Object Oriented Programming

BE(CSE) II-Semester

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Unit-V

Plot Graphs in python

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matplotlib

- matplotlib is module used to plot the graphs in the python.
- We can plot graphs using python script, python and ipython shell.
- How to install matplotlib?

- Go to command prompt type the following command

```
python –m pip install –U pip
pip install matplotlib
```

- - to verify the matplotlib is installed or not give the following command

- import matplotlib
  matplotlib.__version__
  # '3.2.1'

numpy module

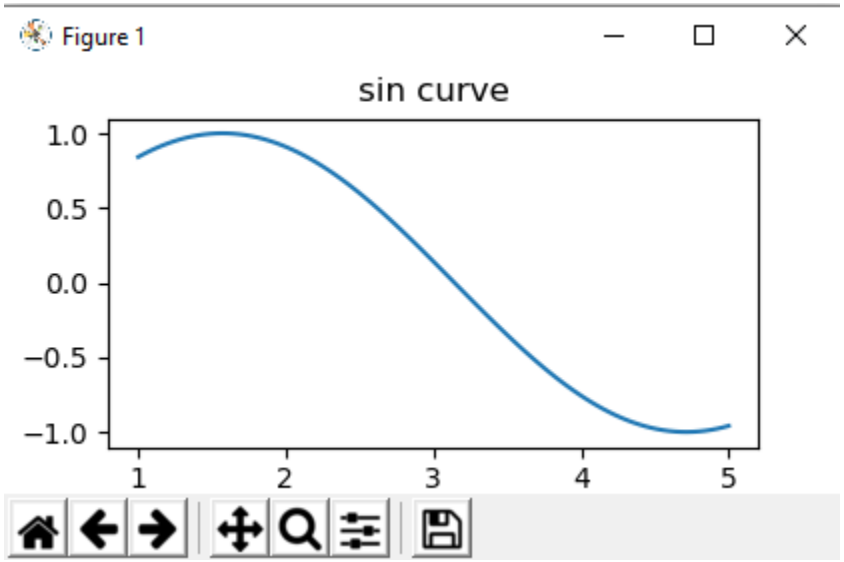
- numpy stands for numerical python
- numpy package provides library for the scientific computing and powerful N dimensional array objects.
- Install numpy module using the following command

  pip install numpy (execute this command in command prompt)

Plot graph for sin function

```
from matplotlib.pyplot import *
from numpy import *
t=linspace(1,5,100)# in numpy
print(t)
plot(t,sin(t))# plot in pyplot
title("sin curve")
show()
```

sincurve.py

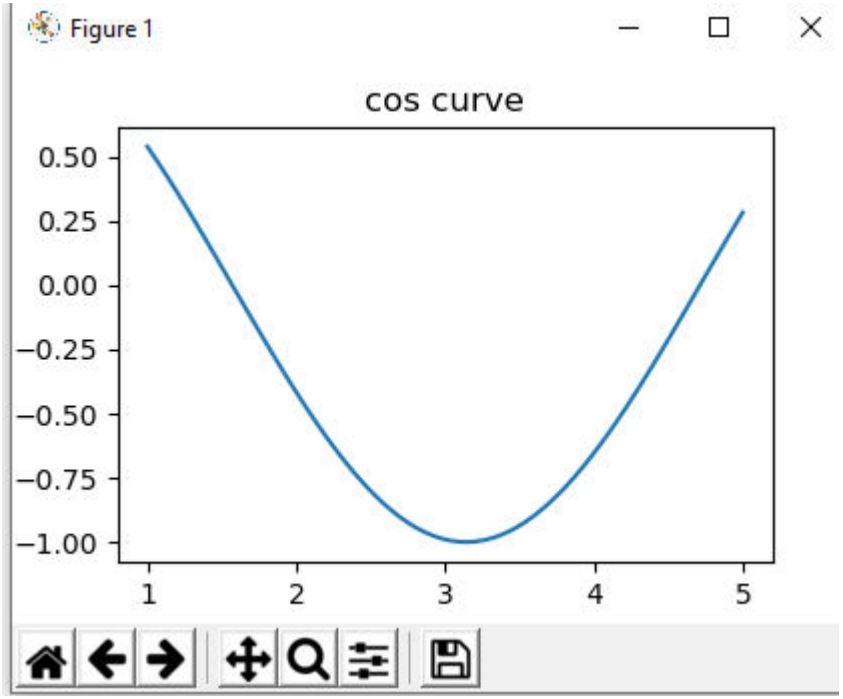


linspace() – generates random numbers in within the specified values.
sin() – available in numpy
plot() method is used to plot the values in the graph using specified functions

Plot graph for cos function

coscurve.py

```
from matplotlib.pyplot import *
from numpy import *
t=linspace(1,5,100)# in numpy
#print(t)
plot(t,cos(t))# plot in pyplot
title('cos curve')
show()
```



Exercise

1. Plot the graph for the following function (sin(x)*sin(x))/x

Solution- plotGraph3.py

```
from matplotlib.pyplot import *
from numpy import *
x=linspace(1,5,100)# in numpy
y=(sin(x)*sin(x))/x
plot(x,y,'r‘,linewidth=3)# graph in red color
show()
```

2. Plot the graph for the following function -x*x+4x-5

plot(x,-x*x+4*x-5) - refer ploatGraph4.py

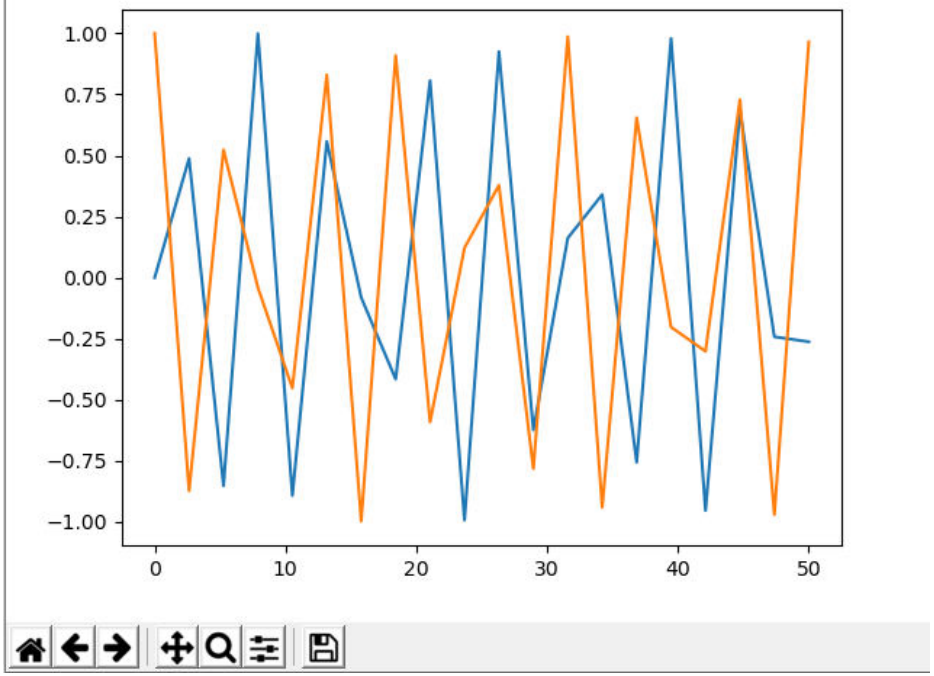
Specify line width and plot graph in dot, double dash

```
from matplotlib.pyplot import *
from numpy import *
x=linspace(1,5,100)# in numpy
y=(sin(x)*sin(x))/x
plot(x,y,'r. ',linewidth=4)# dotted lines
show()
```

```
from matplotlib.pyplot import *
from numpy import *
x=linspace(1,5,100)# in numpy
y=(sin(x)*sin(x))/x
plot(x,y,'r-- ',linewidth=4)# dashed lines
show()
```

Plot multiple graphs

```
from matplotlib.pyplot import *
from numpy import *
x=linspace(0,50,20)
plot(x,sin(x))
y=linspace(0,50,20)
plot(x,cos(y))
show()
```

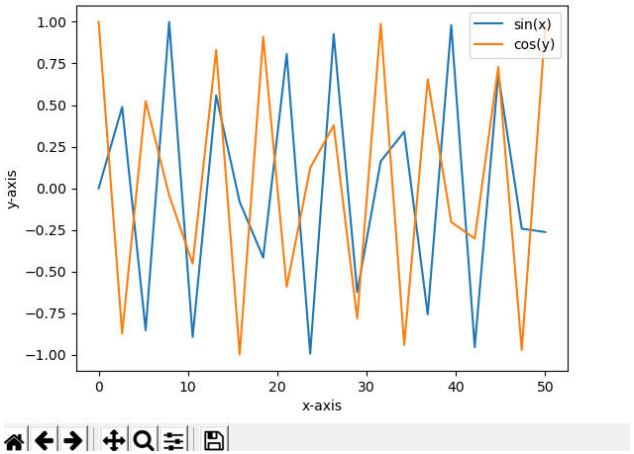


In above figure you have confusion that which graph is sin(x) and cos(y)

- To overcome that problem name each graph using legend() method.

Multiplot1.py

```
from matplotlib.pyplot import *
from numpy import *
x=linspace(0,50,20)
y=linspace(0,50,20)
plot(x,sin(x))
plot(y,cos(y))
legend(['sin(x)','cos(y)'])#distinguish the graphs
xlabel('x-axis')#label x axis
ylabel('y-axis')# label y axis
show()
```

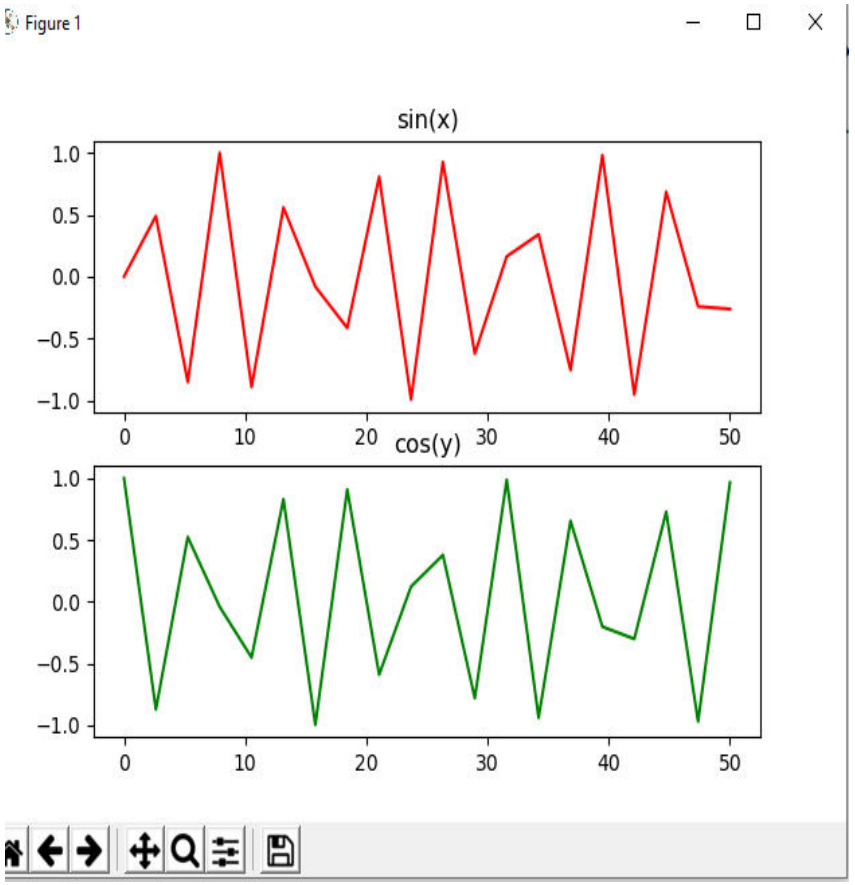


Note: when you plot multiple functions in a single graph they may overlap to separate them we can use subplot() method

subplots

- subplot(rows, cols, serial nofor the plot)

```
from matplotlib.pyplot import *
from numpy import *
x=linspace(0,50,20)
subplot(2,1,1)
plot(x,sin(x),'r')
title("sin(x)")
y=linspace(0,50,20)
subplot(2,1,2)
plot(y,cos(y),'g')
title("cos(y)")
show()
```

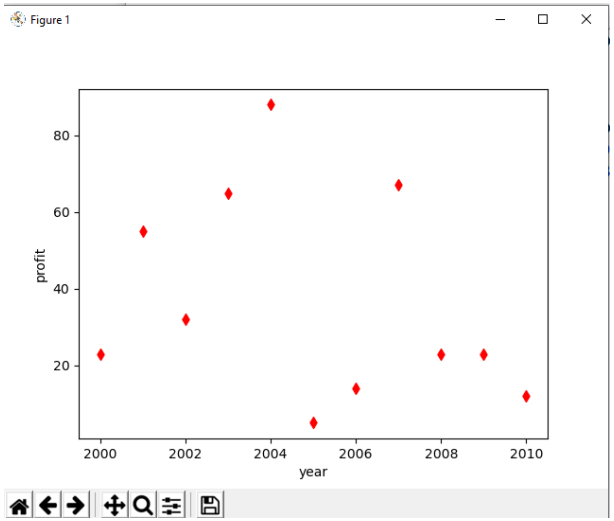


Scatter graph

- Data displayed as collection of points
- scatter() function is used to generate scatter graph.
- Syntax: scatter(x,y)

- Example

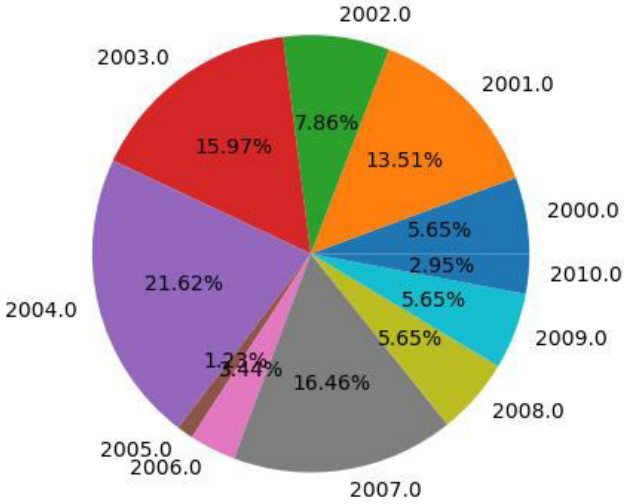
```
from matplotlib.pyplot import *
from numpy import *
year,profit=loadtxt("company-a-data.txt",unpack=True)
print(year)
print(profit)
scatter(year,profit,color='r',marker='d')
xlabel('year')
ylabel('profit')
show()
```



piechart

- Syntax:

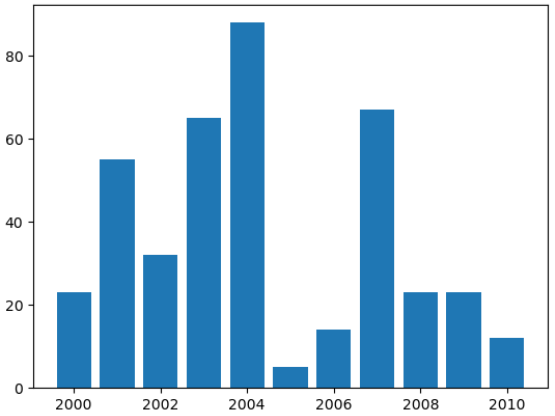
- pie(values,labels=labels)
- Where values: data to be displayed
- labels: labels for each wedge.




```
from matplotlib.pyplot import *
from numpy import *
year,profit=loadtxt("company-a-data.txt",unpack=True)
pie(profit,labels=year,autopct = '%.2f%%')
show()
```

bargraph

- graphs with rectangular graphs
- syntax:
- bar(x,y)



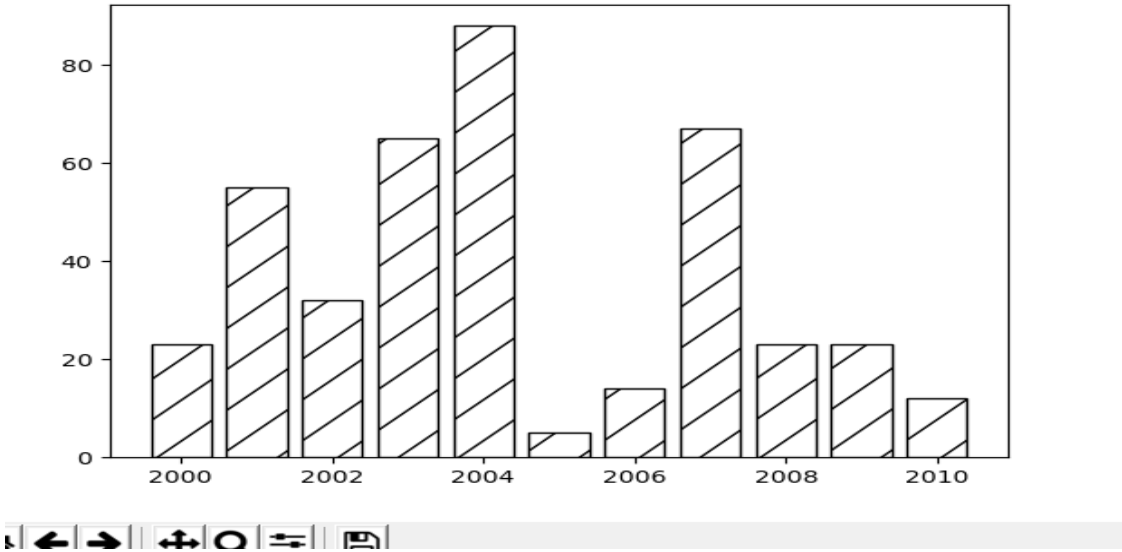
- Example- bargraph.py

```
from matplotlib.pyplot import *
from numpy import *
year,profit=loadtxt("company-a-data.txt",unpack=True)

bar(year,profit)
show()
```

- Create a bar chart is not filled and which is hatched with 45 degrees slanting lines

bar(year,profit,fill=False,hatch='/')



Plot images using matplotlib

- To plot images import matplotlib.image package.

```
import  matplotlib.pyplot as plt
import matplotlib.image as mpimg
img1=mpimg.imread('stinkbug.png')
plt.imshow(img1)
plt.show()
```

References

- https://docs.python.org/3/library/turtle.html
- https://docs.python.org/3/library/turtle.html#turtle.forward