

Python For Data Science Cheat Sheet

Matplotlib

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Matplotlib

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



1 Prepare The Data

Also see [Lists & NumPy](#)

1D Data

```
>>> 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'))
```

2 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)
```

3 Plotting Routines

1D Data

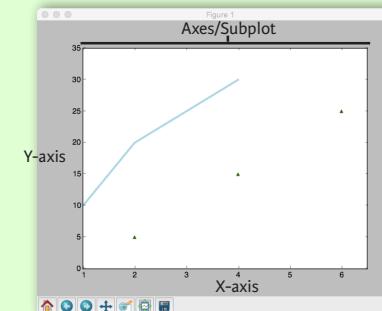
```
>>> fig, ax = plt.subplots()  
>>> lines = ax.plot(x, y)  
>>> ax.scatter(x, y)  
>>> axes[0,0].bar([1,2,3],[3,4,5])  
>>> axes[1,0].barh([0.5,1,2.5],[0,1,2])  
>>> axes[1,1].axhline(0.45)  
>>> axes[0,1].axvline(0.65)  
>>> ax.fill(x,y,color='blue')  
>>> ax.fill_between(x,y,color='yellow')
```

2D Data or Images

```
>>> fig, ax = plt.subplots()  
>>> im = ax.imshow(img,  
                  cmap='gist_earth',  
                  interpolation='nearest',  
                  vmin=-2,  
                  vmax=2)
```

Plot Anatomy & Workflow

Plot Anatomy



Workflow

The basic steps to creating plots with matplotlib are:

- 1 Prepare data
- 2 Create plot
- 3 Plot
- 4 Customize plot
- 5 Save plot
- 6 Show plot

```
>>> import matplotlib.pyplot as plt  
>>> x = [1,2,3,4]  
>>> y = [10,20,25,30] Step 1  
>>> fig = plt.figure() Step 2  
>>> ax = fig.add_subplot(111) Step 3  
>>> ax.plot(x, y, color='lightblue', linewidth=3) Step 3.4  
>>> ax.scatter([2,4,6],  
             [5,15,25],  
             color='darkgreen',  
             marker='^')  
>>> ax.set_xlim(1, 6.5)  
>>> plt.savefig('foo.png')  
>>> plt.show() Step 6
```

4 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"),)
```

Vector Fields

```
>>> axes[0,1].arrow(0,0,0.5,0.5)  
>>> axes[1,1].quiver(y,z)  
>>> axes[0,1].streamplot(X,Y,U,V)
```

Mathtext

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

Limits, Legends & Layouts

```
>>> ax.margins(x=0.0,y=0.1)  
>>> ax.axis('equal')  
>>> ax.set(xlim=[0,10.5],ylim=[-1.5,1.5])  
>>> ax.set_xlim(0,10.5)
```

Legends

```
>>> ax.set(title='An Example Axes',  
           ylabel='Y-Axis',  
           xlabel='X-Axis')  
>>> ax.legend(loc='best')
```

Ticks

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

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)  
>>> ax1.spines['bottom'].set_position(('outward',10))
```

Add padding to a plot
Set the aspect ratio of the plot to 1
Set limits for x-and y-axis
Set limits for x-axis

Set a title and x-and y-axis labels

No overlapping plot elements

Manually set x-ticks

Make y-ticks longer and go in and out

Adjust the spacing between subplots

Fit subplot(s) in to the figure area

Make the top axis line for a plot invisible

Move the bottom axis line outward

5 Save Plot

Save figures

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

Save transparent figures

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

6 Show Plot

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

Close & Clear

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

Clear an axis
Clear the entire figure
Close a window

