MATPLOTLIB

What is matplotlib?

- **Matplotlib** is the basic **plotting library** of Python programming language.
- The project **Matplotlib** was started by **John Hunter in 2002**
- It is the **most prominent tool** among Python visualization packages.
- Matplotlib is **highly efficient** in performing wide range of tasks.
- It can produce **publication-quality figures** in a variety of formats.
- It can export visualizations to all of the common formats like **PDF, SVG, JPG, PNG, BMP, and GIF.**
- It can create popular visualization types – **line plot, scatter plot, histogram, bar chart, error charts, pie chart, box plot,** and many more types of plot.
- Matplotlib also supports 3D plotting.

MATPLOTLIB

How to install Matplotlib?

Open Command Prompt (cmd)

```
 >py --version
>py --m pip --version
>py --m pip install numpy [FOR INSTALLING NUMPY]
>py --m pip install --upgrade pip
>py --m pip --version
>py --m pip install pandas [FOR INSTALLING PANDAS]
>py --m pip install matplotlib [FOR INSTALLING MATPLOTLIB]
```

Now check numpy and matplotlib in IDLE (Open IDLE)

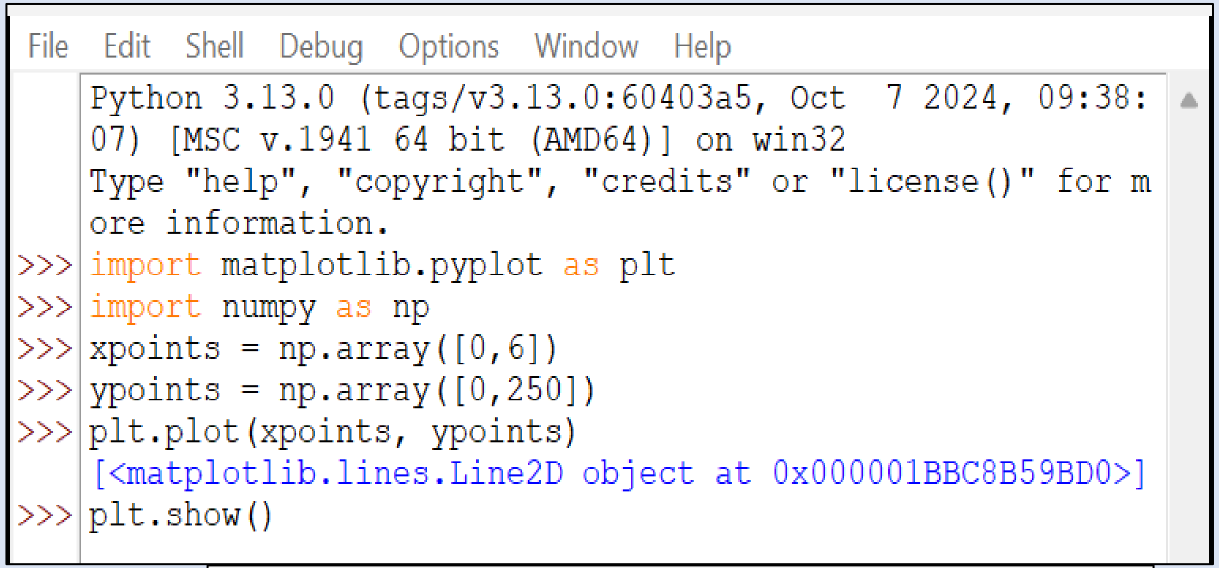
```
>>>import numpy
>>>import matplotlib
```

MATPLOTLIB

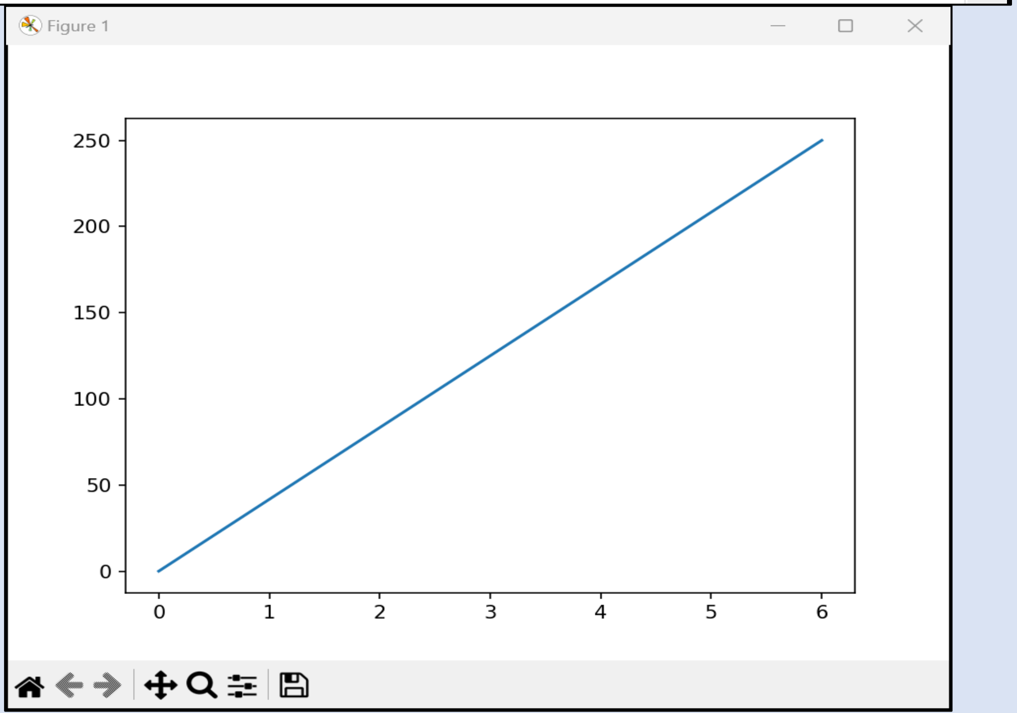
How to run Matplotlib in IDLE?

Open IDLE

```
>>>import matplotlib.pyplot as plt
>>>import numpy as np
>>>xpoints = np.array([0, 6])
>>>ypoints = np.array([0, 250])
>>>plt.plot(xpoints, ypoints)
>>>plt.show()
```

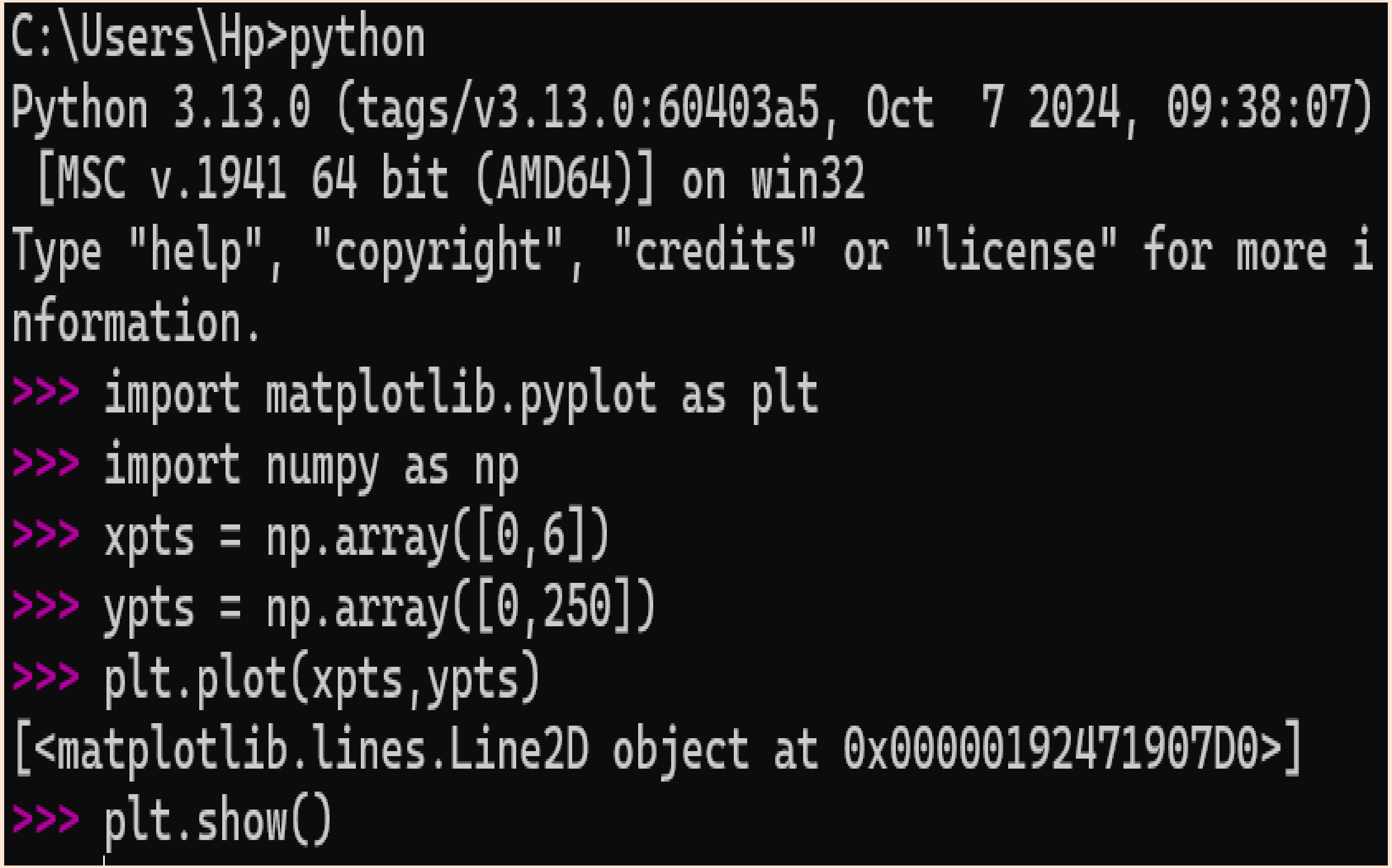


```
Python 3.13.0 (tags/v3.13.0:60403a5, Oct  7 2024, 09:38:
07) [MSC v.1941 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for m
ore information.
>>> import matplotlib.pyplot as plt
>>> import numpy as np
>>> xpoints = np.array([0,6])
>>> ypoints = np.array([0,250])
>>> plt.plot(xpoints, ypoints)
    [<matplotlib.lines.Line2D object at 0x000001BBC8B59BD0>]
>>> plt.show()
```

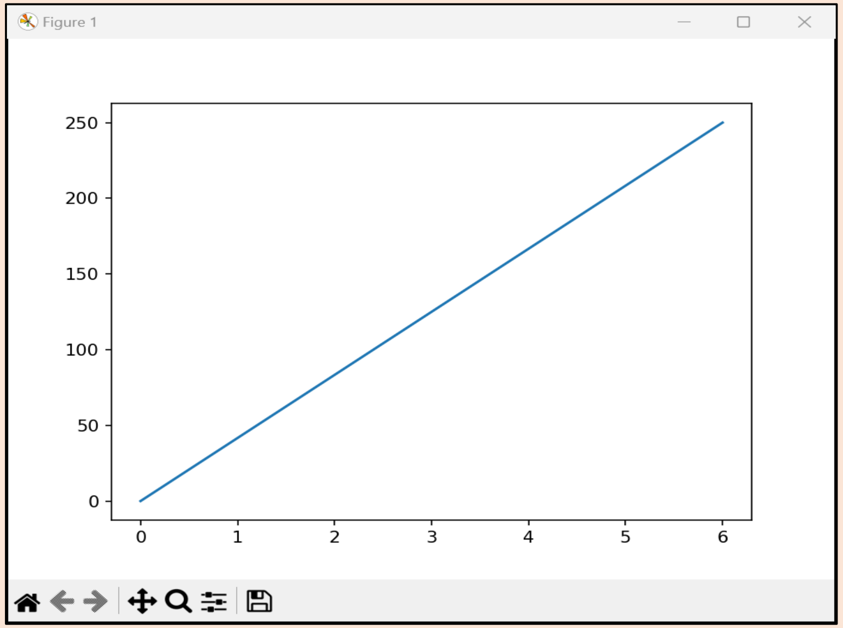


How to run Matplotlib in Command Prompt?

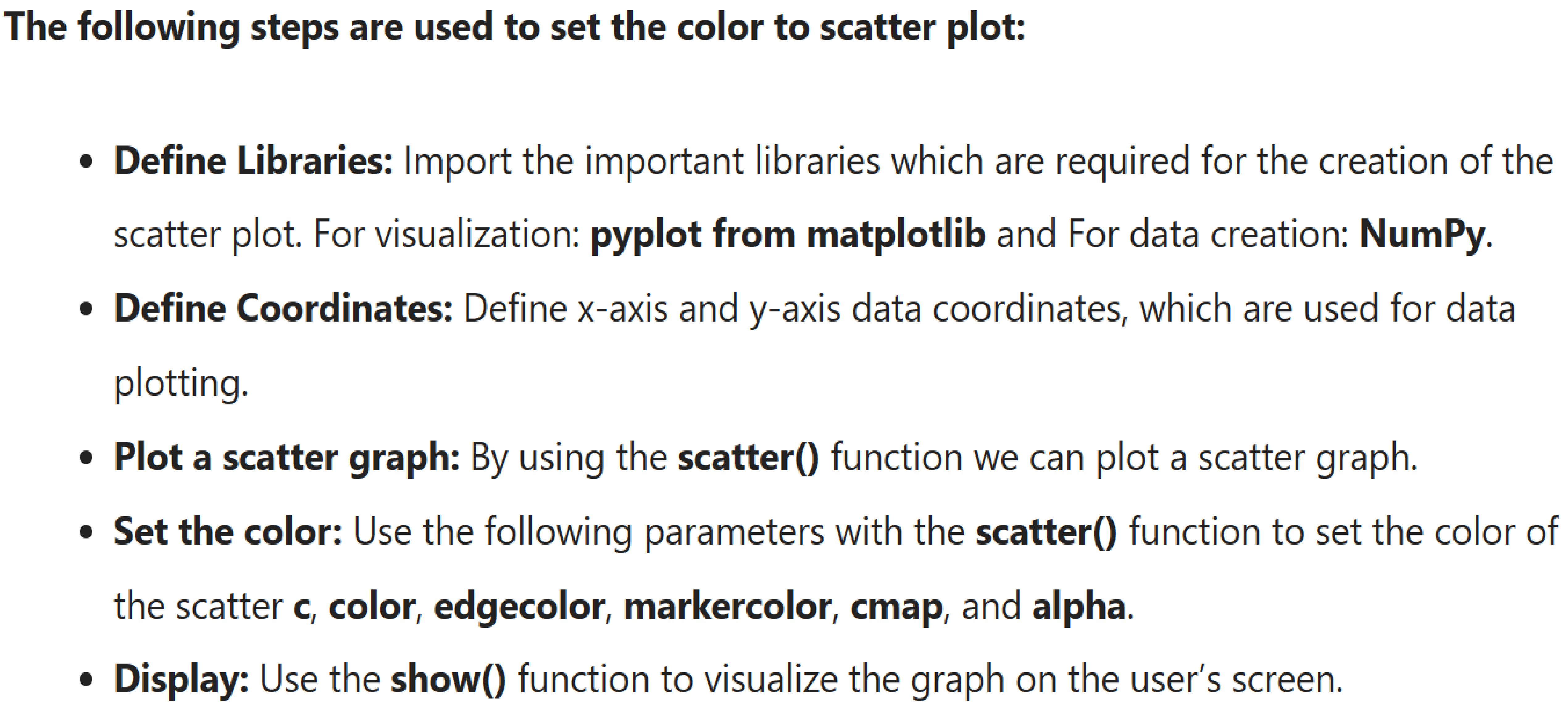
Open Command Prompt (cmd)



```
C:\Users\Hp>python
Python 3.13.0 (tags/v3.13.0:60403a5, Oct  7 2024, 09:38:07)
 [MSC v.1941 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more i
nformation.
>>> import matplotlib.pyplot as plt
>>> import numpy as np
>>> xpts = np.array([0,6])
>>> ypts = np.array([0,250])
>>> plt.plot(xpts,ypts)
[<matplotlib.lines.Line2D object at 0x00000192471907D0>]
>>> plt.show()
```



Matplotlib scatter plot with color



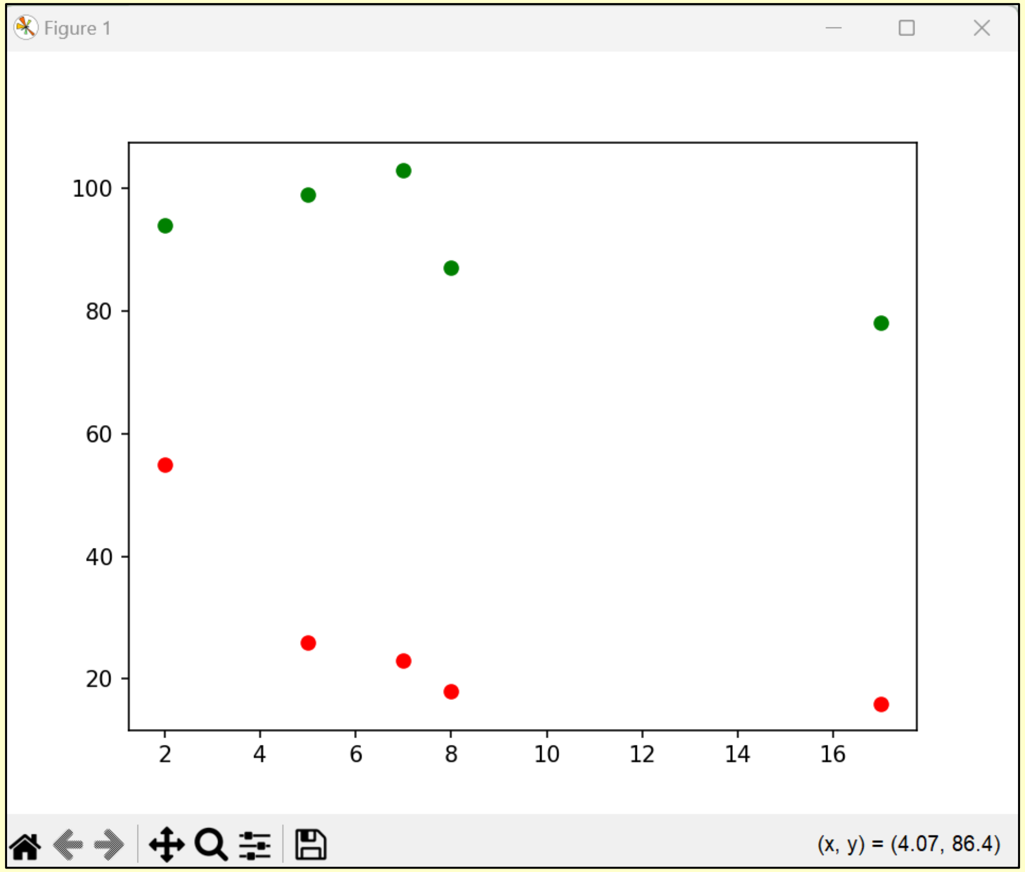
The following steps are used to set the color to scatter plot:

- **Define Libraries:** Import the important libraries which are required for the creation of the scatter plot. For visualization: **pyplot from matplotlib** and For data creation: **NumPy**.
- **Define Coordinates:** Define x-axis and y-axis data coordinates, which are used for data plotting.
- **Plot a scatter graph:** By using the **scatter()** function we can plot a scatter graph.
- **Set the color:** Use the following parameters with the **scatter()** function to set the color of the scatter **c**, **color**, **edgecolor**, **markercolor**, **cmap**, and **alpha**.
- **Display:** Use the **show()** function to visualize the graph on the user's screen.

Matplotlib scatter plot with color

Open IDLE

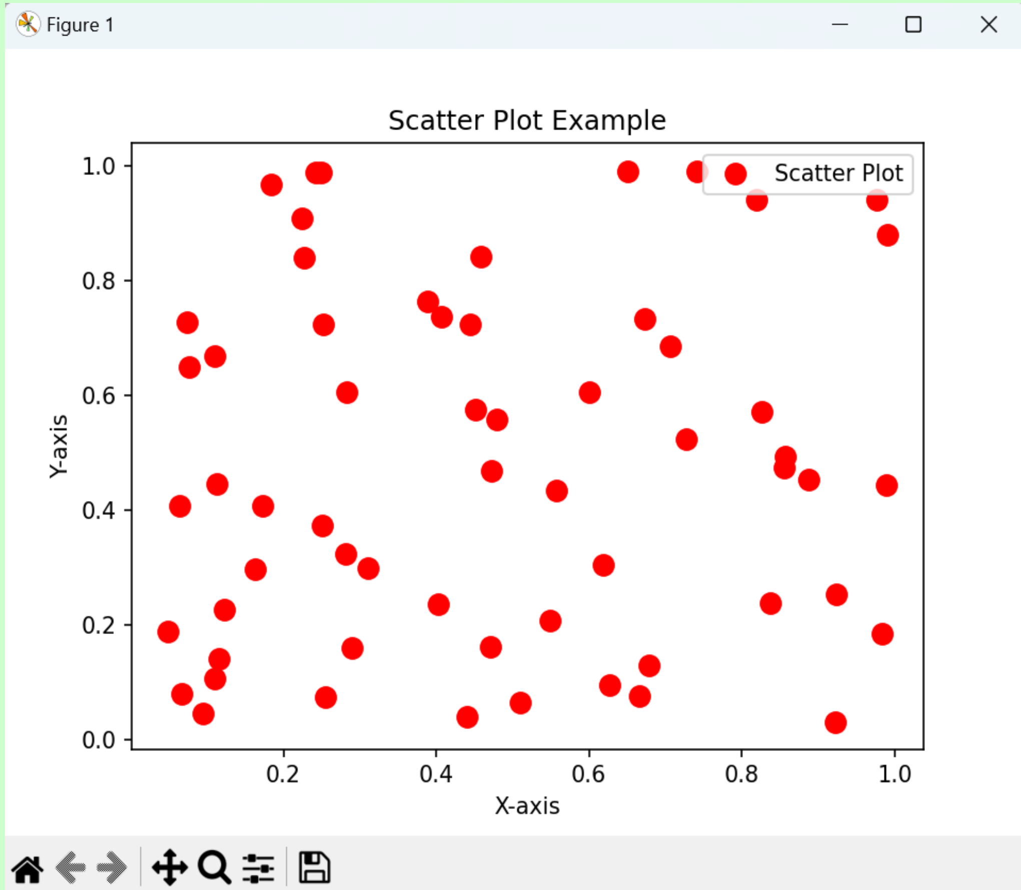
```
# Import Library
>>>import matplotlib.pyplot as plt
>>> import numpy as np
# Define Data
>>> x = np.array([5,7,8, 2,17])
>>> y1 = np.array([99,103,87,94,78])
>>> y2 = np.array([26, 23, 18, 55, 16])
# Scatter Plot color array
>>> plt.scatter(x, y1, color='green’)
>>> plt.scatter(x, y2, color='red’)
# Display
>>> plt.show()
```



Matplotlib scatter plot with color

Open IDLE

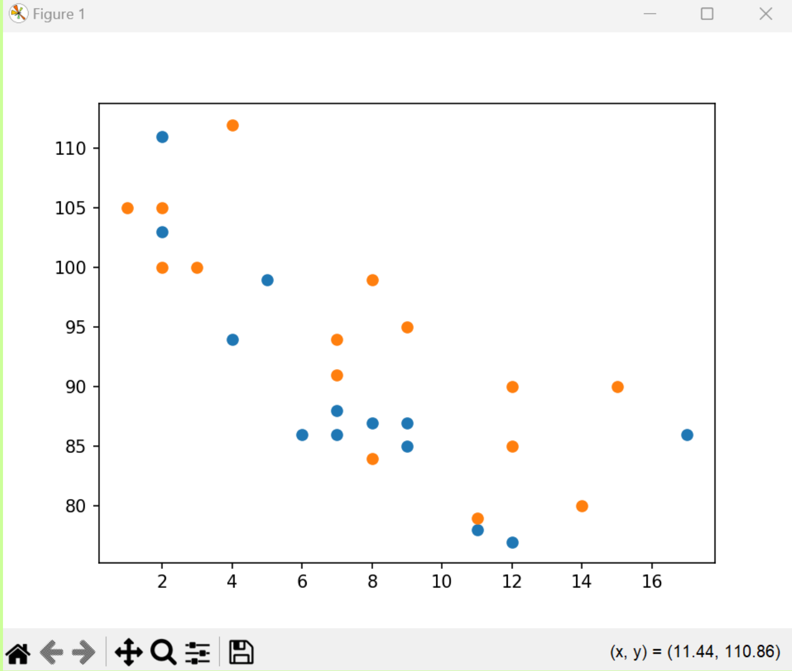
```
>>>import matplotlib.pyplot as plt
>>> import numpy as np
>>> np.random.seed(45)
>>> x = np.random.rand(60)
>>> y = np.random.rand(60)
>>> plt.plot(x,y, marker='o', linestyle=‘’,
    markersize=9, color='r', label='Scatter Plot')
>>> plt.xlabel('X-axis’)
>>> plt.ylabel('Y-axis')
>>> plt.title('Scatter Plot Example')
>>> plt.legend()
>>> plt.show()
```



Matplotlib scatter plot with different color

Open IDLE

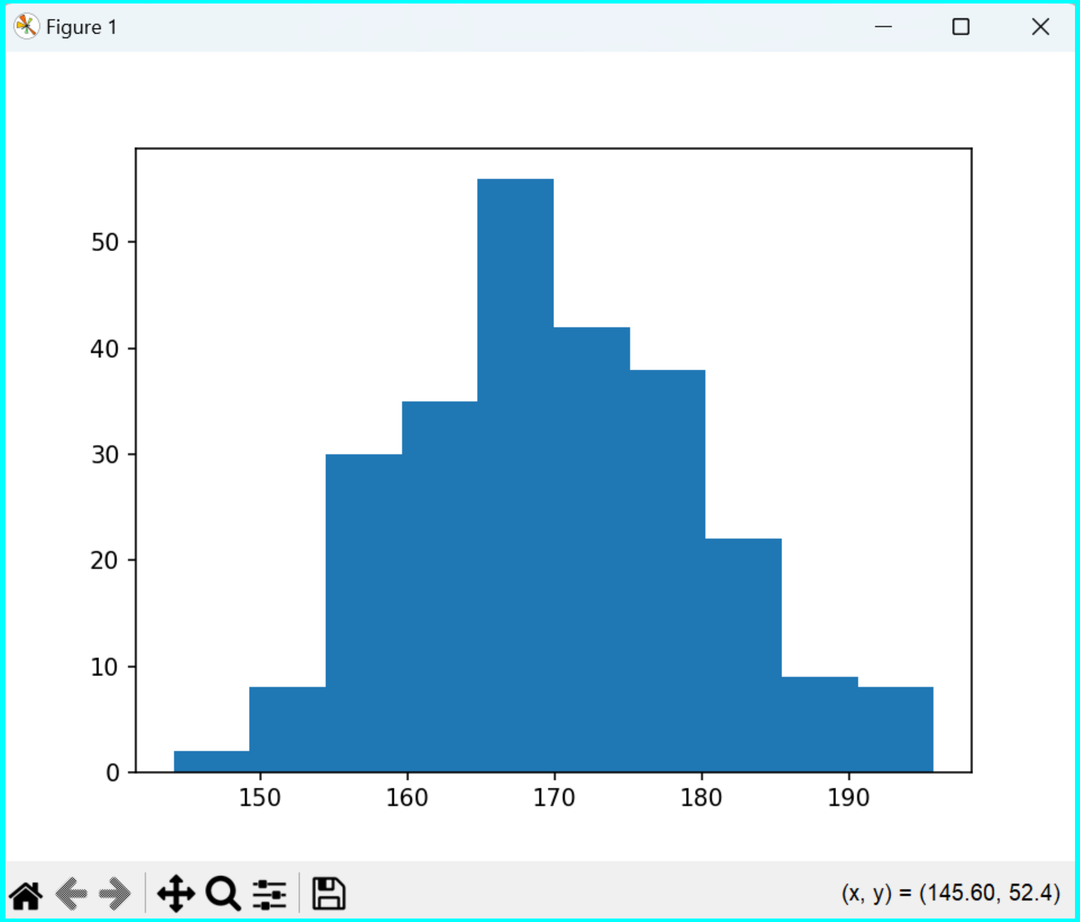
```
>>>import matplotlib.pyplot as plt
>>>import numpy as np

#day one, the age and speed of 13 cars:
x = np.array([5,7,8,7,2,17,2,9,4,11,12,9,6])
y = np.array([99,86,87,88,111,86,103,87,94,78,77,85,86])
plt.scatter(x, y)

#day two, the age and speed of 15 cars:
x = np.array([2,2,8,1,15,8,12,9,7,3,11,4,7,14,12])
y = np.array([100,105,84,105,90,99,90,95,94,100,79,112,91,80,85])
plt.scatter(x, y)

plt.show()
```



Matplotlib Histogram plot

Open IDLE

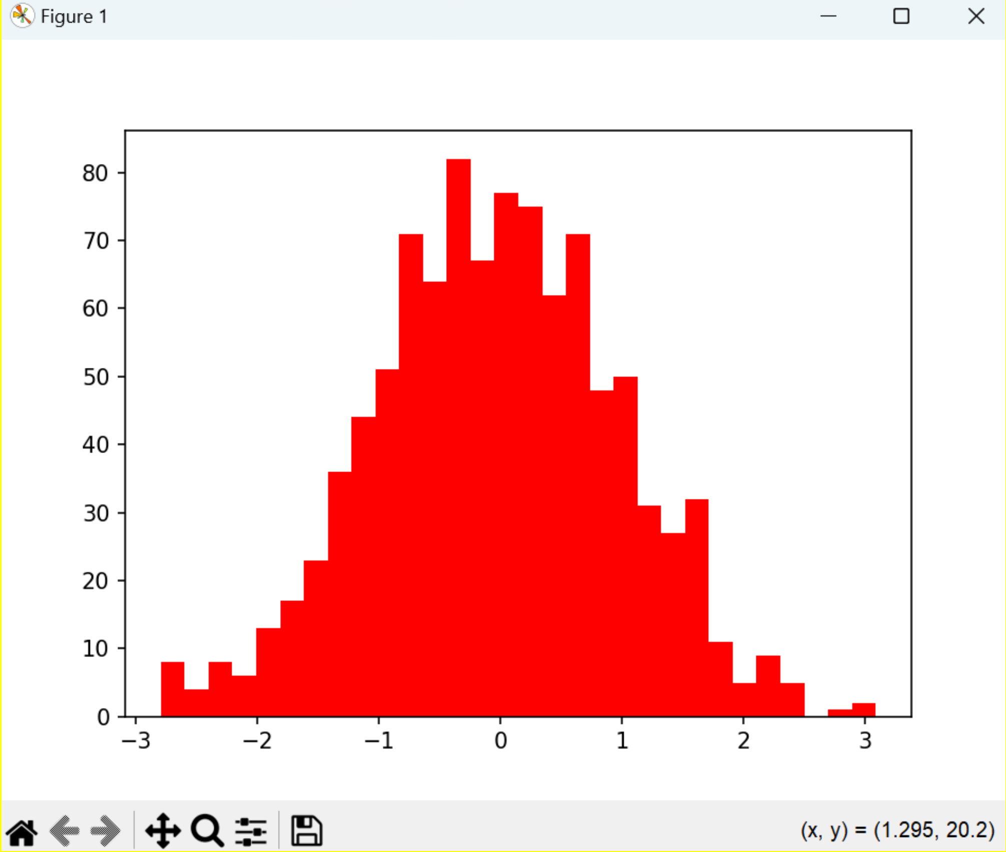
```
>>>import matplotlib.pyplot as plt
>>>import numpy as np

>>>x = np.random.normal(170, 10, 250)

>>>plt.hist(x)
>>>plt.show()
```



Matplotlib histogram plot

Open IDLE

```
>>>import matplotlib.pyplot as plt
>>>import numpy as np
>>>data = np.random.normal(0, 1, 1000)
>>>plt.hist(data, bins=30, color='red’)
>>>plt.show()
```



Matplotlib histogram plot

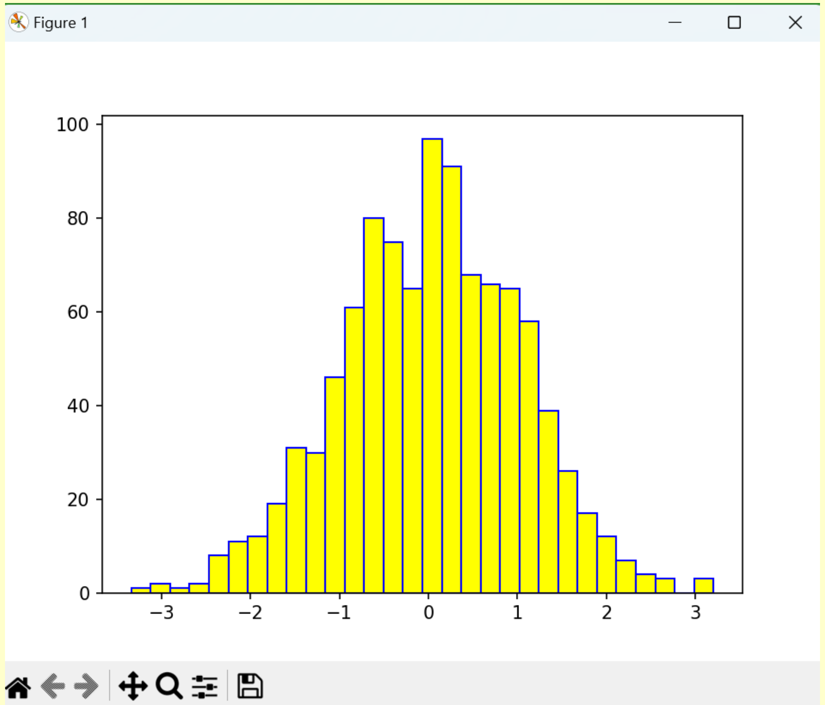
Open IDLE

```
>>>import matplotlib.pyplot as plt
>>>import numpy as np
>>>data = np.random.normal(0, 1, 1000)
>>> plt.hist(data, bins=30, color='yellow', edgecolor='blue')
>>>plt.show()
```

#0-mean of the normal distribution

#1-standard deviation of the normal distribution

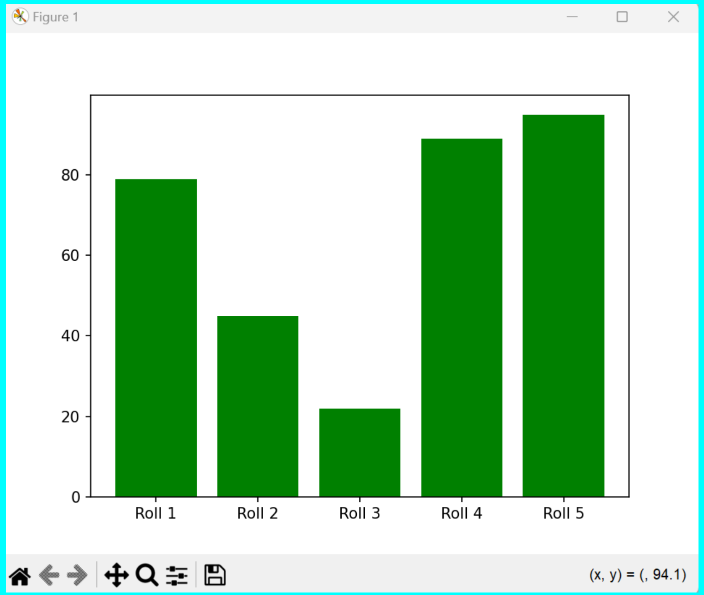
#1000-to generate 1000 random numbers



Matplotlib bar plot

Open IDLE

```
>>>import matplotlib.pyplot as plt
>>>import numpy as np
>>>marks=[79,45,22,89,95]
>>>bars=('Roll 1','Roll 2','Roll 3','Roll 4','Roll 5')
>>>y=np.arange(len(bars))
>>>plt.bar(y,marks,color=‘g’)
>>>plt.xticks(y,bars) #
>>>plt.show()
```



#plt.xticks(): This function is used to set the locations and labels of the ticks on the x-axis.

#y:This is an array-like object that contains the positions where you want to place the ticks on the x-axis.

#bars: This is an array-like object that contains the labels you want to display at the corresponding tick positions specified in y.

#The Python len() function is used to return a numeric value that denotes the length of the given list, tuple, string, array, dictionary, etc.