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Introduction to MatPlot Library

Exercise 1.7

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Agenda

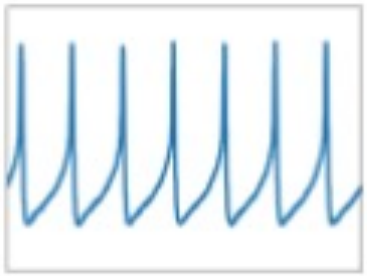
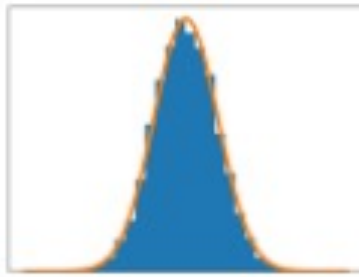
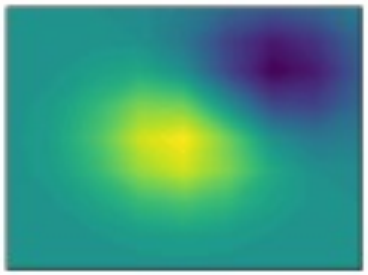
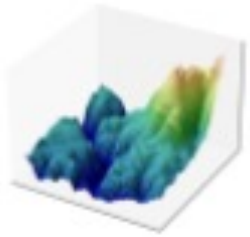
- Introduction to Matplot lib
- Histogram plot
- Multi plot
- Matrix of subplots
- Figure settings

Introduction to Matplotlib

- Matplotlib is an amazing visualization library in Python for 2D plots of arrays
- Matplotlib is a multi-platform data visualization library built on NumPy arrays and designed to work with the broader SciPy stack. It was introduced by John Hunter in the year 2002.
- One of the greatest benefits of visualization is that it allows us visual access to huge amounts of data in easily digestible visuals.
- Matplotlib consists of several plots like line, bar, scatter, histogram etc

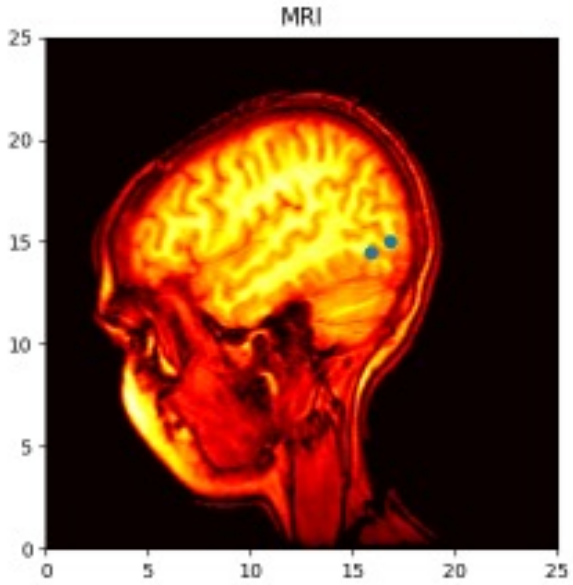
Visualization

- Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python.
- Matplotlib makes easy things easy and hard things possible.

Images

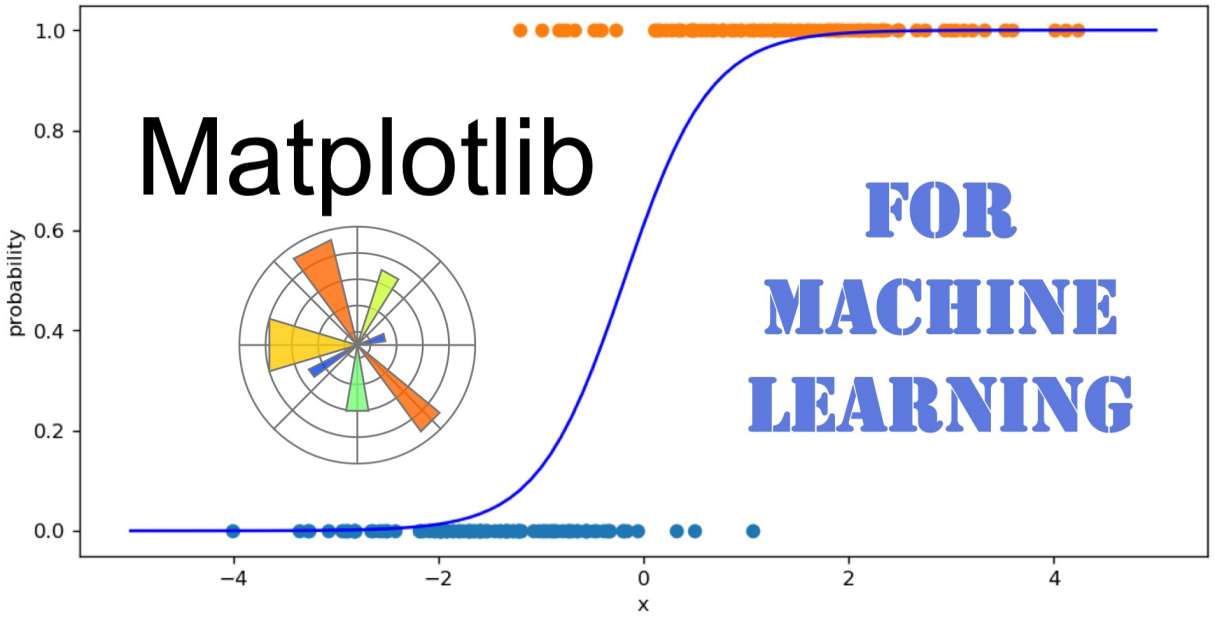
Matplotlib can display images (assuming equally spaced horizontal dimensions) using the imshow() function.



Example of using imshow() to display a CT Scan

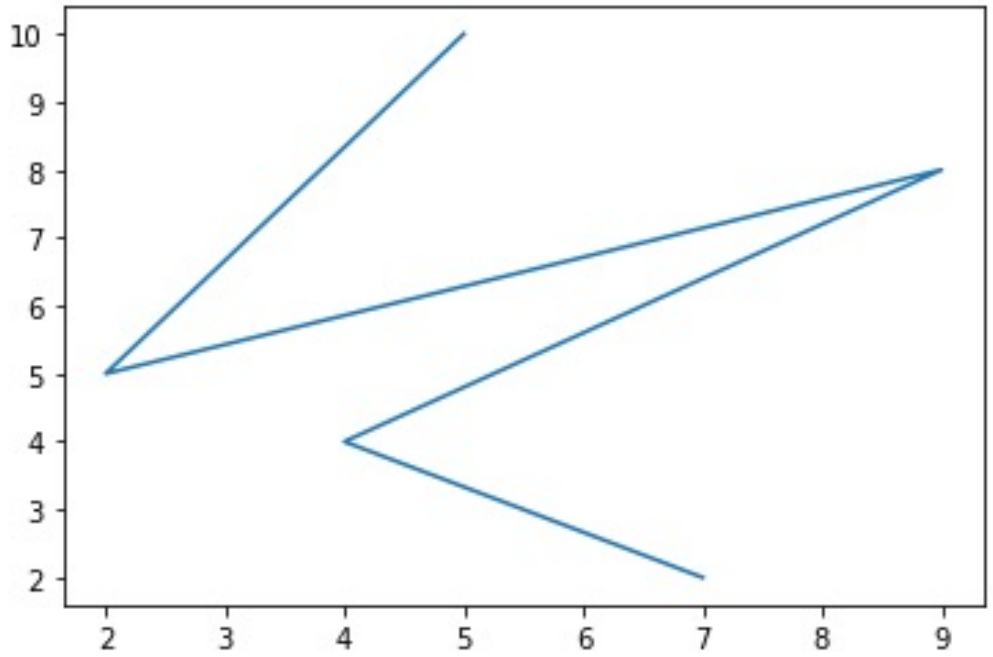
Python: Plotting

- Matplotlib designed to look like MATLAB plot
- 200 subroutines for various plots.
- Generally available with Python



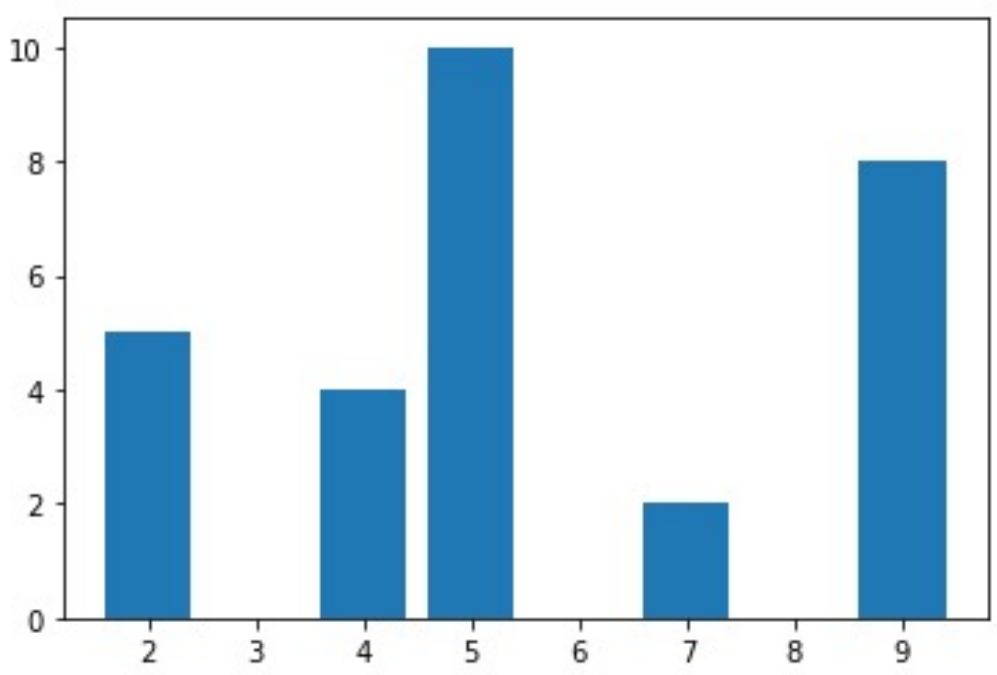
Line plot

```
from matplotlib import pyplot as plt
 # x-axis values
 x = [5, 2, 9, 4, 7]

 # Y-axis values
 y = [10, 5, 8, 4, 2]

 # Function to plot
 plt.plot(x,y)

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



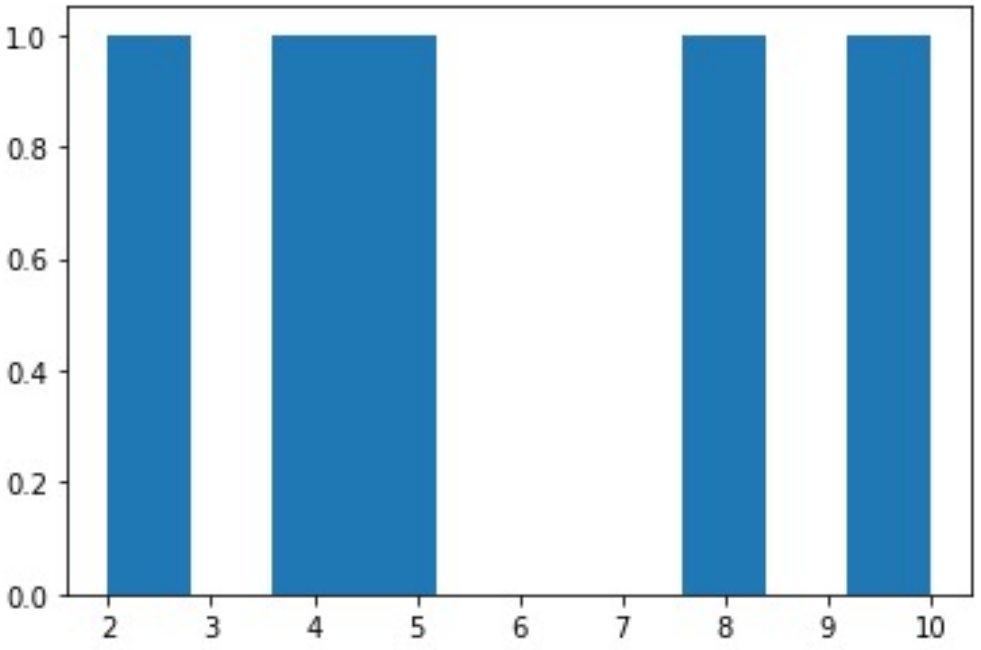
Bar plot

```
from matplotlib import pyplot as plt
 # x-axis values
 x = [5, 2, 9, 4, 7]

 # Y-axis values
 y = [10, 5, 8, 4, 2]

 # Function to plot the bar
 plt.bar(x,y)

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



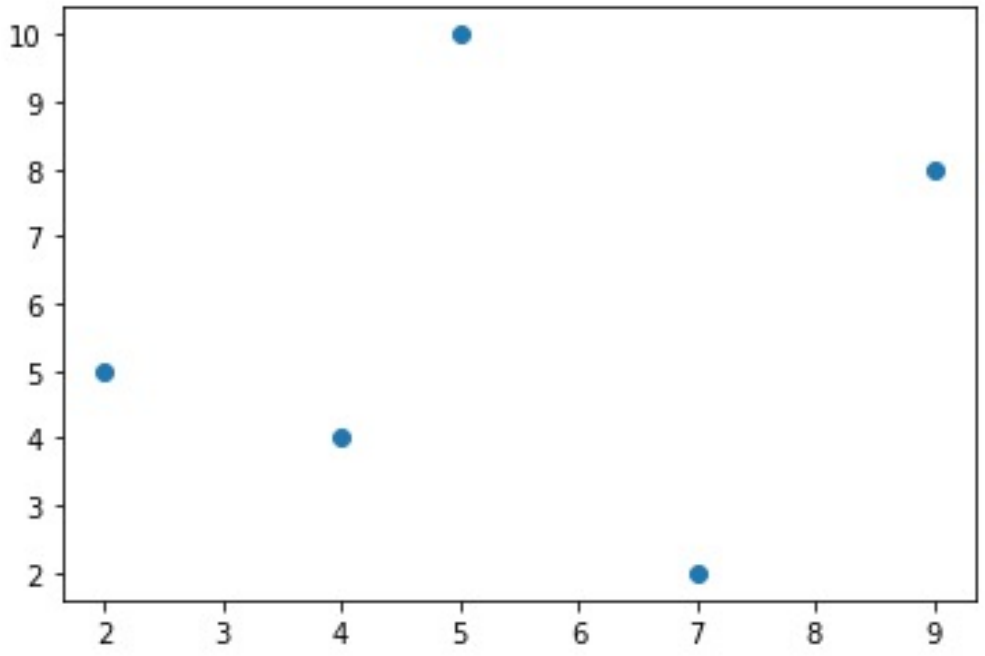
Histogram

```
from matplotlib import pyplot as plt
 # Y-axis values
 y = [10, 5, 8, 4, 2]

 # Function to plot histogram
 plt.hist(y)

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



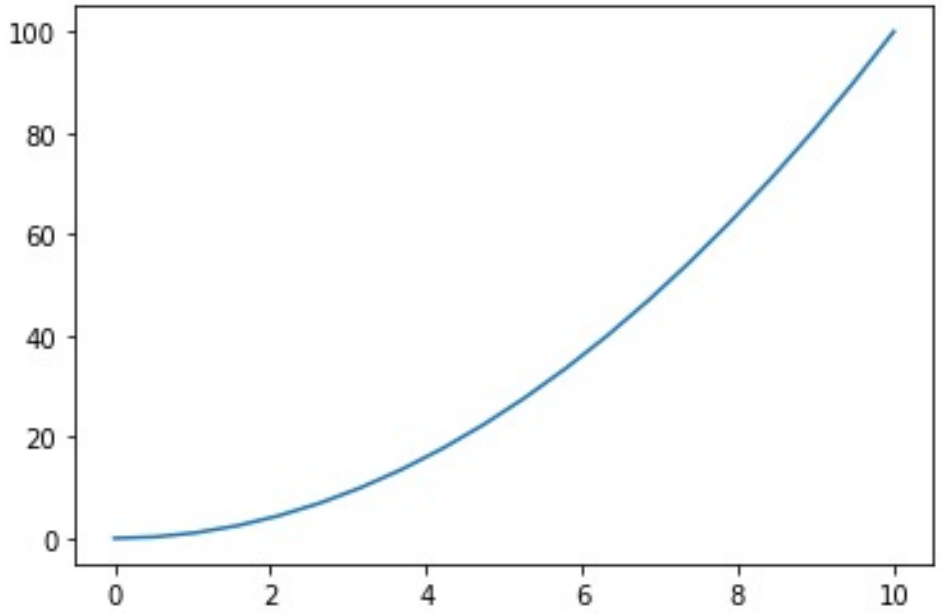
Scatter Plot

```
from matplotlib import pyplot as plt
 # x-axis values
 x = [5, 2, 9, 4, 7]

 # Y-axis values
 y = [10, 5, 8, 4, 2]

 # Function to plot scatter
 plt.scatter(x,y)

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



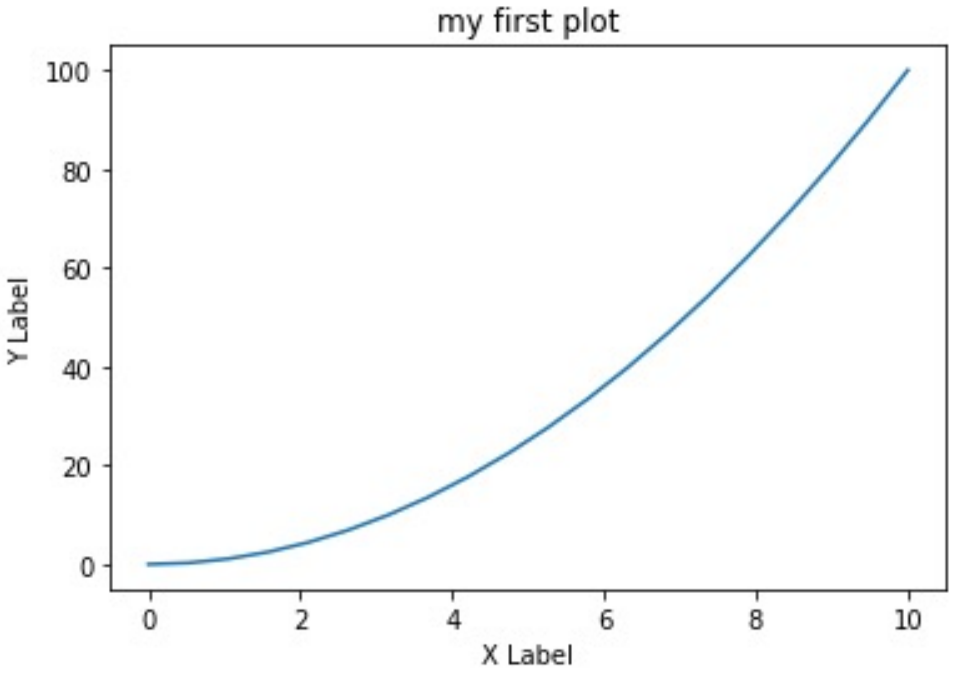
Functional approach

- import numpy as np
- x= np.linspace(0,10,20) # generate 20 datapoints between 0 and 20
- y= x**2 # generate array ‘y’ from square of ’x’
- plt.plot(x,y)



Example

```
from matplotlib import pyplot as plt
plt.plot(x,y)
plt.title('my first plot')
plt.xlabel('X Label')
plt.ylabel('Y Label')
```



Line 2D Properties

Property	Value type
Alpha	Float
animated	[True| False]
Clip_box	A matplotlib.transform.Bbox instance
Clip_on	[True| False]
Color or c	Any matplotlib color
data	(np.arrat xdata, np.array ydata)
label	Any string
picker	Used in interactive line selection
pickradius	The line pick selection radius

Multi plots

- Matplotlib allows us easily create multi-plots on the same figure using the .subplot() method
- This .subplot() method takes in three parameters, namely:
  - nrows:
    - the number of rows the Figure should have.
  - ncols:
    - the number of columns the Figure should have.
  - plot_number :
    - which refers to a specific plot in the Figure.

Multi plots

```
from matplotlib import pyplot as plt
plt.subplot(1,2,1)
plt.plot(x,y,'red')
plt.subplot(1,2,2)
plt.plot(y,x,'green')
```

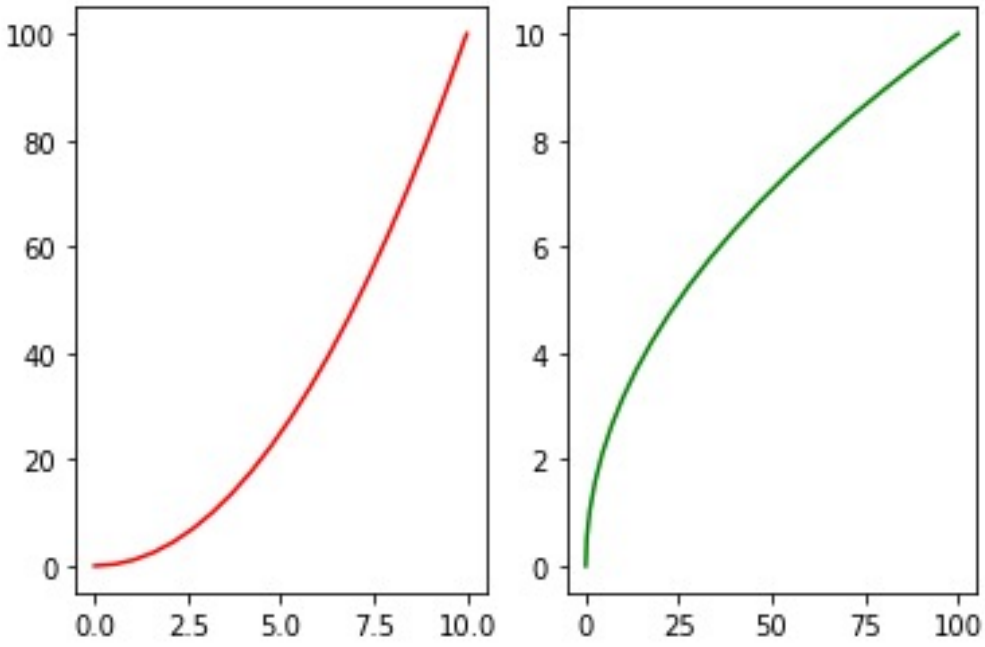
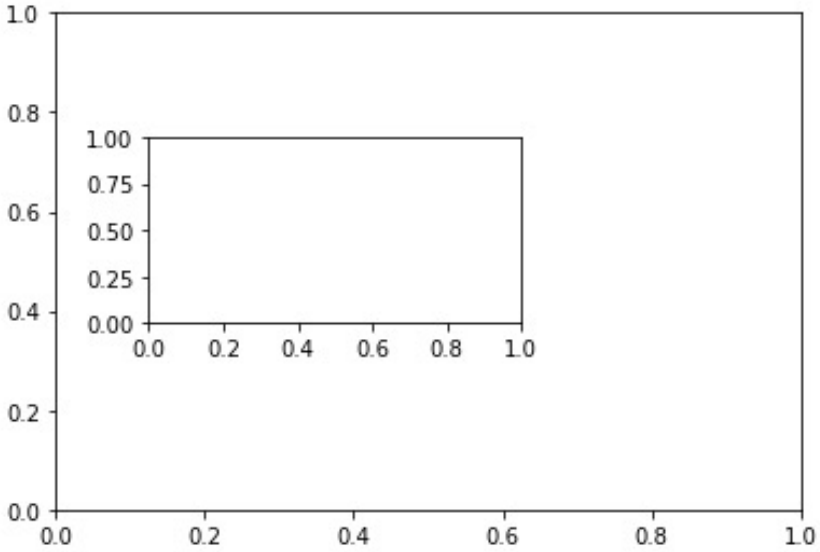


Figure in figure

```
#from matplotlib import pyplot as plt
from matplotlib import pyplot as plt
fig = plt.figure()
axis1= fig.add_axes([0.1,  0.1,  0.8, 0.8])

axis2= fig.add_axes([0.2,  0.5,  0.4, 0.3])
```



Matrix of subplot

```
#from matplotlib import pyplot as plt
from matplotlib import pyplot as plt
fig = plt.figure()
fig.axes= plt.subplots(nrows=3, ncols=3)
```

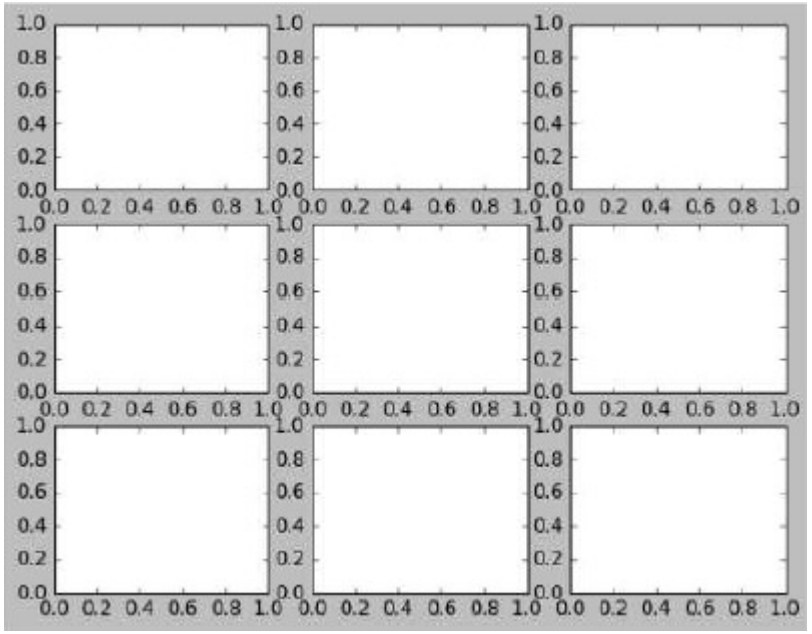
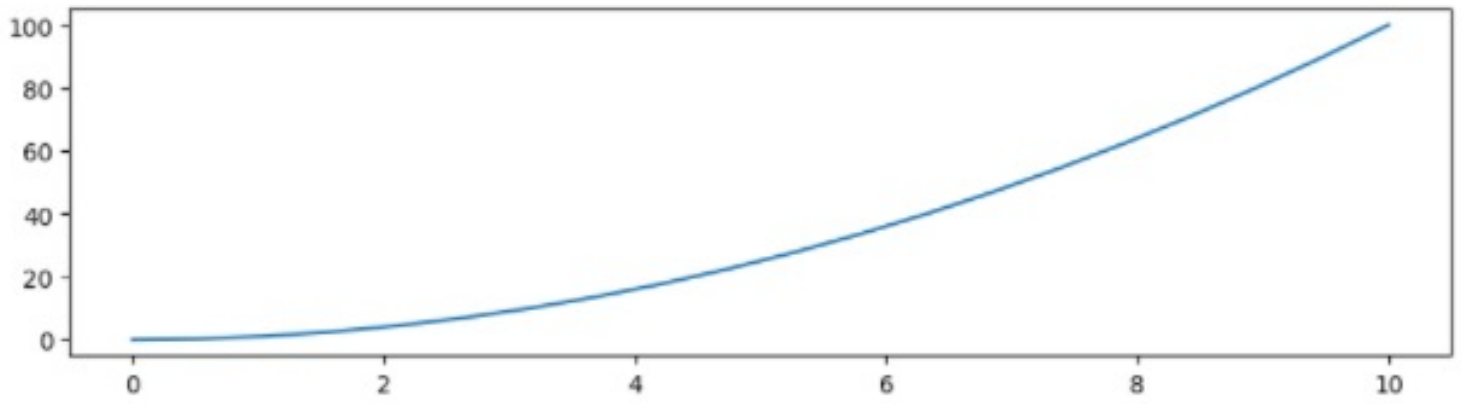


Figure size, aspect ratio, and DPI in figure

```
#from matplotlib import pyplot as plt
from matplotlib import pyplot as plt
fig = plt.figure(figsize=(8,2), dpi = 100)
ax = fig.add_axes([0,0,1,1])
ax.plot(x,y)
```



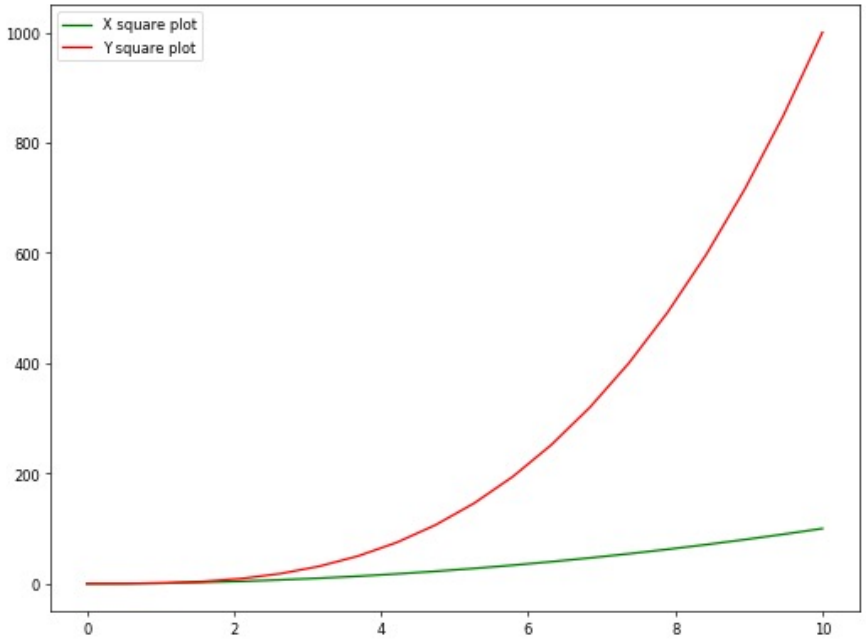
Legends

- Legends allows us to distinguish between plots. With Legends, you can use label texts to identify or differentiate one plot from another. For example, say we have a figure having two plots like below:

```
fig = plt.figure(figsize=(8,6), dpi = 60)
ax = fig.add_axes([0,0,1,1])
ax.plot(x, x**2)
ax.plot(x, x**3, 'red')
```

Legend

```
from matplotlib import pyplot as plt
import numpy as np
fig = plt.figure(figsize=(8,6), dpi = 60)
ax = fig.add_axes([0,0,1,1])
x= np.linspace(0,10,20)
ax.plot(x, x**2, 'green', label = "X square plot")
ax.plot(x, x**3, 'red', label = "Y square plot")
ax.legend()
```



WHAT YOU HAVE LEARN AND WHY

- For data visualization
- We can integrate the visualization technique in our model ML model
- We can sell visualization to company by their data
- Plotly, seaborn and matplotlib are replacement for each other

Exercise 1

- Write a text file
  - test.txt

    1 2
    2 4
    3 1
- Write a Python program to draw a line using given axis values taken from a text file, with suitable label in the x axis, y axis and a title.

Exercise 2

- Write a Python program to plot two or more lines with legends, different widths and colors.

Thank you for your attention

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