

Prepare the Data

1D Data

```
>>> import numpy as np
>>> x = np.linspace(8, 10, 100)
>>> y = np.cos(x)
>>> z = np.sin(x)
```

Prepare the 2D Data

2D Data or Images

```
>>> data = 2 * np.random.random
((10,10))
>>> data2 = 3* np.random.randn -
m(( 10,10)
>>> Y, X = np.mgrid[ -3: 3:180j,
-3:3:180j]
>>> U = -1 - X ** 2 + Y
>>> V = 1 + X - Y ** 2
>>> from matplotlib.pyplot import
get_sample_data
>>> img = np.load(get_sample_data(
'axes_grid/berkeley_norمال.npy))
```

Create Plot

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

Figure

```
>>> fig = plt.figure()
>>> fig2 = plt.figure(figsize
=plt.figure(figsize=(2,0))
```

Create Plot

Axes

All plotting is done with respect to an Axes. In most cases, a subplot will fit your needs.

```
>>> fig.add_axes()
>>> ax1 = fig.add_subplot(221)
>>> ax3 =fig.add_subplot(212)
>>> fig3, axes =plt.subplots(m
row s=2 ,mc ols=2)
>>> fig4, axes2 = plt.subplots -
(nc ols=3)
```

Save Plot

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

Show Plot

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

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')
```

Plotting Routines

2D Data

```
>>> fig, ax = plt.subplots()
>>> im=ax.imshow(img,
cmap='gist_earth',
interpolation='nearest',
vmin=-2,
vmax=2)
>>> axes2[0].pcolor(data2)
>>> axes2[0].pcolormesh(data2)
>>> CS = plt.colorbar(Y,X,U)
>>> axes2[2].contourf(data1)
>>> axes2[2]= ax.clabel(CS)
```

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)
```

Data Distributions

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

Plot Anatomy & Workflow

Plot Anatomy

Workflow

The basic steps to creating plots with matplotlib are:

1. Prepare Data
2. Create Plot
3. Plot
4. Customized 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()
>>> ax.plot(x,y,color='light
blue',linewidth=3)
>>> ax.scatter([2,4,6],[5,15,25],
color='darkgreen',
marker='^')
>>> ax.set_xlim(1,6.5)
>>> plt.savefig('foa.png')
>>> plt.show()
```

Close and Clear

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

Plotting Customize Plot

Colors, Color Bars & Color Maps

```
>>> plt.plot(x, x, x, x2, x, x3)
>>> ax.plot(x, y, alpha=0.4)
>>> ax.plot(x, y, c='k')
>>> fig.colorbar(in, orient='horizontal')
>>> in = ax.inset_axes(img, cmap='seismic')
```

Markers

```
>>> fig, ax=plt.subplots()
>>> ax.scatter(x,y, marker='o',
>>> 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,ls='--',x2,y2,'-')
plt.setp(lines, color='r', linewidth=4.0)
```

Text & Annotations

```
>>> ax.text(1,-2.1, 'Example Graph',
>>> ax.annotate("Sine",
xy=(0,0), xycoords='data',
xytext=(1.05,0), textcoords='data',
arrowprops=dict(arrowstyle="->",
connectionstyle='arc3'))
```

Mathtext

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

Limits, Legends and Layouts

Limits & Autoscaling

```
>>> ax.margins(x=0.0, y=0.1)
>>> ax.axis('equal')
>>> ax.set_xlim([0, 10.5],
ylin=[-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(axi-
s='y',
direction='inout', length=10)
```

Subplot Spacing

```
>>> fig.subplots_adjust(
style='italic',
wspace=0.5,
hspace=0.3, left=0.125,
right=0.9, bottom=0.1)
>>> ax1.spines['top'].set_
_visible(False)
>>> ax1.spines['button']
.set_position(('outward',10))
```

Axis Spines

