Getting Started with Matplotlib

We need matplotlib.pyplot for plotting.

In [1]:
```
import matplotlib.pyplot as plt
import pandas as pd
```

About the Data

In this notebook, we will be working with 2 datasets:

- Facebook's stock price throughout 2018 (obtained using the stock_analysis package)
- Earthquake data from September 18, 2018 - October 13, 2018 (obtained from the US Geological Survey (USGS) using the USGS API)

Plotting lines

In [2]:
```
fb = pd.read_csv(
'fb_stock_prices_2018.csv', index_col='date', parse_dates=True
)
plt.plot(fb.index, fb.open)
plt.show()
```

Since we are working in a Jupyter notebook, we can use the magic command %matplotlib inline once and not have to call plt.show() for each plot.

In [3]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import pandas as pd
fb = pd.read_csv(
'fb_stock_prices_2018.csv', index_col='date', parse_dates=True
)
plt.plot(fb.index, fb.open)
```

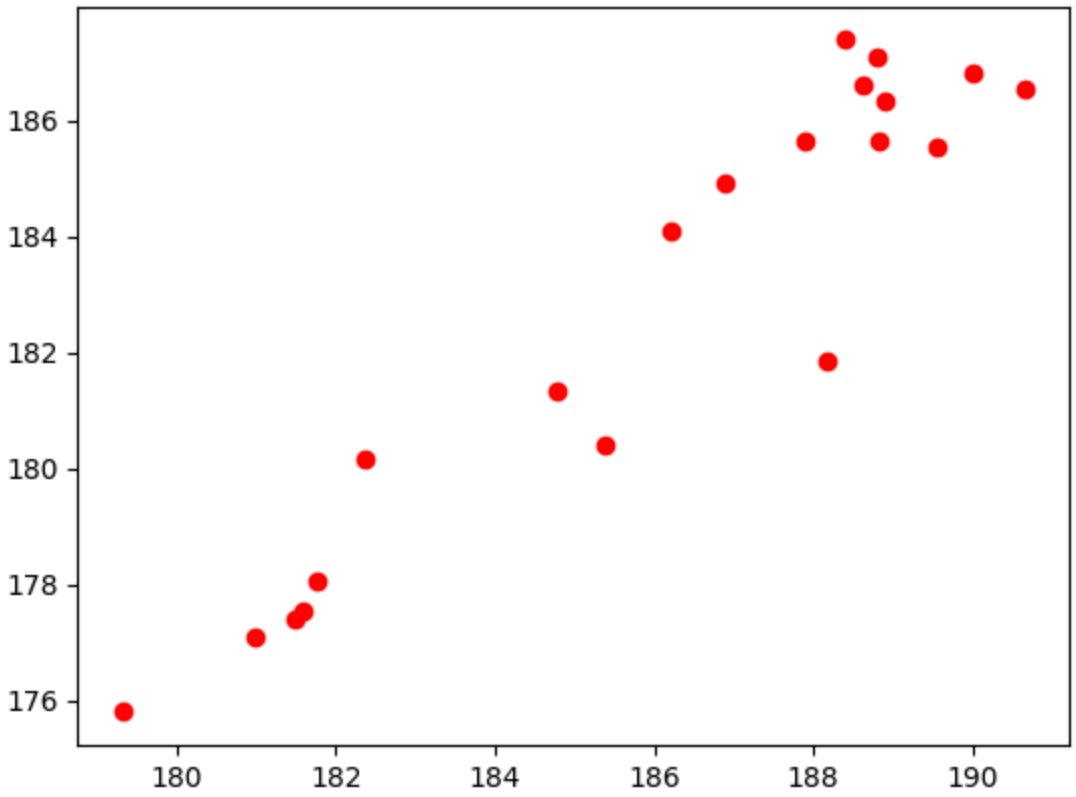
Out[3]:
```
[<matplotlib.lines.Line2D at 0x7e2400dee7d0>]
```

Scatter plots

We can pass in a string specifying the style of the plot. This is of the form '[color][marker][linestyle]'. For example, we can make a black dashed line with 'k--' or a red scatter plot with 'ro' :

In [4]:
```
plt.plot('high', 'low', 'ro', data=fb.head(20))
```

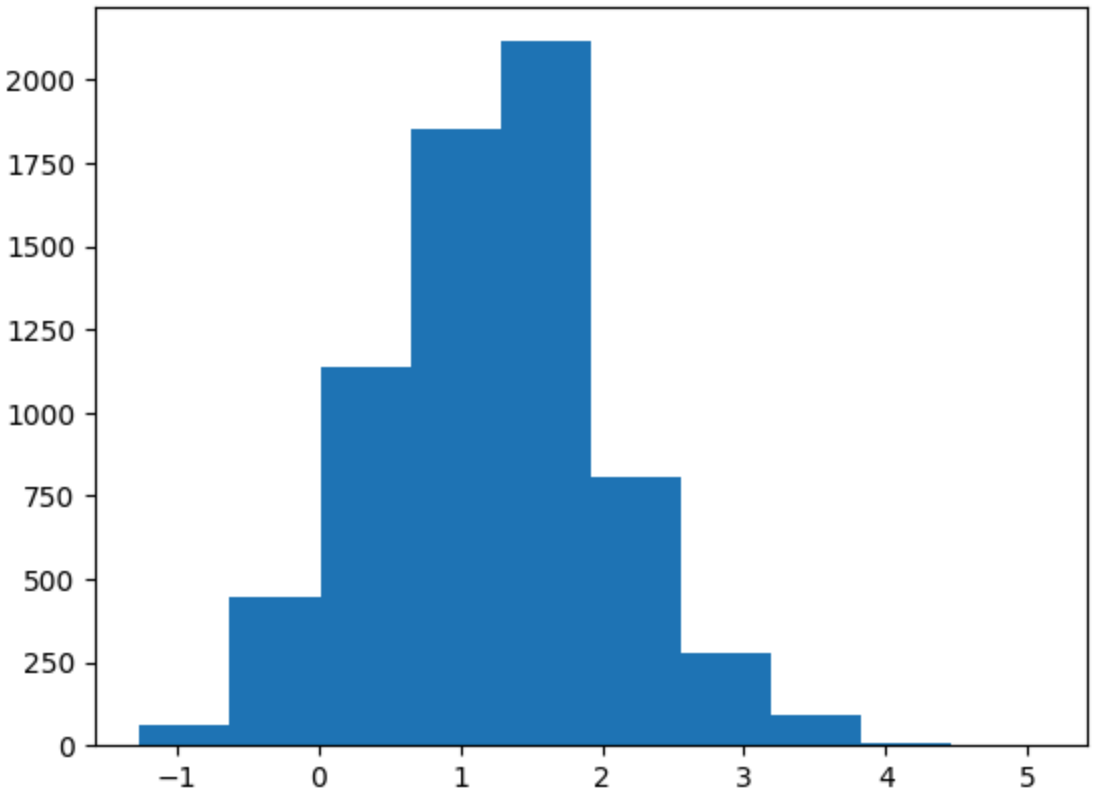
Out[4]:
```
[<matplotlib.lines.Line2D at 0x7e2400df5410>]
```



Histograms

In [5]:
```
quakes = pd.read_csv('earthquakes.csv')
plt.hist(quakes.query('magType == "ml"').mag)
```

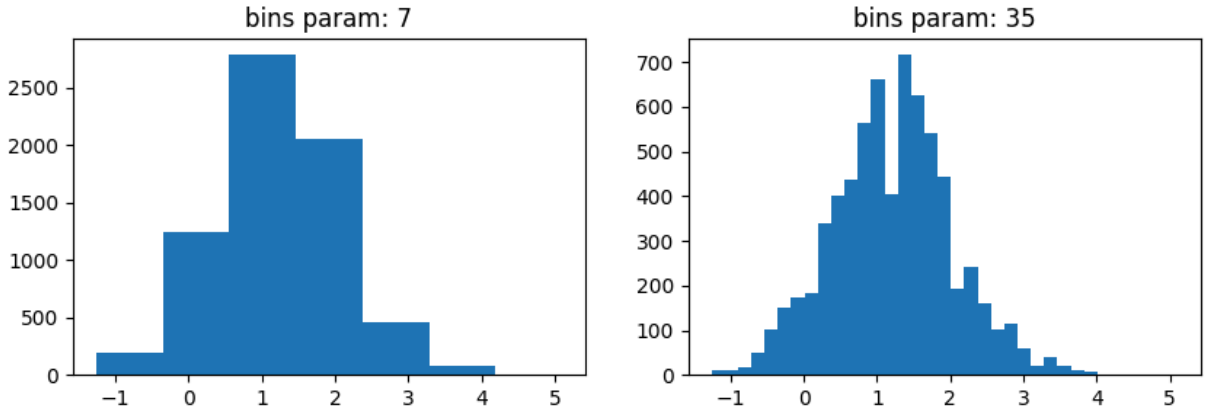
Out[5]:
```
(array([6.400e+01, 4.450e+02, 1.137e+03, 1.853e+03, 2.114e+03, 8.070e+02,
        2.800e+02, 9.200e+01, 9.000e+00, 2.000e+00]),
 array([-1.26 , -0.624,  0.012,  0.648,  1.284,  1.92 ,  2.556,  3.192,
         3.828,  4.464,  5.1  ]),
 <BarContainer object of 10 artists>)
```



Bin size matters

Notice how our assumptions of the distribution of the data can change based on the number of bins (look at the drop between the two highest peaks on the righthand plot):

In [6]:
```
x = quakes.query('magType == "ml"').mag
fig, axes = plt.subplots(1, 2, figsize=(10, 3))
for ax, bins in zip(axes, [7, 35]):
    ax.hist(x, bins=bins)
    ax.set_title(f'bins param: {bins}')
```



Plot components

Figure

Top-level object that holds the other plot components.

In [8]:
```
fig = plt.figure()
```

```
<Figure size 640x480 with 0 Axes>
```

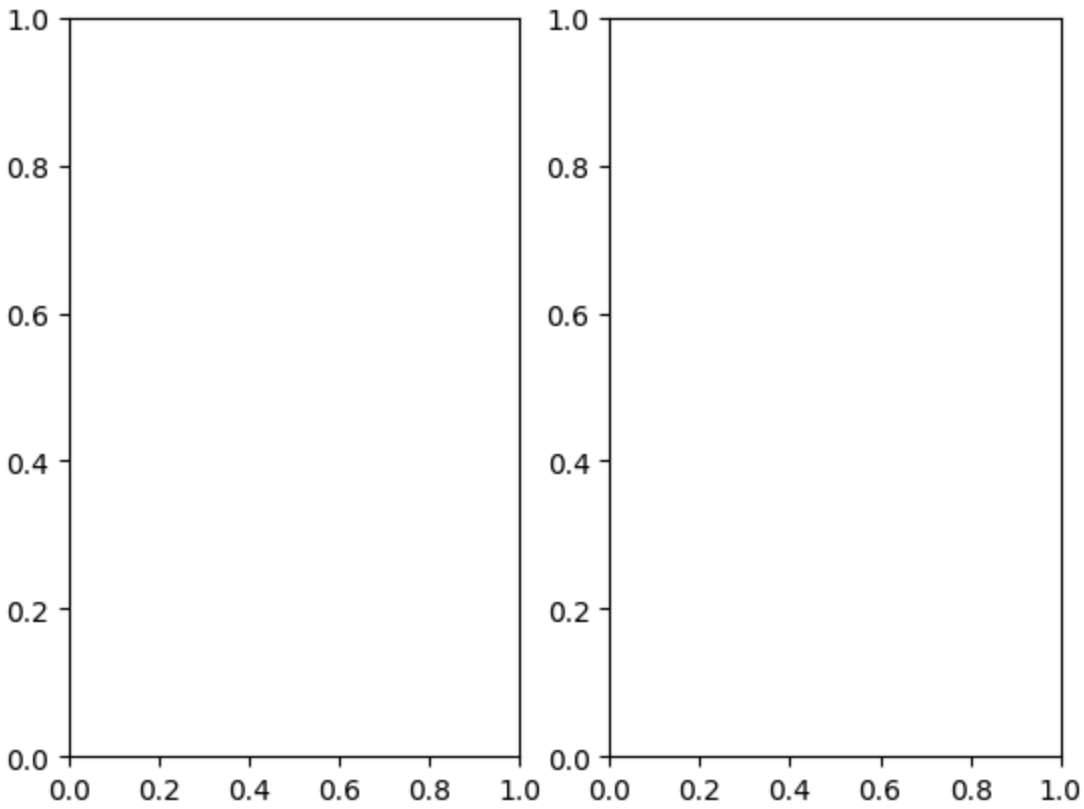
Axes

Individual plots contained within the Figure .

Creating subplots

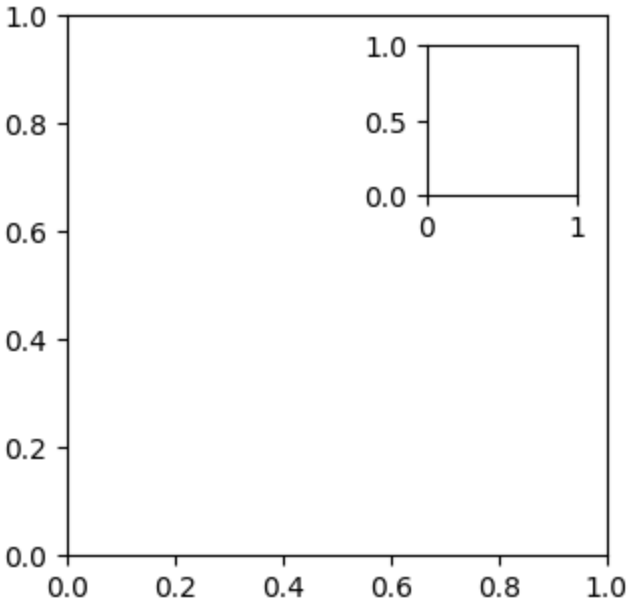
Simply specify the number of rows and columns to create:

In [9]:
```
fig, axes = plt.subplots(1, 2)
```



As an alternative to using plt.subplots() we can add the Axes to the Figure on our own. This allows for some more complex layouts, such as picture in picture:

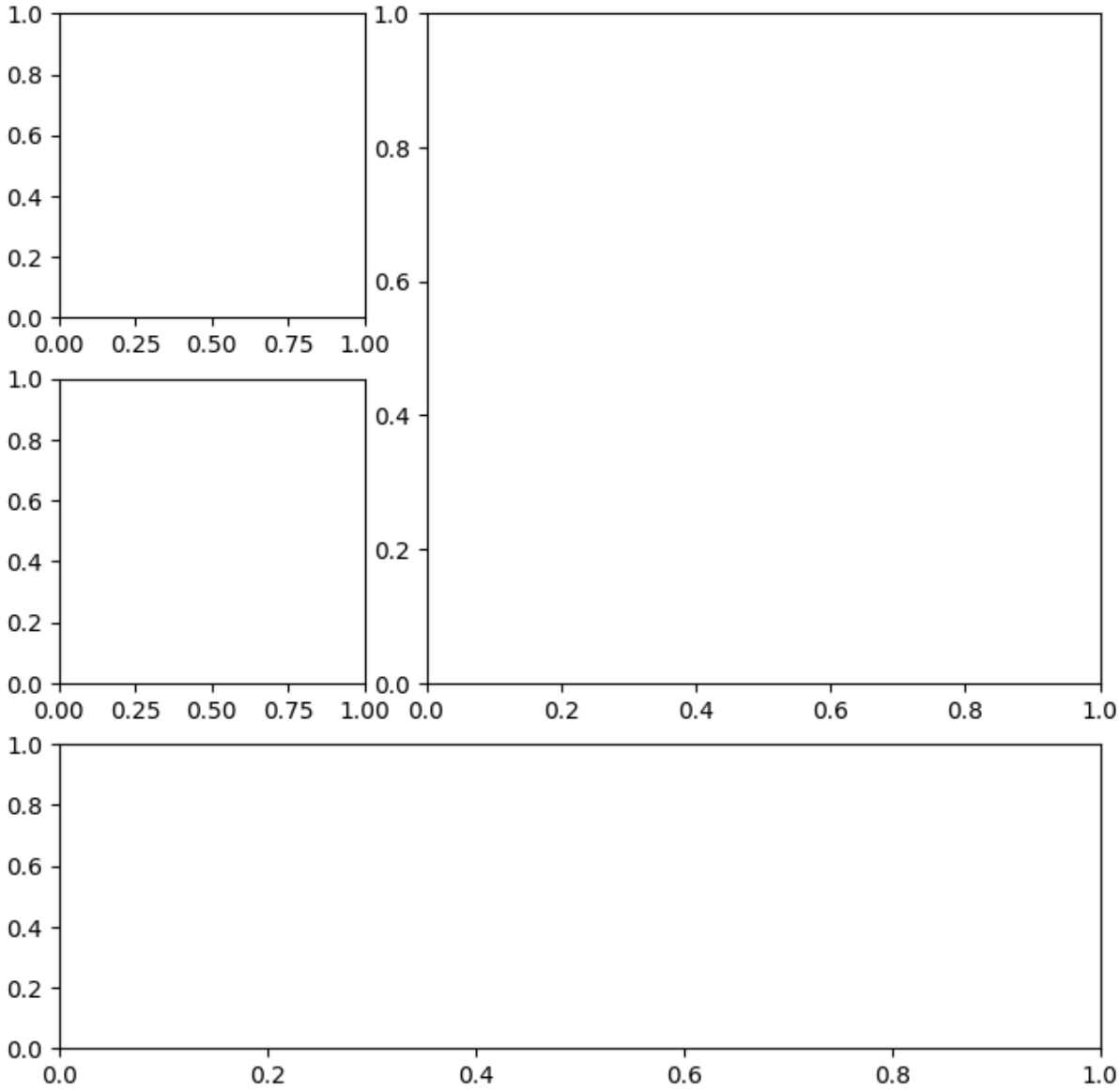
In [10]:
```
fig = plt.figure(figsize=(3, 3))
outside = fig.add_axes([0.1, 0.1, 0.9, 0.9])
inside = fig.add_axes([0.7, 0.7, 0.25, 0.25])
```



Creating Plot Layouts with gridspec

We can create subplots with varying sizes as well:

In [11]:
```
fig = plt.figure(figsize=(8, 8))
gs = fig.add_gridspec(3, 3)
top_left = fig.add_subplot(gs[0, 0])
mid_left = fig.add_subplot(gs[1, 0])
top_right = fig.add_subplot(gs[:2, 1:])
bottom = fig.add_subplot(gs[2,:])
```



Saving plots

Use plt.savefig() to save the last created plot. To save a specific Figure object, use its savefig() method.

In [12]:
```
fig.savefig('empty.png')
```

Cleaning up

It's important to close resources when we are done with them. We use plt.close() to do so. If we pass in nothing, it will close the last plot, but we can pass the specific Figure to close or say 'all' to close all Figure objects that are open. Let's close all the Figure objects that are open with plt.close() :

In [13]:
```
plt.close('all')
```

Additional plotting options

Specifying figure size

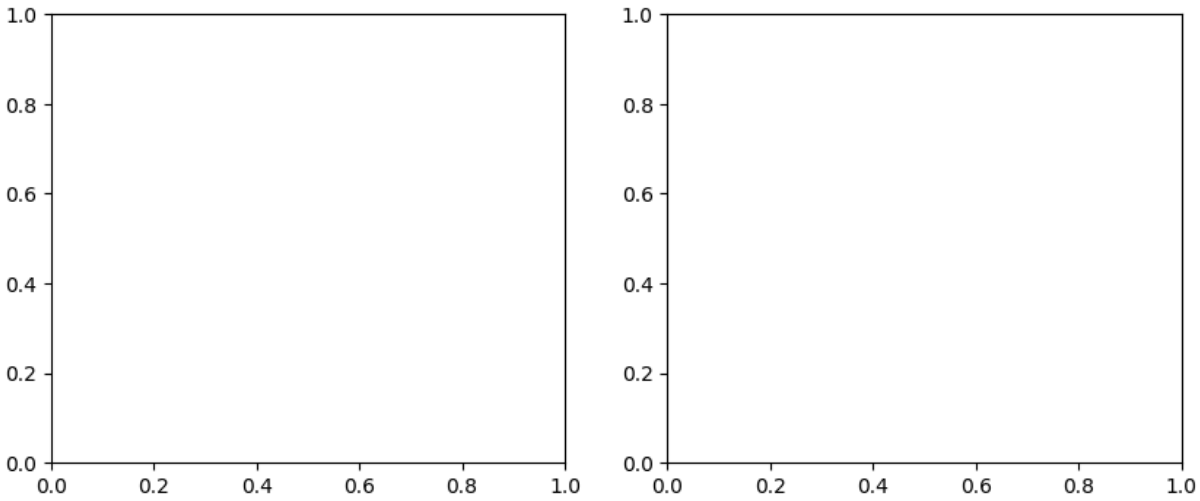
Just pass the figsize parameter to plt.figure() . It's a tuple of (width, height):

In [14]:
```
fig = plt.figure(figsize=(10, 4))
```

```
<Figure size 1000x400 with 0 Axes>
```

This can be specified when creating subplots as well:

In [15]:
```
fig, axes = plt.subplots(1, 2, figsize=(10, 4))
```



rcParams

A small subset of all the available plot settings (shuffling to get a good variation of options):

In [16]:
```
import random
import matplotlib as mpl
rcparams_list = list(mpl.rcParams.keys())
random.seed(20) # make this repeatable
random.shuffle(rcparams_list)
sorted(rcparams_list[:20])
```

Out[16]:
```
['axes.edgecolor',
 'axes.titleweight',
 'boxplot.whiskerprops.linestyle',
 'date.autoformatter.day',
 'figure.constrained_layout.hspace',
 'figure.titlesize',
 'image.interpolation_stage',
 'keymap.copy',
 'legend.framealpha',
 'legend.handleheight',
 'lines.dash_joinstyle',
 'lines.markerfacecolor',
 'mathtext.default',
 'mathtext.fallback',
 'pdf.compression',
 'svg.fonttype',
 'text.usetex',
 'yaxis.labellocation',
 'ytick.major.size',
 'ytick.minor.visible']
```

We can check the current default figsize using rcParams :

In [17]:
```
mpl.rcParams['figure.figsize']
```

Out[17]:
```
[6.4, 4.8]
```

We can also update this value to change the default (until the kernel is restarted):

In [18]:
```
mpl.rcParams['figure.figsize'] = (300, 10)
mpl.rcParams['figure.figsize']
```

Out[18]:
```
[300.0, 10.0]
```

Use rcdefaults() to restore the defaults:

In [19]:
```
mpl.rcdefaults()
mpl.rcParams['figure.figsize']
```

Out[19]:
```
[6.4, 4.8]
```

This can also be done via pyplot :

In [20]:
```
plt.rc('figure', figsize=(20, 20)) # change figsize default to (20, 20)
plt.rcdefaults() # reset the default
```