DSC 540 Week 5-6

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Activity 7: Reading Tabular Data from a Web Page and Creating DataFrames

In this activity, you have been given a Wikipedia page where you have the GDP of all countries listed. You have been asked to create three DataFrames from the three sources mentioned in the page (https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal)):

• Open the page in a separate Chrome/Firefox tab and use something like an Inspect Element tool to view the source HTML and understand its structure Read the page using bs4

• Read the page using bs4

• Find the table structure you will need to deal with (how many tables there are?)

• Find the right table using bs4

• Separate the source names and their corresponding data

• Get the source names from the list of sources you have created

• Separate the header and data from the data that you separated before for the first source only, and then create a DataFrame using that

• Repeat the last task for the other two data sources

In [1]:
```
# Load the necessary libraries.

from bs4 import BeautifulSoup
import requests
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import urllib.request
%matplotlib inline
```

In [2]:
```
# Reading the wikipedia website HTML using beautifulSoup library

url="https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal)"

websiteData = urllib.request.urlopen(url)

bfData = BeautifulSoup(websiteData)
websiteData.close()
```

In [3]:
```
# Reading Html table structure to find how many tables are there in the HTML

no_of_tables = bfData.find_all("table")
print("There are " + str(len(no_of_tables)) + " tables in the website HTML")
```

```
There are 7 tables in the website HTML
```

In [4]:
```
# Find the right table using bs4

# finding table with class wikitable inside HTML, this table holds the data we, are looking for
tabledata = bfData.find("table", {"class": "wikitable"})
print(type(tabledata))
```

```
<class 'bs4.element.Tag'>
```

In [5]:
```
# Separate the source names and their corresponding data

# finding all rows inside table body non recusively as we are interested in, getting only the top level rows

scRow = tabledata.tbody.findAll('tr', recursive=False)[0]

# finding all table cells inside the table rows non recursively to get only the, heder cells (each cell represents a source)
scCell = [td for td in scRow.findAll('th')]

# iterating through the anchor tags in each cell to get the names and header

datasources=[]
header=[]
for index, item in enumerate(scCell):
    if (index == 0):
        head = scCell[index].getText().replace('\n',' ').strip()
        header.append(head)
    if (index == 1):
        head = scCell[index].findAll('a')[0].getText().replace('\n',' ').strip()
        header.append(head)

    if (index > 1 and index < 5):
        val = scCell[index].findAll('a', title=True)[0].getText().replace('\n',' ').strip()
        datasources.append(val)

data = tabledata.tbody.findAll('tr', recursive=False)

for index, item in enumerate(data):
    if index == 1:
        head = data[index].getText().replace('\n',' ').strip()
        for name in head.split():
            header.append(name)

print(datasources)

print("Header")
print(header)
```

```
['IMF', 'World Bank', 'United Nations']
Header
['Country/Territory', 'UN Region', 'Estimate', 'Year', 'Estimate', 'Year', 'Estimate', 'Year']
```

In [6]:
```
# Data loaded in a list
data = tabledata.tbody.findAll('tr', recursive=False)

rowdata = []
for key, val in enumerate(data):
    if key > 1:
        data_country = [td.getText().replace('\n',' ').strip() for td in val.findAll('td')]
        rowdata.append(data_country)

print(rowdata[1])
```

```
['United States', 'Americas', '25,035,164', '2022', '22,996,100', '2021', '20,893,746', '2020']
```

Creating a Dataframe

In [7]:
```
header=['Country/Territory', 'UN Region', 'IMF_Estimate', 'IMF_Year', 'World Bank_Estimate', 'World Bank_Year', 'United Nations_Estimate', 'United Nations_Year']
df = pd.DataFrame(rowdata, columns=header)
df.head(10)
```

Out[7]:

	Country/Territory	UN Region	IMF_Estimate	IMF_Year	World Bank_Estimate	World Bank_Year	United Nations_Estimate	United Nations_Year
0	World	—	101,560,901	2022	96,100,091	2021	85,328,323	2020
1	United States	Americas	25,035,164	2022	22,996,100	2021	20,893,746	2020
2	China	Asia	18,321,197	[n 1]2022	17,734,063	[n 3]2021	14,722,801	[n 1]2020
3	Japan	Asia	4,300,621	2022	4,937,422	2021	5,057,759	2020
4	Germany	Europe	4,031,149	2022	4,223,116	2021	3,846,414	2020
5	India	Asia	3,468,566	2022	3,173,398	2021	2,664,749	2020
6	United Kingdom	Europe	3,198,470	2022	3,186,860	2021	2,764,198	2020
7	France	Europe	2,778,090	2022	2,937,473	2021	2,630,318	2020
8	Canada	Americas	2,200,352	2022	1,990,762	2021	1,644,037	2020
9	Russia	Europe	2,133,092	2022	1,775,800	2021	1,483,498	2020

IMF (GDP Estimate in US$million):

In [20]:
```
df_imf = df.iloc[:,0:4]
df_imf.head(10)
```

Out[20]:

	Country/Territory	UN Region	IMF_Estimate	IMF_Year
0	World	—	101,560,901	2022
1	United States	Americas	25,035,164	2022
2	China	Asia	18,321,197	[n 1]2022
3	Japan	Asia	4,300,621	2022
4	Germany	Europe	4,031,149	2022
5	India	Asia	3,468,566	2022
6	United Kingdom	Europe	3,198,470	2022
7	France	Europe	2,778,090	2022
8	Canada	Americas	2,200,352	2022
9	Russia	Europe	2,133,092	2022

World Bank (GDP Estimate in US$million):

In [21]:
```
df_world_bank = df[['Country/Territory','UN Region','World Bank_Estimate','World Bank_Year']]
df_world_bank.head(10)
```

Out[21]:

	Country/Territory	UN Region	World Bank_Estimate	World Bank_Year
0	World	—	96,100,091	2021
1	United States	Americas	22,996,100	2021
2	China	Asia	17,734,063	[n 3]2021
3	Japan	Asia	4,937,422	2021
4	Germany	Europe	4,223,116	2021
5	India	Asia	3,173,398	2021
6	United Kingdom	Europe	3,186,860	2021
7	France	Europe	2,937,473	2021
8	Canada	Americas	1,990,762	2021
9	Russia	Europe	1,775,800	2021

United Nations (GDP Estimate in US$million):

In [22]:
```
df_UN = df[['Country/Territory','UN Region','United Nations_Estimate','United Nations_Year']]
df_UN.head(10)
```

Out[22]:

	Country/Territory	UN Region	United Nations_Estimate	United Nations_Year
0	World	—	85,328,323	2020
1	United States	Americas	20,893,746	2020
2	China	Asia	14,722,801	[n 1]2020
3	Japan	Asia	5,057,759	2020
4	Germany	Europe	3,846,414	2020
5	India	Asia	2,664,749	2020
6	United Kingdom	Europe	2,764,198	2020
7	France	Europe	2,630,318	2020
8	Canada	Americas	1,644,037	2020
9	Russia	Europe	1,483,498	2020

Activity 8: Handling Outliers and Missing Data

• Read the visit_data.csv file.

• Check for duplicates.

• Check if any essential column contains NaN.

• Get rid of the outliers.

• Report the size difference.

• Create a box plot to check for outliers.

• Get rid of any outliers.

In [11]:
```
# load libraries

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

In [12]:
```
#read the file

dataDF = pd.read_csv("visit_data.csv")
dataDF.head()
```

Out[12]:

	id	first_name	last_name	email	gender	ip_address	visit
0	1	Sonny	Dahl	sdahl0@mysql.com	Male	135.36.96.183	1225.0
1	2	NaN	NaN	dhoovart1@hud.gov	NaN	237.165.194.143	919.0
2	3	Gar	Armal	garmal2@technorati.com	NaN	166.43.137.224	271.0
3	4	Chiarra	Nulty	cnulty3@newyorker.com	NaN	139.98.137.108	1002.0
4	5	NaN	NaN	sleaver4@elegantthemes.com	NaN	46.117.117.27	2434.0

In [13]:
```
# Checking for duplicates by email as email id is the unique value in the data

print("Does data has duplicate Email Ids : {}".format(any(dataDF.email.duplicated())))
```

```
Does data has duplicate Email Ids : False
```

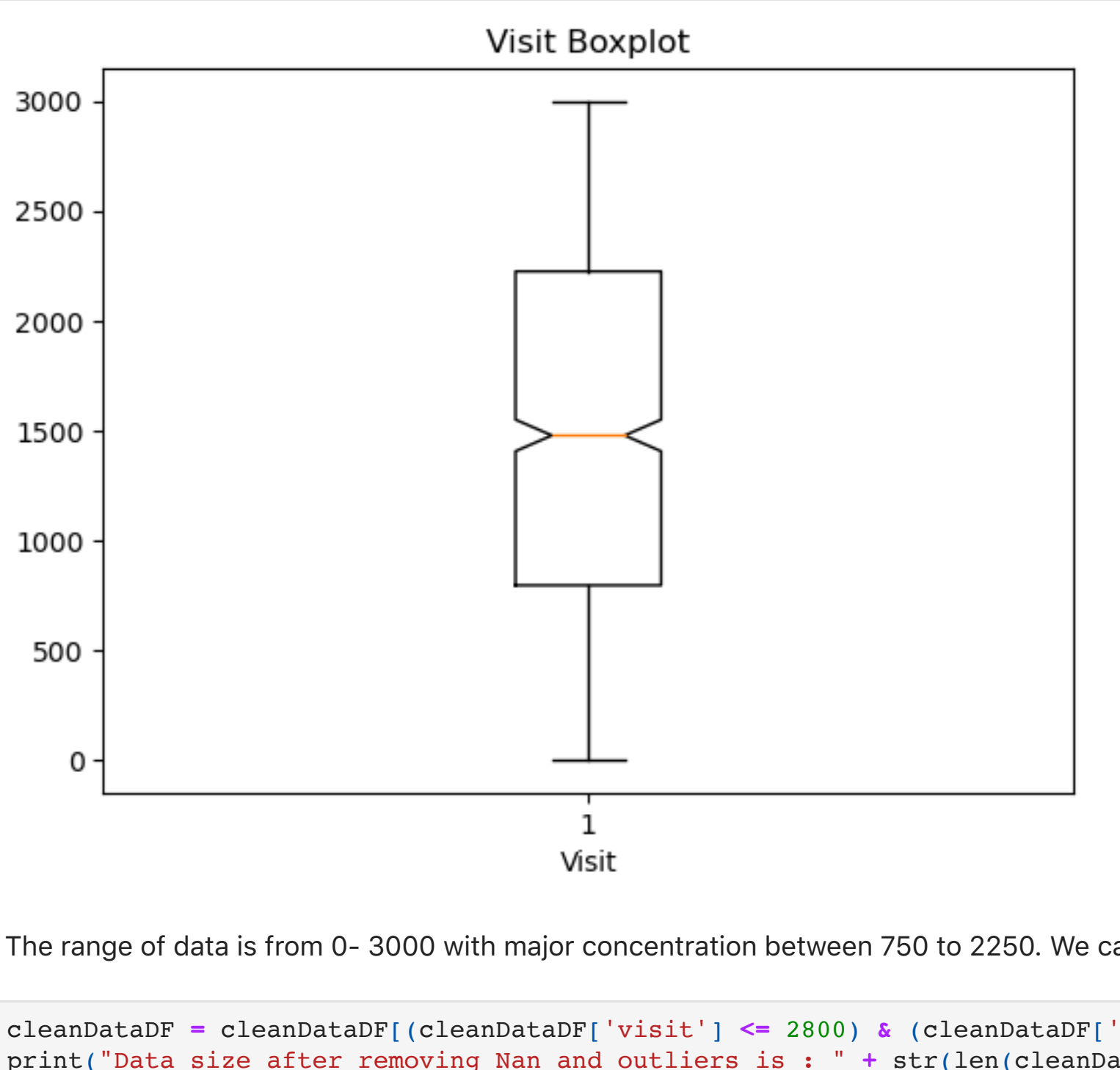
In [14]:
```
# Checking for Nan Values in dataframe, First name last name can contain null, checking for email, gender, ip address and visit

print("IP Address contains NaN - {}".format(dataDF.ip_address.isnull().values.any()))

print("Visit contains NaN - {}".format(dataDF.visit.isnull().values.any()))

print("Email contains NaN - {}".format(dataDF.ip_address.isnull().values.any()))

print("Gender contains NaN - {}".format(dataDF.visit.isnull().values.any()))
```

```
IP Address contains NaN - False
Visit contains NaN - True
Email contains NaN - False
Gender contains NaN - True
```

In [15]:
```
# Getting rid of outliers and reporting the size difference

sizeWithOutliers = len(dataDF)

print("Size before removing outliers : " + str(sizeWithOutliers))

cleanDataDF = dataDF[dataDF.visit.notnull()]

print("Size after removing outliers : " + str(len(cleanDataDF)))
```

```
Size before removing outliers : 1000
Size after removing outliers : 974
```

In [16]:
```
# plotting box plot to check any other outliers

plt.boxplot(cleanDataDF.visit, notch=True)
plt.title("Visit Boxplot")
plt.xlabel("Visit")
plt.show()
```



The range of data is from 0- 3000 with major concentration between 750 to 2250. We can look to get rid of any values which are far away from the major concentration

In [17]:
```
cleanDataDF = cleanDataDF[(cleanDataDF['visit'] <= 2800) & (cleanDataDF['visit'] >= 200)]
print("Data size after removing Nan and outliers is : " + str(len(cleanDataDF)))
```

```
Data size after removing Nan and outliers is : 864
```

Insert data into a SQL Lite database – create a table with the following data

a. Name, Address, City, State, Zip, Phone Number

b. Add at least 10 rows of data and submit your code with a query generating your results.

In [18]:
```
# importing sqlite3 library

import sqlite3
```

In [23]:
```
# making a connection to sql lite db

con = sqlite3.connect('mydata.sqlite')

#defining DDL query

query = "CREATE TABLE UserDataTable (Name VARCHAR(50), Address VARCHAR(500),City VARCHAR(50), State VARCHAR(50),PhoneNumber VARCHAR(50),Zip INTEGER);"

#execute the query to create the table

con.execute(query)
con.commit()
```

In [24]:
```
# Add data into table

data = [('James Butt', '6649 N Blue Gum St', 'New Orleans', 'LA', 70116, '504-621-8927'), ('Josephine Darakjy','4 B Blue Ridge Blvd','Brighton','MI',48116,'810-292-9388

stmt = "INSERT INTO UserDataTable VALUES(?, ?, ?, ?, ?, ?)"

con.executemany(stmt, data)

con.commit()
```

In [25]:
```
# Try reading the data from Sql lite table to verify if the data got inserted

cursor = con.execute('select * from UserDataTable')
rows = cursor.fetchall()
rows
```

Out[25]:
```
[('James Butt',
  '6649 N Blue Gum St',
  'New Orleans',
  'LA',
  '70116',
  '504-621-8927'),
 ('Josephine Darakjy',
  '4 B Blue Ridge Blvd',
  'Brighton',
  'MI',
  '48116',
  '810-292-9388'),
 ('Art Venere',
  '8 W Cerritos Ave␣ , #54',
  'Bridgeport',
  'NJ',
  '8014',
  '856-636-8749'),
 ('Lenna Paprocki', '639 Main St', 'Anchorage', 'AK', '99501', '907-385-4412'),
 ('Donette Foller', '34 Center St', 'Hamilton', 'OH', '45011', '513-570-1893'),
 ('Simona Morasca', '3 Mcauley Dr', 'Ashland', 'OH', '44805', '419-503-2484'),
 ('Mitsue Tollner', '7 Eads St', 'Chicago', 'IL', '60632', '773-573-6914'),
 ('Leota Dilliard',
  '7 W Jackson Blvd',
  'San␣ , Jose',
  'CA',
  '95111',
  '408-752-3500'),
 ('Sage Wieser',
  '5 Boston Ave #88',
  'Sioux ,  Falls',
  'SD',
  '57105',
  '605-414-2147'),
 ('Kris Marrier',
  '228 Runamuck Pl , #2808',
  'Baltimore',
  'MD',
  '21224',
  '410-655-8723')]
```

In [ ]: