



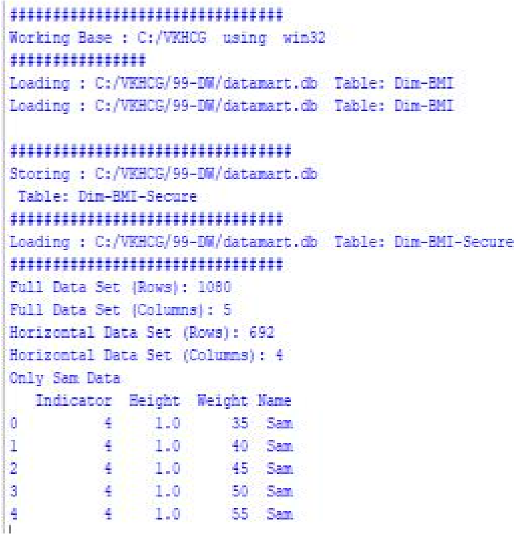
```
################################
Working Base : C:/VKHCG  using  win32
################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI
################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI

#################################
Storing : C:/VKHCG/99-DW/datamart.db
 Table: Dim-BMI-Vertical
################################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI-Vertical
################################
Full Data Set (Rows): 1080
Full Data Set (Columns): 5
Horizontal Data Set (Rows): 771
Horizontal Data Set (Columns): 3
```

D. Organize-secure-vault

Code :

```
import sys import os
import pandas as pd import sqlite3 as sq
if sys.platform == 'linux': Base=os.path.expanduser('~') +
'/VKHCG' else:
    Base='C:/VKHCG'
print('Working Base :',Base, ' using ', sys.platform)
Company='01-Vermeulen' sDataWarehouseDir=Base +
'/99-DW' if not os.path.exists(sDataWarehouseDir):
    os.makedirs(sDataWarehouseDir)
sDatabaseName=sDataWarehouseDir + '/datawarehouse.db' conn1 =
sq.connect(sDatabaseName)
sDatabaseName=sDataWarehouseDir + '/datamart.db' conn2 =
sq.connect(sDatabaseName)
sTable = 'Dim-BMI'
print('Loading :',sDatabaseName,' Table:',sTable) sSQL="SELECT * FROM [Dim-BMI];"
PersonFrame0=pd.read_sql_query(sSQL,
conn1) STable = 'Dim-BMI'
print('Loading :',sDatabaseName,'
Table:',sTable) sSQL="SELECT \
       Height,\ Weight,\ Indicator,\
       CASE Indicator\
WHEN 1 THEN 'Pip'\
       WHEN 2 THEN 'Norman'\ WHEN 3 THEN
       'Grant'\ ELSE 'Sam'\
       END AS Name\ FROM [Dim-BMI]\
   WHERE Indicator > 2\ ORDER
       BY \ Height,\ Weight
PersonFrame1=pd.read_sql_query(sSQL, conn1)
        DimPerson=PersonFrame1
DimPersonIndex=DimPerson.set_index(['Indicat
        or'],inplace=False) sTable = 'Dim-BMI-
        Secure'
      print('Storing :',sDatabaseName,'\n Table:',sTable) DimPersonIndex.to_sql(sTable,
conn2, if_exists="replace")
      sTable = 'Dim-BMI-
      Secure’
```

Output:



```
################################
Working Base : C:/VKHCG  using  win32
###############
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI

#################################
Storing : C:/VKHCG/99-DW/datamart.db
 Table: Dim-BMI-Secure
################################
Loading : C:/VKHCG/99-DW/datamart.db  Table: Dim-BMI-Secure
################################
Full Data Set (Rows): 1080
Full Data Set (Columns): 5
Horizontal Data Set (Rows): 692
Horizontal Data Set (Columns): 4
Only Sam Data
   Indicator  Height  Weight Name
0          4     1.0      35  Sam
1          4     1.0      40  Sam
2          4     1.0      45  Sam
3          4     1.0      50  Sam
4          4     1.0      55  Sam
```

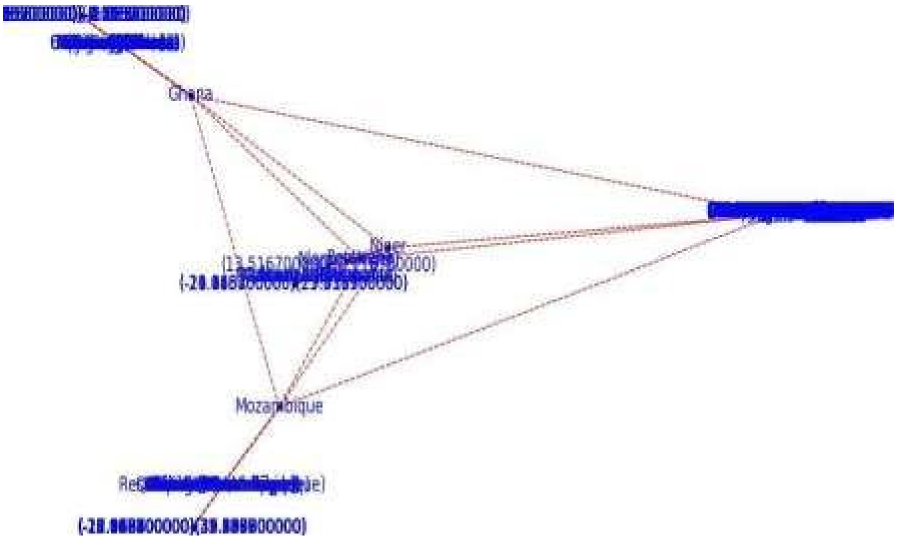
Practical No 9

A. Generating Reports

Code :

```
import sys
import os
import pandas as pd
import networkx as nx
import matplotlib.pyplot as plt
pd.options.mode.chained_assignment =
None if sys.platform == 'linux':
   Base=os.path.expanduser('~') +
'VKHCG' else:
   Base='C:/VKHCG'
sInputFileName='02-Assess/01-EDS/02-Python/Assess-Network-Routing-
Customer.csv' sOutputFileName1='06-Report/01-EDS/02-Python/Report-Network-
Routing-Customer.gml' sOutputFileName2='06-Report/01-EDS/02-Python/Report-
Network-Routing-Customer.png' Company='01-Vermeulen'
sFileName=Base + '/' + Company + '/' + sInputFileName
CustomerDataRaw=pd.read_csv(sFileName, header=0, low_memory=False,
encoding="latin-1") CustomerData=CustomerDataRaw.head(100)
G=nx.Graph()
for i in range(CustomerData.shape[0]):
   for j in range(CustomerData.shape[0]):
      Node0=CustomerData['Customer_Country_Nam
      e'][i]
      Node1=CustomerData['Customer_Country_Nam
      e'][j] if Node0 != Node1:
         G.add_edge(Node0,Node1)
for i in range(CustomerData.shape[0]):
   Node0=CustomerData['Customer_Country_Name'][i]
   Node1=CustomerData['Customer_Place_Name'][i] + '('+
   CustomerData['Customer_Country_Name'][i] + ')' Node2='('+
   "{:.9f}".format(CustomerData['Customer_Latitude'][i]) + ')('+
"{:.9f}".format(CustomerData['Customer_Longitude'][i
   ]) + ')' if Node0 != Node1:
      G.add_edge(Node0,Node 1)
   if Node1 != Node2:
      G.add_edge(Node1,Node2)
sFileName=Base + '/' + Company + '/' +
sOutputFileName1 nx.write_gml(G, sFileName)
sFileName=Base + '/' + Company + '/' + sOutputFileName2
plt.figure(figsize=(25, 25))
pos=nx.spectral_layout(G, dim=2)
nx.draw_networkx_nodes(G, pos, node_color='k', node_size=10, alpha=0.8)
nx.draw_networkx_edges(G, pos, edge_color='r', arrows=False, style='dashed')
nx.draw_networkx_labels(G, pos, font_size=12, font_family='sans-serif',
font_color='b') plt.axis('off')
plt.savefig(sFileName, dpi=600)
plt.show()
```

Output:



Practical No 10

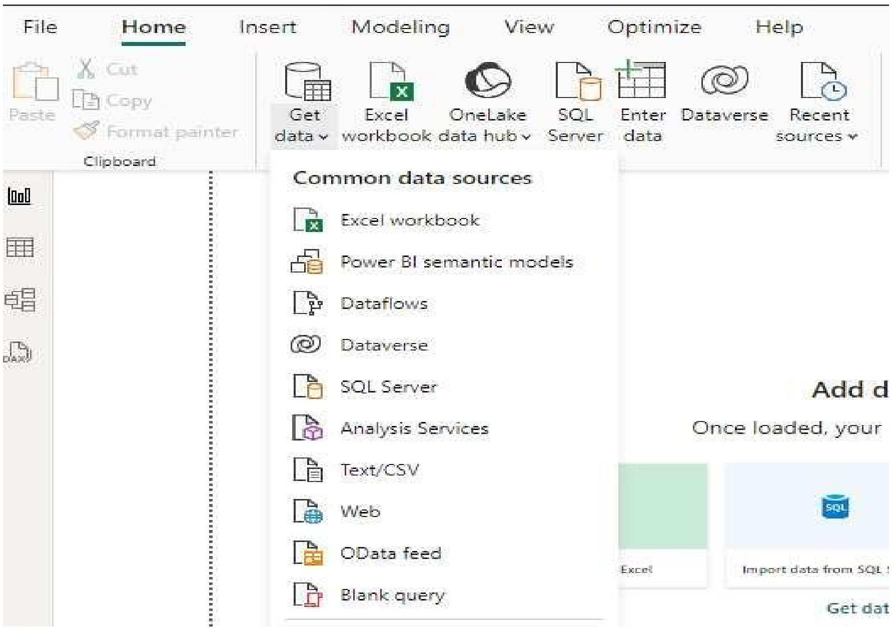
Aim : Data Visualization

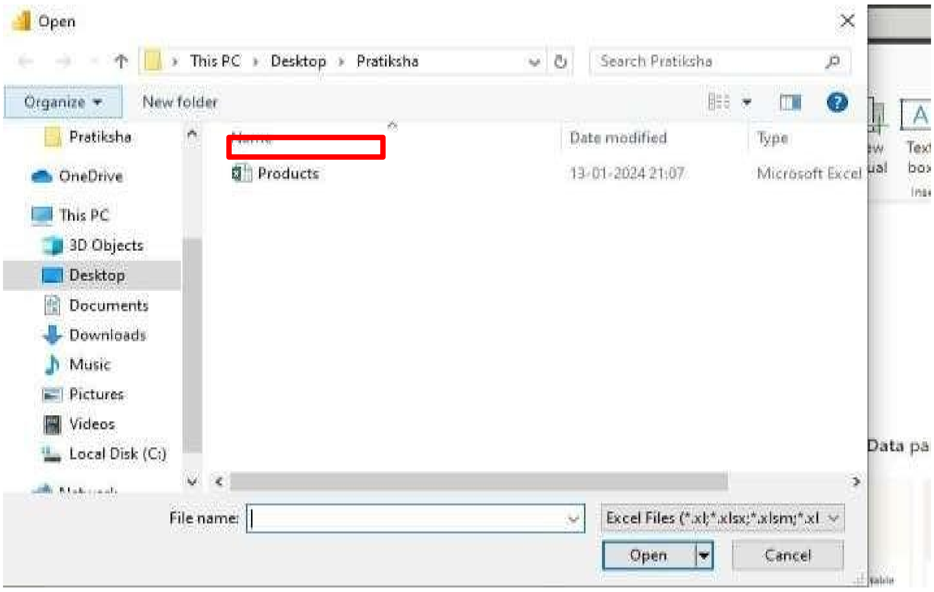
withpower bi Case Study : Sales

Data

Step 1: connect to an Excel Workbook

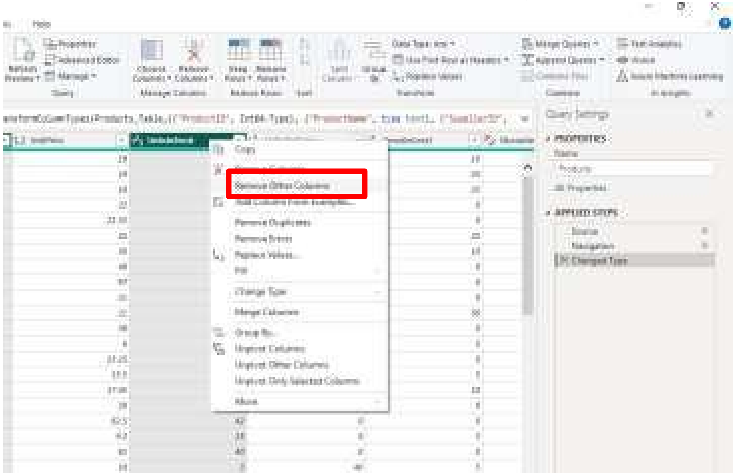
1. Launch power Bi Desktop.
2. From the Home Ribbon, Select Get Data ˥ Select Excel Workbook .
3. In the Open File Dialog Box, Select the Product.xlsx file.



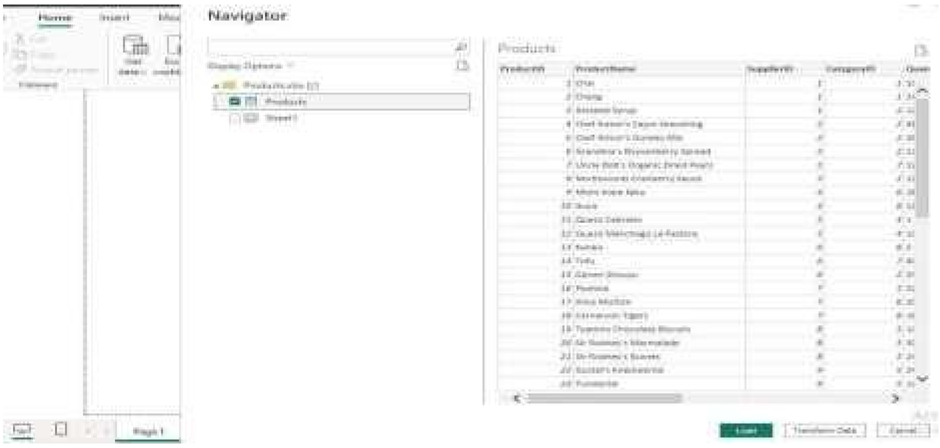


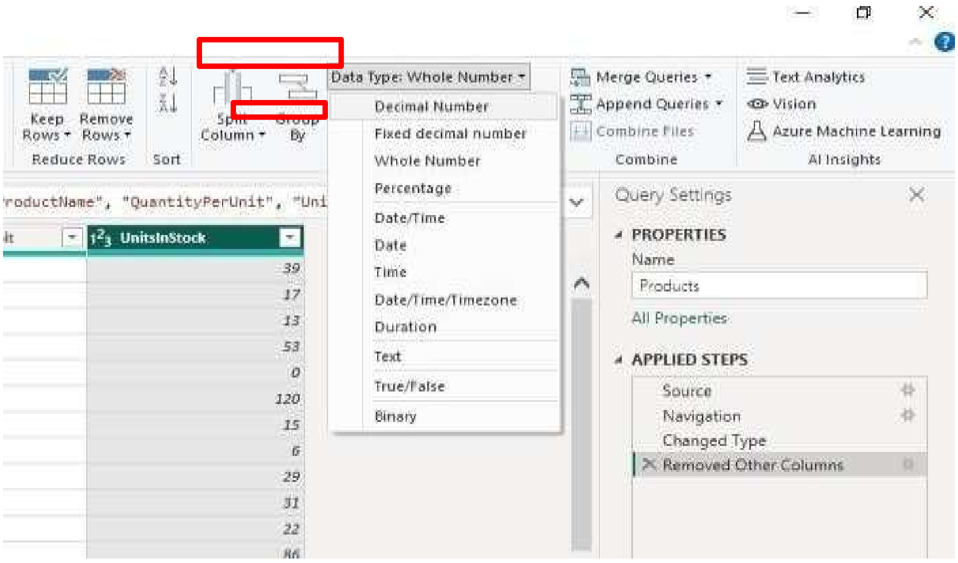
4. In the Open File Dialog Box, Select the Product.xlsx file.

5. Click on Products Check Box. & We Will see the product Table. Select The Transform Data.
6. In Query Editor , Select the ProductID, ProductName, QuantityPerUnit, and unitsInStock Columns. (Use Ctrl + Click to select more than one column).



7. Right Click on Column Header and Click Remove Other Columns.



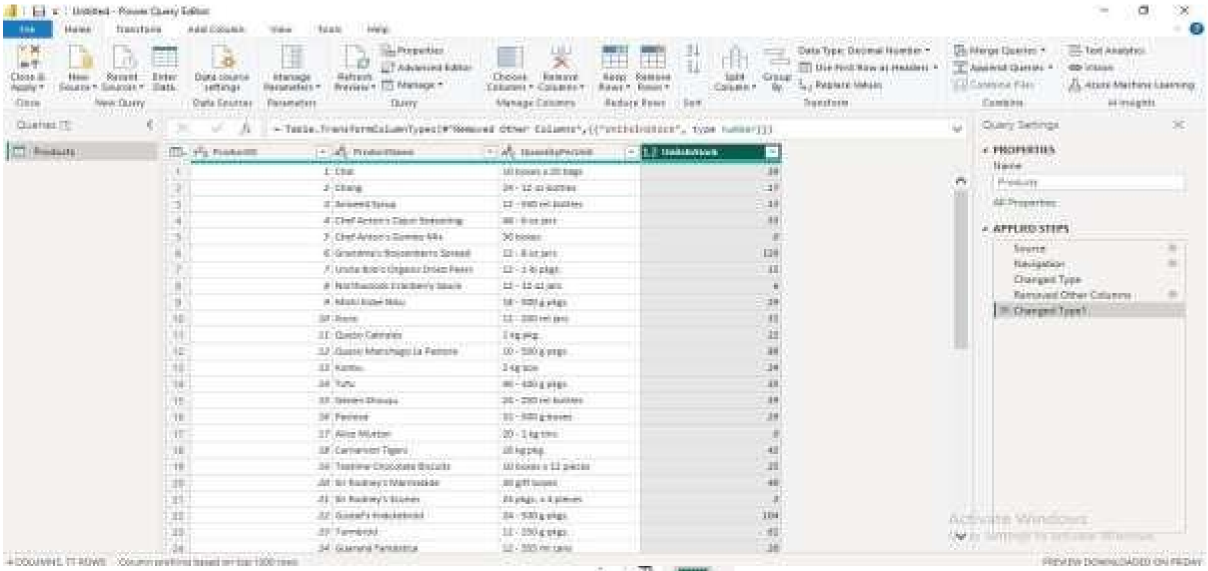


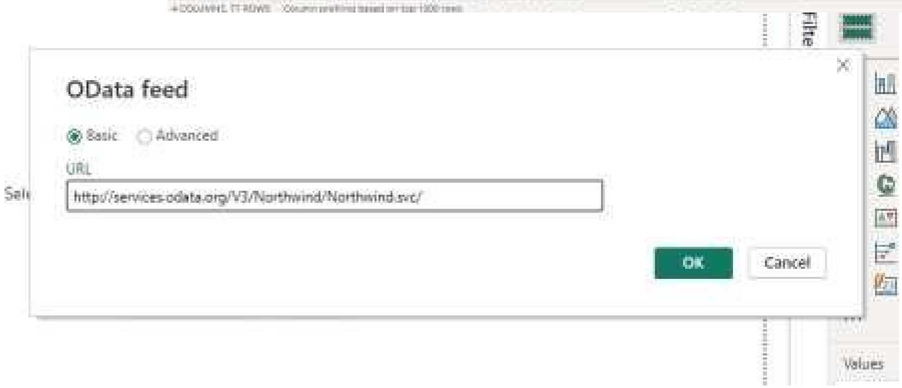
```
roductName", "QuantityPerUnit", "Uni
```

8. Select Close & Apply from Home Ribbon.

9. Another Window on ⌉Select Get Data & Select the OData feed. And Copy the link given below. & Paste it to OData feed URL Box and Click Ok.

http://services.odata.org/V3/Northwind/Northwind.svc/





OData feed

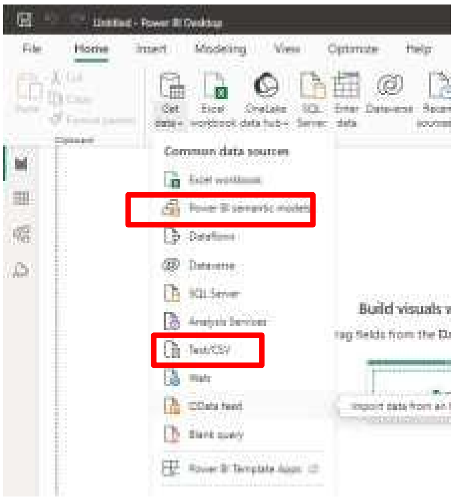
● Basic ○ Advanced

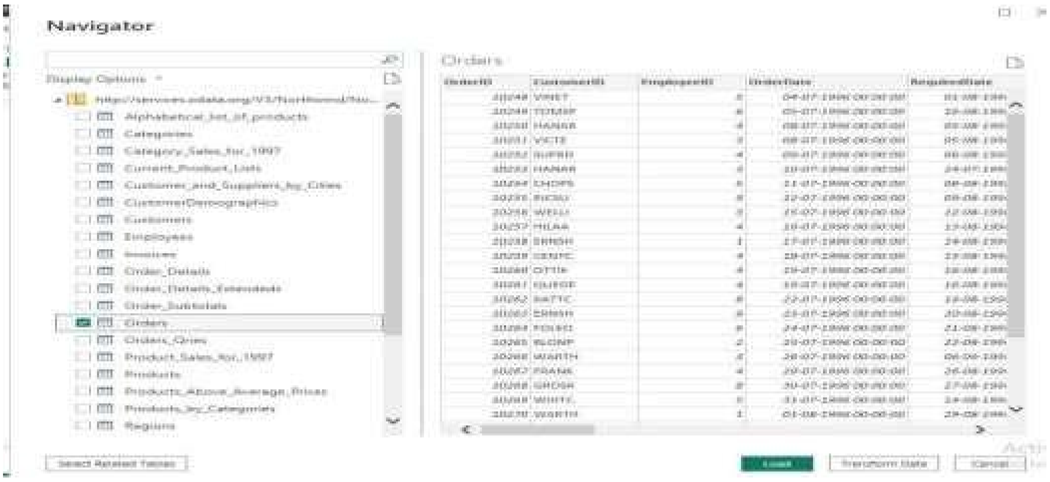
URL

http://services.odata.org/V3/Northwind/Northwind.svc/

OK Cancel

10. We will see the below screen like this then select from navigator orders checkbox. & Click on Transform Data.

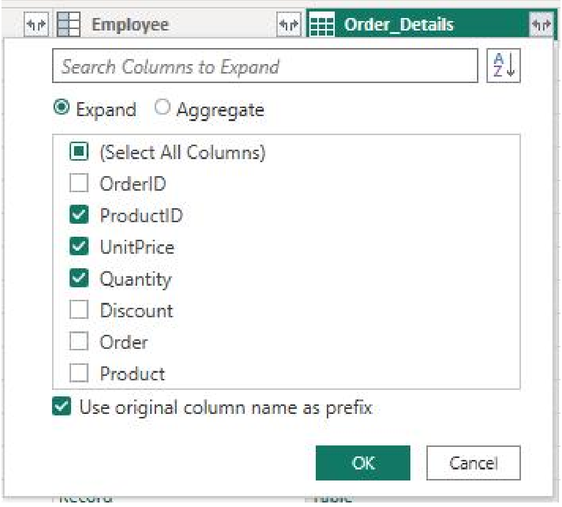




Orders

OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate
10248	VINET	5	04-07-1996 00:00:00	01-08-199
10249	TOMSP	6	05-07-1996 00:00:00	16-08-199
10250	HANAR	4	08-07-1996 00:00:00	05-08-199
10251	VICTE	3	08-07-1996 00:00:00	05-08-199
10252	SUPRD	4	09-07-1996 00:00:00	06-08-199
10253	HANAR	3	10-07-1996 00:00:00	24-07-199
10254	CHOPS	5	11-07-1996 00:00:00	08-08-199
10255	RICSU	9	12-07-1996 00:00:00	09-08-199
10256	WELLI	3	15-07-1996 00:00:00	12-08-199
10257	HILAA	4	16-07-1996 00:00:00	13-08-199
10258	ERNSH	1	17-07-1996 00:00:00	14-08-199
10259	CENTC	4	18-07-1996 00:00:00	15-08-199
10260	OTTIK	4	19-07-1996 00:00:00	16-08-199
10261	QUEDE	4	19-07-1996 00:00:00	16-08-199
10262	RATTC	8	22-07-1996 00:00:00	19-08-199
10263	ERNSH	9	23-07-1996 00:00:00	20-08-199
10264	FOLKO	6	24-07-1996 00:00:00	21-08-199
10265	BLONP	2	25-07-1996 00:00:00	22-08-199
10266	WARTH	3	26-07-1996 00:00:00	06-09-199
10267	FRANK	4	29-07-1996 00:00:00	26-08-199
10268	GROSR	8	30-07-1996 00:00:00	27-08-199
10269	WHITC	5	31-07-1996 00:00:00	14-08-199
10270	WARTH	1	01-08-1996 00:00:00	29-08-199

11. Expand the Order_Details column & select the ProductID, UnitPrice, Quantity & Click OK.

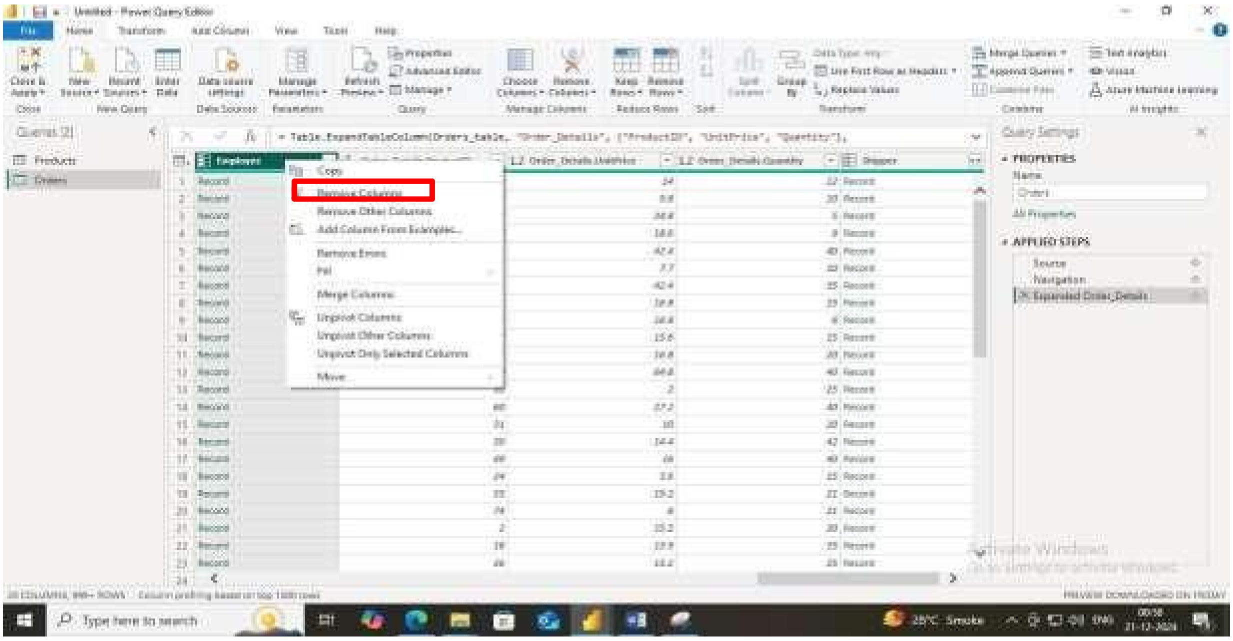


● Expand ○ Aggregate

- ☑ (Select All Columns)
- □ OrderID
- ☑ ProductID
- ☑ UnitPrice
- ☑ Quantity
- □ Discount
- □ Order
- □ Product

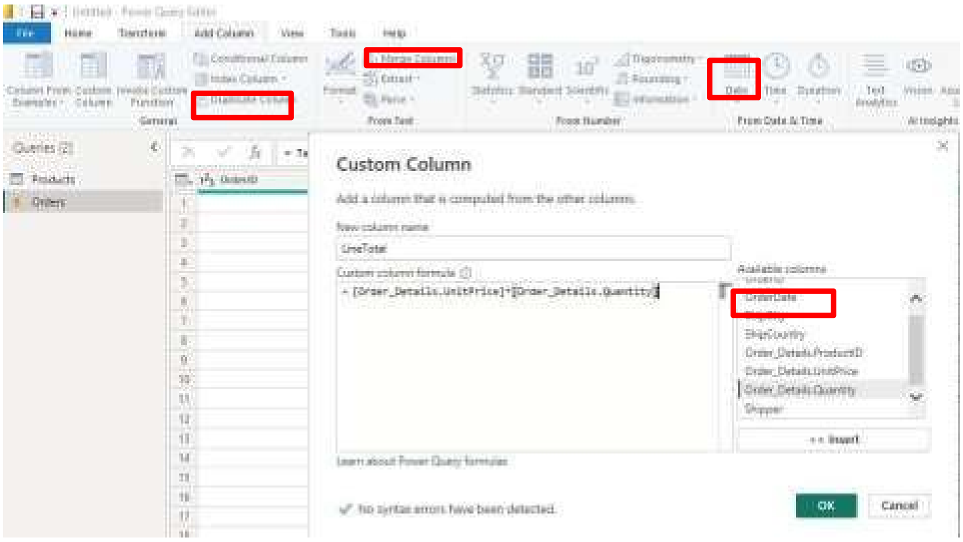
☑ Use original column name as prefix

12. Remove other Column to only display column of interest, In this step you remove all Column except OrderID, OrderDate, ShipCity, Order_Details.ProductID, Order_Details.Unitprice, Order_Details.Quantity, Shipper columns. & Remove Columns.



```
= Table.ExpandTableColumn(Orders_table, "Order_Details", {"ProductID", "UnitPrice", "Quantity"},
```

13. From Add Column Ribbon Select Custom Column. Add New Name in new Column name LineTotal. From Available column Select order_Details.Unitprice and Click insert Add “*” and select Order_Details.Quantity and insert ┐Ok. We Will see the a New Column Name LineTotal Appears.



Custom Column

Add a column that is computed from the other columns.

New column name

LineTotal

Custom column formula

```
= [Order_Details.UnitPrice]*[Order_Details.Quantity]
```

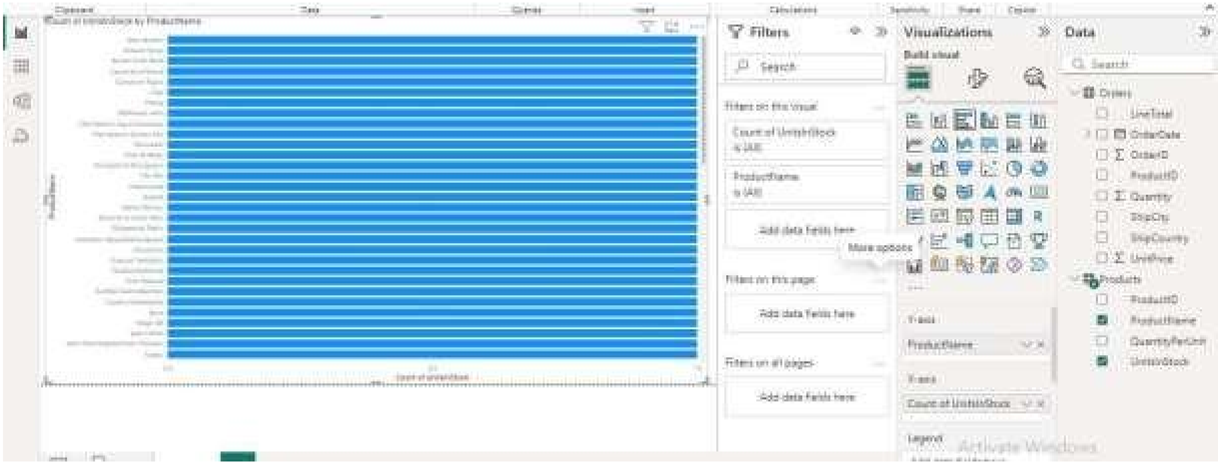
Available columns

OrderDate
ShipCity
ShipCountry
Order_Details.ProductID
Order_Details.UnitPrice
Order_Details.Quantity
Shipper

✓ No syntax errors have been detected.

14. In Query Editor, drag the LineTotal Column to the left , After ShipCountry. ┐ Double Click on Order_Details.ProductID, Order_Details.Unitprice, Order_Details.Quantity change name to Only ProductID, Unitprice, Quantity.

15. From Home Ribbon , Select Close and apply. We Will get new Window of Power Bi. Select From Data Paneel From Products select ProductName And UnitInStock. If output is not seen then Change X-axis and Y-axis from Visualizations.



16. For Orders Select Map from Visualizations. And From data Column Select From Orders Select LineTotal And ShipCity.