MAPÚA UNIVERSITY
SCHOOL OF ELECTRICAL, ELECTRONICS, AND COMPUTER ENGINEERING

Lab 6: Web Scraping and Data Visualization

CPE106L (Software Design Laboratory)

Hannah Mae Antaran

Darrel Tristan Virtusio

Kathleen Joy Tupas

Group: 01

Section: E01

PreLab

Readings, Insights and Reflection

SysNucleus. (2018). WebHarvy Web Scraper. Retrieved August 06, 2020, from https://www.webharvy.com/articles/what-is-web-scraping.html.

Web scraping, also known as Screen Scraping, Web Data Extraction or Web Harvesting, is a process of extracting large data from websites and saving it in computer or a database with formats such CSV. Web scraping allows analyzing, retrieving, and using data in any way the user wants as it simplifies and speeds up obtaining data. For some websites, data can only be viewed and cannot be copied. With web scraping, these kinds of data are still obtained as it extracts data by just a click of a button and can be saved in one's computer. Web scraping has two methods where it can be done using software or writing code. Through web scraping software, data can be saved automatically in one's computer or can be run through Cloud via browsers. Examples of web scraping software are OutWit Hub and WaveHarby. For Cloud web scraping, an example is Mozenda. In writing a code for web scraping, custom data extractions are built to obtain data.

Every brand wants to have a clean and positive online sentiment to improve the chances that customers will choose to purchase their solution instead of their competitors. Web scraping can be used to monitor forums, reviews on e-commerce websites and social media channels for mentions of a brand name to better understand the current voice of the customers. This provides the opportunity to quickly identify and triage any negative comments to mitigate any damage to brand awareness or affinity.

Data Visualization: What it is and why we use it. (2020). Retrieved August 06, 2020, from https://www.microstrategy.com/us/resources/introductory-guides/data-visualization-what-it-is-and-why-we-use-it

Data visualization refers to techniques used to communicate insights from data through visual representation. Its main goal is to distill large datasets into visual graphics to allow for easy understanding of complex relationships within the data. One data visualization used in Python is Matplotlib. It can be used in multiple ways in Python, including Python scripts, the Python and iPython shells, Jupyter Notebooks. Matplotlib supports all the popular charts (lots, histograms, power spectra, bar charts, error charts, scatterplots, etc.) right out of the box. There are also extensions that can be used to create advanced visualizations like 3-Dimensional plots, etc. Another data visualization in Python is Seaborn. One useful feature of Seaborn is that it supports a plethora of advanced plots like categorical plotting (catplot), distribution plotting using kde (distplot), swarm plot, etc. right out of the box.

Companies who can gather and quickly act on their data will be more competitive in the marketplace because they can make informed decisions sooner than the competition. Speed is key, and data visualization aides in the understanding of vast quantities of data by applying visual representations to the data. This visualization layer typically sits on top of a data warehouse or data lake and allows users to discover and explore data in a self-service manner. Not only does this spur creativity, but it reduces the need for IT to allocate resources to continually build new models.

InLab

- ## Objectives

1. To explore web scraping in Python.
2. To demonstrate basic web scraping using the BeautifulSoup library.
3. To understand data visualization with matplotlib library.
4. To visualize datasets using different kinds of graphs.

- ## Tools Used

1. Visual Studio Code
2. Anaconda Prompt
3. Spyder

- ## Procedure

PART 1: Web Scraping

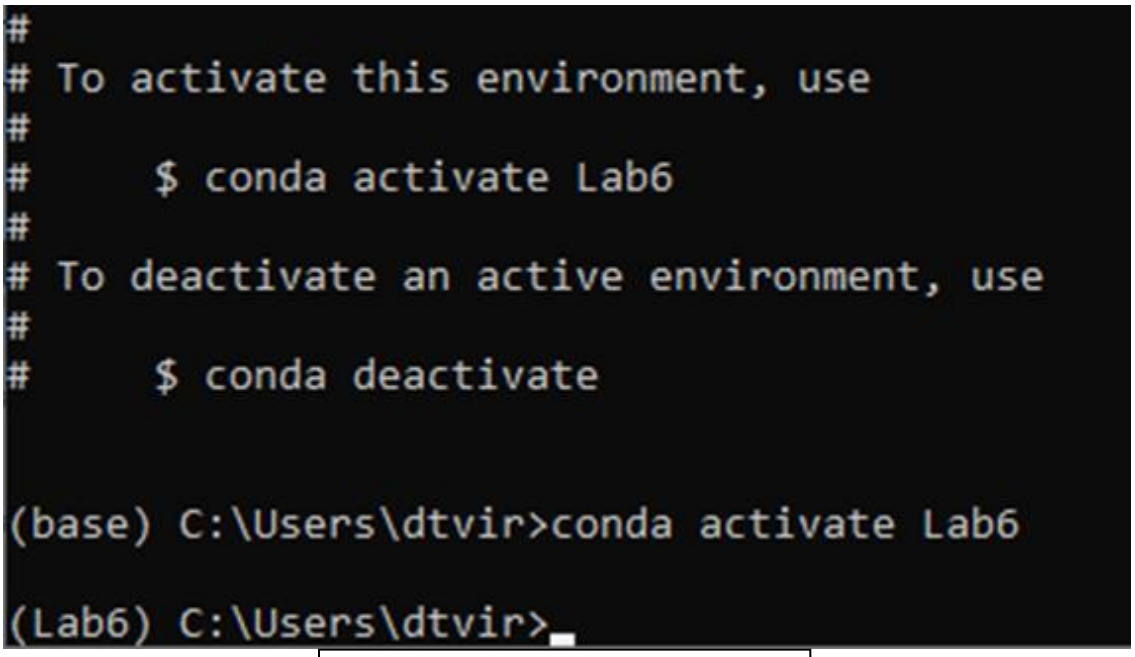


Figure 1.1 Anaconda virtual environment.

For this experiment, we used Anaconda Prompt to create a virtual environment named Lab6. We activated the environment using the command conda activate Lab6 so that we can perform the experiment on the said virtual environment.

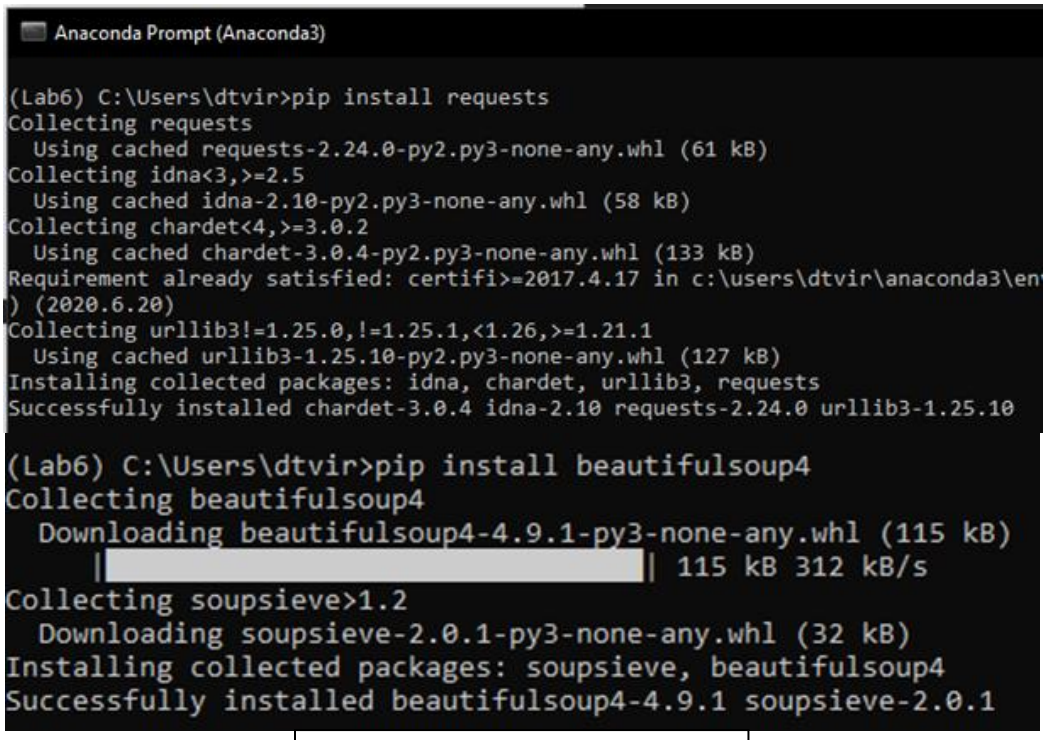


Figure 1.2 Installing required libraries.

Before proceeding to the web scraping experiment, we installed the necessary libraries first. These libraries are requests and beautifulsoup. We used the command pip install to install these libraries.

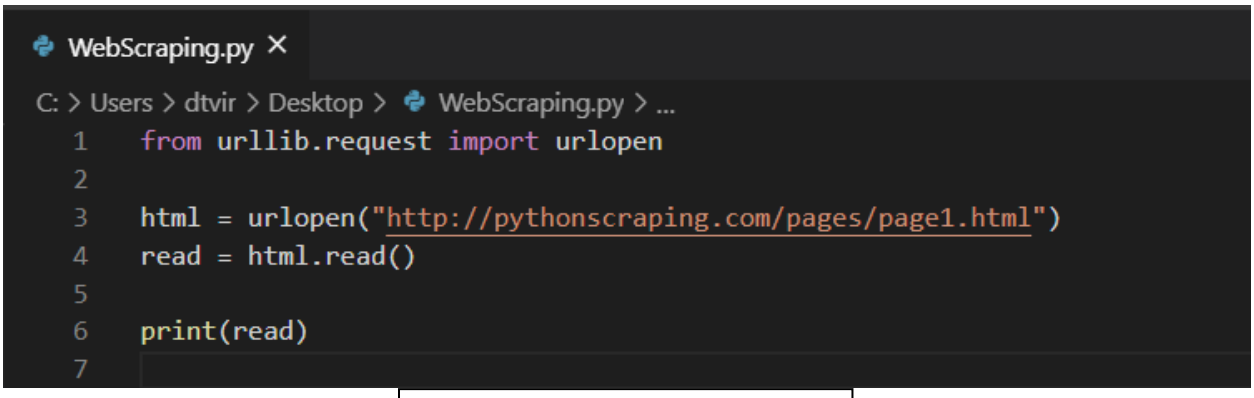


Figure 1.3 Simple Web Scraping code.

We opened VS Code in the Anaconda Prompt and then we entered these lines of codes for web scraping. It gets the data from the website: http://pythonscraping.com/pages/page1.html.

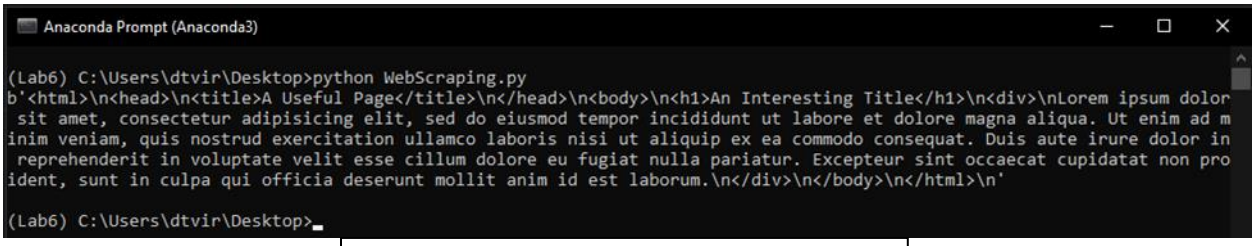


Figure 1.4 Running the Web Scraping program.

We navigated to the path where the program is saved and run it on the Anaconda Prompt. The data that can be found on the web page is printed out on the terminal.

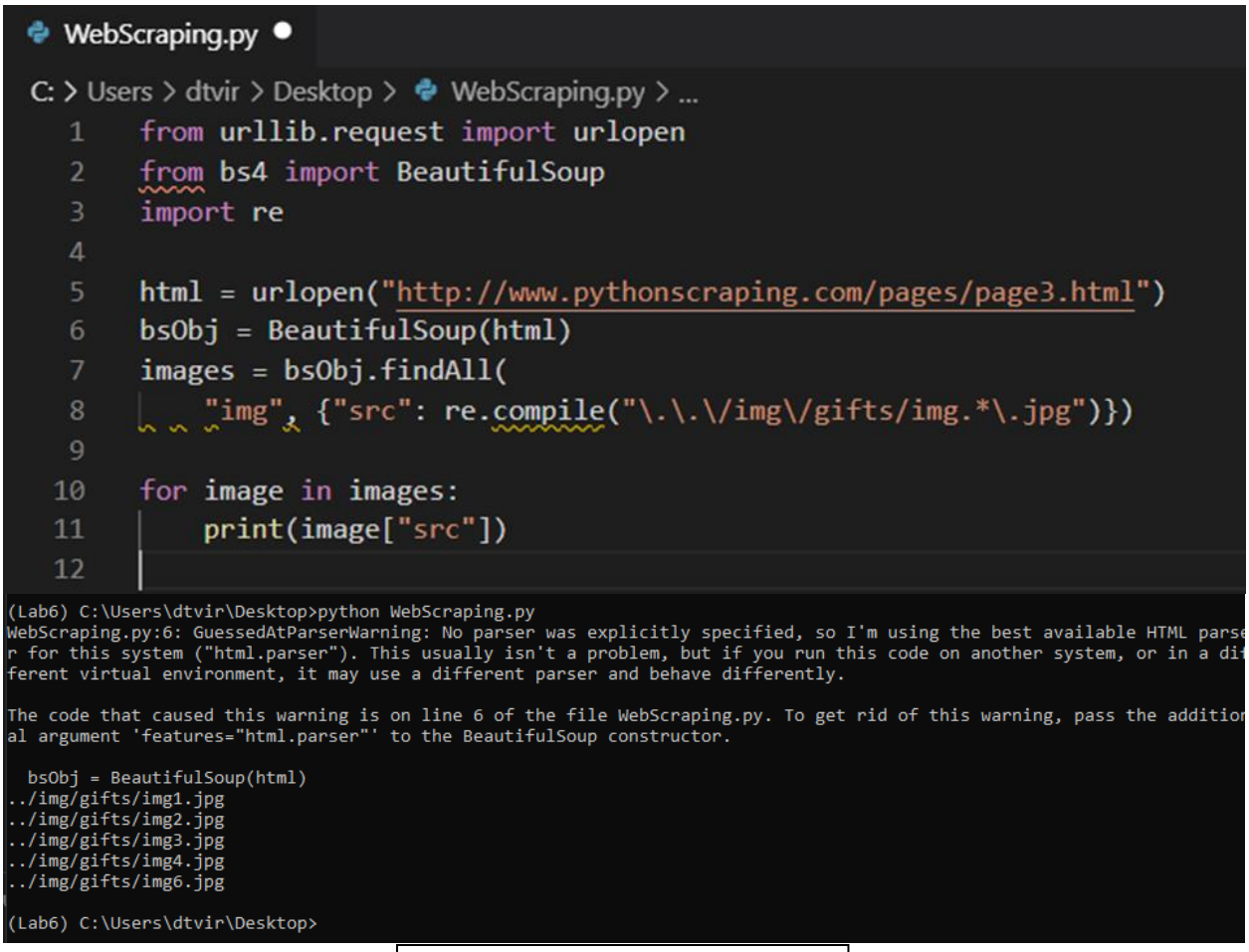


Figure 1.5 Using BeautifulSoup class.

In this web scraping code, we used BeautifulSoup to create an instance which can be used to acquire the img tag and src on a web page. The sample run of the program was provided below the code.

PART 2: Data Visualization with Matplotlib

```
Python 3.8.0 (tags/v3.8.0:fa919fd, Oct 14 2019, 19:21:23) [MSC v.1916 32 bi
Type "help", "copyright", "credits" or "license" for more information.
>>> import matplotlib as mlp
>>> import matplotlib.pyplot as plt
```

Figure 2.1 Using matplotlib in an interactive shell.

Since matplotlib is already installed in my system, I can directly import it on my shell. If matplotlib is not yet installed, it can be installed using the command pip install matplotlib.

```
C:\Users\dtvir>python
Python 3.8.0 (tags/v3.8.0:fa919fd, Oct 14 2019, 19:21:23) [M
Type "help", "copyright", "credits" or "license" for more in
>>> import matplotlib as mlp
>>> import matplotlib.pyplot as plt
>>>
>>> x = [1, 1.25, 1.50, 1.75]
>>> y = [2, 1.75, 1, 2.25]
>>>
>>> plt.plot(x, y)
[<matplotlib.lines.Line2D object at 0x0031CDF0>]
>>> plt.show
<function show at 0x0CA7EA48>
>>> plt.show()
```

Figure 2.2 Sample commands in matplotlib.

In this part, we created an array of integers named x and y. We plotted them using plt.plot() command and displayed the graph using plt.show(). The sample graph is shown below.

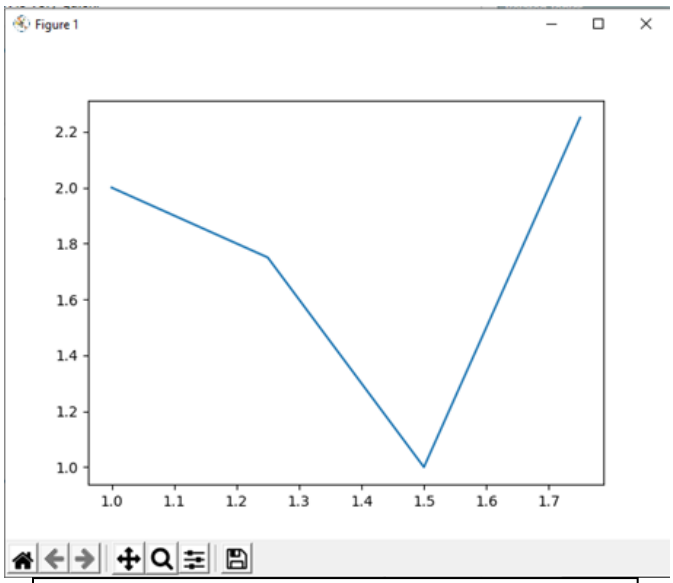


Figure 2.3 Sample run of the matplotlib commands.

```
C:\Users\dtvir>python
Python 3.8.0 (tags/v3.8.0:fa919fd, Oct 14 2019, 19:21:23) [MSC v.1916 32 b
Type "help", "copyright", "credits" or "license" for more information.
>>> import matplotlib as mlp
>>> import matplotlib.pyplot as plt
>>>
>>> x = [1, 1.25, 1.50, 1.75]
>>> y = [2, 1, 1.75, 1.50]
>>>
>>> plt.plot(x, y)
[<matplotlib.lines.Line2D object at 0x0069DDF0>]
>>> plt.xlabel('CPE106 Grades')
Text(0.5, 0, 'CPE106 Grades')
>>> plt.ylabel('CPE106L Grades')
Text(0, 0.5, 'CPE106L Grades')
>>> plt.show()
```

Figure 2.4 Sample commands in matplotlib.

In this part, we introduced a new command which is the plt.xlabel() and plt.ylabel(). It basically adds label on the x-axis and the y-axis of the graph. The sample run of the code is displayed below.

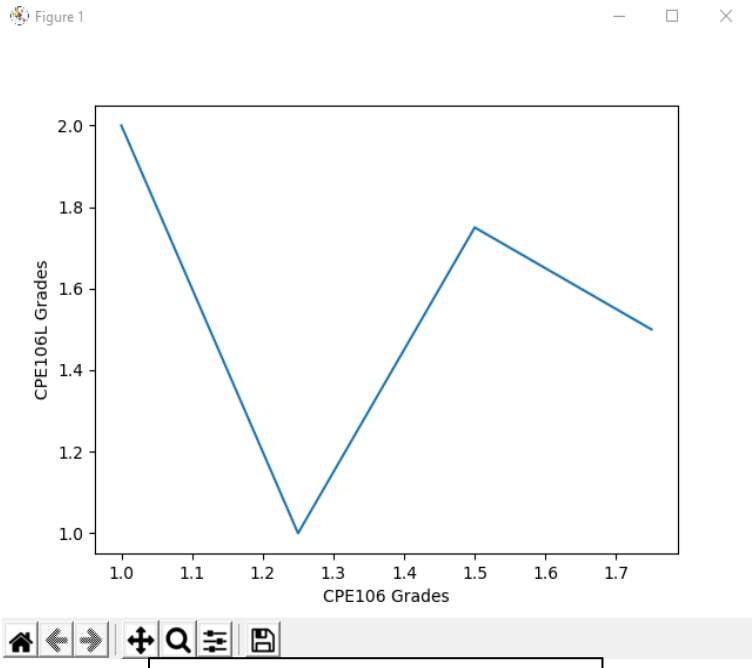


Figure 2.4 Sample run of the script.

After running the created API, we obtain the CSV file of the top posts on the subreddit and we successfully used the Reddit API to scrape the data.

```
>>> plt.plot(x, y, ':r')
[<matplotlib.lines.Line2D object at 0x110F3CD0>]
>>> plt.show()
```

Figure 2.5 Sample commands in matplotlib.

We used the same commands in Figure 4 and added a new parameter in the plt.plot() command. The third parameter controls how the graph will look like. There are several options and it can be found in the matplotlib documentation. For this example, we used ':r' as the third parameter and it means dotted lines and in color red. The sample run is displayed below.

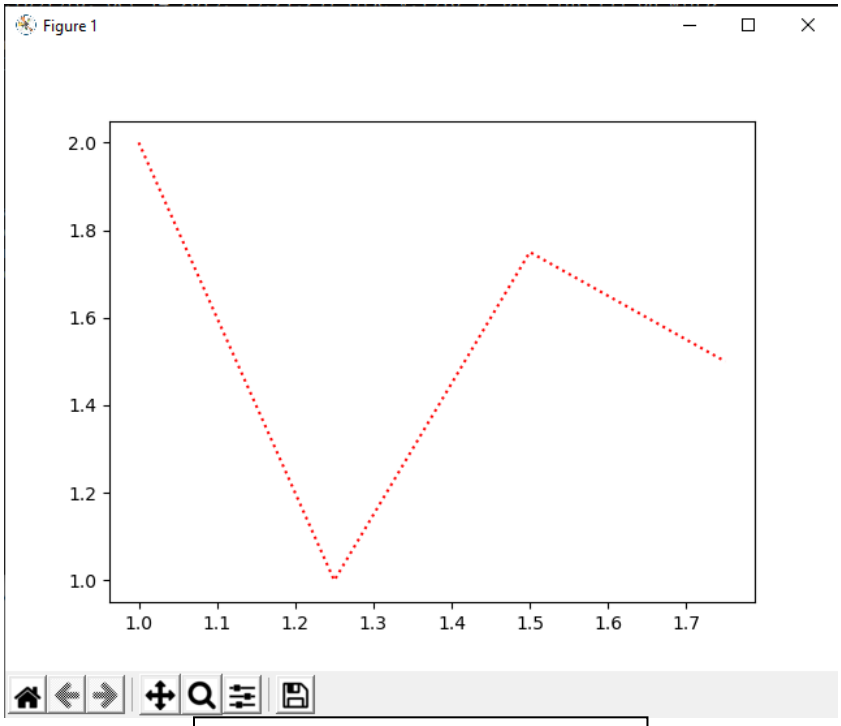


Figure 2.6 Sample run of the script.

After running the created API, we obtain the CSV file of the top posts on the subreddit and we successfully used the Reddit API to scrape the data.

visual.py

C: > Users > dtvir > Desktop > visual.py > ...

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


# Load CSV and columns
df = pd.read_csv("train_data.csv")

Y = df['ApplicantIncome']
X = df['CoapplicantIncome']


# Split the data into training/testing sets
X_train = X[:-250]
X_test = X[-250:]

# Split the targets into training/testing sets
Y_train = Y[:-250]
Y_test = Y[-250:]


# Plot outputs
fig = plt.gcf()
fig.canvas.set_window_title("Loan Prediction")
plt.scatter(X_test, Y_test,  color='red')
plt.title('Loan Prediction')
plt.xlabel('CoapplicantIncome')
plt.ylabel('ApplicantIncome')
plt.xticks(())
plt.yticks(())

plt.show()
```

Figure 2.7 Sample python script using matplotlib.

This is an example of python script that utilizes matplotlib. It uses several other libraries such as pandas and numpy. We used pandas to read into the dataset named train_data.csv. In this script, we will used matplotlib to graph the applicant income and the co-applicant income in the dataset. It sets the window title to "Loan Prediction". It also utilizes scatter plot and set the color to red. The label of the x-axis is the co-applicant income and for the y-axis, the label is applicant income. The sample run of the code is displayed below.

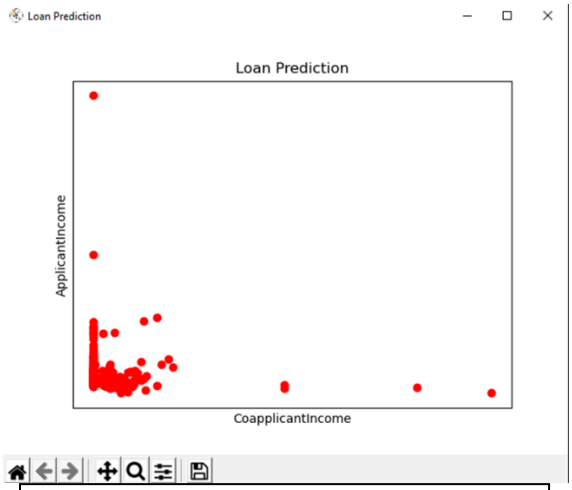
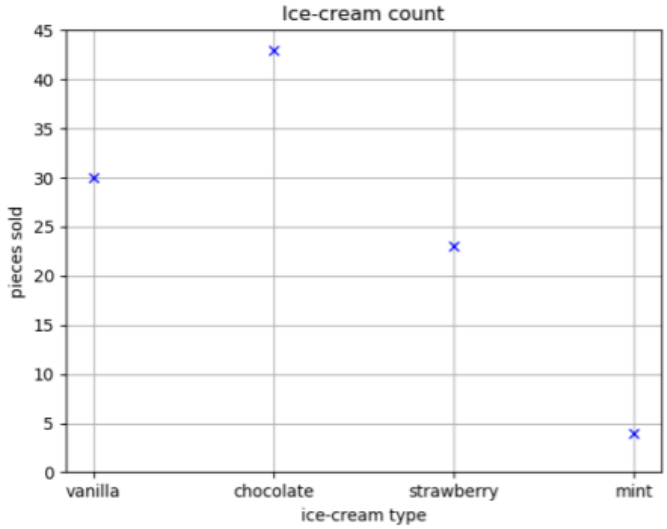


Figure 2.8 Sample run of the python script.

Postlab

Practice Problem 1

Produce the following picture:



untitled0.py*

```
1   import matplotlib.pyplot as plt
2
3   x_axis = ["vanilla", "chocolate", "strawberry", "mint"]
4   y_axis = [30, 43, 23, 4]
5
6   plt.scatter(x_axis, y_axis, marker = "x")
7   plt.ylim(0,45)
8   plt.grid(True)
9   plt.xlabel("ice-cream type")
10  plt.ylabel("pieces sold")
11  plt.title("Ice Cream Count")
12  plt.show()
```

Figure 3.1 Source code for problem 1.

This figure shows the source code for problem 1. As observed from the codes above, matplotlib.pyplot was used to create the following graph in the problem. The x-axis represents the ice cream flavors, vanilla, chocolate, strawberry, and mint while the y-axis represents the pieces sold for each flavor of the ice cream.

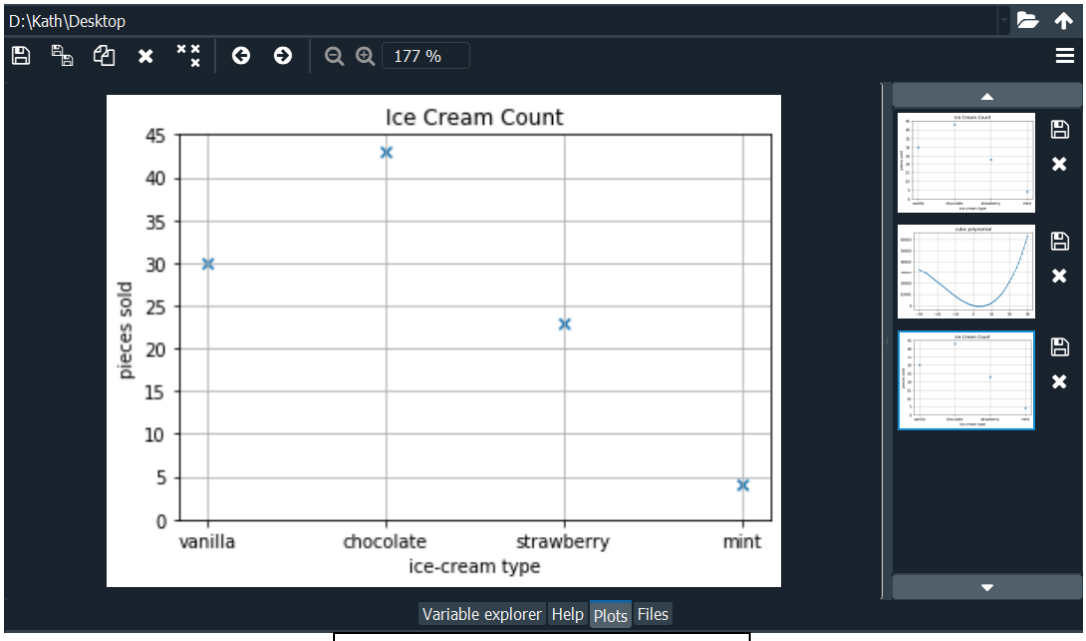


Figure 3.2 Output for problem 1.

This figure shows the output for the source code done and as observed, the group was able to accomplish the goal of providing the same graph in problem 1.

Practice Problem 2

Plot the cubic function x3 + 53 x2 -400 x + 25 from x = -30 to x = 30, in green. Include the grid and mark each value of the function for an integer argument with a point marker. Annotate the graph as 'cubic polynomial'

```
1   import matplotlib.pyplot as plt
2
3   def cubic(x):
4       return (x**3) + (53*(x**2)) - (400*x) +25
5
6   x = []
7   y = []
8
9   for i in range(-30, 31):
10      x.append(i)
11      y.append(cubic(i))
12
13  plt.plot(x, y, marker = ".")
14  plt.grid(True)
15  plt.title("cubic polynomial")
16  plt.show()
```

Figure 3.3 Source code for problem 2.

This figure shows the source code for problem 2. The def cubic module returns the value the points for the function to create the graph.

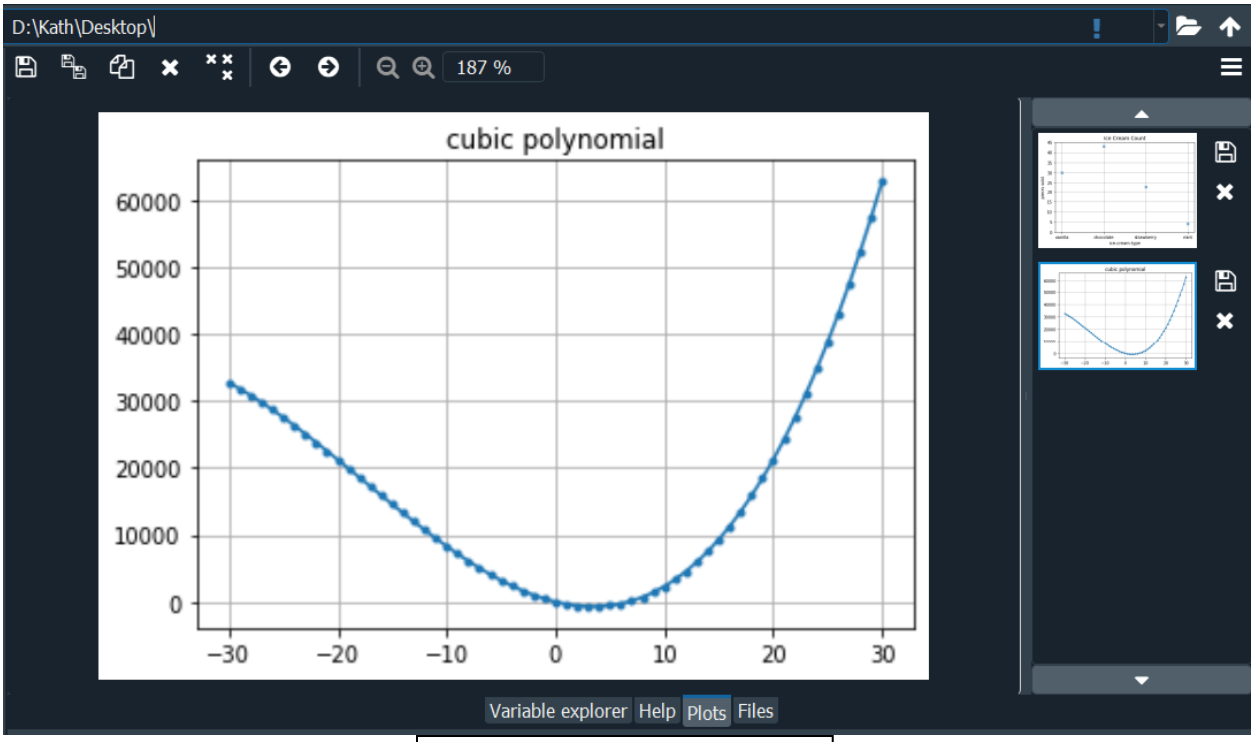


Figure 3.4 Output for problem 2.

This figure shows the output for the source code done and as observed, the group was able to accomplish the goal of providing the graph for the given function in problem 2.

Practice Problems 3-5

The data files for these problems were not provided, hence, the group was not able to solve it.

OneDrive:
Group 1: https://bit.ly/3gDtyiX

Github:
Darrel Virtusio: https://bit.ly/2C6iWu9
Hannah Antaran: https://bit.ly/3hYjP7b
Kathleen Tupas: https://bit.ly/2XE3CMS