

matplotlib

Background

matplotlib is one of many Python libraries for plotting. It's not necessarily my favorite but it is probably the most commonly used.

There are a million ways to do things using matplotlib. We'll use the pyplot interface; it's relatively easy to use and does everything we need it to. I'll just show you one way to do make a couple of common plots.

The examples in this document come from the matplotlib documentation. When I want to figure out how to make a plot, I find the easiest thing to do is find an example like what I want to do at <https://matplotlib.org/gallery/>

Import

It's standard `import matplotlib.pyplot as plt`. Then you will refer to functions provided by pyplot using the syntax `plt._____`, filling in the blank as necessary.

```
import numpy as np
np.random.seed(19680801)

import matplotlib.pyplot as plt
```

Line Plots: `plt.plot()`

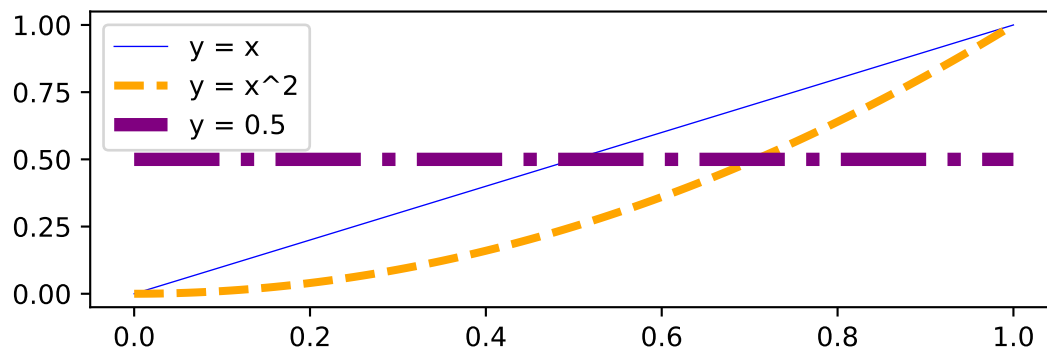
Line segments connect a series of points

- First argument is a vector of numbers specifying horizontal axis coordinates of the points
- Second argument is a vector of numbers specifying vertical axis coordinates of the points
- Optional `color` = specifies color
- Optional `linestyle` = specifies linestyle: '-', '—', '-.', ':'
- Optional `linewidth` = specifies width of line in pixels
- Optional `label` = 'label' says what label to use in a legend

The easiest way to get a legend to be created is to plot things for separate groups in separate calls to `plot`.

```
x = np.linspace(0, 1, 101)
y1 = x
y2 = x**2
y3 = np.full_like(x, 0.5) # vector of same shape as x, filled with all 0.5

plt.plot(x, y1, color = "blue", linestyle = "-", linewidth = 0.5, label = "y = x")
plt.plot(x, y2, color = "orange", linestyle = "--", linewidth = 3, label = "y = x^2")
plt.plot(x, y3, color = "purple", linestyle = "-.", linewidth = 5, label = "y = 0.5")
plt.legend(loc = "upper left")
plt.show()
```



Scatter Plots: `plt.scatter()`

- First argument is a vector of numbers specifying horizontal axis coordinates of the points
- Second argument is a vector of numbers specifying vertical axis coordinates of the points
- Optional `s` = specifies point size
- Optional `color` = specifies color
- Optional `marker` = specifies shape used for point
- Optional `label` = 'label' says what label to use in a legend

```
x = np.linspace(0, 1, 10)
y1 = np.random.random(10)
y2 = np.random.random(10)
y3 = np.random.random(10)

plt.scatter(x, y1, s = 1, color = "blue", marker = '.', label = "y1")
plt.scatter(x, y2, s = 10, color = "orange", marker = '<', label = "y2")
plt.scatter(x, y3, s = 20, color = "purple", marker = 'v', label = "y3")
plt.legend(loc = "upper right")
plt.show()
```

