Matploblib

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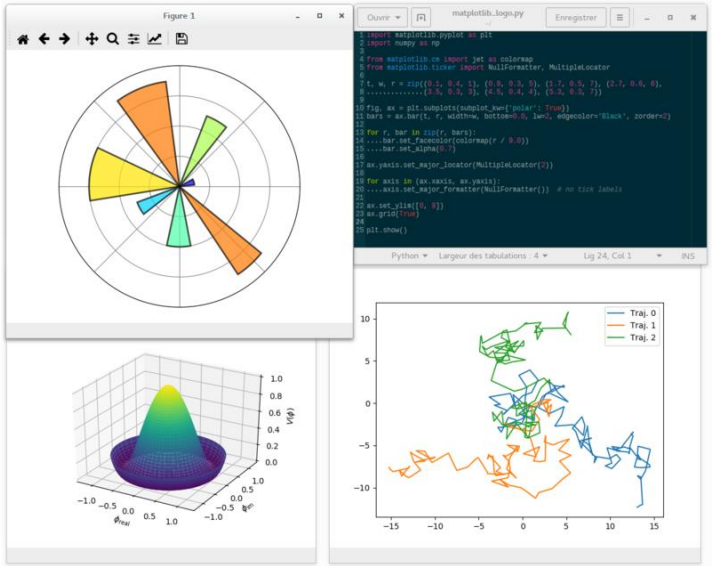
Outline

- matploblib

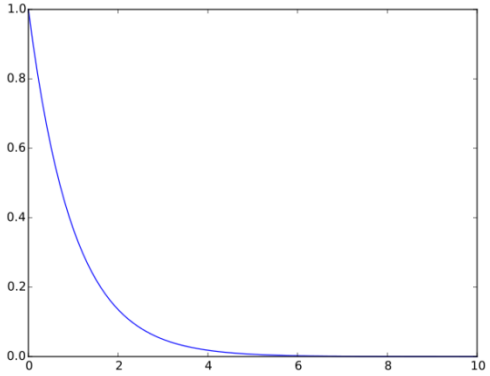
Matplotlib

Matplotlib

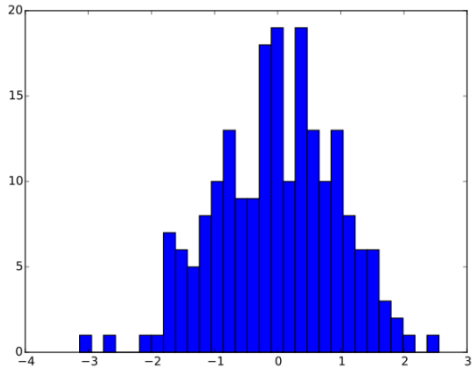
- A plotting library for the Python
  - https://matplotlib.org/
- Numerical mathematics extension NumPy
- Matplotlib 1.2 is the first version of matplotlib to support Python 3.x



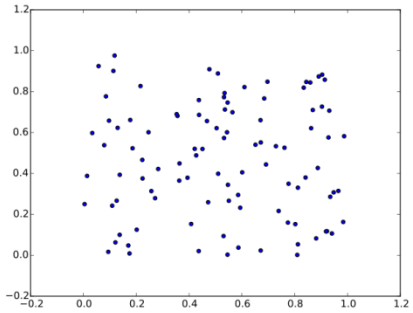
Matplotlib



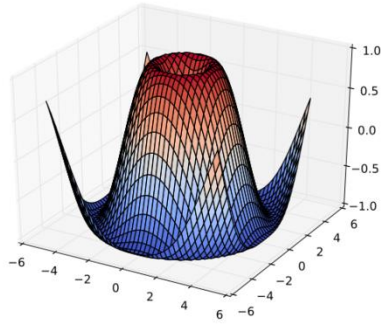
line plot



histogram



scatter plot

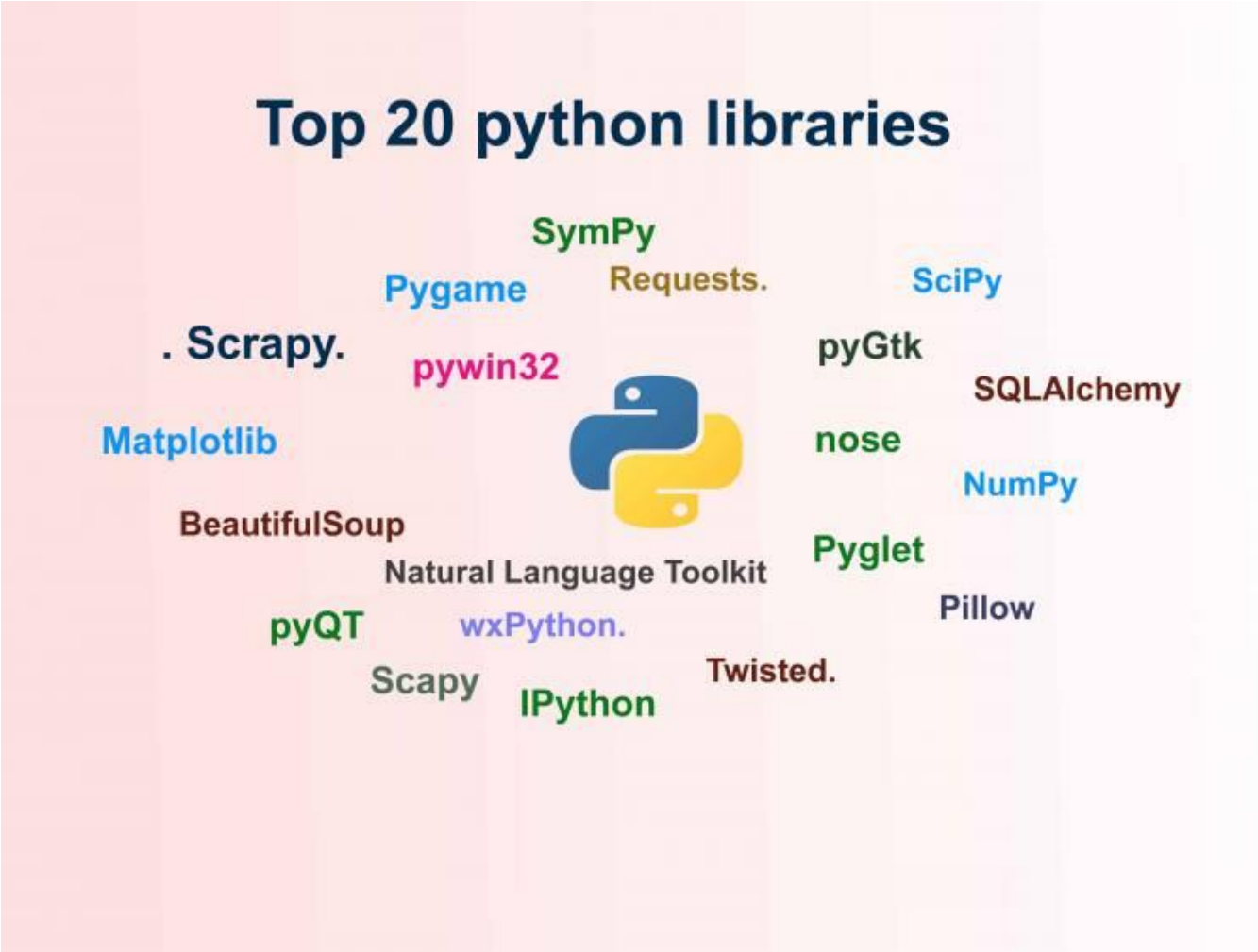


3D plot

Matplotlib

- more example
  - https://matplotlib.org/gallery.html

Popular Python Libraries for Data Analysis


Top 20 python libraries
SymPy
Pygame
Requests.
SciPy
. Scrapy.
pywin32
pyGtk
SQLAlchemy
Matplotlib
nose
NumPy
BeautifulSoup
Pyglet
Natural Language Toolkit
Pillow
pyQT
wxPython.
Twisted.
Scapy
IPython

Figure

- A figure is the windows in the GUI that has "Figure #" as title.
  - figures are numbered starting from 1
  - several parameters that determine what the figure looks like:

Argument	Default	Description
num	1	number of figure
figsize	figure.figsize	figure size in in inches (width, height)
dpi	figure.dpi	resolution in dots per inch
facecolor	figure.facecolor	color of the drawing background
edgecolor	figure.edgecolor	color of edge around the drawing background
frameon	True	draw figure frame or not

Figure

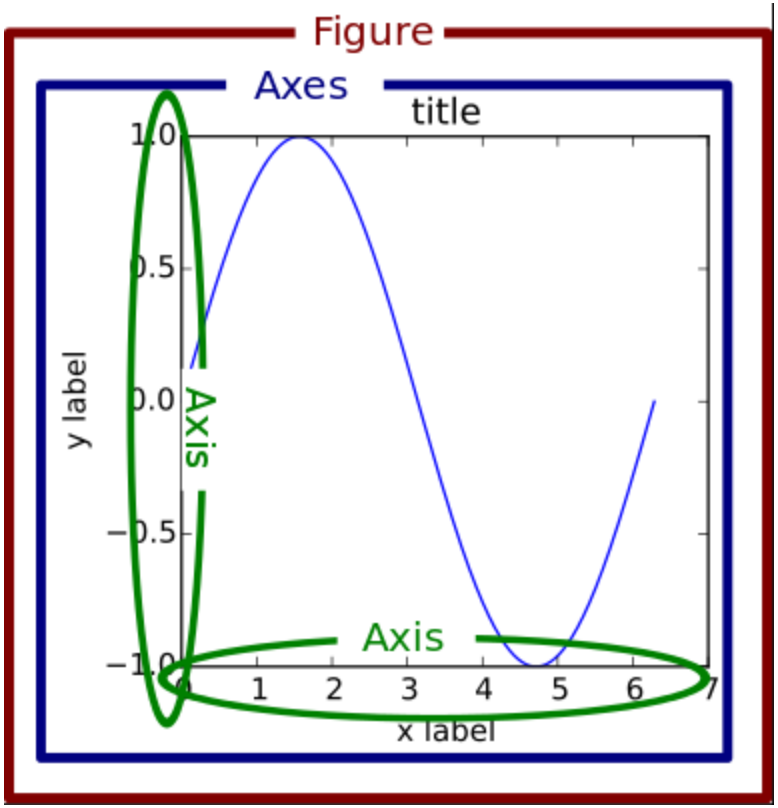
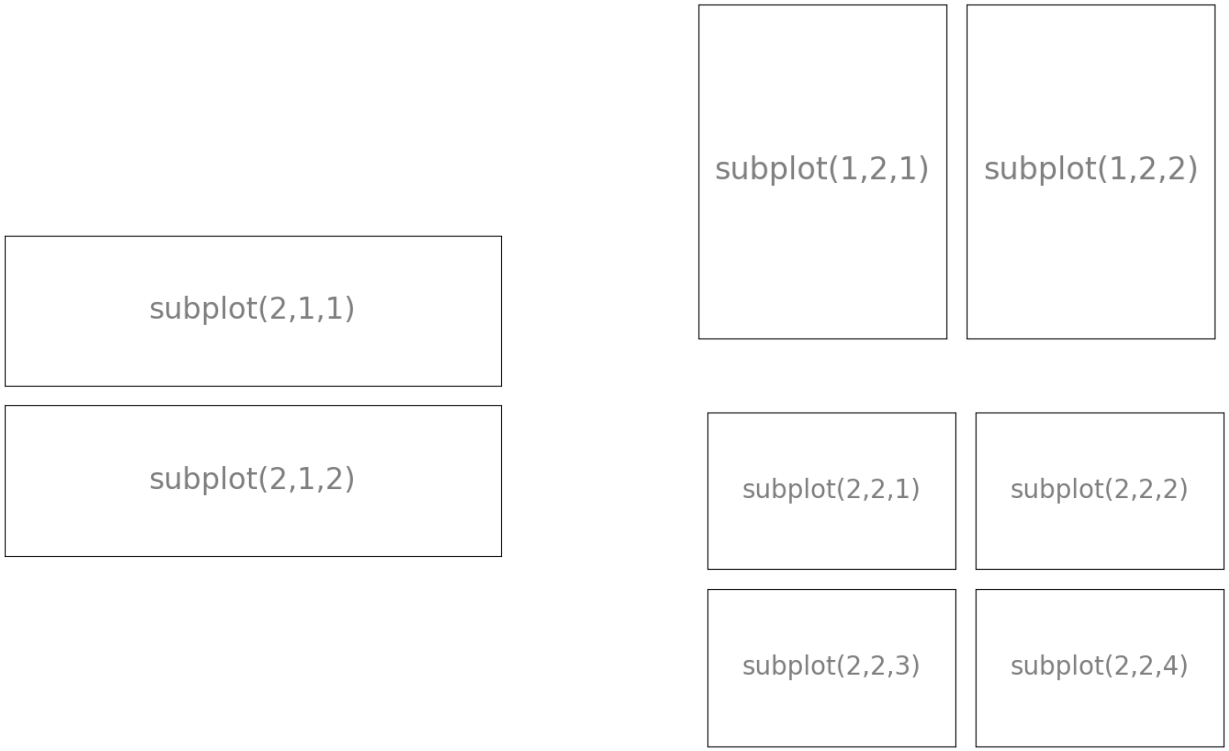


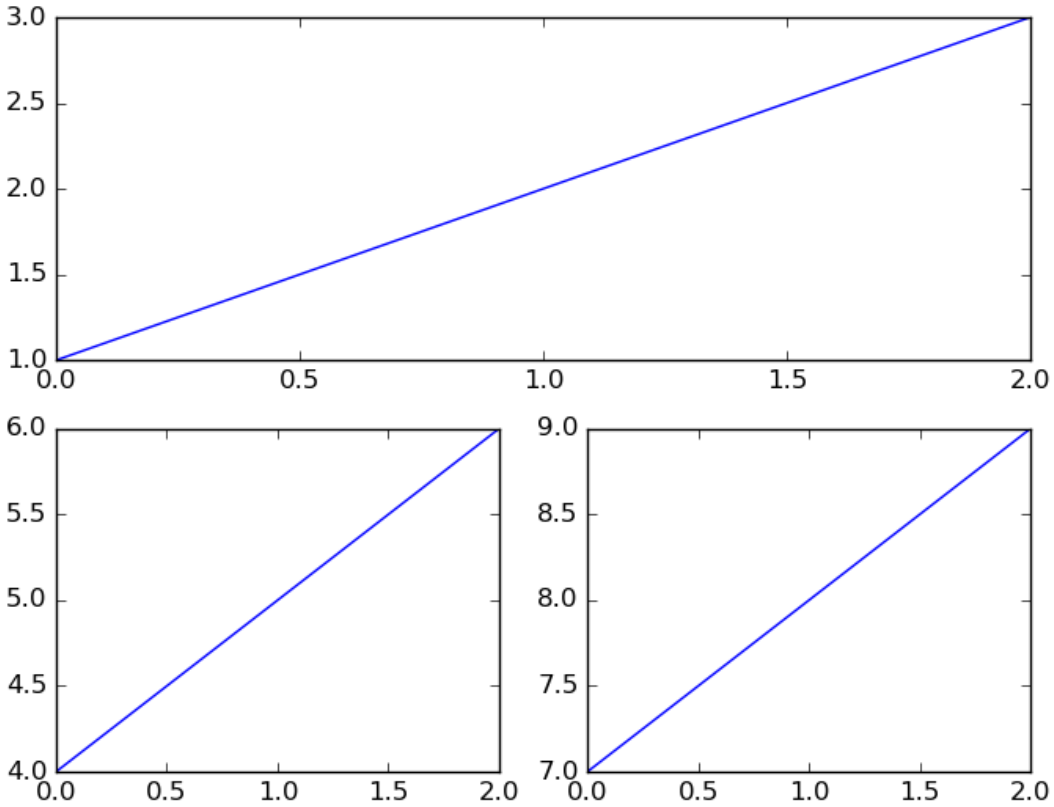
Figure
Axes
title
1.0
0.5
0.0
−0.5
−1.0
y label
Axis
Axis
1
2
3
4
5
6
x label

Subplot

- Subplot allow user to arrange plots in a regular grid
  - need to specify # of rows/columns and # of the plot

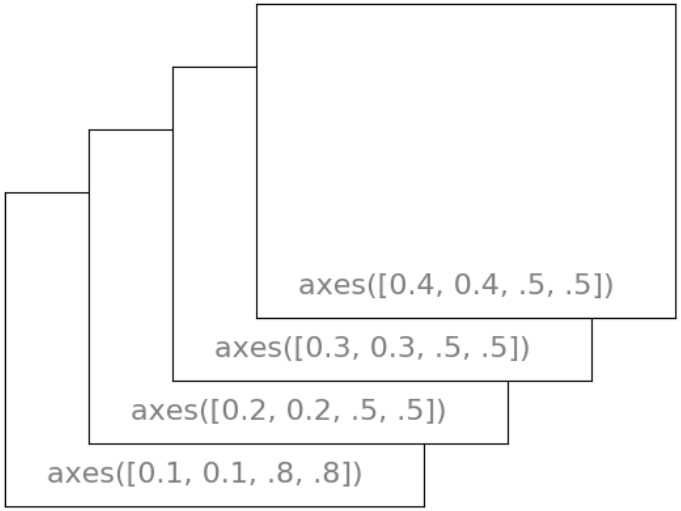


Subplot


3.0
2.5
2.0
1.5
1.0
0.0
0.5
1.0
1.5
2.0
6.0
5.5
5.0
4.5
4.0
0.0
0.5
1.0
1.5
2.0
9.0
8.5
8.0
7.5
7.0
0.0
0.5
1.0
1.5
2.0

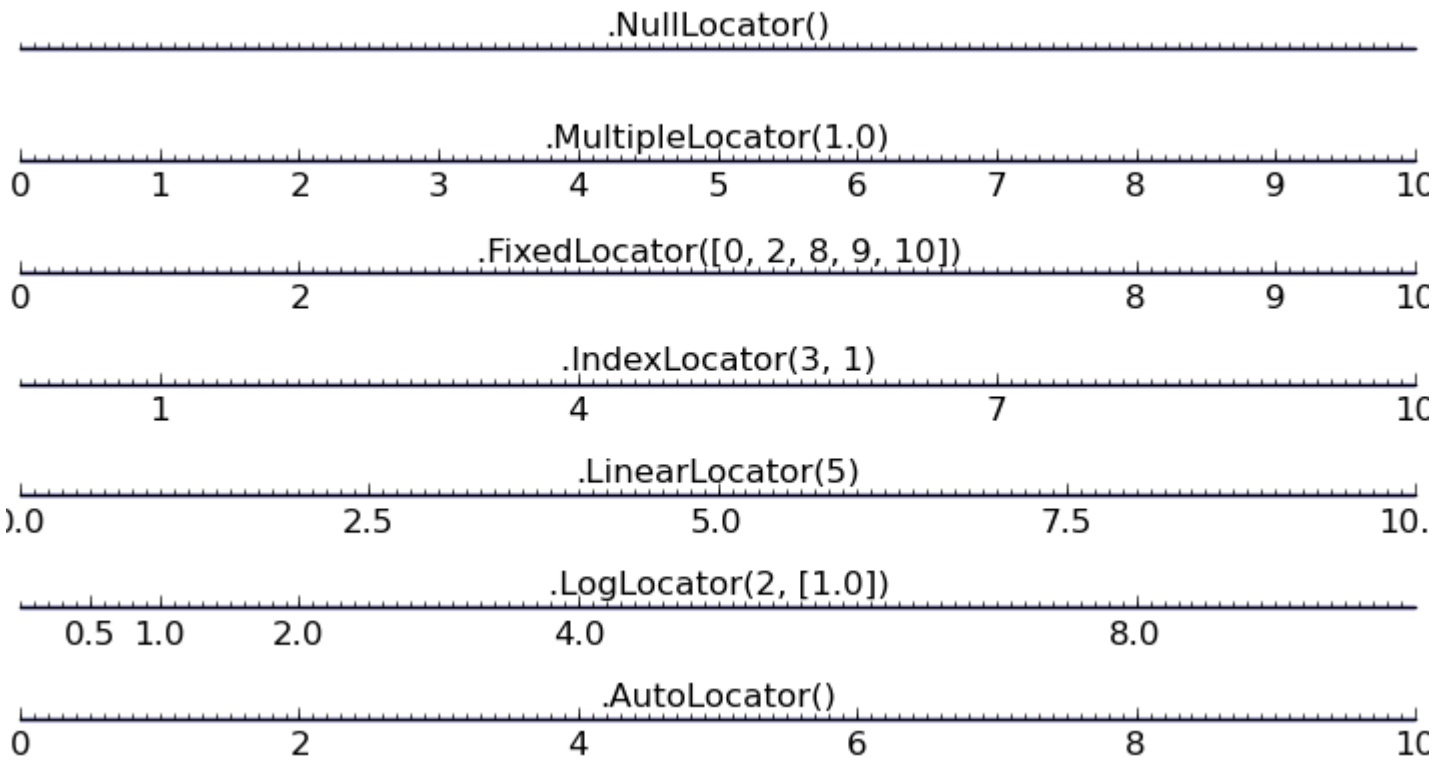
Axes

- Axes allow placement of plots at any location in the figure.
  - Can put a smaller plot inside a bigger one



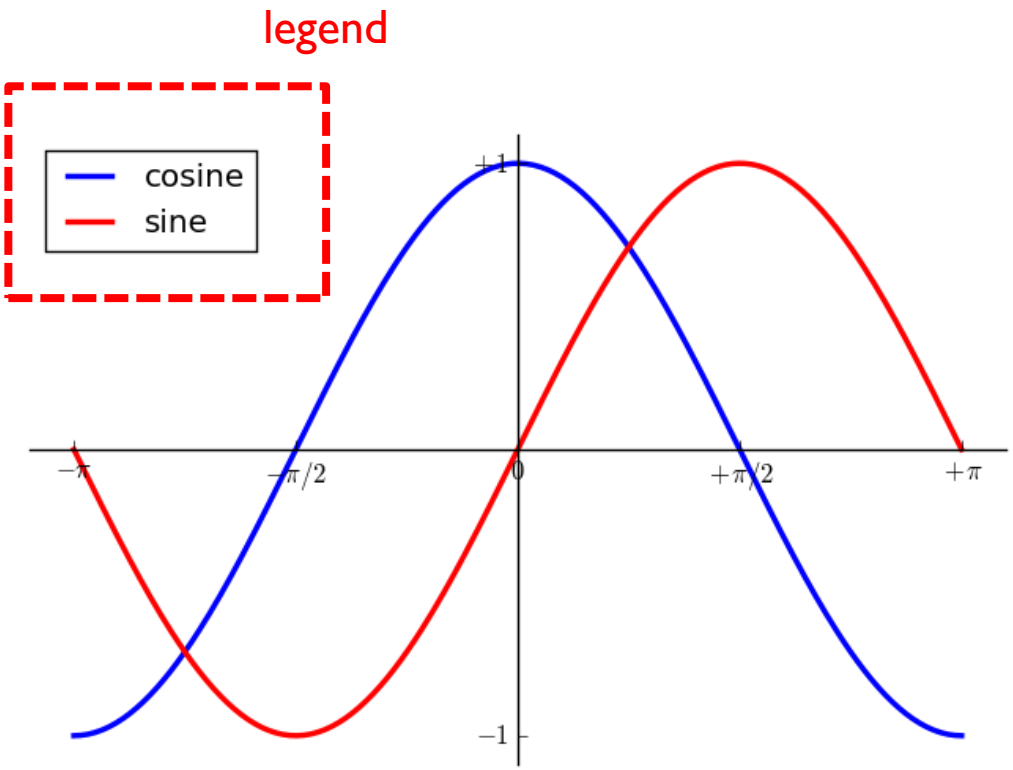
Ticks

- Ticks help specify where ticks should appear and tick formatters to give ticks the appearance you want



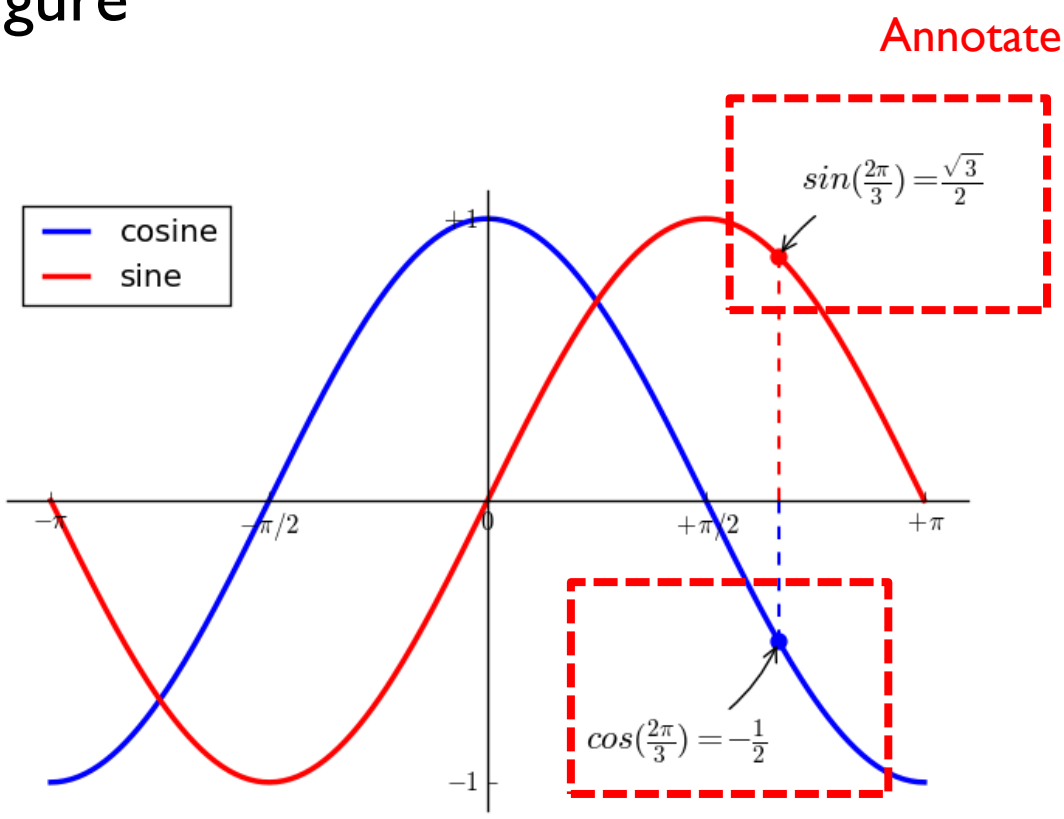
Legend

- Lengend help user to describe figure easily

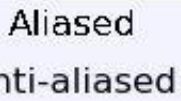
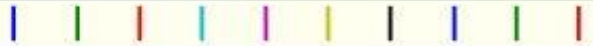


Annotate

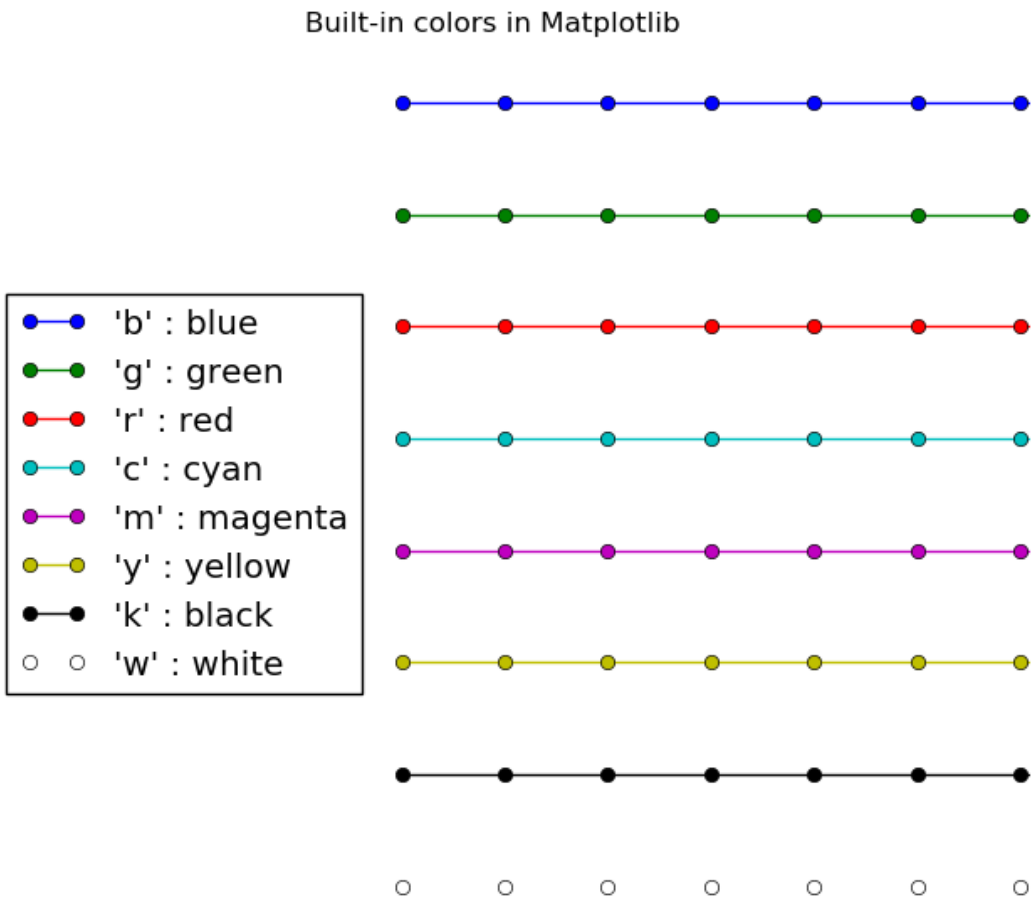
- Annotation some points help user to focus on specific part of figure



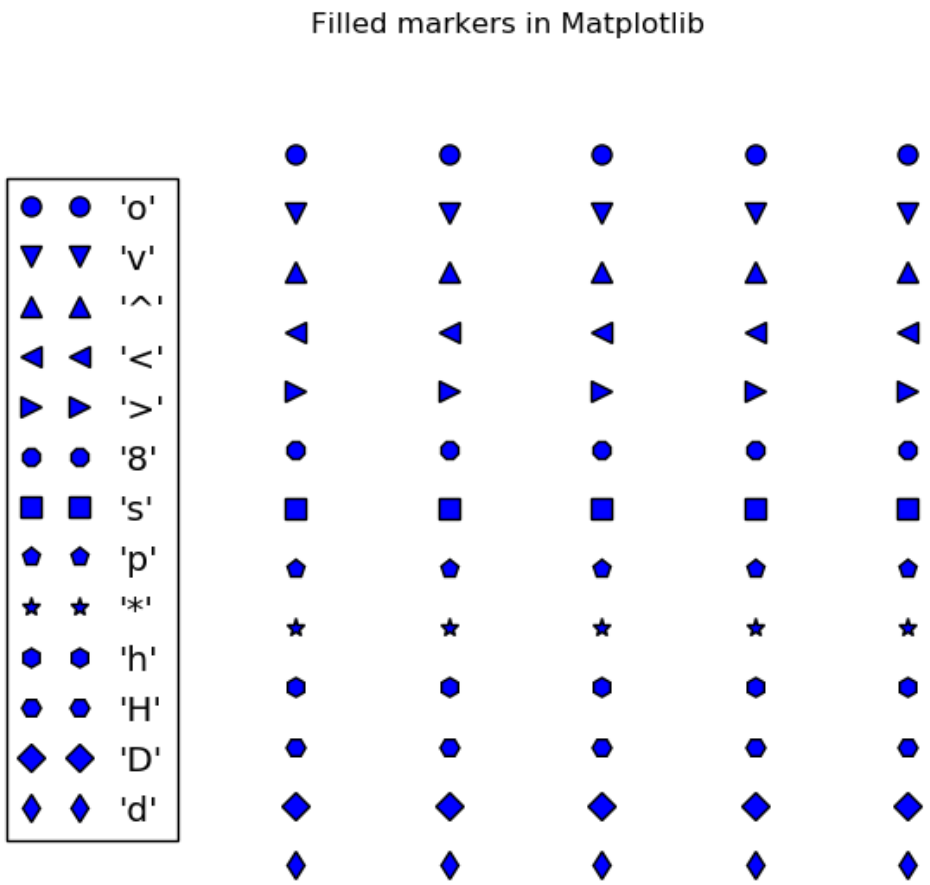
Line property

Property	Description	Appearance
alpha (or a)	alpha transparency on 0-1 scale	
antialiased	True or False - use antialised rendering	
color (or c)	matplotlib color arg	
linestyle (or ls)	see Line properties	
linewidth (or lw)	float, the line width in points	
solid_capstyle	Cap style for solid lines	
solid_joinstyle	Join style for solid lines	
dash_capstyle	Cap style for dashes	
dash_joinstyle	Join style for dashes	
marker	see Markers	
markeredgewidth (mew)	line width around the marker symbol	
markeredgecolor (mec)	edge color if a marker is used	
markerfacecolor (mfc)	face color if a marker is used	
markersize (ms)	size of the marker in points	

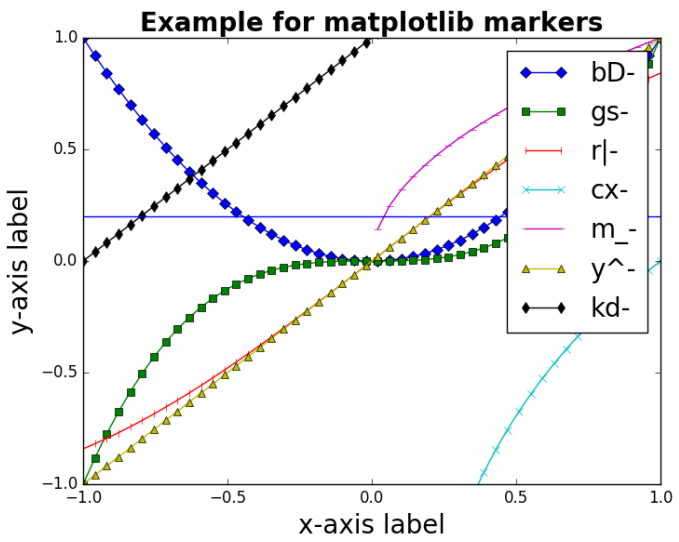
Color

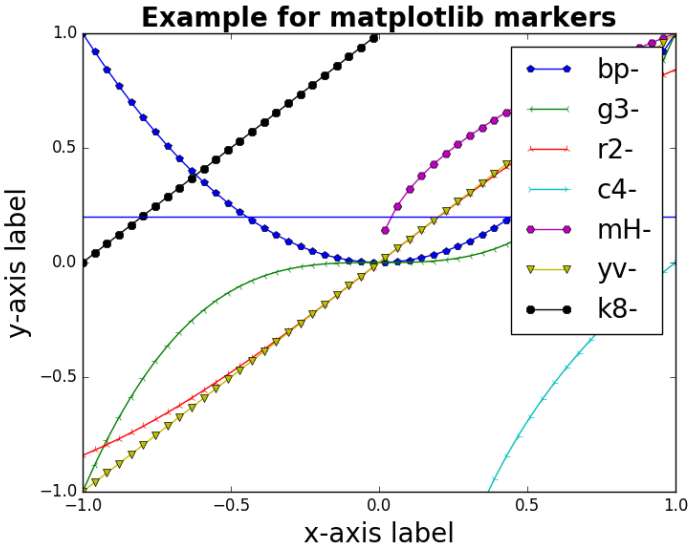

Built-in colors in Matplotlib
'b' : blue
'g' : green
'r' : red
'c' : cyan
'm' : magenta
'y' : yellow
'k' : black
'w' : white

Marker

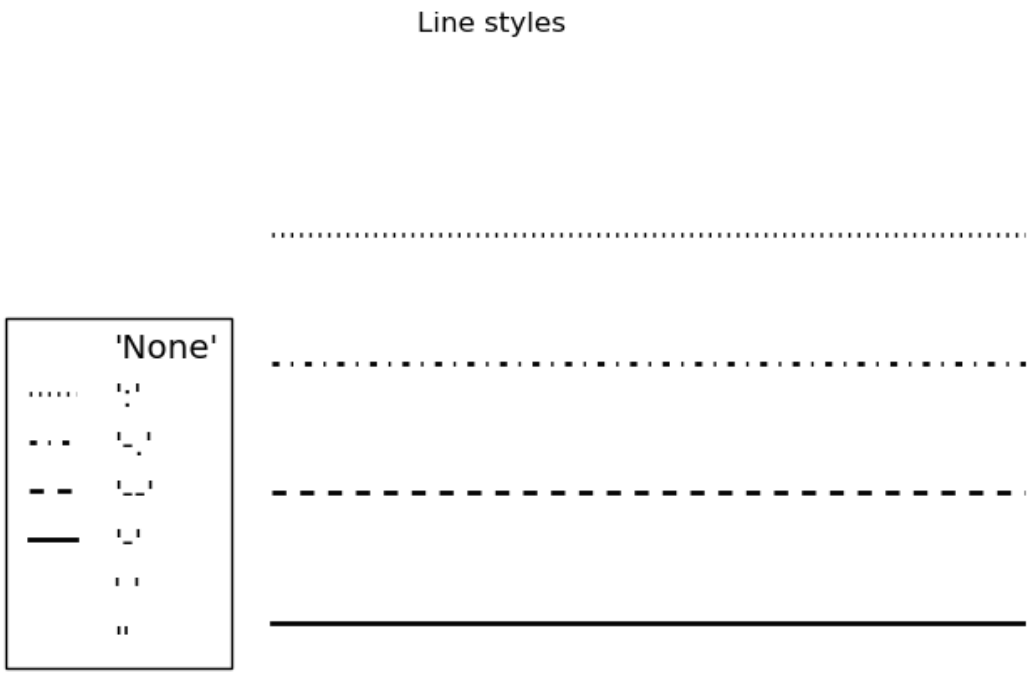


Line style Example



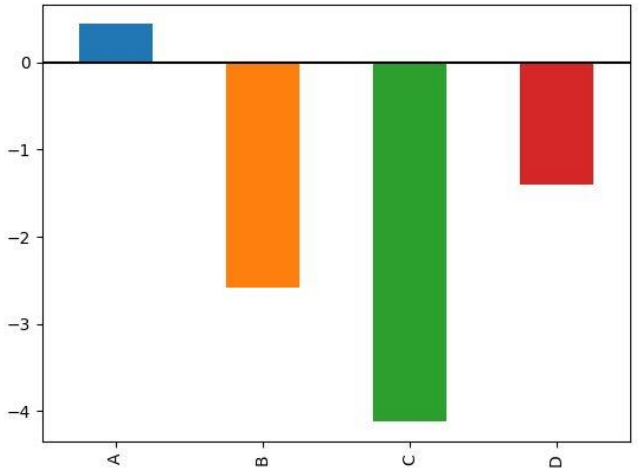


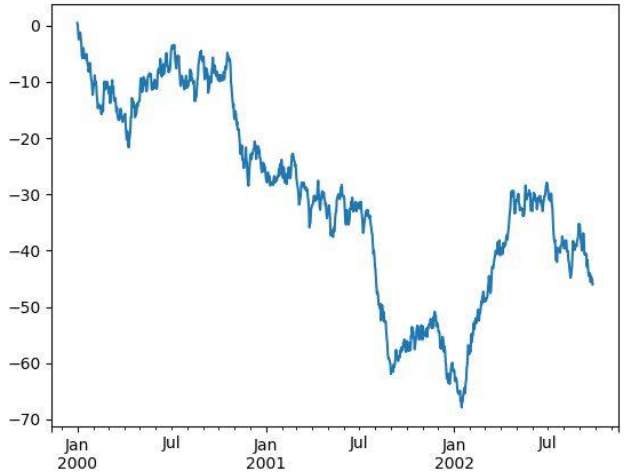
Line style



Pandas plot

- Pandas can also use plot function
  - It is based on matplotlib






```
In [11]: plt.figure();

In [12]: df.iloc[5].plot(kind='bar');
```

```
In [2]: ts = pd.Series(np.random.randn(1000), index=pd.date_range('1/1/2000', periods=1000))

In [3]: ts = ts.cumsum()

In [4]: ts.plot()
Out[4]: <matplotlib.axes._subplots.AxesSubplot at 0x1c36bc0780>
```

Pandas plot

- Pandas can plot include
  - ‘bar’ or ‘barh’ for bar plots
  - ‘hist’ for histogram
  - ‘box’ for boxplot
  - ‘kde’ or ‘density’ for density plots
  - ‘area’ for area plots
  - ‘scatter’ for scatter plots
  - ‘hexbin’ for hexagonal bin plots
  - ‘pie’ for pie plots