(http://www.pieriandata.com)

MATPLOTLIB

Matplotlib Basics

Introduction

Matplotlib is the "grandfather" library of data visualization with Python. It was created by John Hunter. He created it to try to replicate MatLab's (another programming language) plotting capabilities in Python. So if you happen to be familiar with matlab, matplotlib will feel natural to you.

It is an excellent 2D and 3D graphics library for generating scientific figures.

Some of the major Pros of Matplotlib are:

- Generally easy to get started for simple plots
- Support for custom labels and texts
- Great control of every element in a figure
- High-quality output in many formats
- Very customizable in general

Matplotlib allows you to create reproducible figures programmatically. Let's learn how to use it! Before continuing this lecture, I encourage you just to explore the official Matplotlib web page: http://matplotlib.org/ (http://matplotlib.org/)

Installation

If you are using our environment, its already installed for you. If you are not using our environment (not recommended), you'll need to install matplotlib first with either:

```
conda install matplotlib
```

or

```
pip install matplotlib
```

Importing

Import the `matplotlib.pyplot` module under the name `plt` (the tidy way):

In [1]:
```
# COMMON MISTAKE!
# DON'T FORGET THE .PYPLOT part

import matplotlib.pyplot as plt
```

NOTE: If you are using an older version of jupyter, you need to run a "magic" command to see the plots inline with the notebook. Users of jupyter notebook 1.0 and above, don't need to run the cell below:

In [2]:
```
%matplotlib inline
```

NOTE: For users running .py scripts in an IDE like PyCharm or Sublime Text Editor. You will not see the plots in a notebook, instead if you are using another editor, you'll use: *plt.show()* at the end of all your plotting commands to have the figure pop up in another window.

Basic Example

Let's walk through a very simple example using two numpy arrays:

Basic Array Plot

Let's walk through a very simple example using two numpy arrays. You can also use lists, but most likely you'll be passing numpy arrays or pandas columns (which essentially also behave like arrays).

The data we want to plot:

In [3]:
```
import numpy as np
```

In [4]:
```
x = np.arange(0,10)
```

In [5]:
```
y = 2*x
```

In [6]:
```
x
```

Out[6]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [7]:
```
y
```

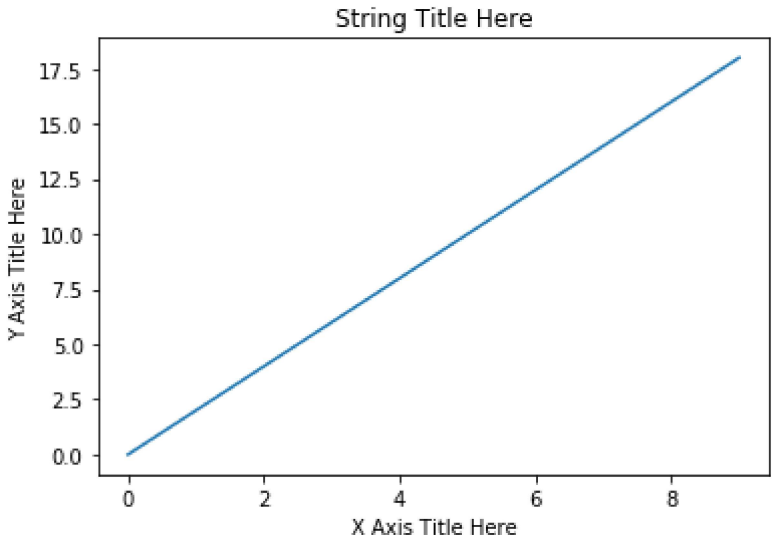
Out[7]:
```
array([ 0,  2,  4,  6,  8, 10, 12, 14, 16, 18])
```

Using Matplotlib with plt.plot() function calls

Basic Matplotlib Commands

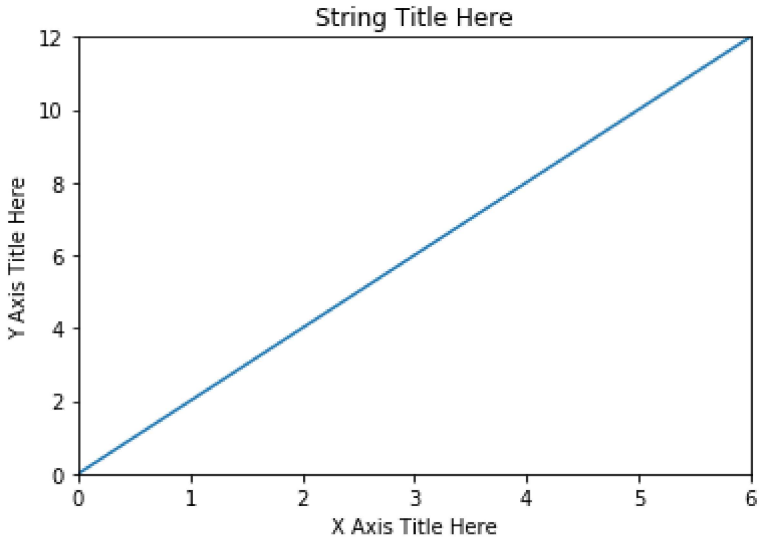
We can create a very simple line plot using the following (I encourage you to pause and use Shift+Tab along the way to check out the document strings for the functions we are using).

In [11]:
```
plt.plot(x, y)
plt.xlabel('X Axis Title Here')
plt.ylabel('Y Axis Title Here')
plt.title('String Title Here')
plt.show() # Required for non-jupyter users , but also removes Out[] info
```



Editing more figure parameters

In [15]:
```
plt.plot(x, y)
plt.xlabel('X Axis Title Here')
plt.ylabel('Y Axis Title Here')
plt.title('String Title Here')
plt.xlim(0,6) # Lower Limit, Upper Limit
plt.ylim(0,12) # Lower Limit, Upper Limit
plt.show() # Required for non-jupyter users , but also removes Out[] info
```



Exporting a plot

In [18]:
```
help(plt.savefig)
```

```
Help on function savefig in module matplotlib.pyplot:

savefig(*args, **kwargs)
    Save the current figure.

    Call signature::

      savefig(fname, dpi=None, facecolor='w', edgecolor='w',
              orientation='portrait', papertype=None, format=None,
              transparent=False, bbox_inches=None, pad_inches=0.1,
              frameon=None, metadata=None)

    The output formats available depend on the backend being used.

    Parameters
    ----------

    fname : str or PathLike or file-like object
        A path, or a Python file-like object, or
```

In [19]:
```
plt.plot(x,y)
plt.savefig('example.png')
```