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# Graph Plotting in Python | Set 1

This series will introduce you to graphing in python with Matplotlib, which is arguably the most popular graphing and data visualization library for Python.

**Installation**

Easiest way to install matplotlib is to use pip. Type following command in terminal:

```
pip install matplotlib
```

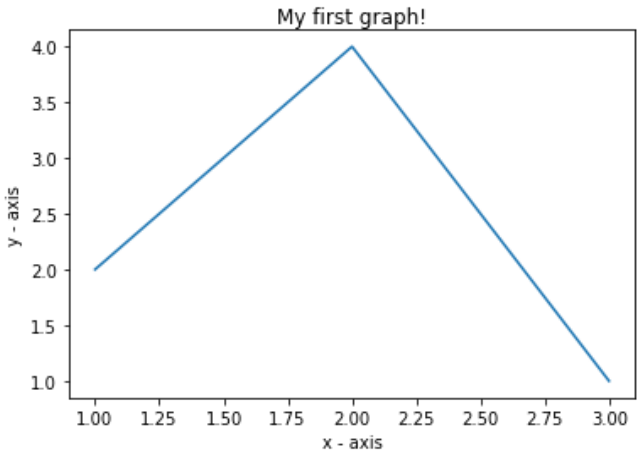
OR, you can download it from here and install it manually.

**Getting started ( Plotting a line)**

```
# importing the required module
import matplotlib.pyplot as plt

# x axis values
x = [1,2,3]
# corresponding y axis values
y = [2,4,1]

# plotting the points
plt.plot(x, y)

# naming the x axis
plt.xlabel('x - axis')
# naming the y axis
plt.ylabel('y - axis')

# giving a title to my graph
plt.title('My first graph!')

# function to show the plot
plt.show()
```

Run on IDE

Output:




The code seems self explanatory. Following steps were followed:

- Define the x-axis and corresponding y-axis values as lists.
- Plot them on canvas using **.plot()** function.
- Give a name to x-axis and y-axis using **.xlabel()** and **.ylabel()** functions.
- Give a title to your plot using **.title()** function.
- Finally, to view your plot, we use **.show()** function.

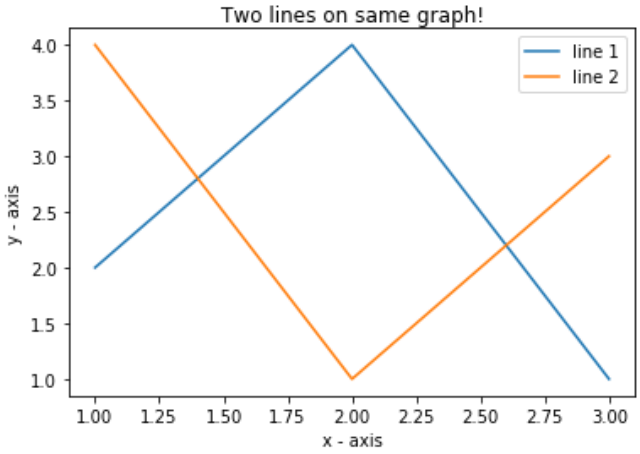
**Plotting two or more lines on same plot**

```
import matplotlib.pyplot as plt

# line 1 points
x1 = [1,2,3]
y1 = [2,4,1]
```

```
# plotting the line 1 points
plt.plot(x1, y1, label = "line 1")

# line 2 points
x2 = [1,2,3]
y2 = [4,1,3]
# plotting the line 2 points
plt.plot(x2, y2, label = "line 2")

# naming the x axis
plt.xlabel('x - axis')
# naming the y axis
plt.ylabel('y - axis')
# giving a title to my graph
plt.title('Two lines on same graph!')

# show a legend on the plot
plt.legend()

# function to show the plot
plt.show()
```

Run on IDE

Output:




- Here, we plot two lines on same graph. We differentiate between them by giving them a name(**label**) which is passed as an argument of .plot() function.
- The small rectangular box giving information about type of line and its color is called legend. We can add a legend to our plot using **.legend()** function.

**Customization of Plots**

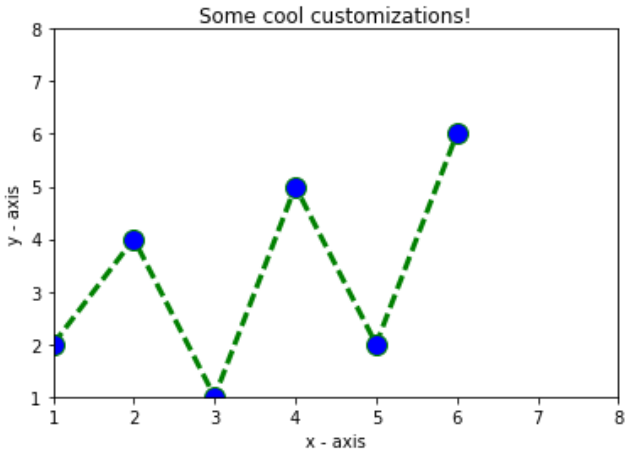
Here, we discuss some elementary customizations applicable on almost any plot.

```
import matplotlib.pyplot as plt

# x axis values
x = [1,2,3,4,5,6]
# corresponding y axis values
y = [2,4,1,5,2,6]

# plotting the points
plt.plot(x, y, color='green', linestyle='dashed', linewidth = 3,
         marker='o', markerfacecolor='blue', markersize=12)
```

```
# setting x and y axis range
plt.ylim(1,8)
plt.xlim(1,8)

# naming the x axis
plt.xlabel('x - axis')
# naming the y axis
plt.ylabel('y - axis')

# giving a title to my graph
plt.title('Some cool customizations!')

# function to show the plot
plt.show()
```

Run on IDE

Output:




As you can see, we have done several customizations like

- setting the line-width, line-style, line-color.
- setting the marker, marker's face color, marker's size.
- overriding the x and y axis range. If overriding is not done, pyplot module uses auto-scale feature to set the axis range and scale.

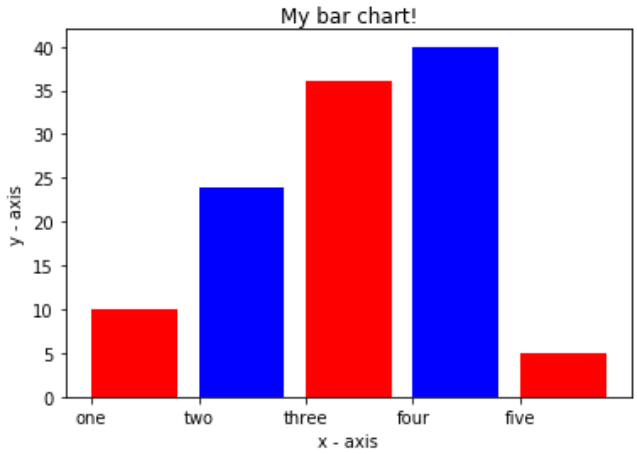
**Bar Chart**

```
import matplotlib.pyplot as plt

# x-coordinates of left sides of bars
left = [1, 2, 3, 4, 5]

# heights of bars
height = [10, 24, 36, 40, 5]

# labels for bars
tick_label = ['one', 'two', 'three', 'four', 'five']

# plotting a bar chart
plt.bar(left, height, tick_label = tick_label,
```

```
        width = 0.8, color = ['red', 'blue'])

# naming the x-axis
plt.xlabel('x - axis')
# naming the y-axis
plt.ylabel('y - axis')
# plot title
plt.title('My bar chart!')

# function to show the plot
plt.show()
```

Run on IDE

Output :

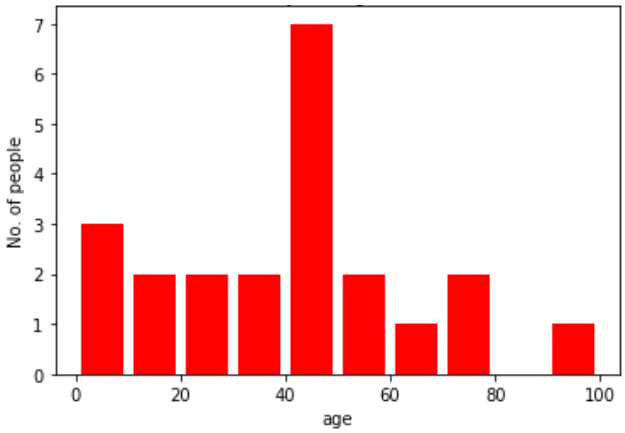



- Here, we use **plt.bar()** function to plot a bar chart.
- x-coordinates of left side of bars are passed along with heights of bars.
- you can also give some name to x-axis coordinates by defining **tick_labels**

**Histogram**

```
import matplotlib.pyplot as plt

# frequencies
ages = [2,5,70,40,30,45,50,45,43,40,44,
        60,7,13,57,18,90,77,32,21,20,40]

# setting the ranges and no. of intervals
range = (0, 100)
bins = 10

# plotting a histogram
plt.hist(ages, bins, range, color = 'red',
        histtype = 'bar', rwidth = 0.8)

# x-axis label
plt.xlabel('age')
# frequency label
plt.ylabel('No. of people')
# plot title
plt.title('My histogram')

# function to show the plot
plt.show()
```

Run on IDE



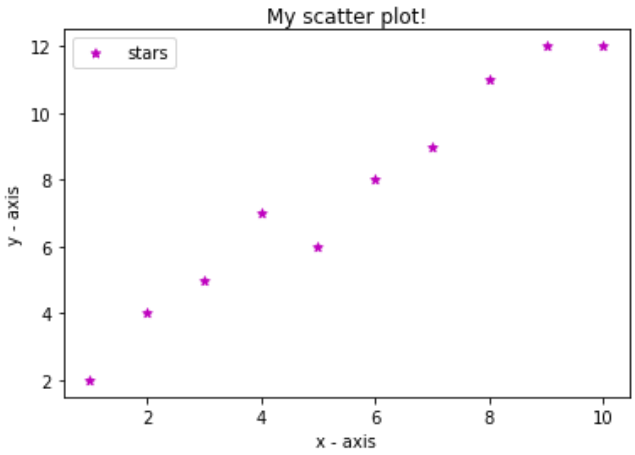

- Here, we use **plt.hist()** function to plot a histogram.
- frequencies are passed as the **ages** list.
- Range could be set by defining a tuple containing min and max value.
- Next step is to "**bin**" the range of values—that is, divide the entire range of values into a series of intervals—and then count how many values fall into each interval. Here we have defined **bins** = 10. So, there are a total of 100/10 = 10 intervals.

**Scatter plot**

```
import matplotlib.pyplot as plt

# x-axis values
x = [1,2,3,4,5,6,7,8,9,10]
# y-axis values
y = [2,4,5,7,6,8,9,11,12,12]

# plotting points as a scatter plot
plt.scatter(x, y, label= "stars", color= "m",
            marker= "*", s=30)

# x-axis label
plt.xlabel('x - axis')
# frequency label
plt.ylabel('y - axis')
# plot title
plt.title('My scatter plot!')
# showing legend
plt.legend()

# function to show the plot
plt.show()
```

Run on IDE

Output:



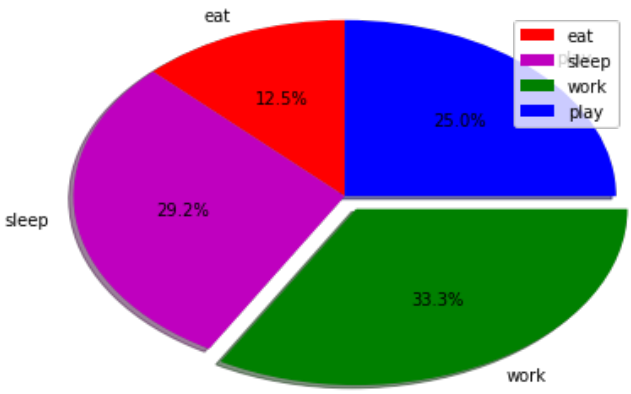

- Here, we use **plt.scatter()** function to plot a scatter plot.
- Like a line, we define x and corresponding y – axis values here as well.
- **marker** argument is used to set the character to use as marker. Its size can be defined using **s** parameter.

**Pie-chart**

```
import matplotlib.pyplot as plt

# defining labels
activities = ['eat', 'sleep', 'work', 'play']

# portion covered by each label
slices = [3, 7, 8, 6]

# color for each label
colors = ['r', 'm', 'g', 'b']

# plotting the pie chart
plt.pie(slices, labels = activities, colors=colors,
        startangle=90, shadow = True, explode = (0, 0, 0.1, 0),
        radius = 1.2, autopct = '%1.1f%%')

# plotting legend
plt.legend()

# showing the plot
plt.show()
```

Run on IDE

Output of above program looks like this:



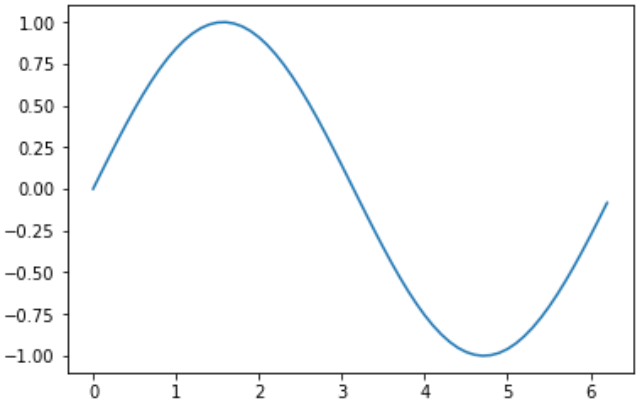

- Here, we plot a pie chart by using **plt.pie()** method.
- First of all, we define the **labels** using a list called **activities**.
- Then, portion of each label can be defined using another list called **slices**.
- Color for each label is defined using a list called **colors**.
- **shadow = True** will show a shadow beneath each label in pie-chart.
- **startangle** rotates the start of the pie chart by given degrees counterclockwise from the x-axis.
- **explode** is used to set the fraction of radius with which we offset each wedge.
- **autopct** is used to format the value of each label. Here, we have set it to show the percentage value only upto 1 decimal place.

**Plotting curves of given equation**

```
# importing the required modules
import matplotlib.pyplot as plt
import numpy as np

# setting the x - coordinates
x = np.arange(0, 2*(np.pi), 0.1)
# setting the corresponding y - coordinates
y = np.sin(x)

# potting the points
plt.plot(x, y)

# function to show the plot
plt.show()
```

Run on IDE

Output of above program looks like this:




Here, we use **NumPy** which is a general-purpose array-processing package in python.

- To set the x – axis values, we use **np.arange()** method in which first two arguments are for range and third one for step-wise increment. The result is a numpy array.
- To get corresponding y-axis values, we simply use predefined **np.sin()** method on the numpy array.
- Finally, we plot the points by passing x and y arrays to the **plt.plot()** function.

So, in this part, we discussed various types of plots we can create in matplotlib. There are more plots which haven't been covered but the most significant ones are discussed here –

- Graph Plotting in Python | Set 2
- Graph Plotting in Python | Set 3

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