

matplotlib



BEGINNER'S CODE GUIDE

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Python library
for detailed graphs

pyplot

- is a Matplotlib module.
- Creates figure, labels, and plot area

```
import matplotlib.pyplot as plt
```

plot()

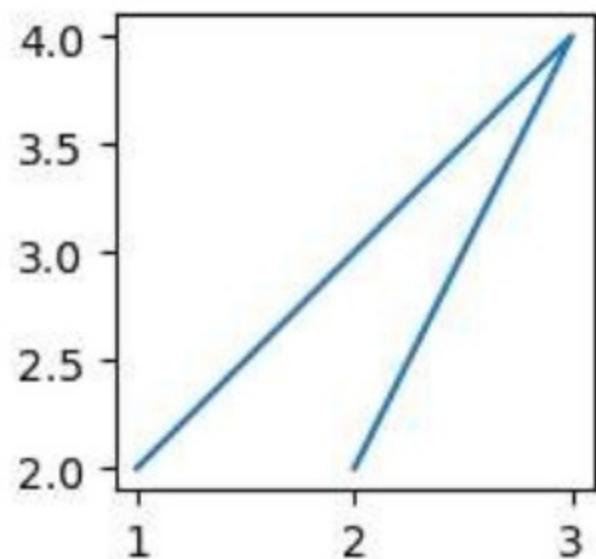
Draws points
with default connecting lines

syntax: plot(x aixs, y axis)

e.g. draw line in diagram

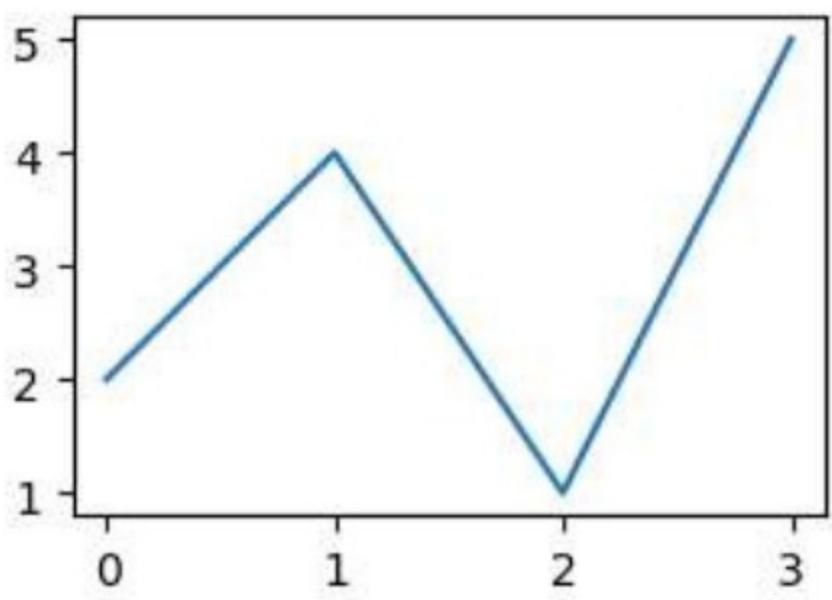
```
# Basic Line graph using plot()  
plt.plot([1,3,2],[2,4,2])
```

```
# show plot & hide default title  
plt.show()
```



Default X points values 0,1,2,3 ...

```
import numpy as np  
  
y whole points = np.array([2, 4, 1, 5])  
  
#Plotting without x-points  
plt.figure()  
  
plt.plot(y whole points) # y axis  
  
plt.show()
```



Format Strings

marker | line | color

optional 3rd argument in plot() for 'marker','line type' & 'color'

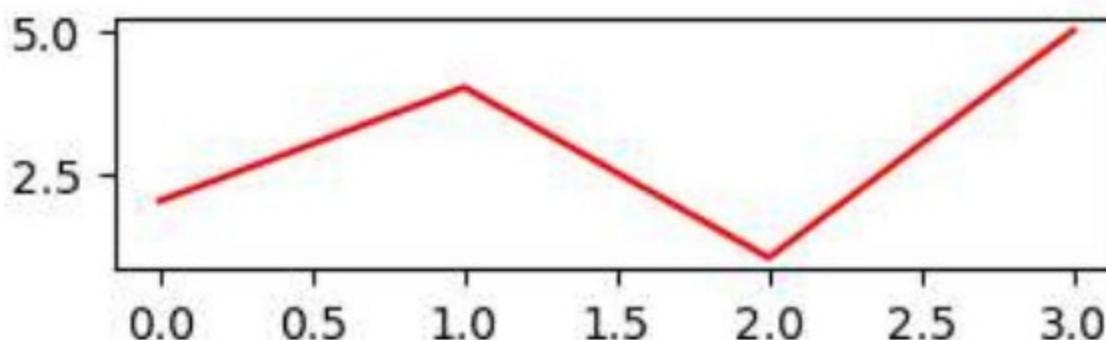
Line Color Change

'color' or 'c' or use shortcut string

- ways to specify colors:-

- Named Colors: 'red', 'blue', 'green'
- Short Color Codes: 'r' for red, 'b' for blue, 'g' for green
- RGB & Hexadecimal Color Codes

```
plt.plot(ypoints, 'r')  
  
plt.show()
```

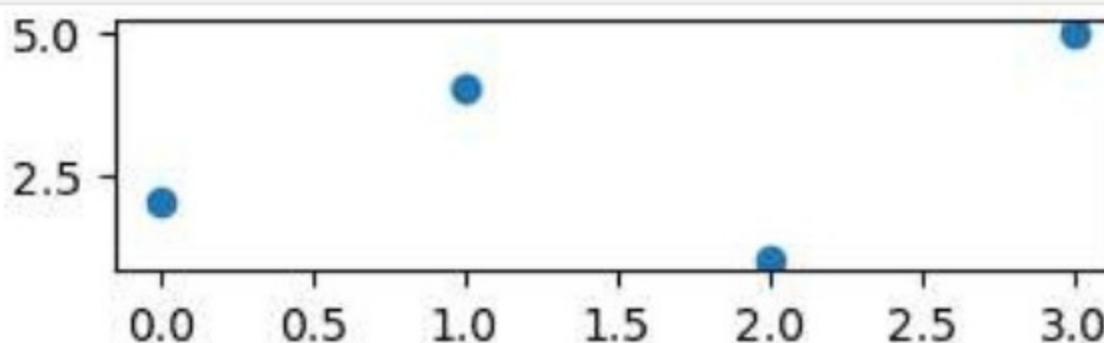


Change Line Style

'linestyle' or 'ls' or use shortcut string

e.g: '--', '-.', '.', ',', 'o', 'v', '^', '<', '>', '+', '|', '_', '*', ':'

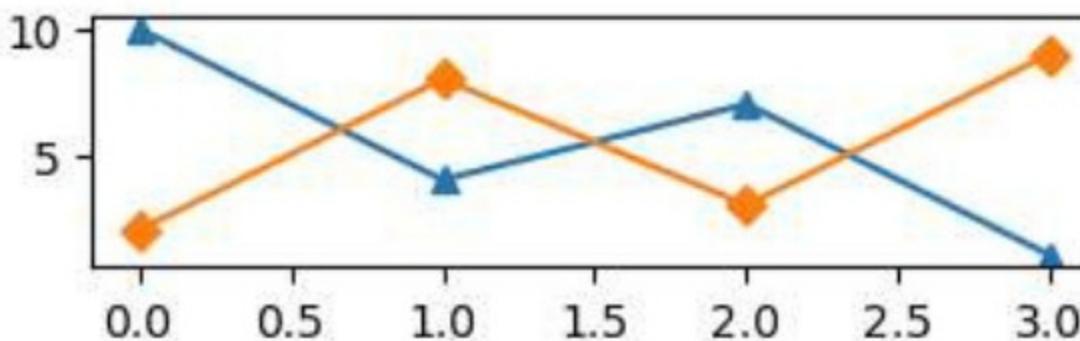
```
plt.plot(ypoints, 'o')  
  
plt.show()
```



Multiple Lines Plot x & y axis seperately

```
x = [10,4,7,1]  
y = [2,8,3,9]
```

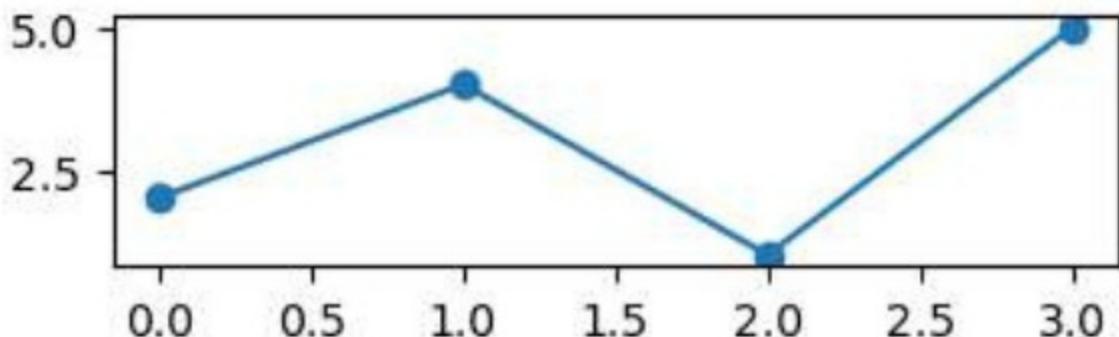
```
plt.plot(x, marker = '^')  
plt.plot(y, marker = 'D')  
  
plt.show()
```



Marker mark the data points on a line plot

styles available: 'o', 's', 'D', 'd',
'x', 'X', 'P', 'p', 'H', 'h', 'v', 'V', '1', '2', '3', '4'
'^', '<', '>', '*', '.', ',', '|', '_', '+'

```
plt.plot(ypoints, marker = 'o')  
  
plt.show()
```

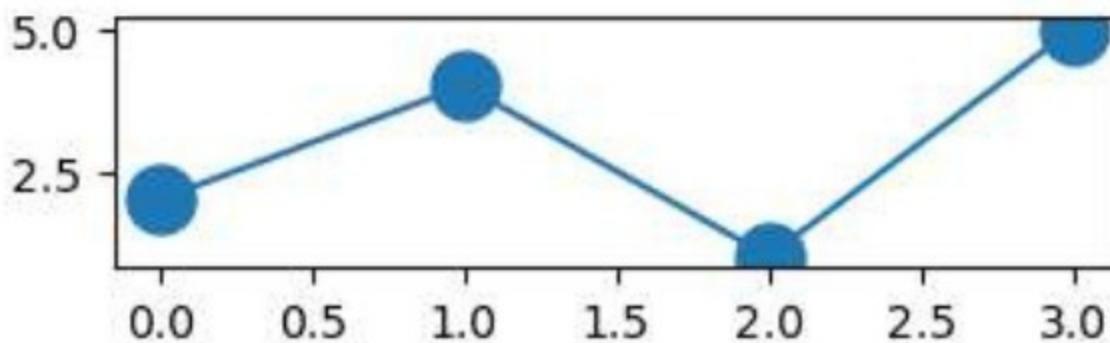


Marker Size

argument 'markersize' or the shorter version, 'ms'

```
plt.plot(ypoints, marker = 'o',  
         ms = 15)
```

```
plt.show()
```



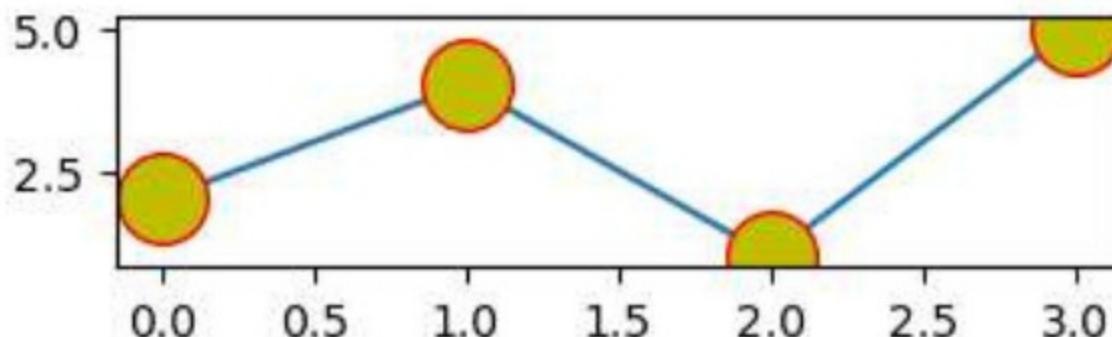
Marker Color

'markeredgecolor' or 'mec' to set the color of the edge

'markerfacecolor' or 'mfc' to set the color inside the edge

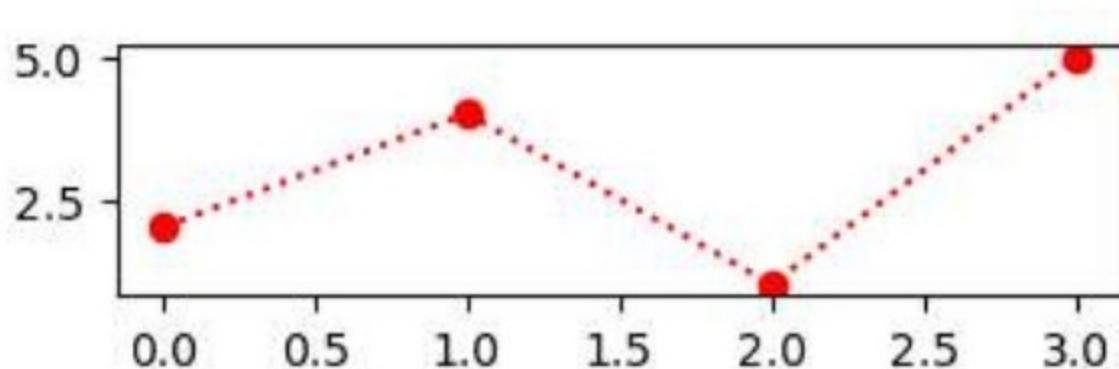
```
plt.plot(ypoints, marker = 'o',  
         ms = 20, mec = 'r', mfc = 'y')
```

```
plt.show()
```



Marker + Line + Color

```
#marker='o', Line=':', color red 'r'  
plt.plot(ypoints, 'o:r')  
  
plt.show()
```

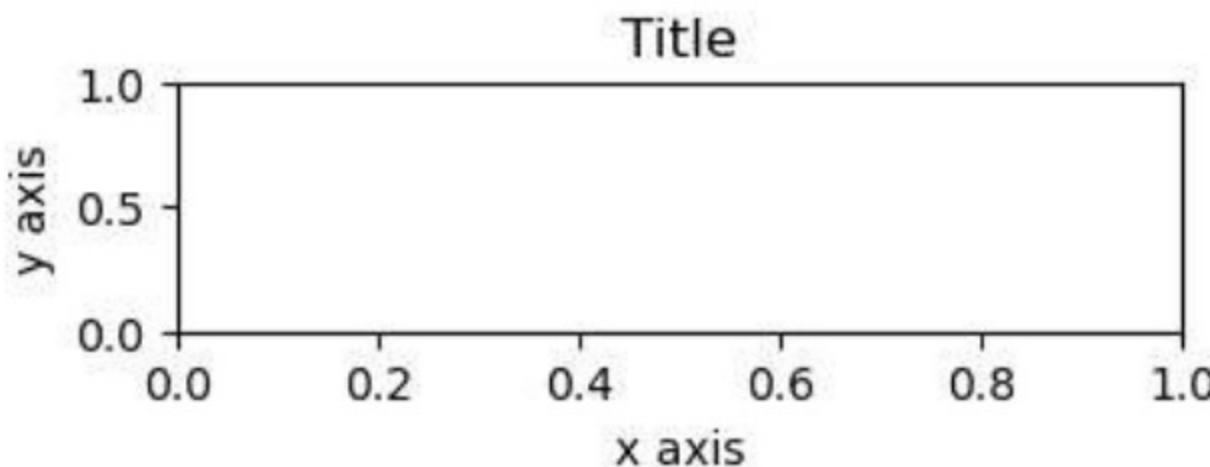


Labels and Title

xlabel() and ylabel() functions to set label for x- & y-axis
 title() function to set a title

```
plt.title("Title")  
plt.xlabel("x axis")  
plt.ylabel("y axis")
```

```
plt.show()
```



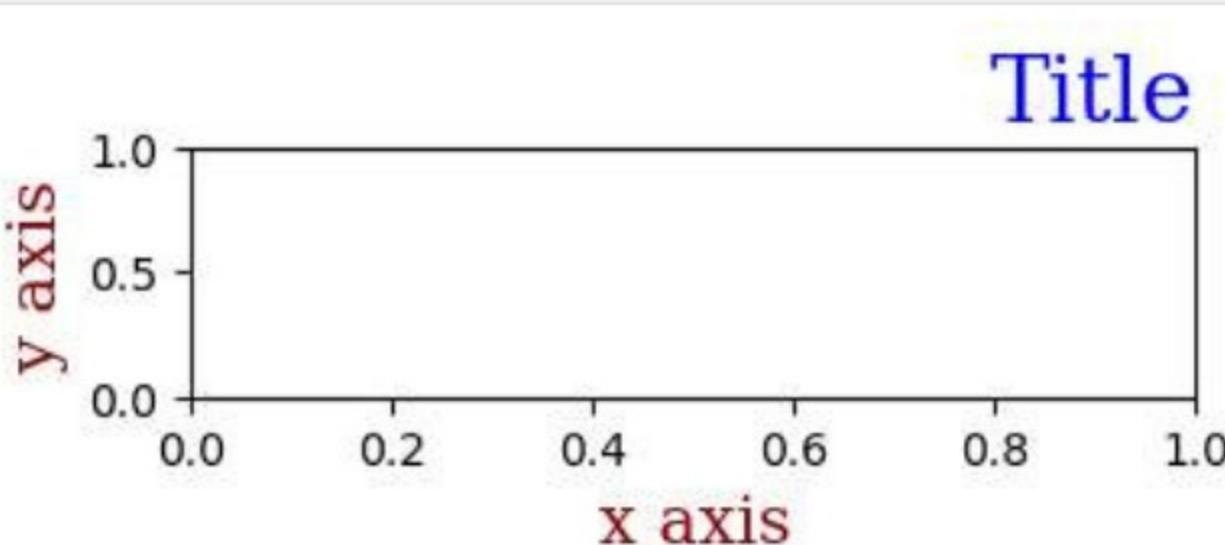
Font of Title and Labels

'fontdict' parameter

```
font1 = {'family': 'serif',
          'color': 'blue', 'size': 20}
font2 = {'family': 'serif',
          'color': 'darkred', 'size': 15}

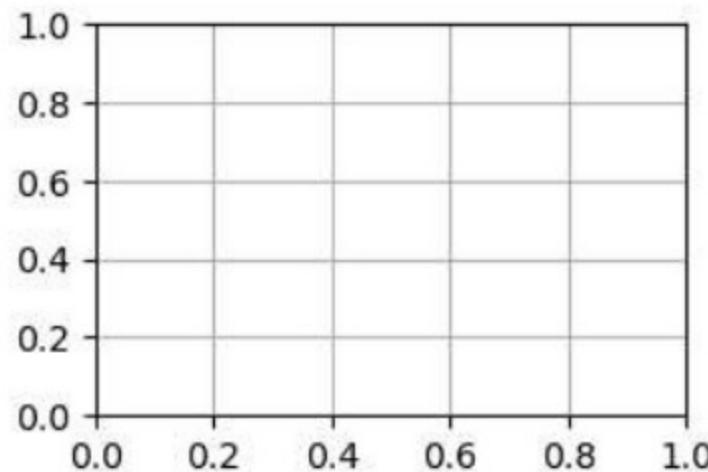
#'Loc' to position the title
plt.title("Title",
          fontdict = font1, loc = 'right')
plt.xlabel("x axis",
           fontdict = font2)
plt.ylabel("y axis",
           fontdict = font2)

plt.show()
```



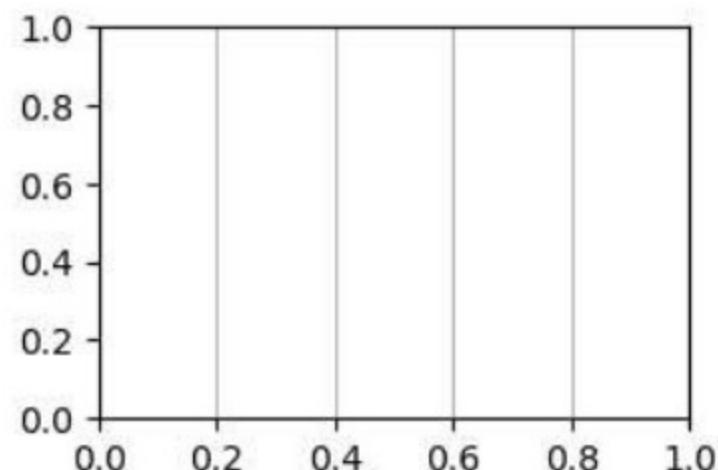
Grid Lines

```
plt.grid()
```



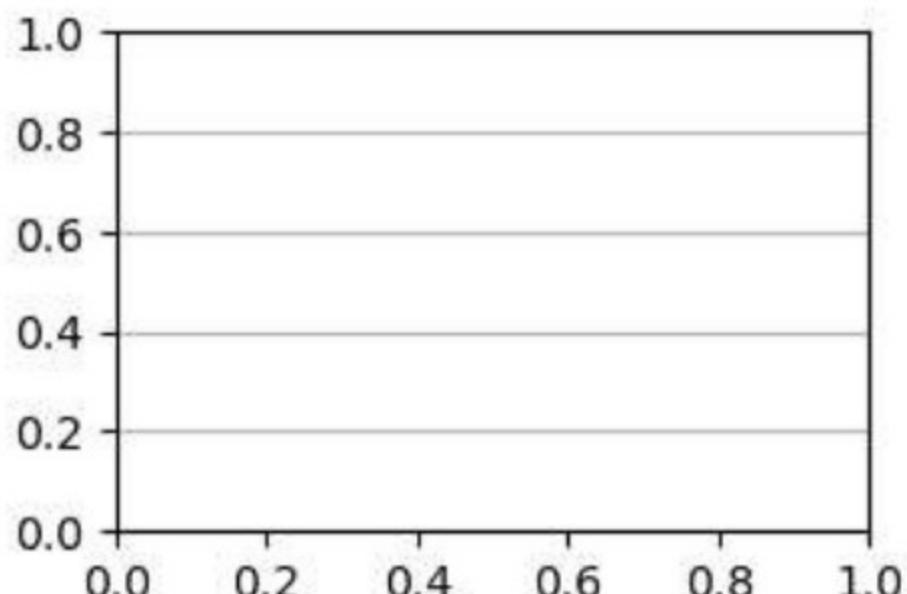
grid lines for the x-axis

```
plt.grid(axis='x')
```



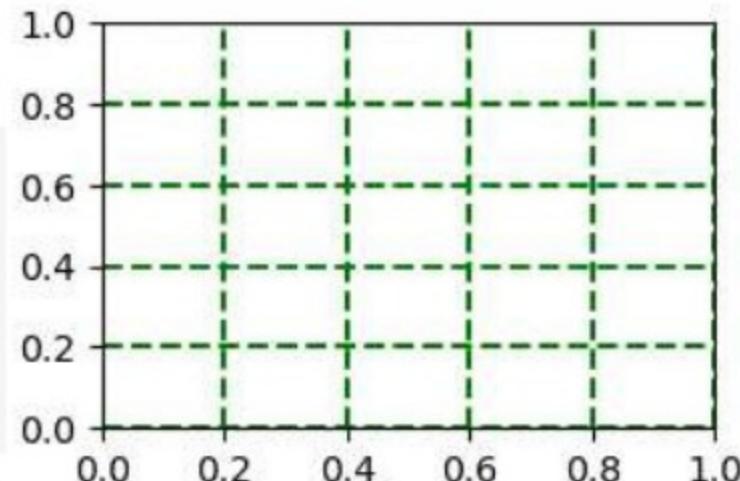
grid lines for the y-axis

```
plt.grid(axis='y')
```



Line Properties for the Grid

```
plt.grid(color = 'green',  
         linestyle = '--',  
         linewidth = 1.5)
```



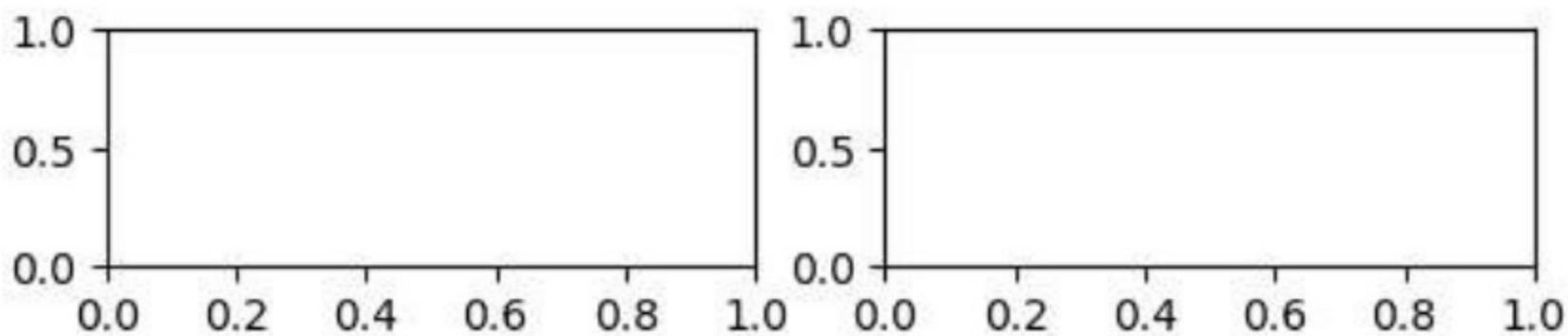
Multiple Plots

Method 1: Subplot

draw multiple plots in one figure
Syntax: subplot(rows, columns, index)

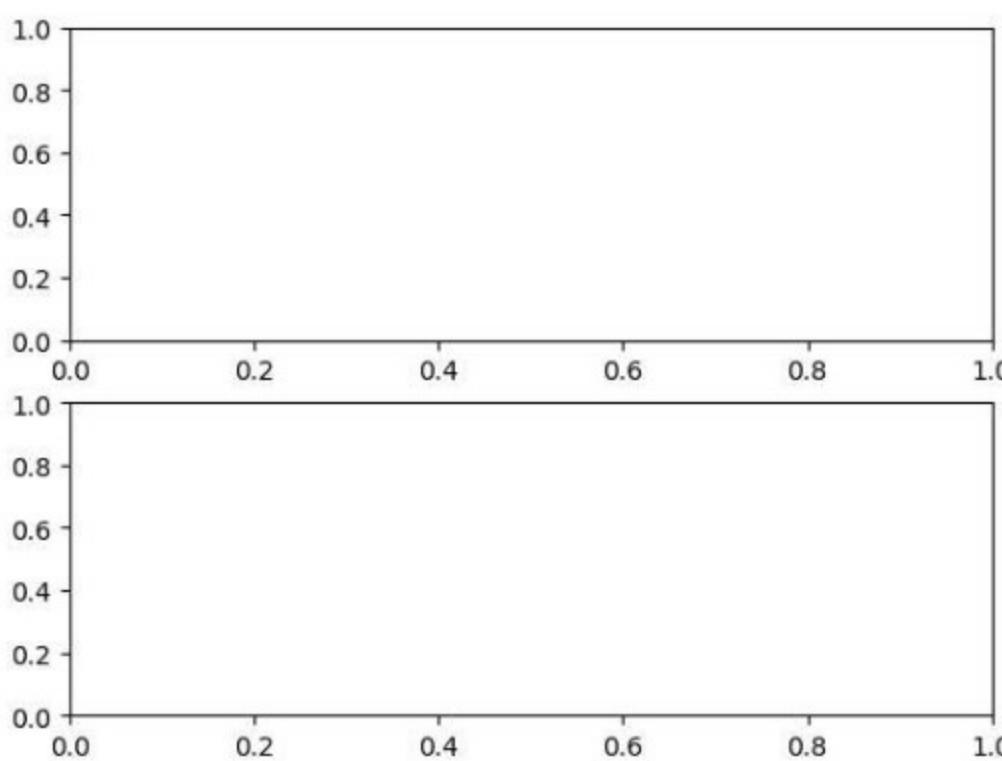
Draw Two Plots : 1 row 2 column

```
plt.subplot(1, 2, 1) # 1st plot  
  
plt.subplot(1, 2, 2) # 2nd plot  
  
plt.show()
```



2 row and 1 column

```
plt.subplot(2, 1, 1) # 1st plot  
  
plt.subplot(2, 1, 2) # 2nd plot  
  
plt.show()
```



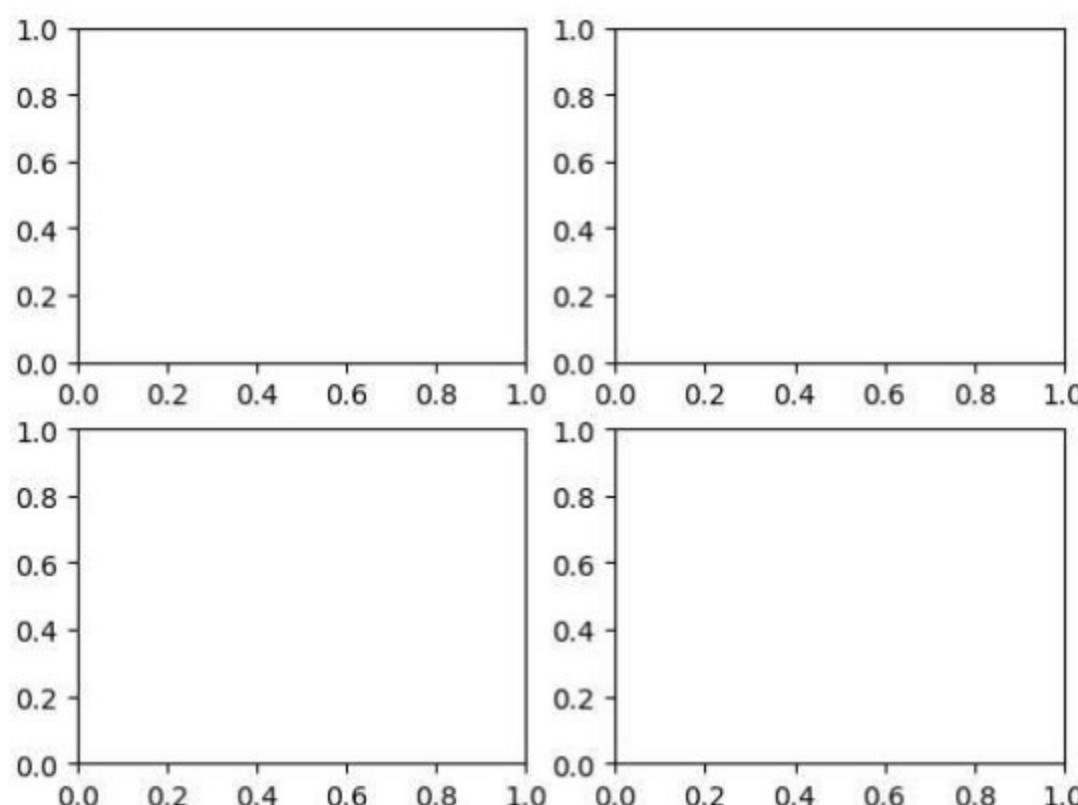
2 row and 2 column subplot

```
plt.subplot(2, 2, 1) # Subplot 1
```

```
plt.subplot(2, 2, 2) # Subplot 2
```

```
plt.subplot(2, 2, 3) # Subplot 3
```

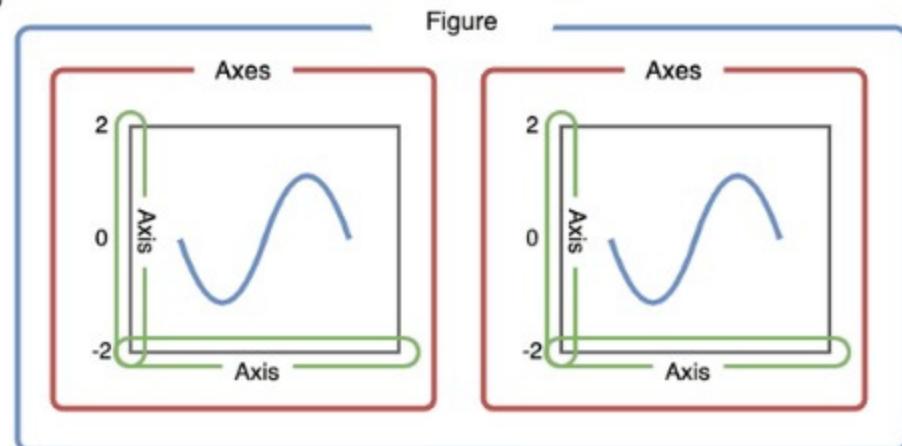
```
plt.subplot(2, 2, 4) # Subplot 4
```



Method 2: add_subplot

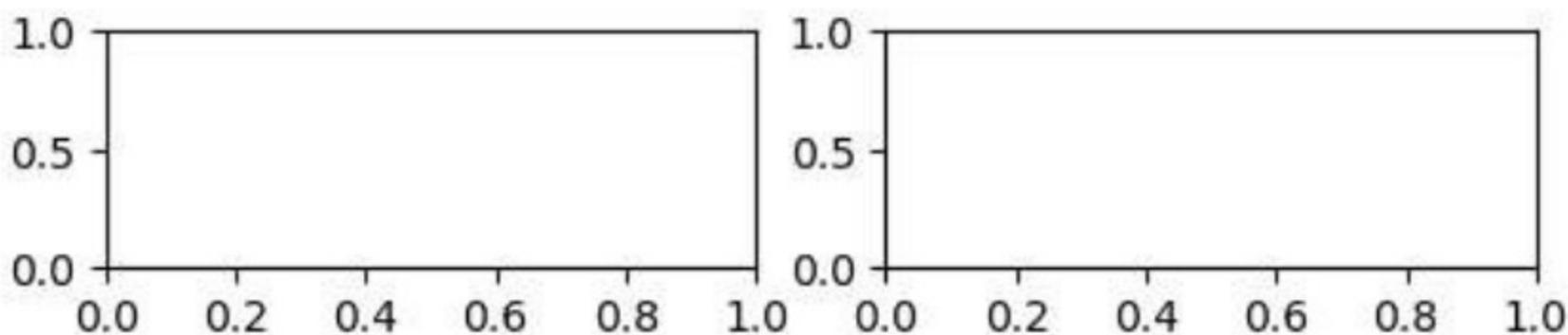
Syntax:- add_subplot(rows, cols, index)

Figure and Axes



- Figure represents entire area where your data visualizations will be displayed
 - like a container that holds all the individual plots or charts
- Axes is like an individual plot or chart within the figure
 - e.g. line charts, bar graphs, or scatter plots.

```
# Add subplots to the figure
ax1 = fig.add_subplot(1, 2, 1)
ax2 = fig.add_subplot(1, 2, 2)
```

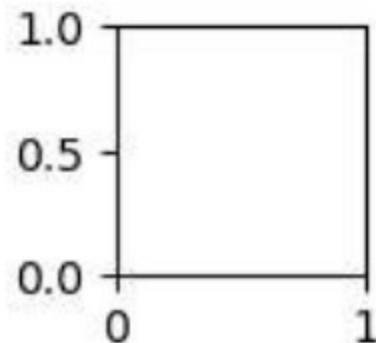


Method 3 : subplots()

```
plt.subplots()
```

```
# it return 2 values in tuple.  
# (<Figure with 1 Axes>, <Axes:>)
```

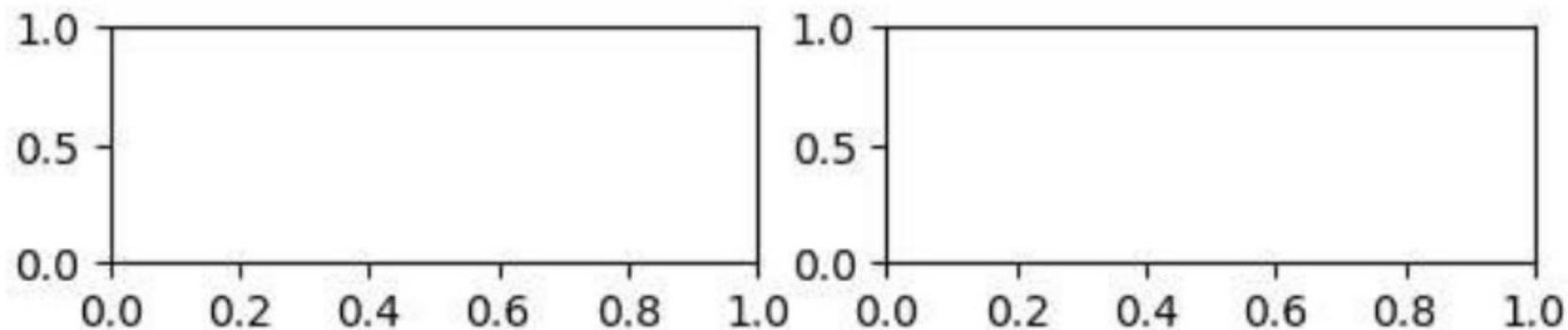
```
(<Figure size 100x100 with 1 Axes>, <Axes: >)
```



```
# Unpack a tuple into fig and ax.
```

```
fig, ax = plt.subplots(1,2)
```

```
# 1 row 2 column
```



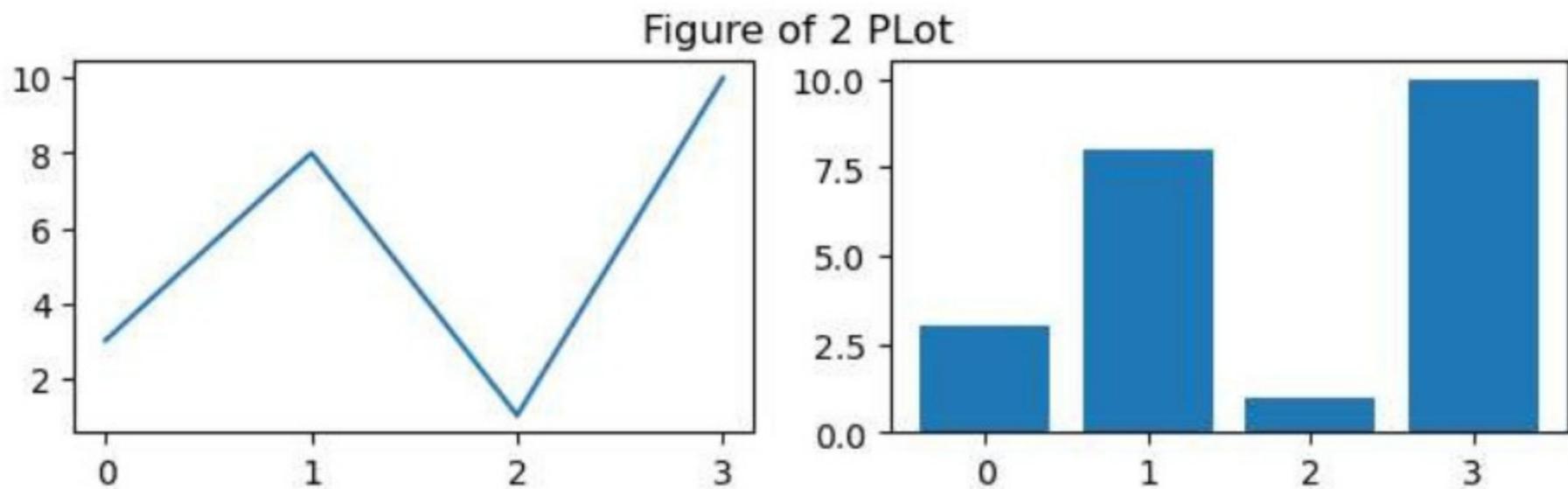
Create Multiple Axes With Example

```
# create data  
x = [0, 1, 2, 3]  
y = [3, 8, 1, 10]
```

```
fig, ax = plt.subplots(1,2)
```

```
ax[0].plot(x,y)  
ax[1].bar(x,y)
```

```
fig.suptitle('Figure of 2 PLOT')  
plt.show()
```

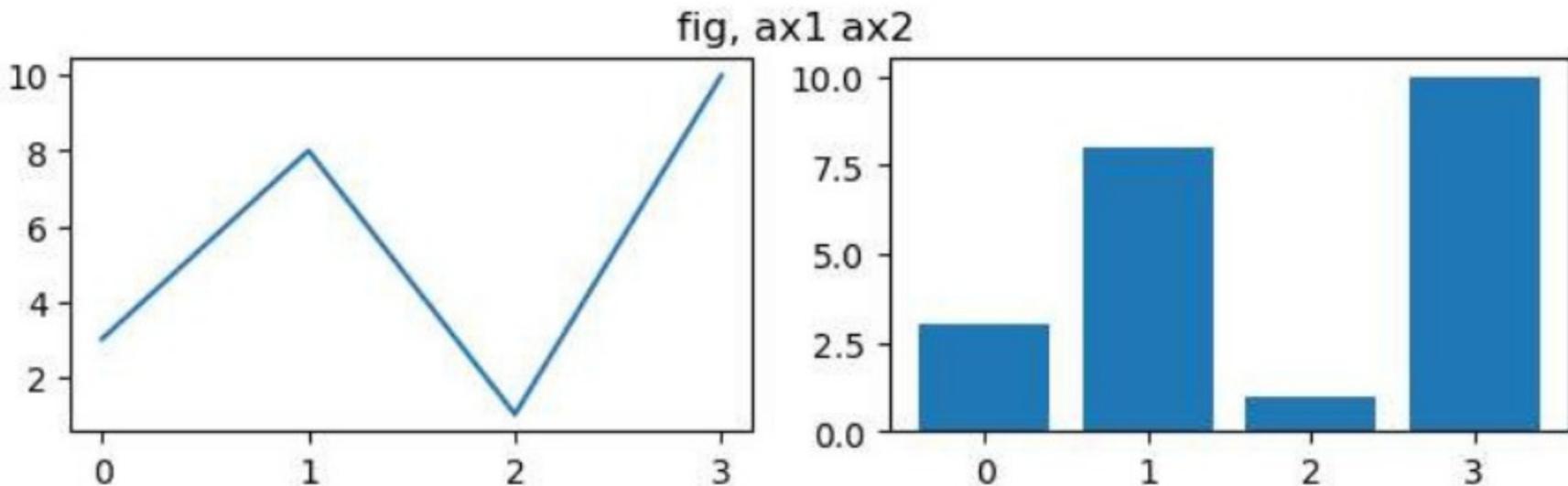


Alternate code

```
fig, (ax1,ax2)= plt.subplots(1,2)

ax1.plot(x,y)
ax2.bar(x,y)

fig.suptitle('fig, ax1 ax2')
plt.show()
```

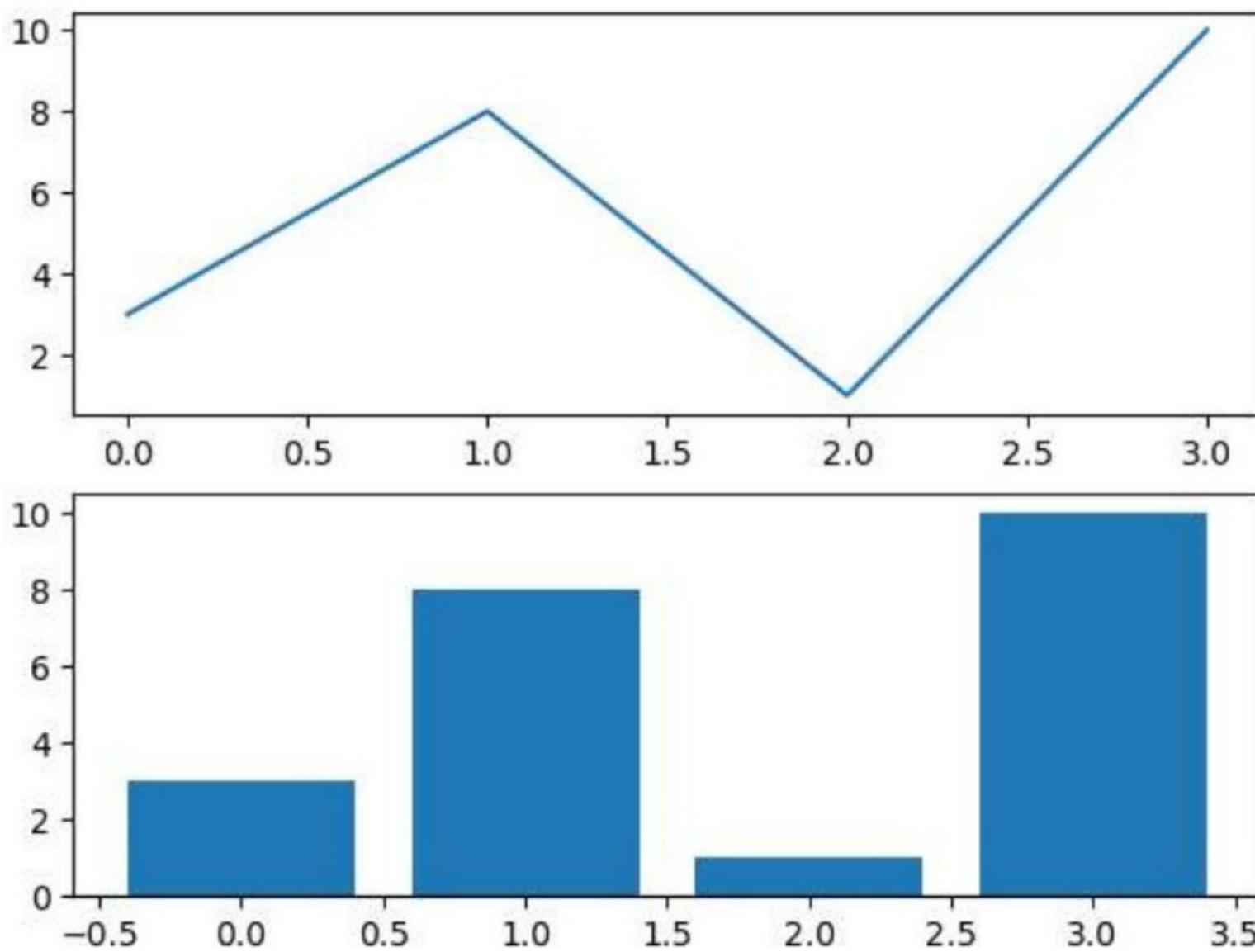


Vertically stacked subplots

```
fig, ax = plt.subplots(2)
# row=0, column=2

ax[0].plot(x,y)
ax[1].bar(x,y)
```

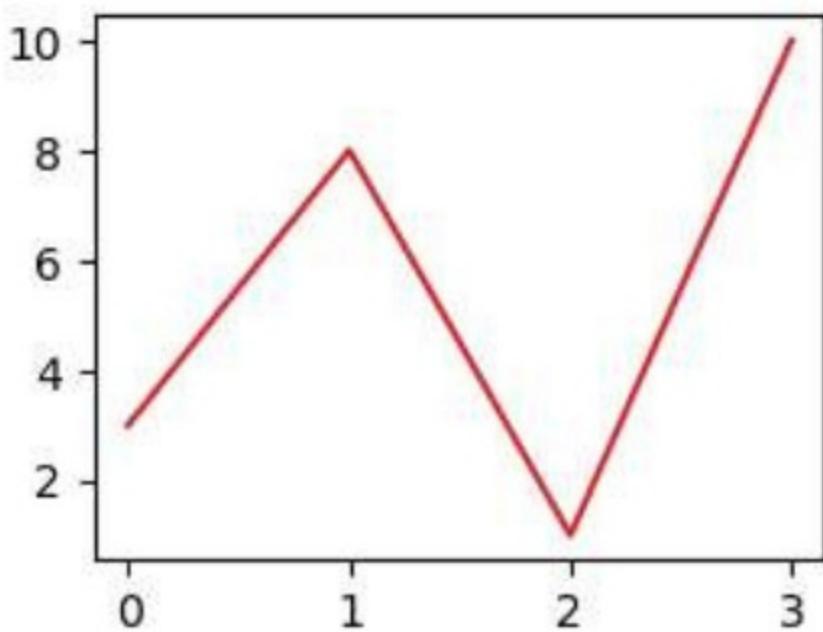
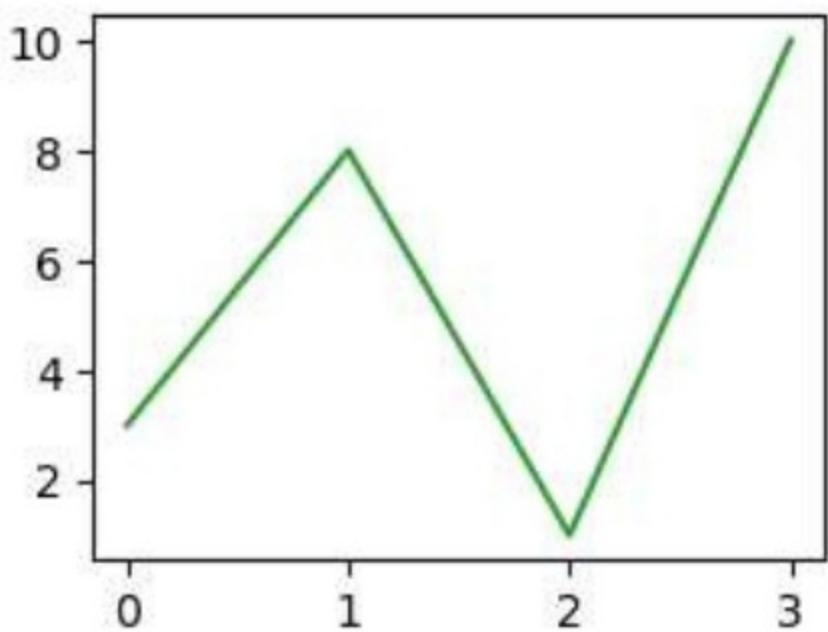
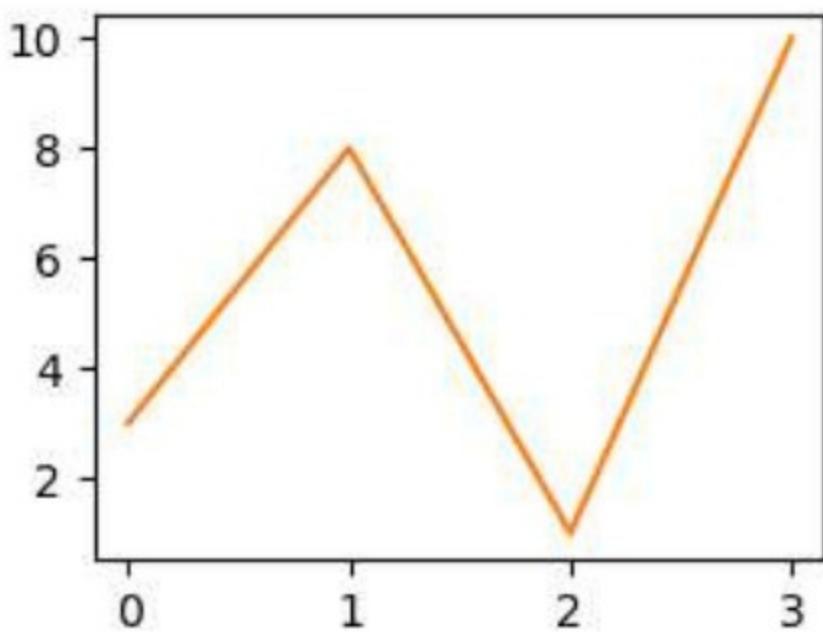
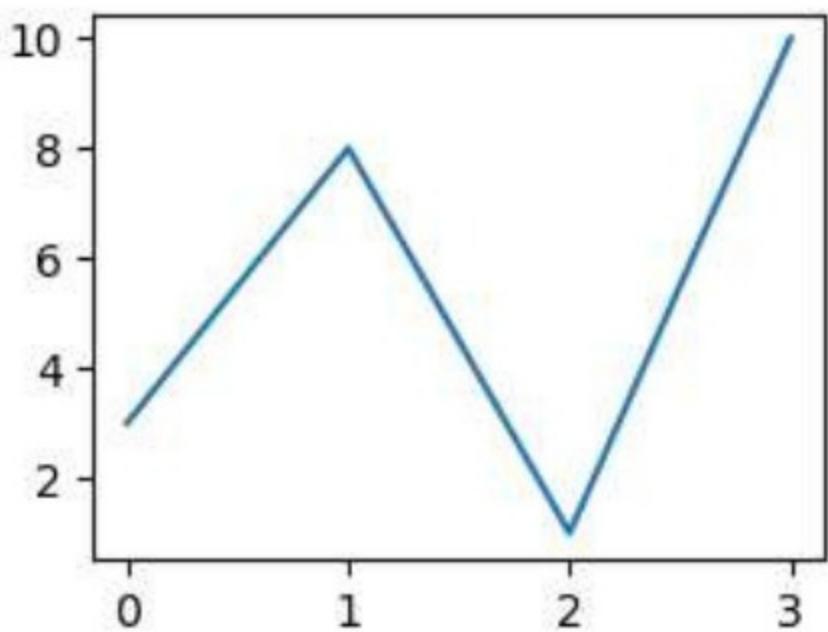
Vertical Stacked Plots



2 rows 2 columns

```
fig, ax = plt.subplots(2, 2)

ax[0, 0].plot(x, y)
ax[0, 1].plot(x, y, 'tab:orange')
ax[1, 0].plot(x, y, 'tab:green')
ax[1, 1].plot(x, y, 'tab:red')
```

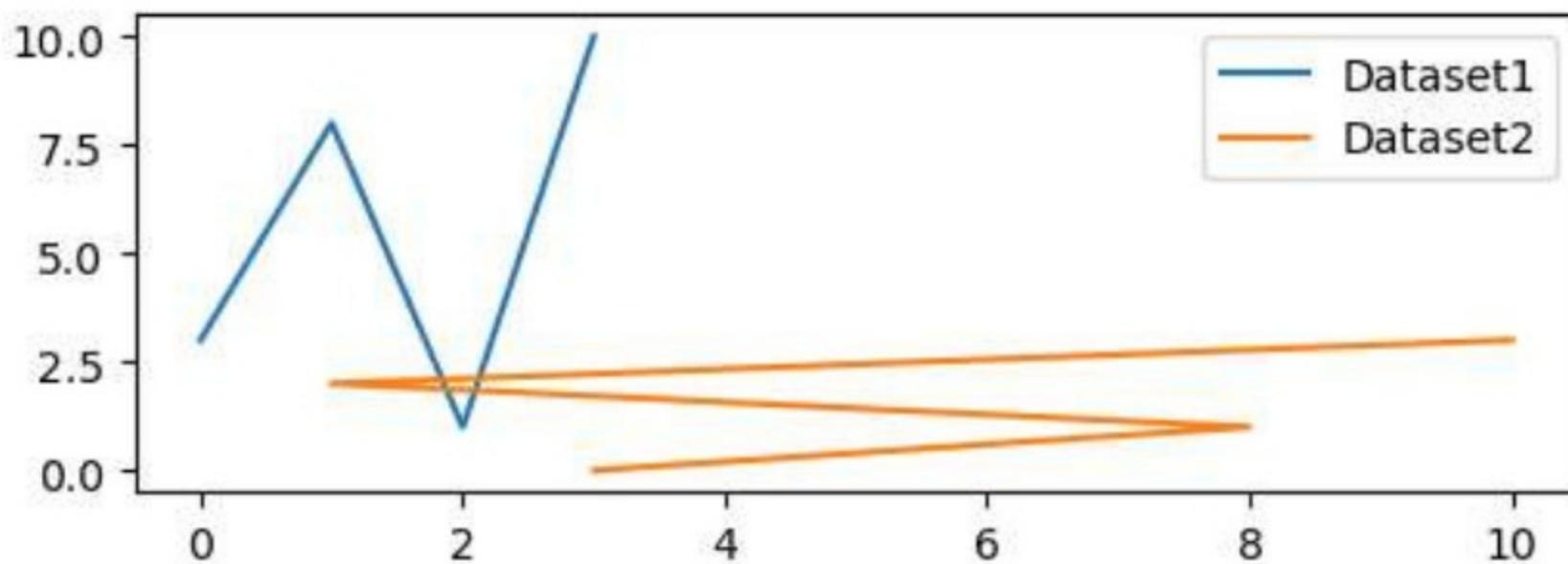


Alternate way to code

```
fig, ((ax1, ax2), (ax3, ax4))  
= plt.subplots(2, 2)  
  
ax1.plot(x, y)  
ax2.plot(x, y, 'tab:orange')  
ax3.plot(x, y, 'tab:green')  
ax4.plot(x, y, 'tab:red')
```

legend()

```
plt.plot(x,y)  
plt.plot(y,x)  
  
plt.legend(['Dataset1', 'Dataset2'])  
  
plt.show()
```

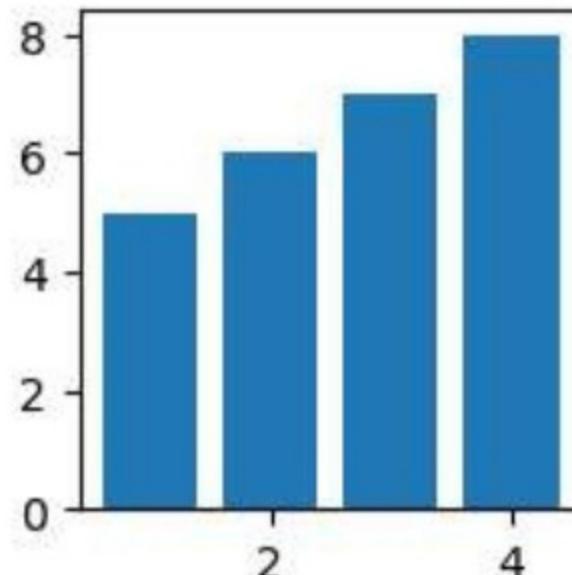


More Different Types of Plots

Bar Graph bar()

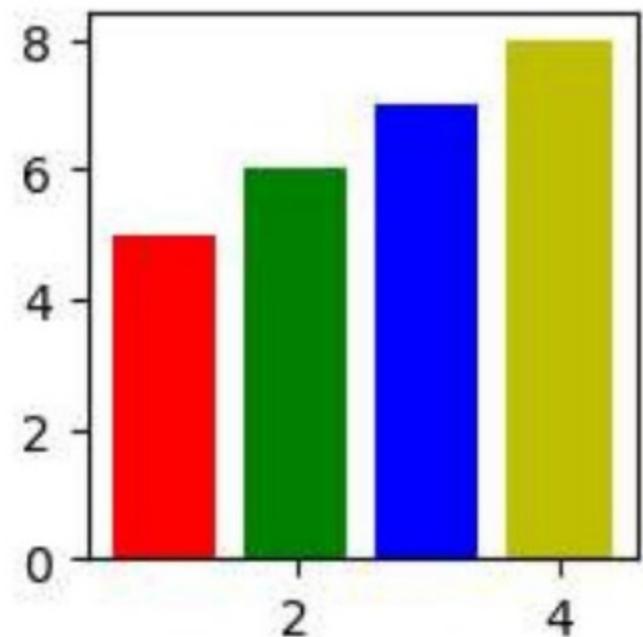
```
x = [1,2,3,4]  
y = [5,6,7,8]
```

```
plt.bar(x,y)
```



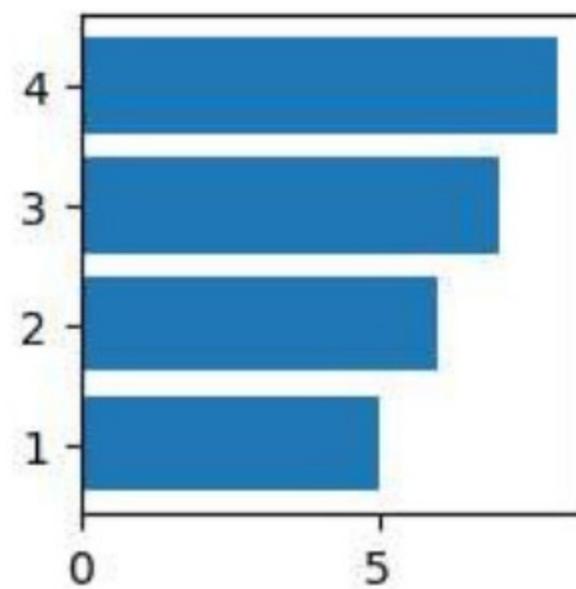
Change color of bar

```
# set colors of bar  
c = ['r','g','b','y']  
  
plt.bar(x,y, color=c)  
  
plt.show()
```



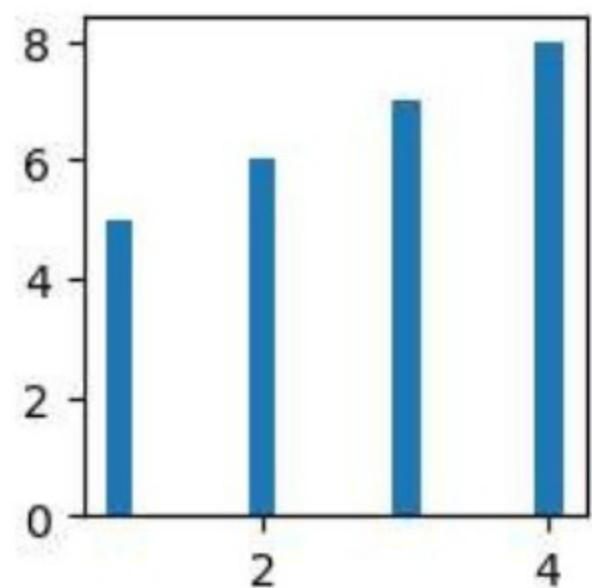
horizontal Bar graph barh()

```
plt.barh(x,y)  
  
plt.show()
```

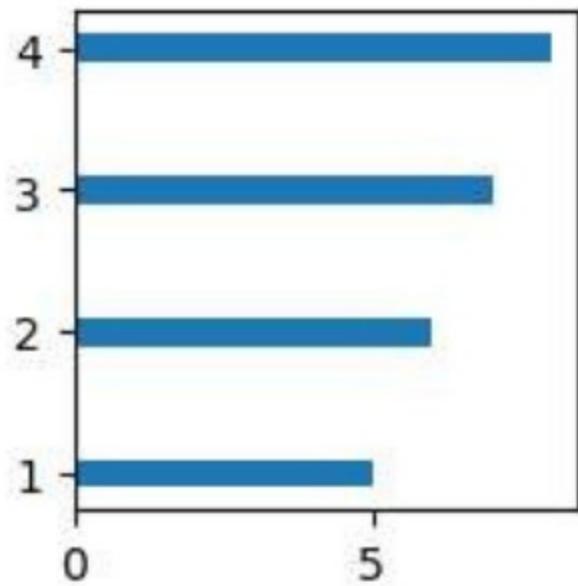


change width of bar

```
# width use in vertical bar  
plt.bar(x,y, width = 0.2)
```

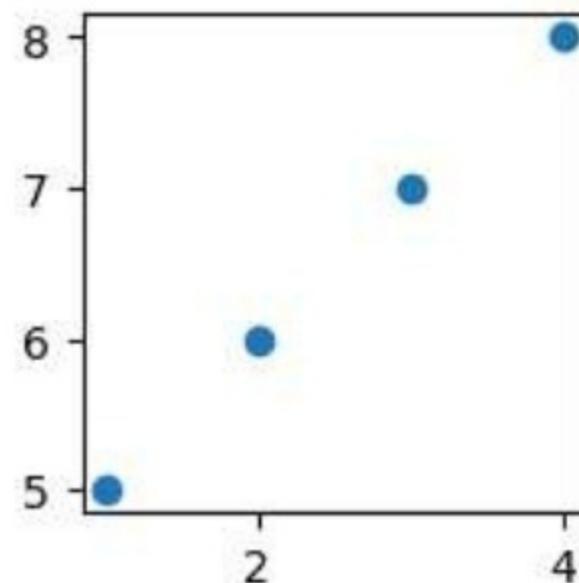


```
# height use in horizontal bar chart  
plt.barh(x,y, height = 0.2)  
  
plt.show()
```



Scatter Plot scatter()

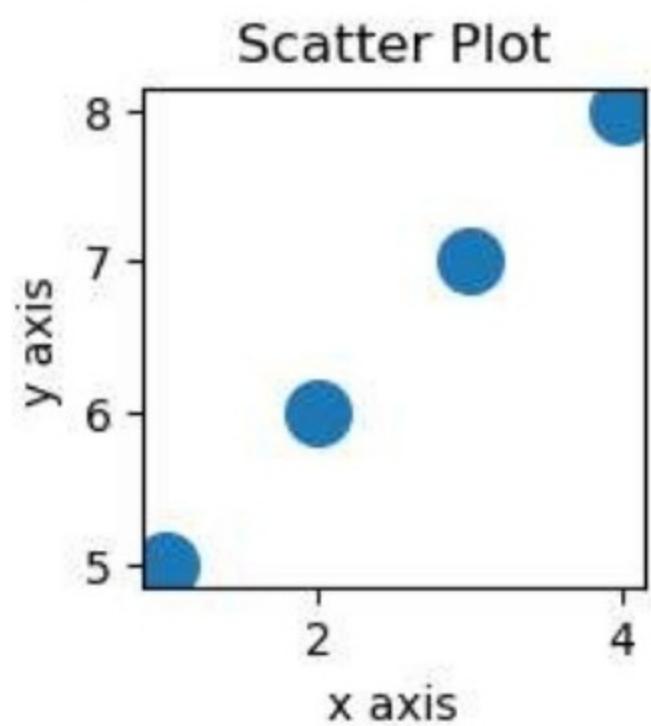
```
x = [1,2,3,4]  
y = [5,6,7,8]  
  
plt.scatter(x,y)  
plt.show()
```



change size of scatter dot

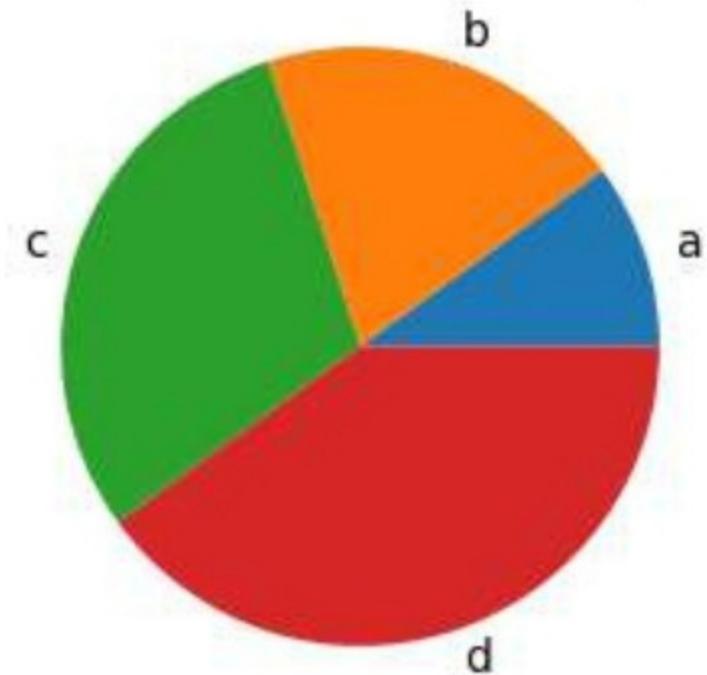
s parameter in scatter()

```
plt.scatter(x,y, s=200)  
  
plt.show()
```



Pie Chart

```
x = [10,20,30,40] # Create Data  
y=['a','b','c','d'] #Create Labels  
  
plt.pie(x, labels=y)  
  
plt.show()
```

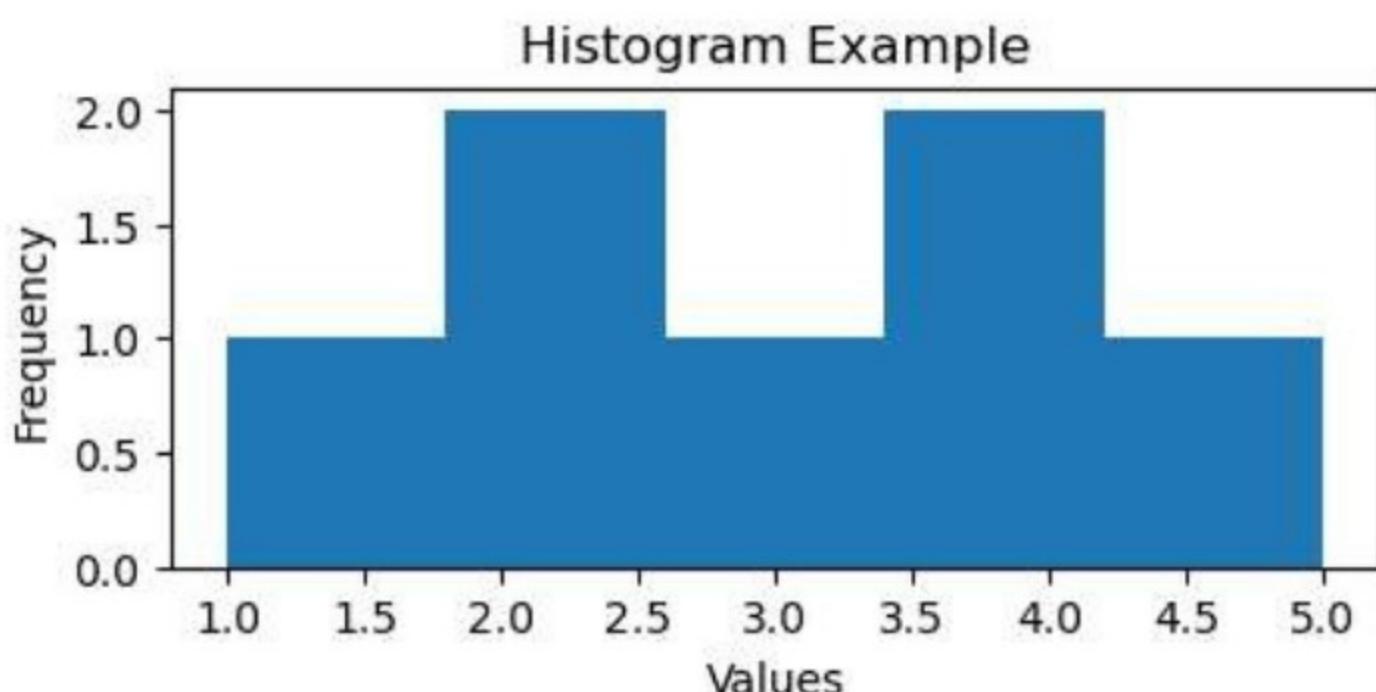


Histograms

```
plt.hist([1,2,2,3,4,4,5],bins=5)
```

```
# Labeling (optional)  
plt.title('Histogram Example')  
plt.xlabel('Values')  
plt.ylabel('Frequency')
```

```
plt.show()
```



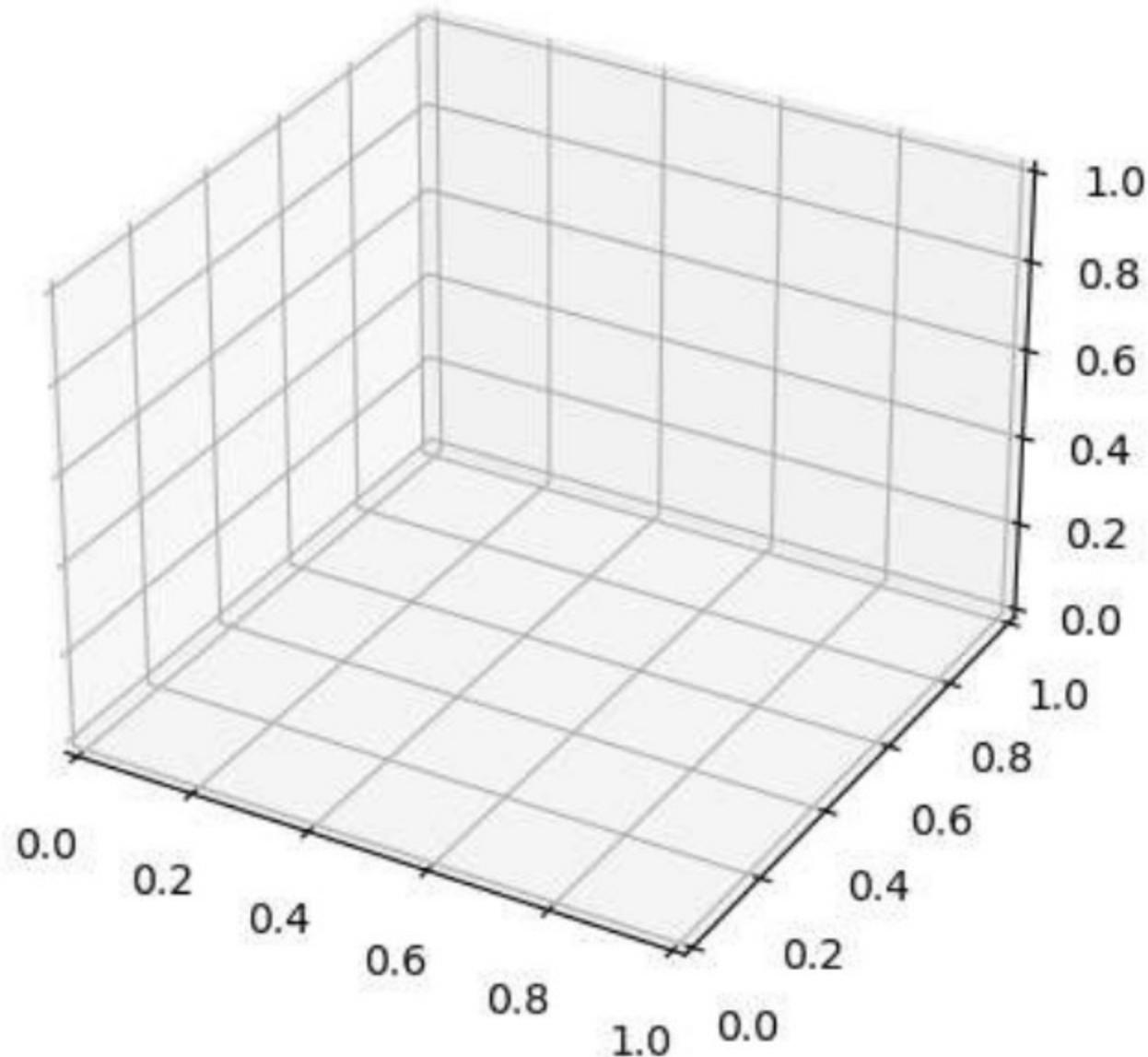
3D Plots

```
# Creating the figure object
```

```
fig = plt.figure()
```

```
# creates the 3d plot
```

```
ax = plt.axes(projection = '3d')
```

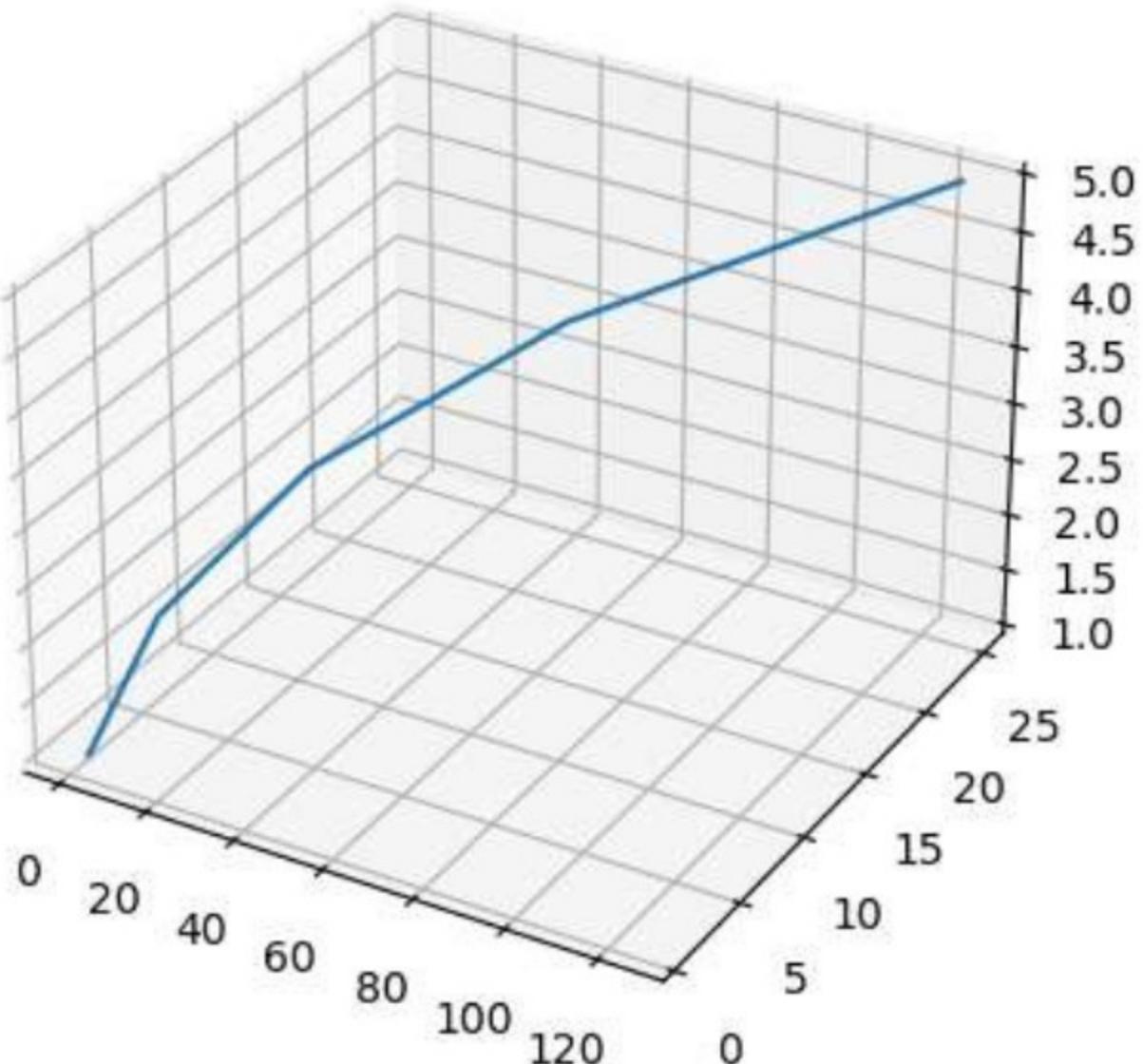


3D Line Plot

```
# creating data
x = [1, 2, 3, 4, 5]
y = [1, 4, 9, 16, 25]
z = [1, 8, 27, 64, 125]
```

```
fig = plt.figure()
```

```
# creates the 3d plot
ax = plt.axes(projection = '3d')
ax.plot3D(z, y, x)
```



Working with Images

image module from Python Imaging Library (PIL)

```
from PIL import Image
```

Access, Load & Display the Image

```
# Access the image from folder  
# r is syntax for path  
fname = r'samplepic.JPG'
```

```
# Load the image in application  
image = Image.open(fname)
```

```
# Display the image in graph  
plt.imshow(image)
```

```
plt.show()
```



Add effects on image

```
# convert to Luminance grayscale
image=Image.open(fname).convert('L')
```

```
# colormap to blue
plt.imshow(image, cmap='Blues')
plt.show()
```



Thank

you