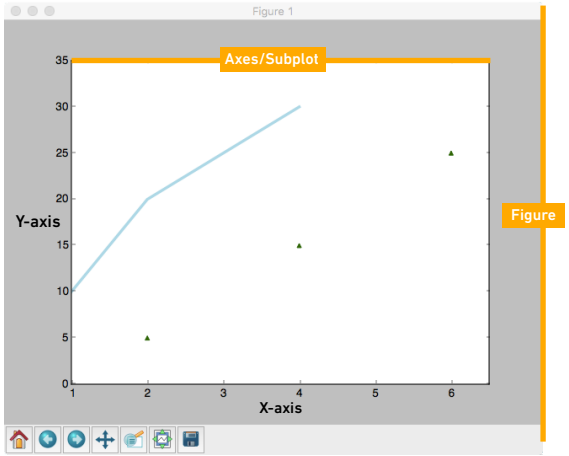
Matplotlib is a Python 2D plotting library which produces publication-quality figures in a variety of hardcopy formats and interactive environments across platforms.

Matplotlib Cheat Sheet

BecomingHuman.AI

Anatomy & Workflow

Plot Anatomy



Workflow

01 Prepare data

02 Create plot

03 Plot

04 Customize plot

05 Save plot

06 Show plot

```
>>> import matplotlib.pyplot as plt
step 1  >>> x = [1,2,3,4]
        >>> y = [10,20,25,30]
step 2  >>> fig = plt.figure()
step 3  >>> ax = fig.add_subplot(111)
step 3,4>>> ax.plot(x, y, color='lightblue', linewidth=3)
        >>> ax.scatter([2,4,6],
                       [5,15,25],
                       color='darkgreen',
                       marker='^')
        >>> ax.set_xlim(1, 6.5)
        >>> plt.savefig('foo.png')
step 5  >>> plt.show()
```

Prepare The Data

Also see Lists & NumPy

Index Tricks

```
>>> import numpy as np
>>> x = np.linspace(0, 10, 100)
>>> y = np.cos(x)
>>> z = np.sin(x)
```

2D Data or Images

```
>>> data = 2 * np.random.random((10, 10))
>>> data2 = 3 * np.random.random((10, 10))
>>> Y, X = np.mgrid[-3:3:100j, -3:3:100j]
>>> U = -1 - X**2 + Y
>>> V = 1 + X - Y**2
>>> from matplotlib.cbook import get_sample_data
>>> img = np.load(get_sample_data('axes_grid/bivariate_normal.npy'))
```

Create Plot

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

Figure

```
>>> fig = plt.figure()
>>> fig2 = plt.figure(figsize=plt.figaspect(2.0))
```

Axes

All plotting is done with respect to an Axes**. In most cases, a subplot will fit your needs. A subplot is an axes on a grid system.**

```
>>> fig.add_axes()
>>> ax1 = fig.add_subplot(221) # row-col-num
>>> ax3 = fig.add_subplot(212)
>>> fig3, axes = plt.subplots(nrows=2,ncols=2)
>>> fig4, axes2 = plt.subplots(ncols=3)
```

Customize Plot

Colors, Color Bars & Color Maps

```
>>> plt.plot(x, x, x, x**2, x, x**3)
>>> ax.plot(x, y, alpha = 0.4)
>>> ax.plot(x, y, c='k')
>>> fig.colorbar(im, orientation='horizontal')
>>> im = ax.imshow(img,
                   cmap='seismic')
```

Markers

```
>>> fig, ax = plt.subplots()
>>> ax.scatter(x,y,marker=".")
>>> ax.plot(x,y,marker="o")
```

Linestyles

```
>>> plt.plot(x,y,linewidth=4.0)
>>> plt.plot(x,y,ls='solid')
>>> plt.plot(x,y,ls='--')
>>> plt.plot(x,y,'--',x**2,y**2,'-.')
>>> plt.setp(lines,color='r',linewidth=4.0)
```

Text & Annotations

```
>>> ax.text(1,
            -2.1, 'Example Graph',
            style='italic')
>>> ax.annotate("Sine", xy=(8, 0),
                xycoords='data',
                xytext=(10.5, 0),
                textcoords='data',
                arrowprops=dict(arrowstyle="->",
                                connectionstyle="arc3"),)
```

Mathtext

```
>>> plt.title(r'$sigma_i=15$', fontsize=20)
```

Limits, Legends & Layouts

Limits & Autoscaling

```
>>> ax.margins(x=0.0,y=0.1)
```
Add padding to a plot

```
>>> ax.axis('equal')
```
Set the aspect ratio of the plot to 1

```
>>> ax.set(xlim=[0,10.5],ylim=[-1.5,1.5])
```
Set limits for x-and y-axis

```
>>> ax.set_xlim(0,10.5)
```
Set limits for x-axis

Legends

```
>>> ax.set(title='An Example Axes',
           ylabel='Y-Axis',
           xlabel='X-Axis')
```
Set a title and x-and y-axis labels

```
>>> ax.legend(loc='best')
```
No overlapping plot elements

Ticks

```
>>> ax.xaxis.set(ticks=range(1,5),
                 ticklabels=[3,100,-12,"foo"])
>>> ax.tick_params(direction='inout',
                   length=10)
```
Manually set x-ticks

Make y-ticks longer and go in and out

Subplot Spacing

```
>>> fig3.subplots_adjust(wspace=0.5,
                         hspace=0.3,
                         left=0.125,
                         right=0.9,
                         top=0.9,
                         bottom=0.1)
>>> fig.tight_layout()
```

Axis Spines

```
>>> ax1.spines['top'].set_visible(False)
```
Make the top axis line for a plot invisible

```
>>> ax1.spines['bottom'].set_position(('outward',10))
```
Move the bottom axis line outward

Plotting Routines

1D Data

```
>>> lines = ax.plot(x,y)
```
Draw points with lines or markers connecting them

```
>>> ax.scatter(x,y)
```
Draw unconnected points, scaled or colored

```
>>> axes[0,0].bar([1,2,3],[3,4,5])
```
Plot vertical rectangles (constant width)

```
>>> axes[1,0].barh([0.5,1,2.5],[0,1,2])
```
Plot horiontal rectangles (constant height)

```
>>> axes[1,1].axhline(0.45)
```
Draw a horizontal line across axes

```
>>> axes[0,1].axvline(0.65)
```
Draw a vertical line across axes

```
>>> ax.fill(x,y,color='blue')
```
Draw filled polygons

```
>>> ax.fill_between(x,y,color='yellow')
```
Fill between y-values and 0

2D Data

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

```
>>> im = ax.imshow(img,
                   arrays cmap='gist_earth',
                   interpolation='nearest',
                   vmin=-2,
                   vmax=2)
```
Colormapped or RGB

Vector Fields

```
>>> axes[0,1].arrow(0,0,0.5,0.5)
```
Add an arrow to the axes

```
>>> axes[1,1].quiver(y,z)
```
Plot a 2D field of arrows

```
>>> axes[0,1].streamplot(X,Y,U,V)
```
Plot 2D vector fields

Data Distributions

```
>>> ax1.hist(y)
```
Plot a histogram

```
>>> ax3.boxplot(y)
```
Make a box and whisker plot

```
>>> ax3.violinplot(z)
```
Make a violin plot

```
>>> axes2[0].pcolor(data2)
```
Pseudocolor plot of 2D array

```
>>> axes2[0].pcolormesh(data)
```
Pseudocolor plot of 2D array

```
>>> CS = plt.contour(Y,X,U)
```
Plot contours

```
>>> axes2[2].contourf(data1)
```
Plot filled contours

```
>>> axes2[2]= ax.clabel(CS)
```
Label a contour plot

Save Plot

Save figures

```
>>> plt.savefig('foo.png')
```

Save transparent figures

```
>>> plt.savefig('foo.png', transparent=True)
```

Show Plot

```
>>> plt.show()
```

Close & Clear

```
>>> plt.cla()
>>> plt.clf()
>>> plt.close()
```