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 * matplotlib platforms.



Prepare The Data

Also see Lists & NumPy

>>> import numpy as np

```
>>> x = np.linspace(0, 10, 100)
>>> v = 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
```

```
>>> 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.

cmap='gist earth',

vmin=-2.

vmax=2)

interpolation='nearest',

```
>>> 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)
```

Plot Anatomy & Workflow

Plot Anatomy

Axes/Subplot Y-axis Figure X-axis **☆○○+ ☞** ◎ **■**

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]
>>> 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()
```

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()
>>>	<pre>ax.scatter(x,y,marker=".")</pre>
>>>	ax.plot(x,y,marker="o")

```
>>> 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

```
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 v-axis
>>> ax.set xlim(0,10.5)
                                                            Set limits for x-axis
 Leaends
                                                            Set a title and x-and y-axis labels
>>> ax.set(title='An Example Axes',
             vlabel='Y-Axis',
```

```
xlabel='X-Axis')
>>> ax.legend(loc='best')
                                                         No overlapping plot elements
                                                         Manually set x-ticks
>>> ax.xaxis.set(ticks=range(1,5),
```

>>> plt.title(r'\$sigma i=15\$', fontsize=20)

```
ticklabels=[3,100,-12,"foo"])
>>> ax.tick params(axis='y',
                   direction='inout'.
```

Make y-ticks longer and go in and out

length=10) Subplot Spacing

```
>>> fig3.subplots adjust(wspace=0.5,
                                                        Adjust the spacing between subplots
                          hspace=0.3,
                          left=0.125,
                          right=0.9,
                           top=0.9,
```

bottom=0.1) >>> fig.tight_layout() Fit subplot(s) in to the figure area

Axis Spines

>>>	<pre>ax1.spines['top'].set visible(False)</pre>
>>>	ax1.spines['bottom'].set position(('outward',10)

Make the top axis line for a plot invisible)) Move the bottom axis line outward

Plotting Routines

2D Data or Images

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

>>> im = ax.imshow(img,

```
>>> 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')
```

Draw points with lines or markers connecting them Draw unconnected points, scaled or colored Plot vertical rectangles (constant width) Plot horiontal rectangles (constant height) Draw a horizontal line across axes Draw a vertical line across axes

Colormapped or RGB arrays

Draw filled polygons

Fill between y-values and o

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)	

Add an arrow to the axes Plot a 2D field of arrows Plot 2D vector fields

Data Distributions

>>>	ax1.hist(y)
>>>	ax3.boxplot(y)
>>>	ax3.violinplot(z

Plot a histogram Make a box and whisker plot Make a violin plot

>>>	axes2[0].pcolor(data2)
>>>	axes2[0].pcolormesh(data)
	CS = plt.contour(Y, X, U)
>>>	axes2[2].contourf(data1)
>>>	axes2[2] = ax.clabel(CS)

Pseudocolor plot of 2D array Pseudocolor plot of 2D array Plot contours Plot filled contours 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.clf() >>> plt.close()		pro.cra()	
>>> plt.close()	>>>	plt.clf()	
	>>>	plt.close()	

Clear an axis Clear the entire figure Close a window

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