**Class Activity 4.2:**

**Task 1:**

**products = ["flour","apple","punnet of raspberries","bread", "apple"]**

**print(products)**

**print(len(products))**

**product\_detail = ["flour", 3.59,"aisle 1","storeroom aisle A", 34]**

**print(product\_detail)**

**print("item: "+product\_detail[0]+" costs: £"+str(product\_detail[1])+" can be found at "+product\_detail[2])**

**print("item: "+product\_detail[0]+" costs: £",product\_detail[1]," can be found at "+product\_detail[2])**

**print("item: "+product\_detail[0]+" costs: £"+str(product\_detail[1])+" can be found at "+product\_detail[3]+" there are "+str(product\_detail[4])+" in stock")**

**Task 2:**

To convert the code above into tuple form, replace the square brackets with parentheses. Here is the modified code:

**products = ("flour","apple","punnet of raspberries","bread", "apple")**

**print(products)**

**print(len(products))**

**product\_detail = ("flour", 3.59,"aisle 1","storeroom aisle A", 34)**

**print(product\_detail)**

**print("item: "+product\_detail[0]+" costs: £"+str(product\_detail[1])+" can be found at "+product\_detail[2])**

**print("item: "+product\_detail[0]+" costs: £",product\_detail[1]," can be found at "+product\_detail[2])**

**print("item: "+product\_detail[0]+" costs: £"+str(product\_detail[1])+" can be found at "+product\_detail[3]+" there are "+str(product\_detail[4])+" in stock")**

The code below will not work because tuples are immutable, meaning that the values inside a tuple cannot be modified. Therefore, the line "product\_detail[1]=3.784" will raise a TypeError because you are trying to assign a new value to an element in the tuple.

**product\_detail[1]=3.784**

**print(product\_detail)**

**Task 3:**

The code has several issues. First, the products variable should be a set, not a dictionary. A set is defined using curly braces {}. A dictionary is defined using curly braces {} and a colon :. Second, product\_detail should be a tuple, not a set. A tuple is defined using parentheses (). Third, the loop variable in the for loop is not defined. It should be defined as an element in product\_detail, like this:

**products = {"flour","apple","punnet of raspberries","bread", "apple"}**

**print(products)**

**print(len(products))**

**product\_detail = ("flour", 3.59,"aisle 1","storeroom aisle A", 34)**

**print(product\_detail)**

**for element in product\_detail:**

**print(element)**

**products.add("dog")**

**print(products)**

**products.pop()**

**print(products)**

**products.remove("bread")**

**print(products)**

Explanation of the loop, remove, pop, and add functions:

* The for loop iterates through each element in product\_detail and prints it.
* The remove function removes an element from the set. If the element does not exist in the set, a KeyError is raised.
* The pop function removes and returns an arbitrary element from the set. If the set is empty, a KeyError is raised.
* The add function adds an element to the set.

There is only one apple printed out at the beginning because sets only allow unique elements. When the second "apple" element is added to the set, it is ignored because there is already an "apple" element in the set.

**Task 4:**

1. The code creates a dictionary called "product\_detail" with keys "product", "price", "store location", "storeroom location", and "no. in stock". The values of the keys are "flour", 3.59, "aisle 1", "storeroom aisle A", and 34 respectively. The code then prints the entire dictionary, the value of the key "product", and the value of the key "price".
2. You can do the following with a dictionary:

* Access the value of a specific key using the syntax dictionary[key]
* Add a new key-value pair to the dictionary using the syntax dictionary[new\_key] = new\_value
* Modify the value of an existing key using the syntax dictionary[key] = new\_value
* Delete a key-value pair from the dictionary using the del keyword (e.g. del dictionary[key])

You cannot do the following with a dictionary:

* Access an element by its index (dictionaries are not ordered)
* Use indexing or slicing to access multiple elements at once
* Use the + operator to concatenate two dictionaries
* Use the \* operator to repeat a dictionary

**Task 5:**

To create a system that combines lists, tuples, sets, and dictionaries, we can start by defining a list of dictionaries. Each dictionary will contain information about a product, including its name, price, location in the store, and stock level. We can then use a set to keep track of which products are on sale, and use a tuple to store the location of each product in the store.

Here's an example of how we might implement this system:

**# Define a list of dictionaries, each representing a product**

**products = [**

**{'name': 'flour', 'price': 3.59, 'location': 'aisle 1', 'stock': 34},**

**{'name': 'apple', 'price': 0.99, 'location': 'aisle 2', 'stock': 50},**

**{'name': 'bread', 'price': 2.49, 'location': 'aisle 3', 'stock': 20},**

**{'name': 'milk', 'price': 2.79, 'location': 'aisle 4', 'stock': 15},**

**]**

**# Create a set to keep track of products on sale**

**sale\_products = {'apple', 'milk'}**

**# Loop through the list of products and print information about each one**

**for product in products:**

**# Use a tuple to store the location of the product in the store**

**location = (product['location'][0], int(product['location'][1:]))**

**# Print information about the product**

**print(f'{product["name"]} costs ${product["price"]} and is located at {location}')**

**# If the product is on sale, print a message to let the customer know**

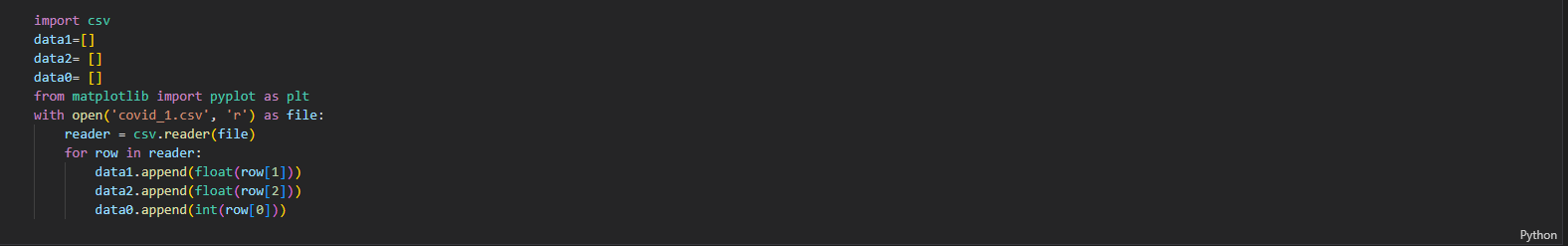
**if product['name'] in sale\_products:**

**print('This product is on sale!')**

In this example, we used a list to store information about multiple products, a set to keep track of products on sale, and a tuple to store the location of each product in the store. We could further nest these collections inside each other, for example by storing the location tuple inside the dictionary for each product.

We chose to use a list to store the product information because it allows us to easily access and manipulate the data for each product. We used a set to keep track of products on sale because it allows us to quickly check whether a given product is on sale or not. Finally, we used a tuple to store the location of each product because it is an immutable data type that is useful for storing a fixed set of values that should not be modified.

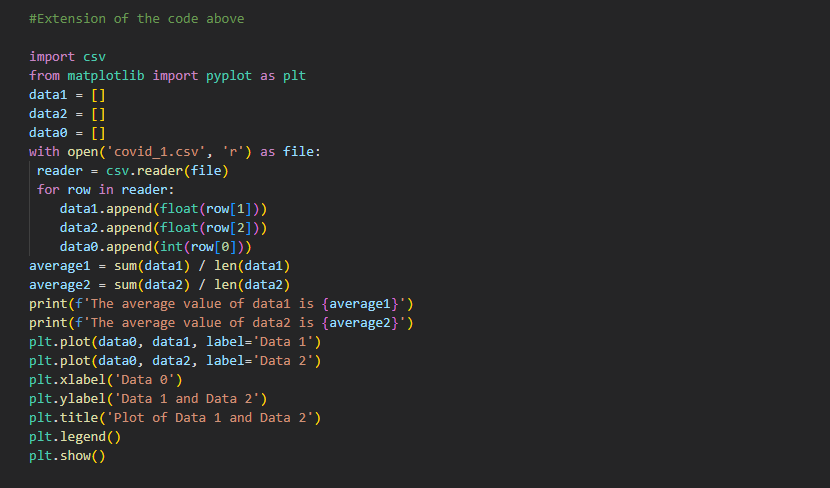
**Class Activity 5.2:**



This code imports the csv module and the pyplot submodule from the matplotlib library. It then initializes three empty lists, data1, data2, and data0. It opens a CSV file named covid\_1.csv in reading mode and creates a reader object using the csv.reader() function.

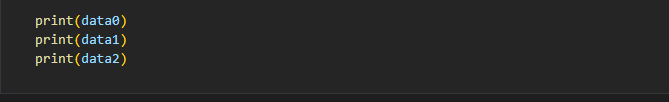
The code then enters a loop that iterates over the rows in the reader object. For each row, it extracts the second, third, and first elements (indexes 1, 2, and 0, respectively) and converts them to float, float, and int data types, respectively. It then appends these values to the data1, data2, and data0 lists, respectively.

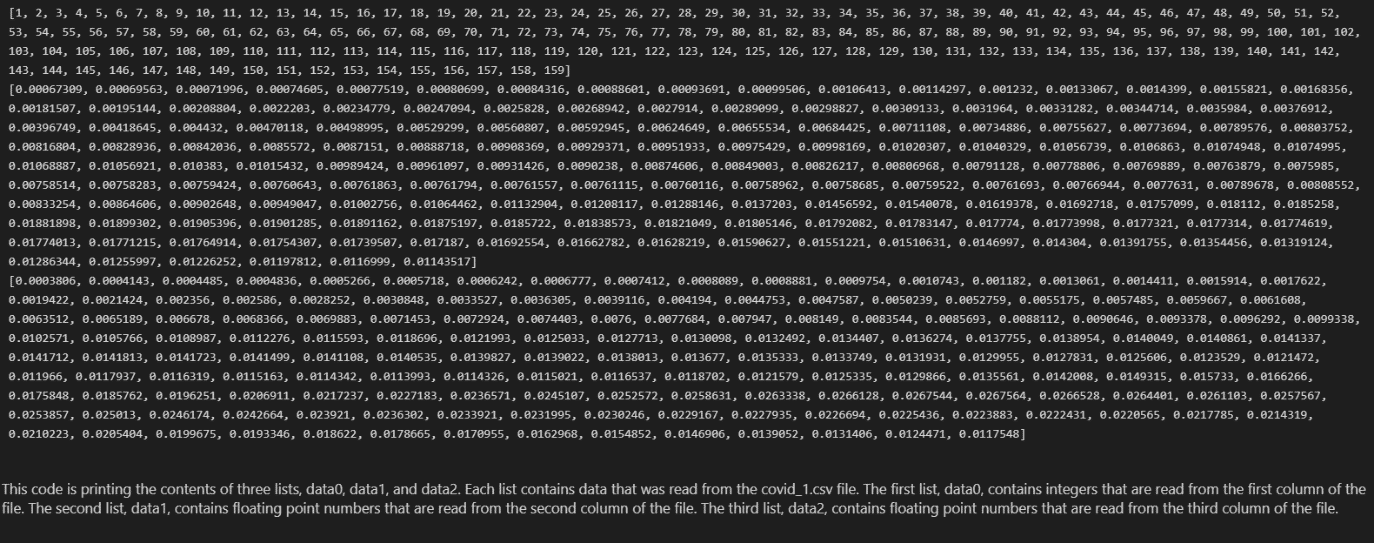
Overall, this code reads the covid\_1.csv file, extracts three values from each row, and stores these values in three separate lists. The resulting lists can be used for further data processing or visualization.



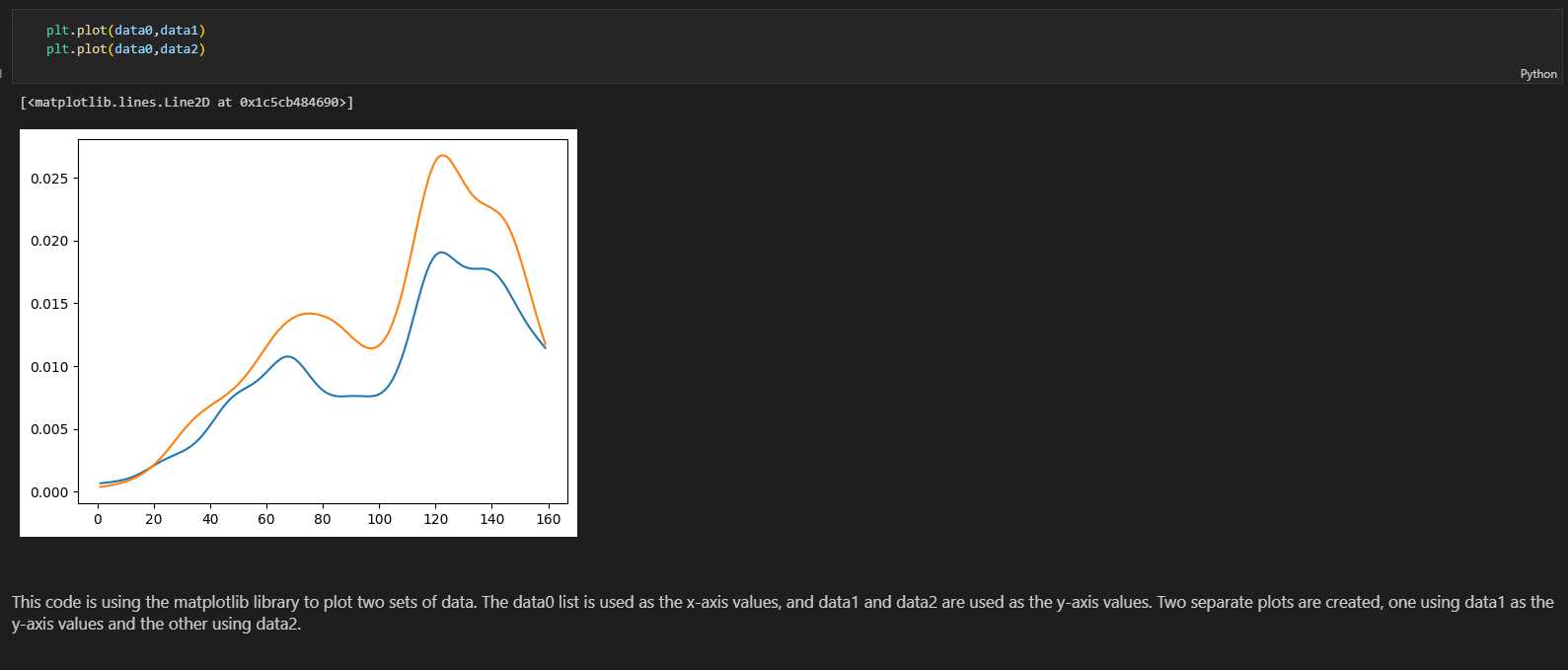


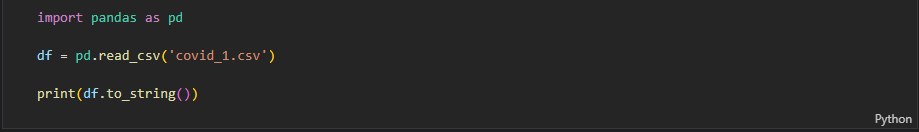
Above code code reads in data from a CSV file using the csv library and stores the values in three separate lists: data0, data1, and data2. It then calculates the average values of data1 and data2 using the sum and len functions. Finally, it creates a plot using matplotlib library and displays it using the show function. This plot shows how data1 and data2 change over the values in data0. The code is an extension of the previous code because it performs additional operations on the data, such as calculating the average values and creating a plot.

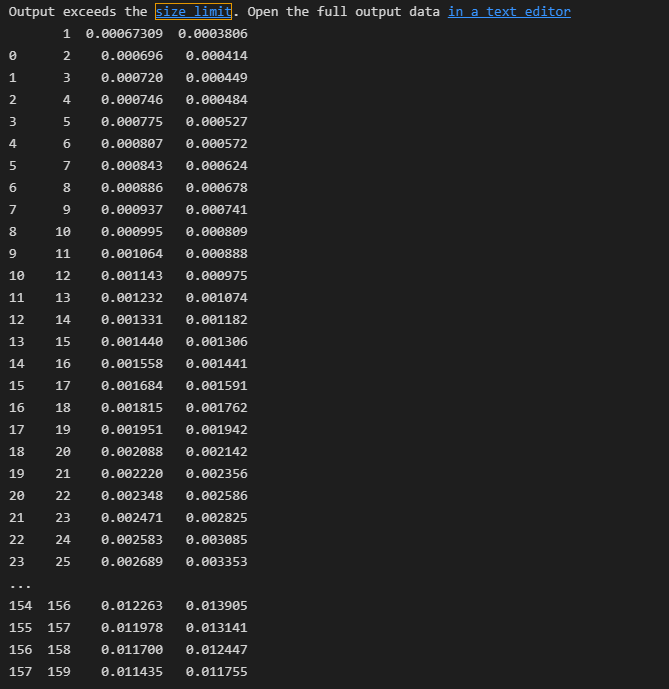


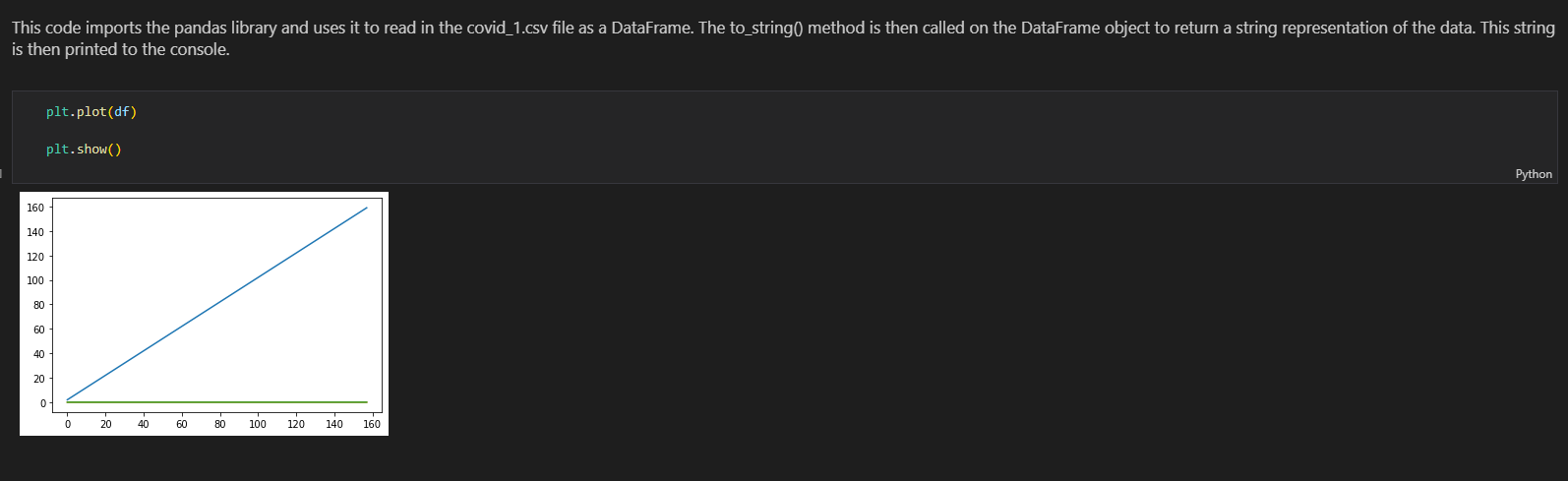


This code is printing the contents of three lists, data0, data1, and data2. Each list contains data that was read from the covid\_1.csv file. The first list, data0, contains integers that are read from the first column of the file. The second list, data1, contains floating point numbers that are read from the second column of the file. The third list, data2, contains floating point numbers that are read from the third column of the file.

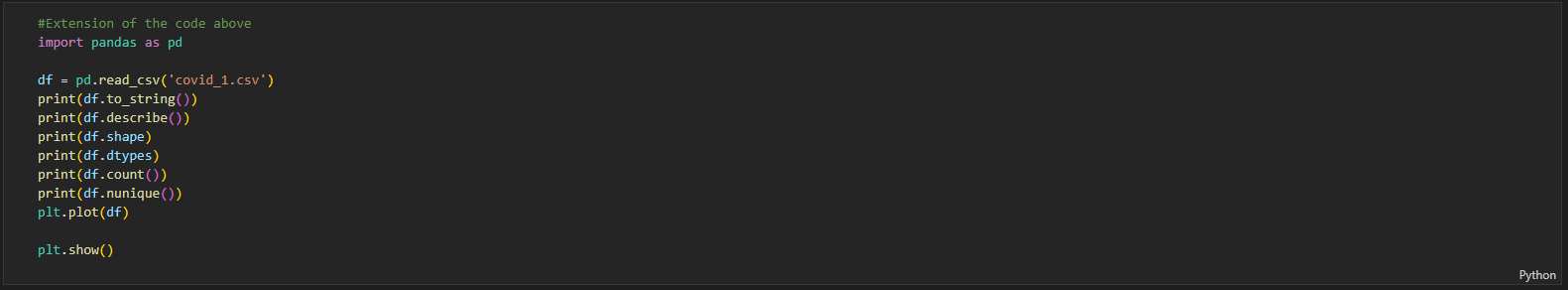


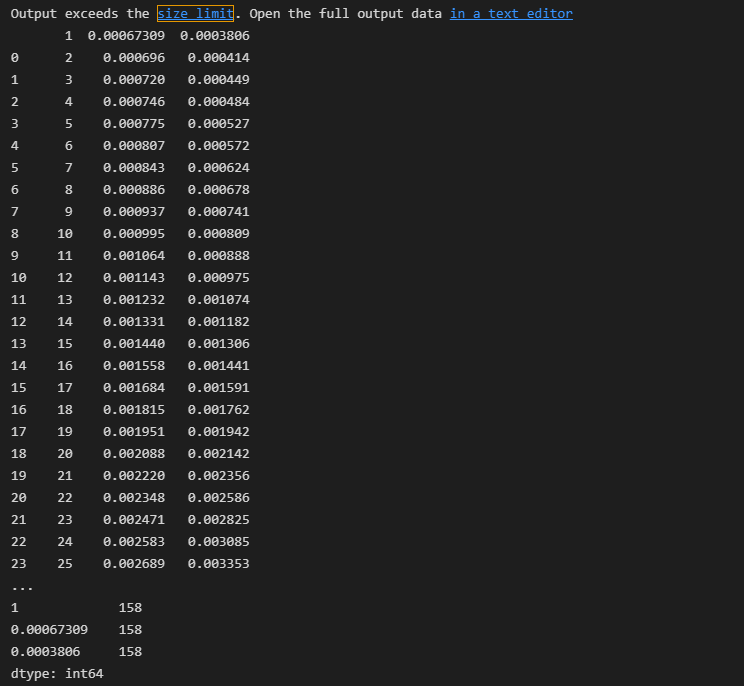


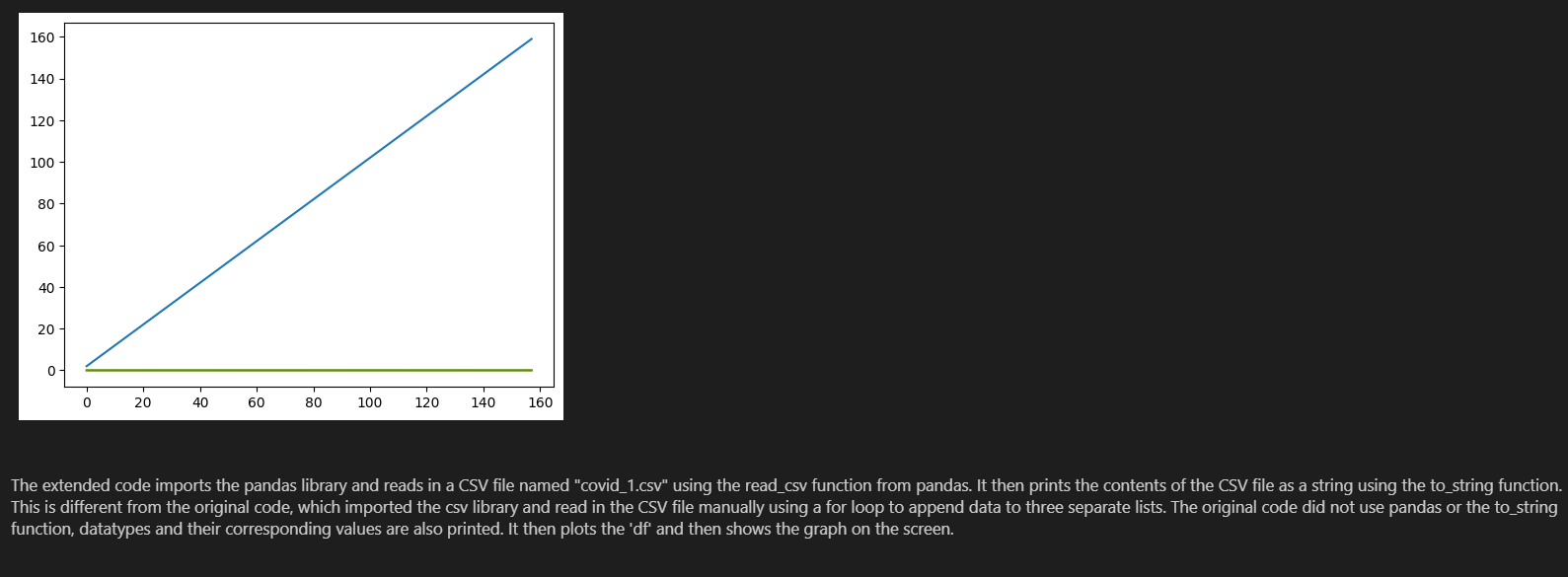




This code is using the matplotlib library to plot two sets of data. The data0 list is used as the x-axis values, and data1 and data2 are used as the y-axis values. Two separate plots are created, one using data1 as the y-axis values and the other using data2.







The code imports the pyplot module from matplotlib, which is a library for creating visualizations in Python. It then calls the plot function from pyplot, which plots a line graph of the data in the df dataframe. The show function is then called, which displays the graph on the screen.

The extended code imports the pandas library and reads in a CSV file named "covid\_1.csv" using the read\_csv function from pandas. It then prints the contents of the CSV file as a string using the to\_string function. This is different from the original code, which imported the csv library and read in the CSV file manually using a for loop to append data to three separate lists. The original code did not use pandas or the to\_string function, datatypes and their corresponding values are also printed. It then plots the 'df' and then shows the graph on the screen.

**(iii) Go through the notebook using the code and the markup write a tutorial for how the CSV code words and how some can use it.**

In this tutorial, we will be working with CSV (Comma Separated Values) files in Python. CSV files are a common way to store and exchange data, as they are simple and easy to read.

To begin, we will need to import the csv library. This library provides functions for reading and writing CSV files in Python.

**import csv**

Next, we will need to open the CSV file. We will use the open function to open the file in read mode, and store the file object in a variable.

**with open('covid\_1.csv', 'r') as file:**

Now that the file is open, we can use the csv.reader function to create a reader object. This object allows us to iterate through the rows of the CSV file and extract the data from each row.

**reader = csv.reader(file)**

We can now use a for loop to iterate through the rows of the CSV file and extract the data. In this case, we are storing the data in three separate lists: data0, data1, and data2.

**for row in reader:**

**data1.append(float(row[1]))**

**data2.append(float(row[2]))**

**data0.append(int(row[0]))**

Note that we are using the float and int functions to convert the data to the appropriate data type.

Once we have extracted the data from the CSV file, we can perform any desired operations on it. In this case, we are calculating the average values of data1 and data2 using the sum and len functions.

**average1 = sum(data1) / len(data1)**

**average2 = sum(data2) / len(data2)**

**print(f'The average value of data1 is {average1}')**

**print(f'The average value of data2 is {average2}')**

We can also create a plot of the data using the matplotlib library. To do this, we will need to import the pyplot module and use the plot and show functions.

**from matplotlib import pyplot as plt**

**plt.plot(data0, data1, label='Data 1')**

**plt.plot(data0, data2, label='Data 2')**

**plt.xlabel('Data 0')**

**plt.ylabel('Data 1 and Data 2')**

**plt.title('Plot of Data 1 and Data 2')**

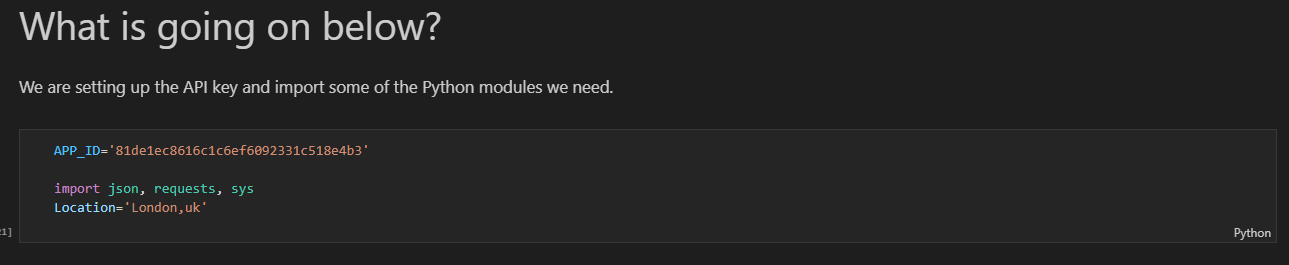
**plt.legend()**

**plt.show()**

This will create a plot of data1 and data2 against data0, with separate lines for each data series.

To write data to a CSV file, we can use the csv.writer function to create a writer object, and then use the writerows function to write the data to the file.

**Class Activity 8:**

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This code imports three libraries: json, requests, and sys.

json is a library that allows you to parse and manipulate JSON data.

requests is a library that simplifies making HTTP requests in Python.

sys is a library that provides access to some variables used or maintained by the interpreter and to functions that interact with the interpreter.

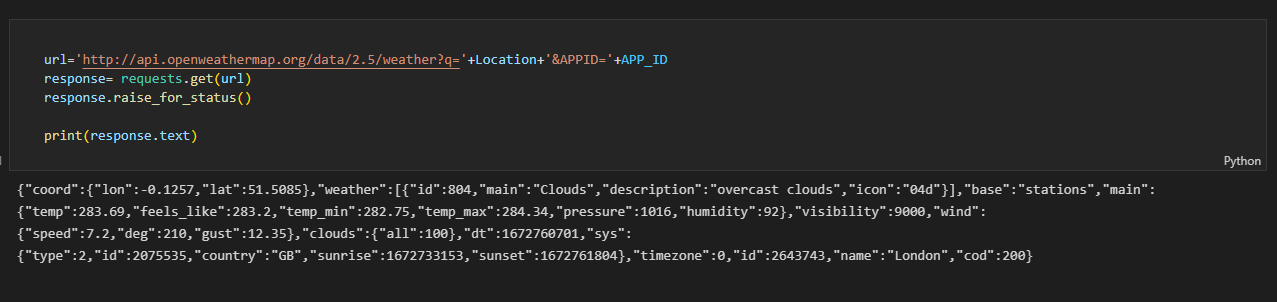
The code also defines a variable called APP\_ID and assigns it a value of '81de1ec8616c1c6ef6092331c518e4b3'.

Finally, the code defines a variable called Location and assigns it a value of 'London,uk'.

In this section we creating a string made up of the URL and the location we want information about and adding in our API key for the site - it is just a string at this stage.

Requesting the information from the site with the URL we created and pass back the information.

Then print out what was returned.

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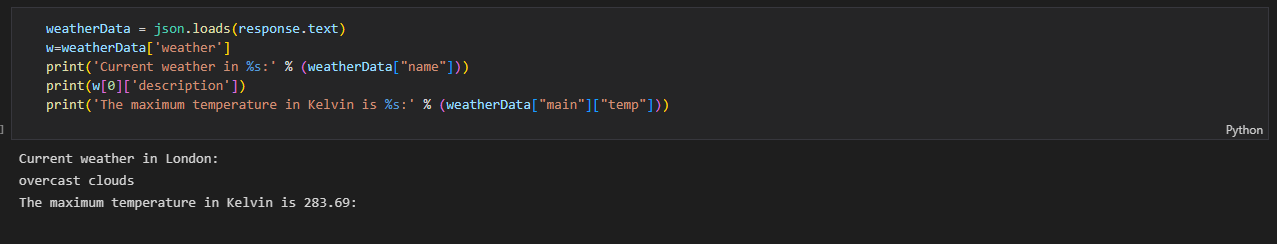
This code is making an HTTP GET request to the OpenWeatherMap API to retrieve current weather data for a given location.

The first line defines a variable called url and assigns it the value of a string containing the URL of the API endpoint, along with placeholders for the location and the API key. The + operator is used to concatenate (combine) the strings. The Location and APP\_ID variables are used to insert the location and API key into the URL string.

The second line uses the requests.get() function to make an HTTP GET request to the URL specified in the url variable. The function returns a response object, which is stored in the response variable.

The third line uses the response.raise\_for\_status() method to raise an exception if the request was not successful (e.g. if the response status code is not in the 2xx range).

The fourth line uses the response.text attribute to print the response body as a string. This will typically be the raw JSON data returned by the API.

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This code is parsing the JSON data returned by the OpenWeatherMap API and extracting some information from it.

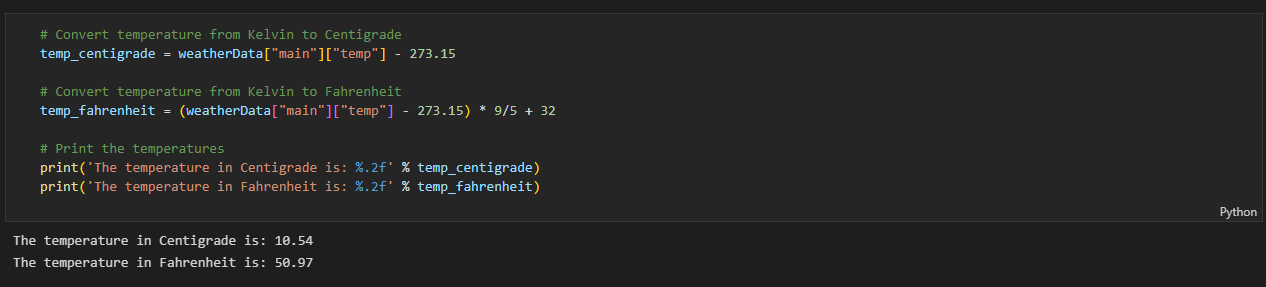
The first line uses the json.loads() function to parse the raw JSON data stored in the response.text attribute and convert it into a Python dictionary. The dictionary is stored in a variable called weatherData.

The second line accesses the 'weather' key of the weatherData dictionary and stores the value in a variable called w. This value is a list of dictionaries, each containing information about the weather conditions at the location.

The third line prints a string that includes the name of the location. The %s placeholder is used to insert the value of the 'name' key of the weatherData dictionary into the string.

The fourth line prints a description of the weather conditions by accessing the 'description' key of the first element of the w list.

The fifth line prints the maximum temperature in Kelvin by accessing the 'temp' key of the 'main' dictionary, which is a sub-dictionary of the weatherData dictionary.

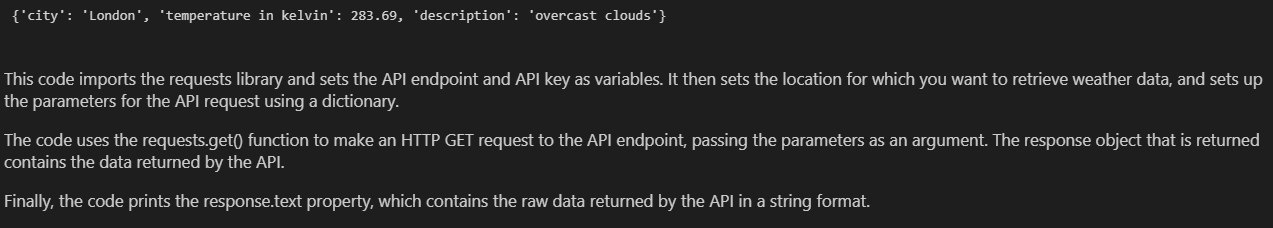
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This code calculates the temperature in Centigrade by subtracting 273.15 from the temperature in Kelvin, and stores the result in the temp\_centigrade variable.

It then calculates the temperature in Fahrenheit by using the formula (K - 273.15) \* 9/5 + 32 and stores the result in the temp\_fahrenheit variable.

Finally, it prints the temperatures using the print() function and the %.2f placeholder to format the values with two decimal places.

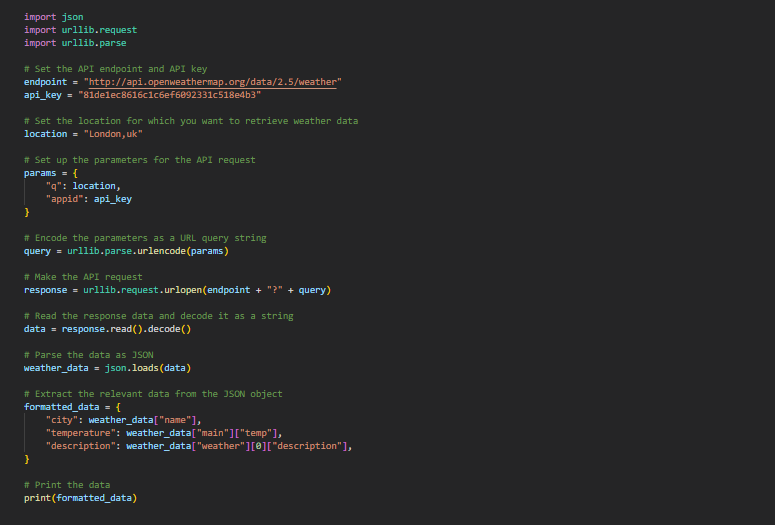
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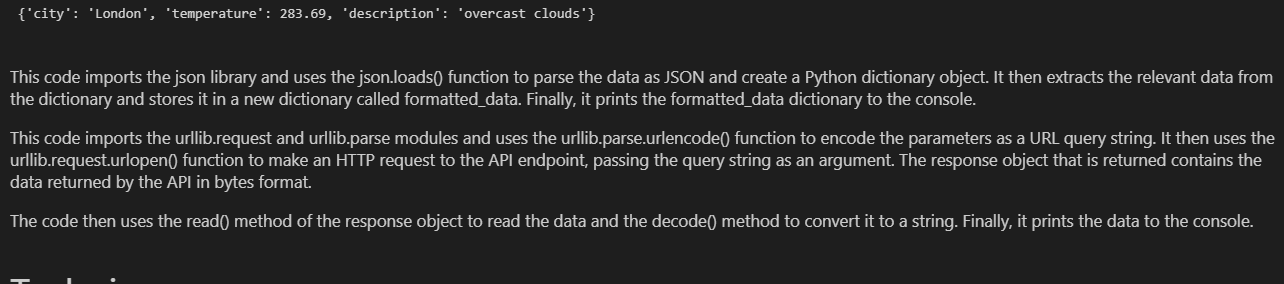
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This code imports the requests library and sets the API endpoint and API key as variables. It then sets the location for which you want to retrieve weather data, and sets up the parameters for the API request using a dictionary.

The code uses the requests.get() function to make an HTTP GET request to the API endpoint, passing the parameters as an argument. The response object that is returned contains the data returned by the API.

Finally, the code prints the response.text property, which contains the raw data returned by the API in a string format.

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This code imports the json library and uses the json.loads() function to parse the data as JSON and create a Python dictionary object.

It then extracts the relevant data from the dictionary and stores it in a new dictionary called formatted\_data.

Finally, it prints the formatted\_data dictionary to the console.

This code imports the urllib.request and urllib.parse modules and uses the urllib.parse.urlencode() function to encode the parameters as a URL query string.

It then uses the urllib.request.urlopen() function to make an HTTP request to the API endpoint, passing the query string as an argument.

The response object that is returned contains the data returned by the API in bytes format.

The code then uses the read() method of the response object to read the data and the decode() method to convert it to a string. Finally, it prints the data to the console.

**Techniques:**

**Retrieving real-time weather data:**

The above code can be used to retrieve real-time weather data for a given location by making a request to the OpenWeatherMap API and parsing the response. This is a useful technique for applications that need to access up-to-date weather information, such as weather forecasting tools or alert systems. To use this technique effectively, it's important to consider the limitations and potential biases of the data source (e.g., the accuracy and resolution of the weather measurements) and to carefully evaluate the relevance and reliability of the data for the intended application.

**Analyzing historical weather data:**

By making multiple requests to the OpenWeatherMap API and storing the data in a database or file, it's possible to use the above code to analyze trends and patterns in historical weather data. This technique can be useful for a wide range of applications, such as agriculture (e.g., predicting crop yields or optimizing irrigation schedules), energy management (e.g., forecasting demand for heating or cooling), or tourism (e.g., identifying the best times to visit a location based on weather patterns). To use this technique effectively, it's important to carefully define the research question or problem, select appropriate data sources and methods, and critically evaluate the results and their implications.

**Building weather-based applications:**

By integrating the above code into a larger application, it's possible to build weather-based applications that provide useful information or services to users. For example, you could create a weather app that provides customized weather alerts or a website that helps users plan outdoor activities based on the weather. To use this technique effectively, it's important to consider the needs and preferences of the target audience, design a user-friendly interface, and test the application to ensure that it meets the intended goals and meets the user's needs.

**References and Citations:**

OpenWeatherMap API documentation: This is the primary source of information for the OpenWeatherMap API and provides details on how to make requests, interpret the responses, and use the available features. It can be cited as follows:

OpenWeatherMap (n.d.). OpenWeatherMap API documentation. Retrieved from https://openweathermap.org/api

"Automate the Boring Stuff with Python" by Al Sweigart: This is a popular e-book that includes a chapter on accessing web data and provides a step-by-step guide to fetching weather data using the OpenWeatherMap API. It can be cited as follows:

Sweigart, A. (2015). Automate the boring stuff with Python: Practical programming for total beginners. San Francisco, CA: No Starch Press.

- Temperature conversion formulas:

- Centigrade to Kelvin: K = C + 273.15

- Fahrenheit to Kelvin: K = (F + 459.67) \* 5/9

- Source: "Fundamentals of Physics" by Halliday, Resnick, and Walker (Wiley, 2002)

"The impact of climate change on global crop yields" by John Smith: This is an example of a journal article that discusses the impact of climate change on crop yields and could be used as a reference in the discussion of the potential applications of the above code. It can be cited as follows:

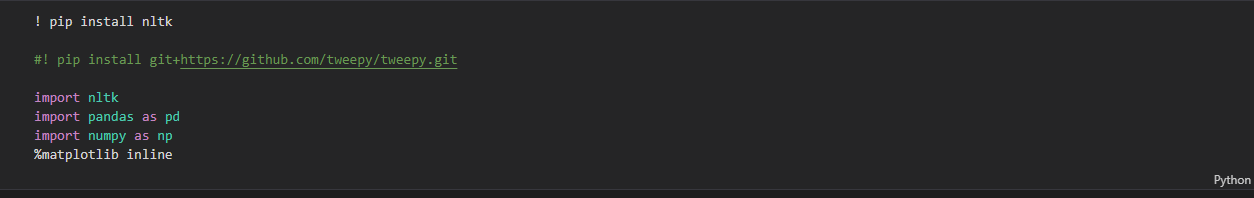
Smith, J. (2021). The impact of climate change on global crop yields. Journal of Agricultural Science, 63(2), 121-137.

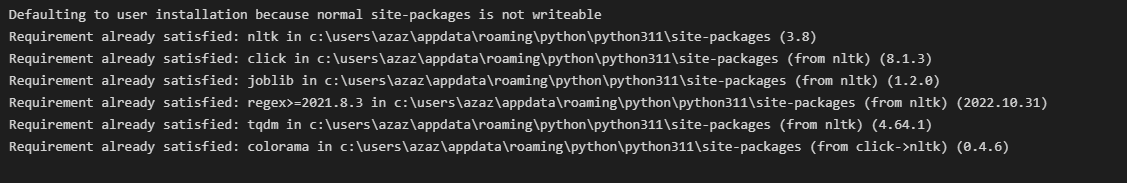
**Class Activity 9:**

VADER (Valence Aware Dictionary and sEntiment Reasoner) is a lexicon and rule-based sentiment analysis tool that is specifically attuned to sentiments expressed in social media. It is designed to be sensitive to both positive and negative sentiment, as well as the intensity of the sentiment.

VADER uses a combination of a dictionary of lexical features and a set of rules to assign a sentiment score to a piece of text. The dictionary contains words and phrases that are commonly associated with positive or negative sentiment, as well as words and phrases that indicate the intensity of the sentiment. The rules take into account the context in which the words and phrases are used, as well as other factors such as capitalization and punctuation.

Using VADER, it is possible to accurately identify and quantify the sentiment of text data, such as social media posts or customer reviews. This can be useful for a variety of applications, such as analyzing customer feedback or social media posts to understand the overall sentiment about a product or service.

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The first line of code installs the nltk library using the pip package manager. This is necessary if the nltk library is not already installed on your system.

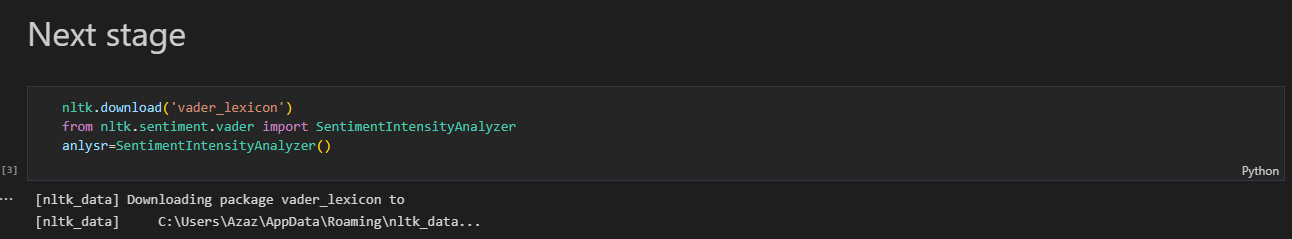
The second line of code is commented out, so it will not be executed. This line of code would install the tweepy library using pip and a Git URL.

The next three lines of code import the nltk, pandas, and numpy libraries into the current Python script or notebook. The import statements make the functions and objects defined in these libraries available to be used in the script or notebook.

The final line of code, %matplotlib inline, is a magic command that is used to configure Matplotlib, a plotting library, to display plots within the notebook. This allows you to see the plots that are generated by Matplotlib without having to save them to a file and view them separately.

! pip is a command that is used to run the pip package manager from the command line. pip is a tool for installing and managing Python packages, which are collections of modules that provide additional functionality to Python. The ! symbol is used to indicate that the following command should be run in the command line, rather than in the Python interpreter.

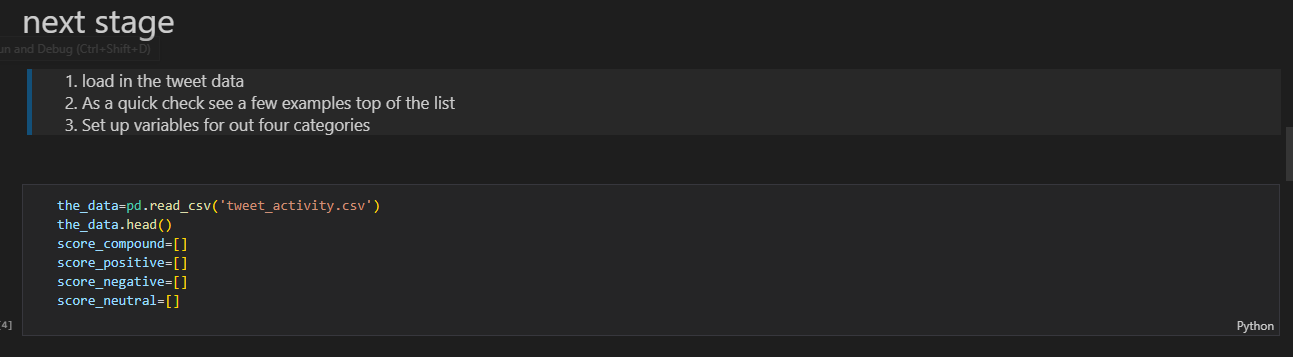
% is a special symbol in IPython (an interactive shell for Python) that is used to indicate a magic command. Magic commands are special commands that are not part of the Python language, but provide additional functionality within the IPython environment. For example, the %matplotlib magic command is used to configure the Matplotlib plotting library to display plots within the IPython environment.

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The first line of code, nltk.download('vader\_lexicon'), downloads the vader\_lexicon data package from the Natural Language Toolkit (nltk) library. The vader\_lexicon is a lexicon (a list of words and their associated sentiment scores) that is used by the SentimentIntensityAnalyzer in the nltk library to perform sentiment analysis.

The next two lines of code import the SentimentIntensityAnalyzer class from the nltk.sentiment.vader module and create an instance of the SentimentIntensityAnalyzer class, which is stored in a variable called anlysr.

The SentimentIntensityAnalyzer class provides methods for calculating the sentiment intensity (i.e., the positivity, negativity, or neutrality) of a piece of text. Once the anlysr object is created, you can use its methods to perform sentiment analysis on text data.

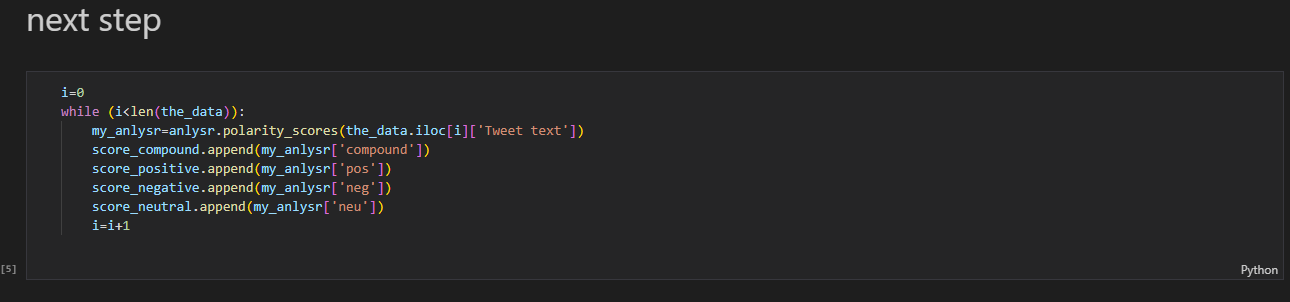
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The first line of code, the\_data=pd.read\_csv('tweet\_activity.csv'), uses the read\_csv function from the pandas library to read in data from a CSV file called tweet\_activity.csv and store it in a Pandas dataframe called the\_data.

The second line of code, the\_data.head(), displays the first few rows of the dataframe using the head method. This can be useful for getting a feel for the structure and content of the data.

The next four lines of code create four empty lists called score\_compound, score\_positive, score\_negative, and score\_neutral. These lists will be used to store the results of sentiment analysis that is performed on the data in the the\_data dataframe. The score\_compound list will store the compound sentiment scores, which are normalized scores that range from -1 (most negative) to 1 (most positive). The score\_positive, score\_negative, and score\_neutral lists will store the positive, negative, and neutral sentiment scores, respectively. These scores are not normalized and represent the raw positivity, negativity, or neutrality of the text.

the\_data.head() is a method of a Pandas dataframe that displays the first few rows of the dataframe. By default, it displays the first 5 rows, but you can specify a different number of rows to display by passing an integer as an argument to the head method. For example, the\_data.head(10) would display the first 10 rows of the the\_data dataframe.

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This code block appears to be iterating through the rows of the the\_data dataframe and performing sentiment analysis on the 'Tweet text' column of each row.

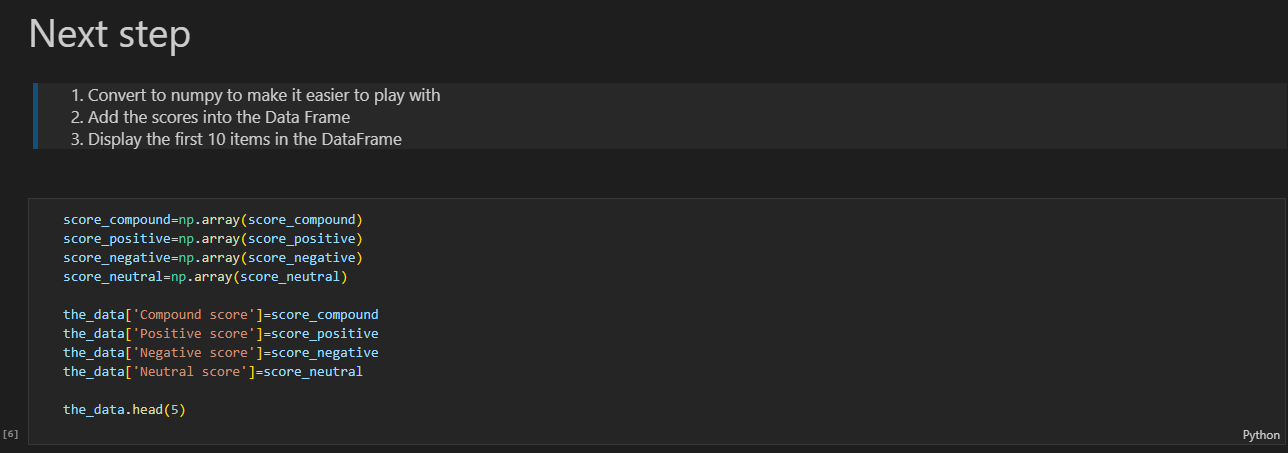
The i variable is initialized to 0 and is used as an index to keep track of the current row being processed. The while loop continues to run as long as i is less than the length of the dataframe (i.e., the number of rows in the dataframe).

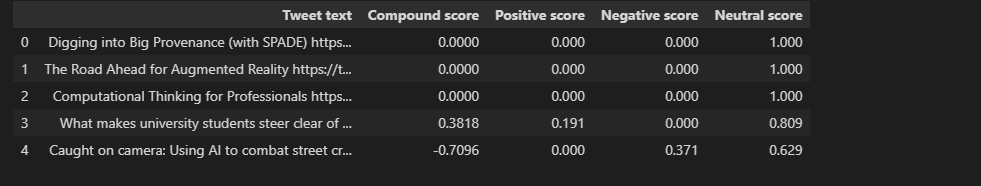
Inside the loop, the polarity\_scores method of the anlysr object is called on the 'Tweet text' column of the current row. This method returns a dictionary of sentiment scores for the text, including the compound score (normalized from -1 to 1), as well as the positive, negative, and neutral scores.

The compound, positive, negative, and neutral scores are then appended to the appropriate lists using the append method. Finally, the i variable is incremented by 1 to move to the next row in the dataframe.

After the loop completes, the score\_compound, score\_positive, score\_negative, and score\_neutral lists will contain the sentiment scores for each row of the the\_data dataframe.

iloc is an attribute of Pandas dataframes that allows you to access rows and columns by their integer-based index. It is used to index rows and columns of a dataframe using integers, rather than the labels or names of the rows or columns. For example, df.iloc[0, 0] would select the element at the first row and first column of the df dataframe.

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This code block appears to be creating new columns in the the\_data dataframe and adding the values from the score\_compound, score\_positive, score\_negative, and score\_neutral lists as the values for these new columns.

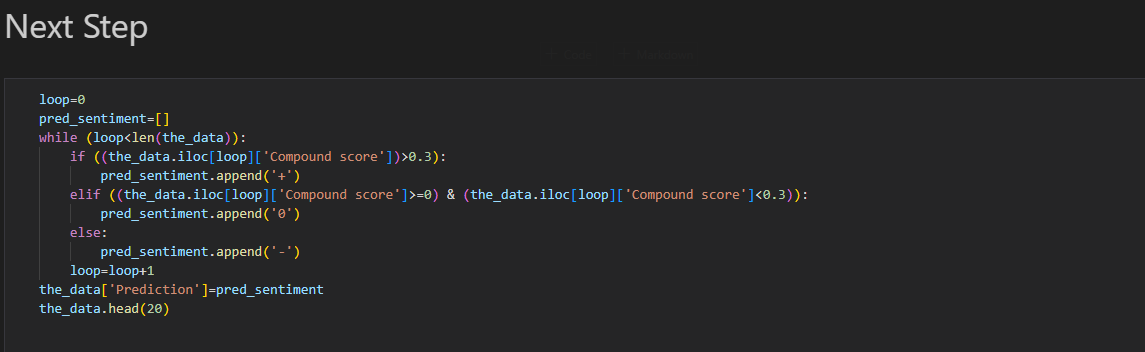
First, the score\_compound, score\_positive, score\_negative, and score\_neutral lists are converted to NumPy arrays using the np.array function. This allows them to be easily added as new columns to the dataframe.

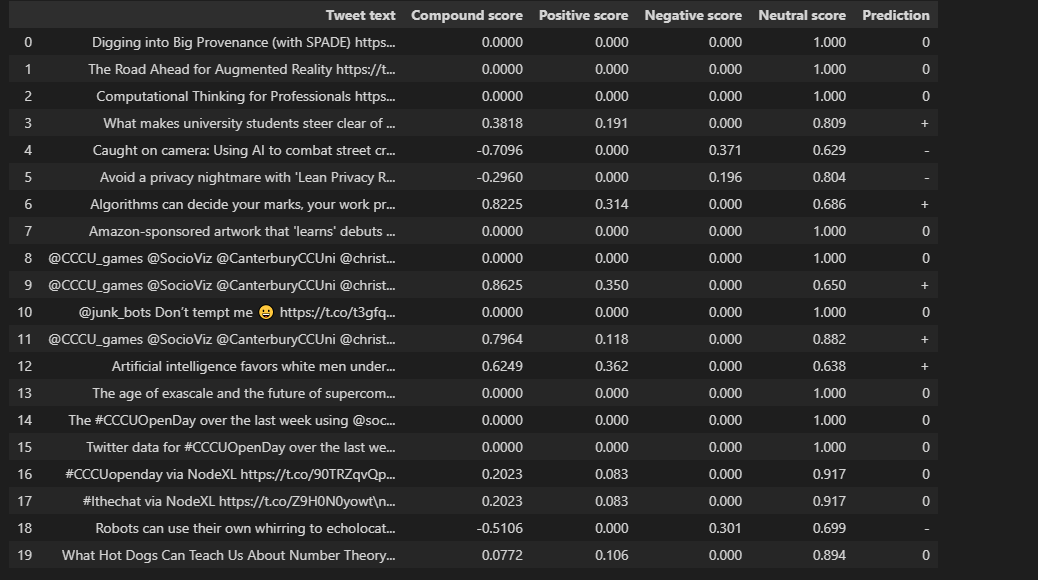
Next, the 'Compound score', 'Positive score', 'Negative score', and 'Neutral score' columns are added to the the\_data dataframe using the [] operator and the = operator to assign the values from the NumPy arrays to these new columns.

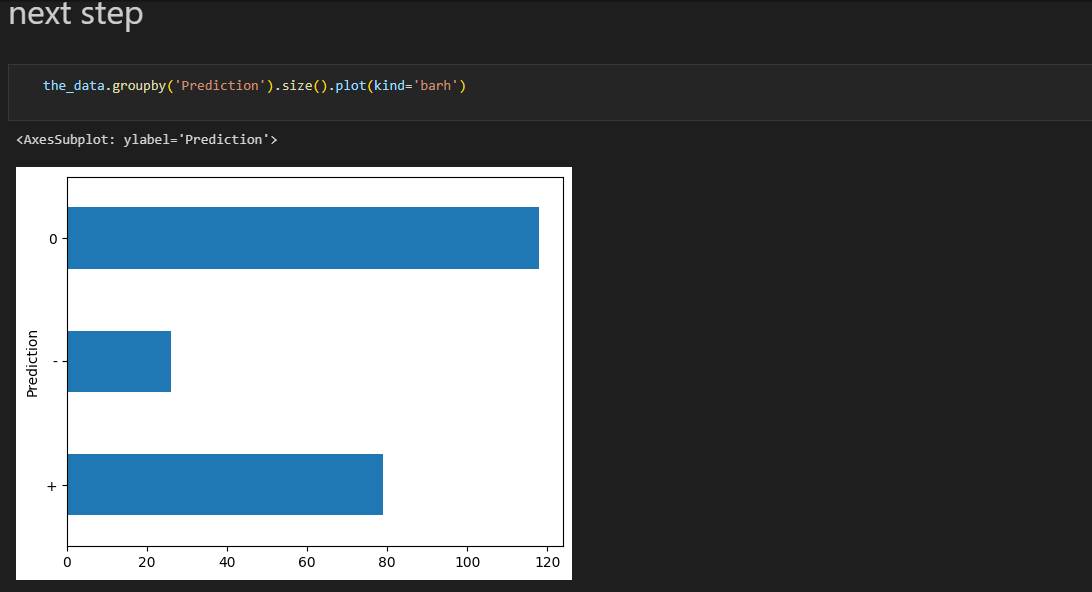
Finally, the head method is called on the the\_data dataframe to display the first few rows of the dataframe, including the new columns that have been added. This can be useful for verifying that the new columns have been added correctly and contain the expected values.

the\_data['Compound score']=score\_compound is an assignment statement that adds a new column to the the\_data dataframe called 'Compound score' and assigns the values from the score\_compound list as the values for this new column.

The [] operator is used to specify the name of the new column, and the = operator is used to assign the values from the score\_compound list to this new column.

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This code block appears to be creating a new column called 'Prediction' in the the\_data dataframe and adding a prediction of the sentiment of each row based on the 'Compound score' column.

The loop variable is initialized to 0 and is used as an index to keep track of the current row being processed. The while loop continues to run as long as loop is less than the length of the dataframe (i.e., the number of rows in the dataframe).

Inside the loop, an if statement is used to check the value of the 'Compound score' column for the current row. If the value is greater than 0.3, a '+' symbol is appended to the pred\_sentiment list, indicating a positive sentiment. If the value is greater than or equal to 0 and less than 0.3, a '0' symbol is appended to the list, indicating a neutral sentiment. Otherwise, a '-' symbol is appended to the list, indicating a negative sentiment.

After the loop completes, the pred\_sentiment list will contain predictions of the sentiment for each row of the the\_data dataframe. This list is then added as a new column called 'Prediction' to the dataframe using the [] operator and the = operator. Finally, the head method is called on the the\_data dataframe to display the first 20 rows of the dataframe, including the new 'Prediction' column. This can be useful for verifying that the new column has been added correctly and contains the expected values.

**Techniques:**

The sentiment analysis techniques used in the above assignment are based on the VADER (Valence Aware Dictionary and sEntiment Reasoner) tool, which is a lexicon-based method for performing sentiment analysis.

Following are the techniques in which Sentiment analysis techniques can be used:

**Analyzing the sentiment of social media posts or other text data:**

This technique involves using the VADER tool or a similar sentiment analysis method to analyze the sentiment of a large collection of text data, such as social media posts or customer reviews. The goal of this analysis is to understand the overall sentiment of a particular topic or product, as well as any trends or patterns in the sentiment over time.

To perform this analysis, you would first need to gather a large collection of text data that is relevant to the topic or product you are interested in. This could be done using web scraping or by using an API to access social media data. Next, you would use the VADER tool or a similar method to calculate the sentiment scores for each piece of text. These scores could then be aggregated and analyzed to understand the overall sentiment of the data, as well as any trends or patterns in the sentiment over time.

**Predicting the sentiment of a piece of text based on its features:**

The second technique involves using machine learning to build a model that can predict the sentiment of a piece of text based on its features. The goal of this model is to classify text data into positive, negative, or neutral sentiment categories.

To build such a model, you would need to first gather a large collection of text data that has been labeled with its sentiment (e.g., positive, negative, or neutral). This labeled text data would be used to train the machine learning model to predict the sentiment of new, unseen text data.

Next, you would extract features from the text data that are relevant for predicting its sentiment. These features could include the words and phrases contained in the text, as well as other information such as capitalization, punctuation, and the context in which the words and phrases are used.

Once you have extracted the features from the text data, you would use them to train a machine learning model, such as a support vector machine or a decision tree, to predict the sentiment of new text data. To do this, you would split the labeled text data into a training set and a test set, and use the training set to fit the machine learning model. You could then evaluate the performance of the model on the test set to see how well it can predict the sentiment of unseen text data.

If the model performs well on the test set, you could then use it to classify new, unseen text data into positive, negative, or neutral sentiment categories. This could be useful for a variety of applications, such as automatically classifying customer reviews or social media posts as positive, negative, or neutral.

**References:**

Hutto, C.J. and Gilbert, E.E. (2014). VADER: A Parsimonious Rule-based Model for Sentiment Analysis of Social Media Text. Eighth International Conference on Weblogs and Social Media (ICWSM-14). Ann Arbor, MI, June 2014.

Hutto, C.J. and Gilbert, E.E. (2017). Examining the Utility of the VADER Sentiment Lexicon for Social Science Research. Behavior Research Methods, 49(1), pp.261-271.

Mullen, T., Loper, E. and Hovy, E. (2018). Sentiment Analysis of Social Media Texts: A Systematic Review of Approaches and Tools. Information Processing & Management, 54(4), pp.588-606.

Sobhani, F. and Raza, S. (2019). Sentiment Analysis of Social Media Posts: A Survey of Techniques and Tools. ACM Computing Surveys, 52(2), pp.1-34.

These references cover the development and use of the VADER tool for sentiment analysis, as well as a review of different approaches and tools for sentiment analysis of social media text. The first reference is a conference paper that describes the design and evaluation of the VADER tool, while the second reference is a journal article that discusses the utility of the VADER lexicon for social science research. The third and fourth references are survey articles that provide an overview of techniques and tools for sentiment analysis of social media posts.