Matplotlib Assignment

January 8, 2024

0.0.1 Q1: What is Matplotlib? Why is it used? Name five plots that can be plotted using the Pyplot module of Matplotlib.

0.0.2 Matplotlib is a Python library used for creating static, animated, and interactive visualizations in Python 1. It can be used in Python scripts, the Python and IPython shell, web application servers, and various graphical user interface toolkits like Tkinter, awxPython, etc. Matplotlib is widely used in data science and machine learning for data visualization.

- Here are five plots that can be plotted using the Pyplot module of Matplotlib:
- Line Plot: A line plot is a way to display data along a number line. It is created by plotting points on a graph and then connecting them with straight lines.
- Histogram: A histogram is a graphical representation of the distribution of a dataset. It is created by dividing the data into intervals and plotting the number of values that fall into each interval .
- Scatter Plot: A scatter plot is a type of plot that displays values for two variables as points on a two-dimensional plane. It is created by plotting one variable against another .
- 3D Plot: A 3D plot is a way to display data in three dimensions. It is created by plotting points in a three-dimensional space .
- Image Plot: An image plot is a way to display an image in a plot. It is created by plotting the pixel values of an image .

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0.0.3 Q2: What is a scatter plot? Use the following code to generate data for x and y. Using this generated dataplot a scatter plot.

[3]:

```
import numpy as np
np.random.seed(3)
x = 3 + np.random.normal(0, 2, 50)
y = 3 + np.random.normal(0, 2, len(x))
#Note: Also add title, xlabel, and ylabel to the plot.
```

[4]:

```
x
```

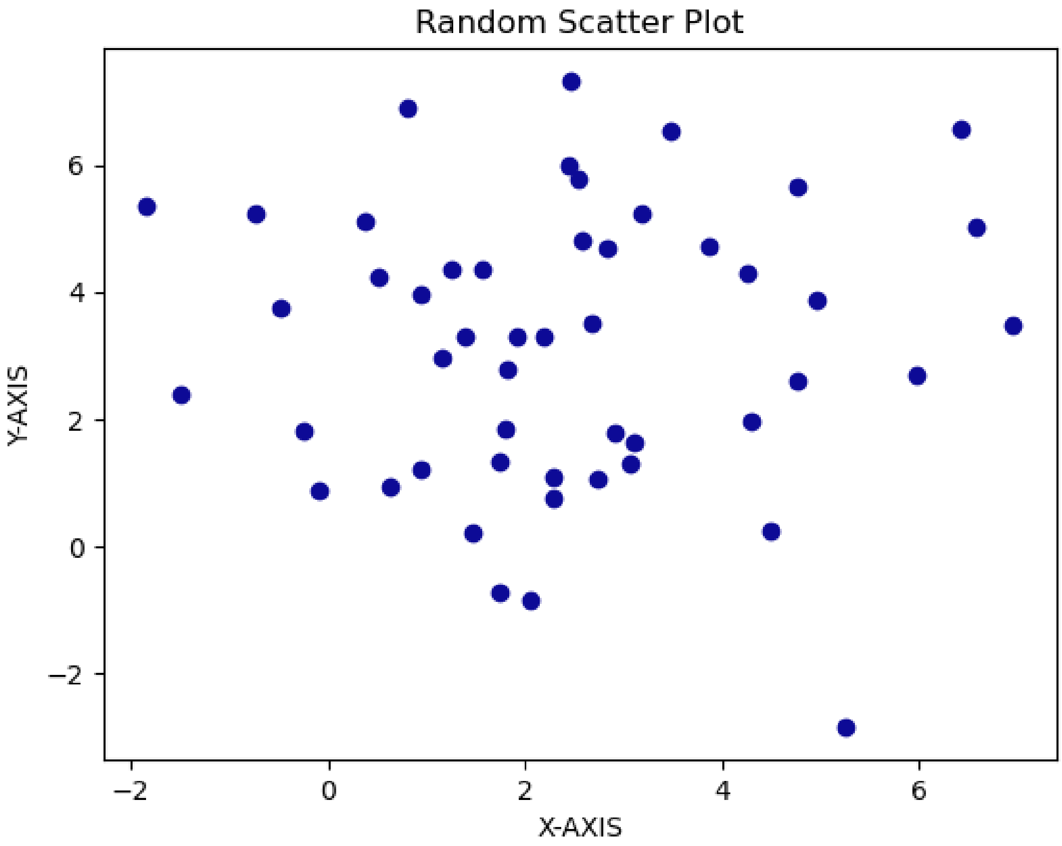
```
[4]: array([ 6.57725695,  3.8730197 ,  3.19299494, -0.72698541,  2.44522359,
             2.29048204,  2.83451704,  1.74599865,  2.91236366,  2.04556394,
             0.37227049,  4.76924476,  4.76263608,  6.41914613,  3.10006728,
             2.19064517,  1.9092801 , -0.09295463,  4.96473487,  0.79786474,
             0.62990695,  2.5887002 ,  5.97229671,  3.47343253,  0.95242972,
             1.5740136 ,  4.25048993,  2.67897327,  1.4623273 ,  2.53993856,
             4.49011253,  6.95222157,  0.51175334,  1.74716618,  1.39246781,
            -1.83816635,  1.15241596,  0.95224848,  5.24795592,  2.73617153,
            -0.24657089,  4.2933509 ,  2.28745848, -0.48628207,  1.80670072,
             1.82281124,  1.2522354 ,  3.05942763, -1.49651554,  2.46447627])
```

```
[5]: y
```

```
[5]: array([ 5.02636688,  4.70559568,  5.216375  ,  5.23878131,  5.97508626,
             0.76339863,  4.69166681, -0.72177906,  1.79422979, -0.82894409,
             5.09629502,  5.66747564,  2.60517064,  6.54929006,  1.65054498,
             3.30123373,  3.30589141,  0.87160945,  3.87589322,  6.87795692,
             0.95013825,  4.79867689,  2.6909863 ,  6.53925461,  3.9675767 ,
             4.3524328 ,  4.28632656,  3.49817341,  0.20847299,  5.78332582,
             0.25866197,  3.47712638,  4.22815418,  1.32417545,  3.29012643,
             5.33576457,  2.95179106,  1.22268516, -2.8314755 ,  1.05631899,
             1.81784252,  1.96716526,  1.08000764,  3.75459047,  1.85058316,
             2.78109133,  4.3581432 ,  1.28912566,  2.39958785,  7.31629868])
```

0.0.4 Scatter plot: A scatter plot is a type of plot that displays values for two variables as points on a two-dimensional plane. It is created by plotting one variable against another 123. Scatter plots are useful for identifying trends and patterns in data, as well as for detecting outliers.

```
[19]: import numpy as np
      import matplotlib.pyplot as plt
      np.random.seed(3)
      x = 3 + np.random.normal(0, 2, 50)
      y = 3 + np.random.normal(0, 2, len(x))
      plt.title('Random Scatter Plot')
      plt.xlabel('X-AXIS')
      plt.ylabel('Y-AXIS')
      colour=['#0d0a96']
      plt.scatter(x,y,c=colour)
      plt.show()
```



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0.0.5 Q3: Why is the subplot() function used? Draw four line plots using the subplot() function.Use the following data:

- The subplot() function in Matplotlib is used to create multiple plots in a single figure. It takes three arguments that describe the layout of the figure: the number of rows, the number of columns, and the index of the current plot

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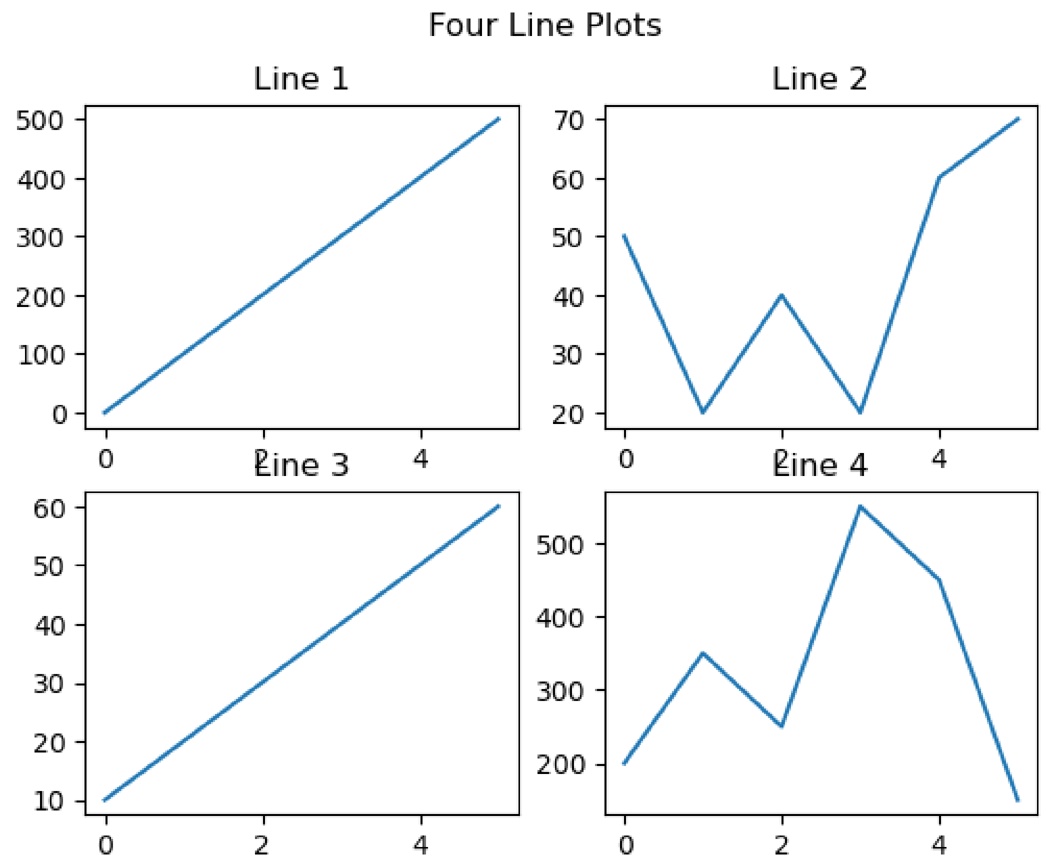
```
import numpy as np
For line 1: x = np.array([0, 1, 2, 3, 4, 5]) and y = np.array([0, 100, 200,␣
 ↪300, 400, 500])
For line 2: x = np.array([0, 1, 2, 3, 4, 5]) and y = np.array([50, 20, 40, 20,␣
 ↪60, 70])
For line 3: x = np.array([0, 1, 2, 3, 4, 5]) and y = np.array([10, 20, 30, 40,␣
 ↪50, 60])
For line 4: x = np.array([0, 1, 2, 3, 4, 5]) and y = np.array([200, 350, 250,␣
 ↪550, 450, 150])
```

[25]:

```
import matplotlib.pyplot as plt
import numpy as np

# Data for line 1
x1 = np.array([0, 1, 2, 3, 4, 5])
y1 = np.array([0, 100, 200, 300, 400, 500])

# Data for line 2
x2 = np.array([0, 1, 2, 3, 4, 5])
y2 = np.array([50, 20, 40, 20, 60, 70])

# Data for line 3
x3 = np.array([0, 1, 2, 3, 4, 5])
y3 = np.array([10, 20, 30, 40, 50, 60])

# Data for line 4
x4 = np.array([0, 1, 2, 3, 4, 5])
y4 = np.array([200, 350, 250, 550, 450, 150])

# Create a figure with four subplots
fig, axs = plt.subplots(2, 2)

# Plot line 1
axs[0, 0].plot(x1, y1)
axs[0, 0].set_title('Line 1')

# Plot line 2
axs[0, 1].plot(x2, y2)
axs[0, 1].set_title('Line 2')

# Plot line 3
axs[1, 0].plot(x3, y3)
axs[1, 0].set_title('Line 3')

# Plot line 4
axs[1, 1].plot(x4, y4)
axs[1, 1].set_title('Line 4')

# Add a title to the figure
fig.suptitle('Four Line Plots')

# Display the figure
plt.show()
```



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0.0.6 Q4: What is a bar plot? Why is it used? Using the following data plot a bar plot and a horizontal bar plot.

[26]:

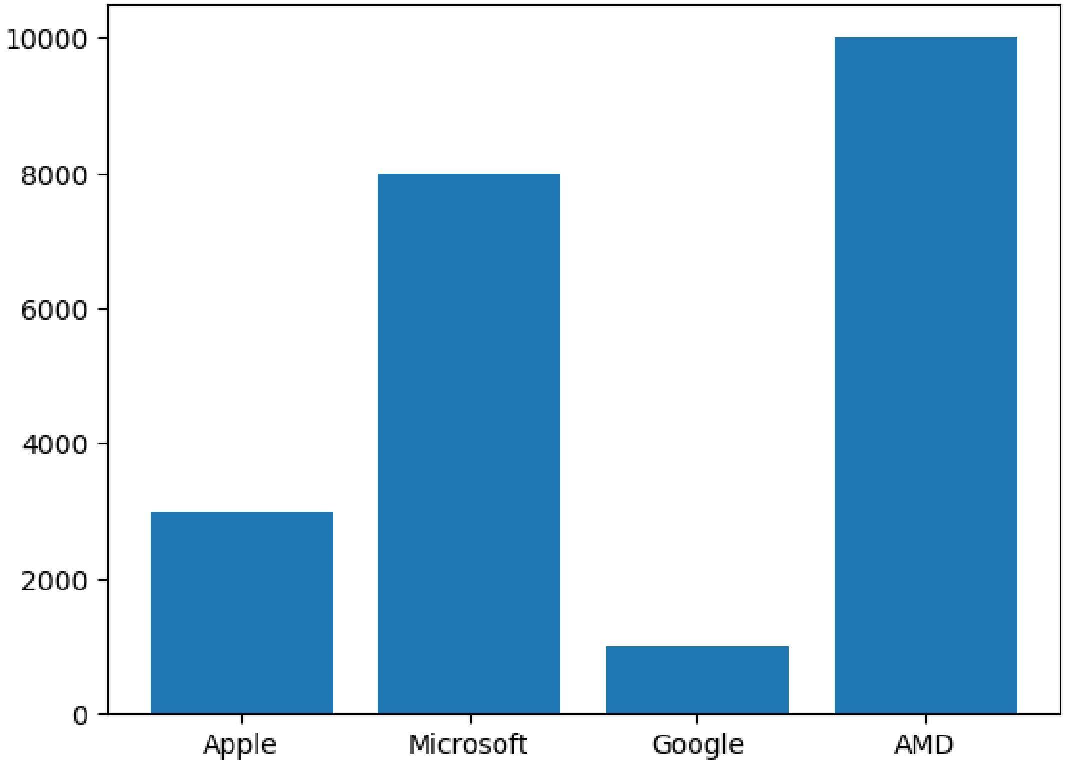
```
import numpy as np
company = np.array(["Apple", "Microsoft", "Google", "AMD"])
profit = np.array([3000, 8000, 1000, 10000])
```

0.0.7 A bar chart is a type of chart that presents categorical data with rectangular bars with heights or lengths proportional to the values that they represent . The bars can be plotted vertically or horizontally. Bar charts are used to compare different categories or to track changes over time .

- Bar charts are widely used because they are easy to understand, can show changes over time, and can compare different categories at a glance . They are effective tools for helping people visualize and comprehend large amounts of data .

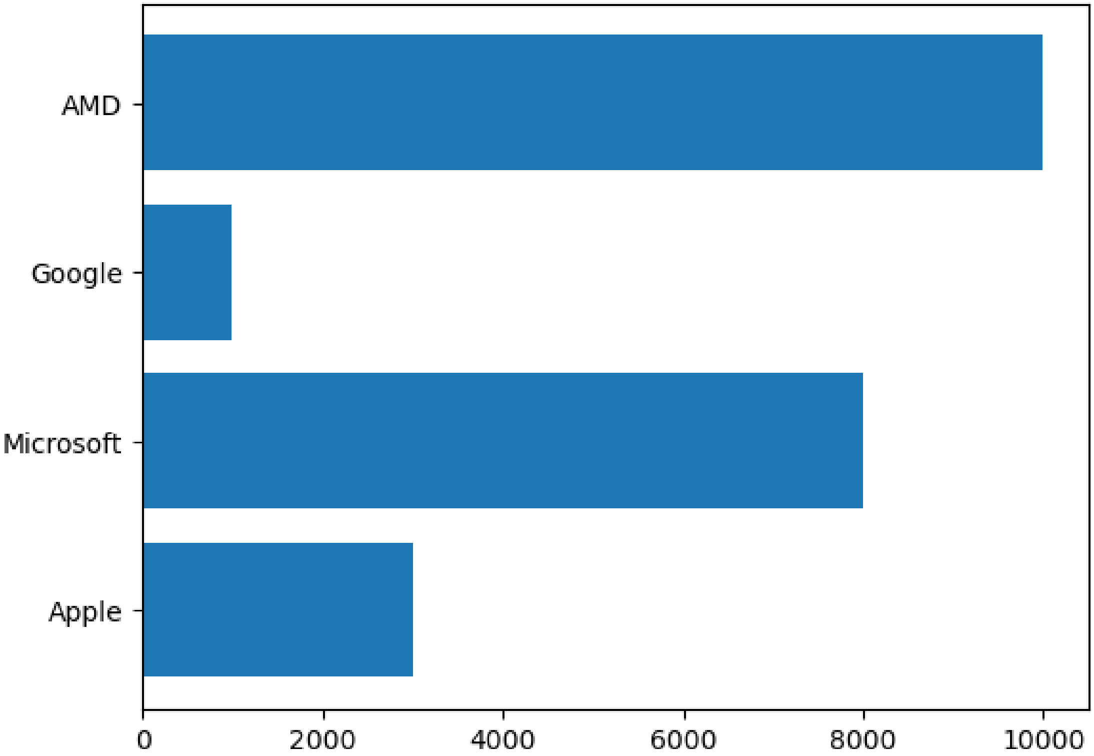
[29]:

```
import matplotlib.pyplot as plt
import numpy as np

# Data for the bar chart
company = np.array(["Apple", "Microsoft", "Google", "AMD"])
profit = np.array([3000, 8000, 1000, 10000])

# Add labels and title
ax.set_xlabel('Company')
ax.set_ylabel('Profit')
ax.set_title('Company Profits')

# Display the chart
plt.bar(company,profit)
plt.show()
```



[30]:

```
# Display the horizontal chart
plt.barh(company,profit)
plt.show()
```



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0.0.8 Q5: What is a box plot? Why is it used? Using the following data plot a box plot.

[31]:

```
box1 = np.random.normal(100, 10, 200)
box2 = np.random.normal(90, 20, 200)
```

0.0.9 A box plot is a type of chart that displays the distribution of a dataset through its quartiles. It is a standardized way of displaying the dataset based on the five-number summary: the minimum, the maximum, the sample median, and the first and third quartiles . Box plots are useful for identifying outliers, comparing distributions, and detecting skewness .

[33]:

```
import matplotlib.pyplot as plt
import numpy as np

# Data for box plot 1
box1 = np.random.normal(100, 10, 200)

# Data for box plot 2
box2 = np.random.normal(90, 20, 200)
```

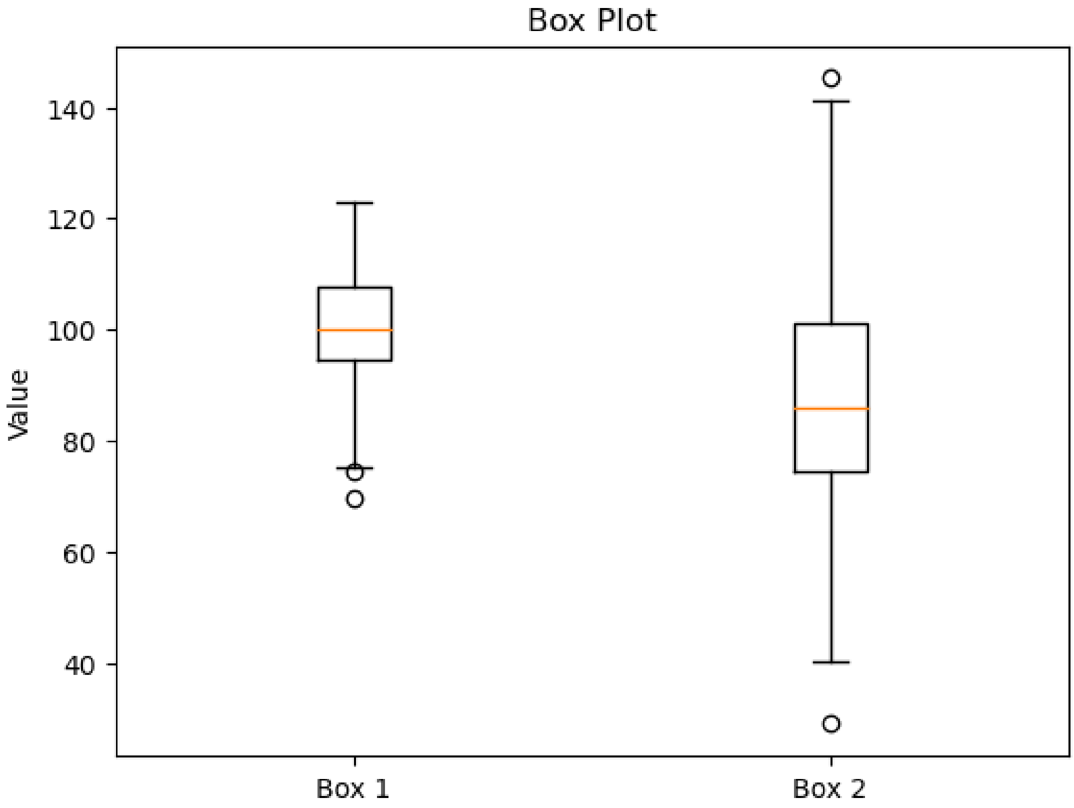
```
# Combine the data into a list
data = [box1, box2]

# Create a figure and axis object
fig, ax = plt.subplots()

# Create a box plot
ax.boxplot(data)

# Add labels and title
ax.set_xticklabels(['Box 1', 'Box 2'])
ax.set_ylabel('Value')
ax.set_title('Box Plot')

# Display the chart
plt.show()
```



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