

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/bivariate_norm.mat.npy'))
```

Create Plot

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

Figure

```
>>> fig = plt.figure()
>>> fig2 = plt.figure(figsize=
=plt.figure(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
rows=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(data
)
>>> 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_xlabel(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',
                 label='horizontal')
>>> in = ax.imshow(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.subplot(2,2,1,axes=[x1,x2,y1,y2],label='linewid
h=4.0)
```

Text & Annotations

```
>>> ax.text(1,-2.1, 'Example Graph',
>>> ax.annotate("Sine",
xy=(0,0), xycoords='data',
xytext=(1.05, 0), textcoords=
arrowprops=dict(arrowstyle=
connectstyle='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],
           ylim = [-1.5, 1.5])
>>> ax.set(xlim = (0, 10.5))
```

Legends

```
>>> ax.set (ti tle='An Example
Axes'
ylabel ="Y- axis", xlabel ='X -
Ax is")
>>> ax.leg end (lo c="b est ")
```

Ticks

```
>>> ax.x ax is.s et (ti cks -
=ra nge (1,5),
tickla bel s=[ 3,1 00, -
12 ,"fo a"])
```

```
>>> ax.tic k_p ara ma( axi -
i dt
s='y',
direct ion ='i nout', length=10)
```

Subplot Spacing

```
>>> fig3.s ubp lot s_a dju st( -
style='italic')
wsp ace=0.5,

hspace =0.3, left=0.125,

right= 0.9 ,bu tto n=0.1)
```

```
'data'
Axis Spines
```

```
>>> ax1.spine.s['top'].set_viable(False)
>>> ax1.spine.s['but-ton'].set_position((-outward,10))
```

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