

# Introduction to Data Science with Python

Instructor: Soubhik Barari  
Faculty Advisor: In Song Kim  
MIT Political Science Methods Workshop

Friday 9<sup>th</sup> February, 2018

## 1 Introduction

Welcome! This workshop will cover the fundamentals of Python programming with specific applications to data science (e.g. statistical computing on real-world datasets).

**The purpose of this document is to provide directions on technical set-up for this workshop.** Workshop attendees are assumed to be proficient in R and/or have a basic knowledge of Python.

Overall, there are four tools we will need for our workshop:

- **Python** - a programming language.
- **Spyder** - an integrated development environment (IDE) for writing Python code (much like RStudio).
- **Jupyter** - an easy-to-use document format for sharing/presenting code, visualizations, and equations.
- **Anaconda** - a high-level environment for Python that organizes and integrates different data science libraries, tools, and editors.

Installing the `anaconda` environment ensures the installation of the first three tools.

## 2 Setup

### 2.1 Overview

If you are an experienced Python user, the following installations will be sufficient for the workshop:

- An installation of Python 2.7 *or* an installation of Anaconda 4.3.

- The following Python packages installed:

- pandas
- numpy
- scipy
- matplotlib
- scikit-learn

- A current installation of Jupyter.

If you have already installed the above modules on the machine you will be using during the workshop, you are all set for the workshop. If you have not, please continue reading for instructions on setting up the necessary modules.

## 2.2 Installing the Anaconda Environment

*Note to Linux users: if you are not familiar with the command line interface on Terminal, please refer to the Appendix for an introduction to basic commands before proceeding.*

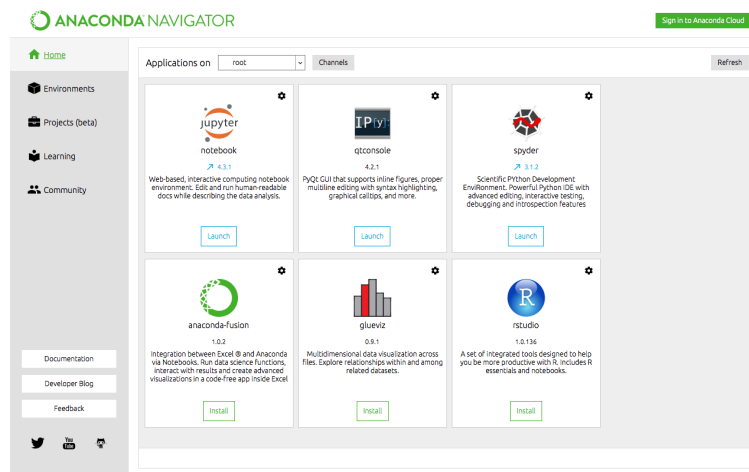
For ease of use, we will use the Anaconda environment, an all-inclusive data science-oriented environment for Python, in our workshop. The version of Python we will be using is **Python 2.7**. Installing Anaconda will automatically install the appropriate version of Python on our machine. To install Anaconda:

1. Visit <https://www.continuum.io/downloads> and click on the appropriate tab.
2. Download the specific installer for **Python 2.7**:
  - If you are a Mac or Windows user, double-click the installer file (**.pkg** or **.exe**). Follow the directions for a successful installation of Anaconda.
  - If you are a Linux user, after downloading the installer script, open the Terminal application and change directories to the folder containing the downloaded file (e.g. /Downloads) and type:

```
bash Anaconda2-4.3.1-Linux-x86_64.sh
```

Follow the directions for a successful installation.

3. Open the **Anaconda-Navigator** app on your machine. The application window should look like:



You now have both Anaconda and Python on your machine. To verify this, launch the **qtconsole** (an interactive interpreter for Python similar to the R interpreter) from the Home page on the Anaconda-Navigator by clicking on the button below:



On the command prompt that launches, type in `print "hello world!"`. You should be able to see the output “hello world!” on your console:

```
Jupyter QtConsole 4.2.1
Python 2.7.13 |Anaconda 4.3.1 (x86_64)| (default, Dec 20 2016, 23:05:08)
Type "copyright", "credits" or "license" for more information.

IPython 5.1.0 -- An enhanced Interactive Python.
?                -> Introduction and overview of IPython's features.
%quickref        -> Quick reference.
help             -> Python's own help system.
object?         -> Details about 'object', use 'object??' for extra details.

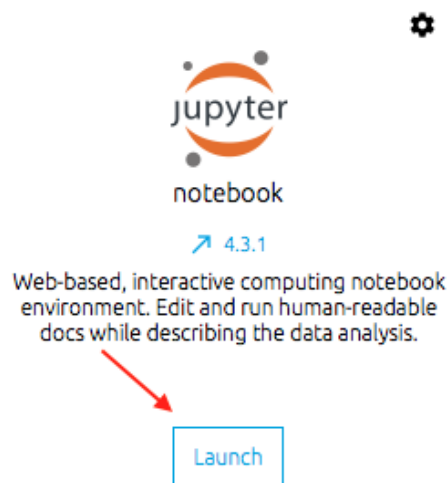
In [1]: print "hello world!"
hello world!

In [2]:
```

## 2.3 Setting up a Jupyter notebook

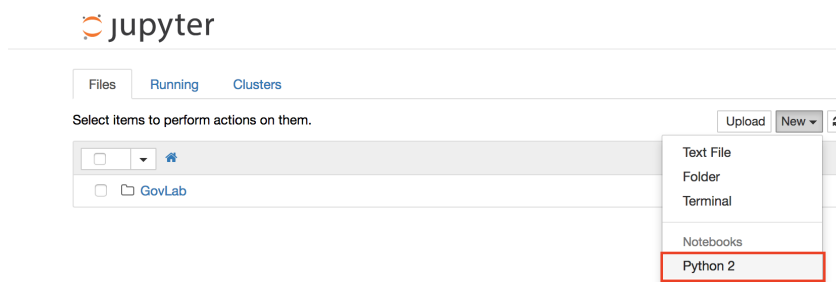
For the workshop code demos, we will use Jupyter notebooks (**.ipynb**) to write and execute code in a block-by-block fashion and also create notes in Markdown along the way as needed.

To create your own Jupyter notebook for this workshop, open your **Anaconda-Navigator** application and on the Home screen, click to launch:

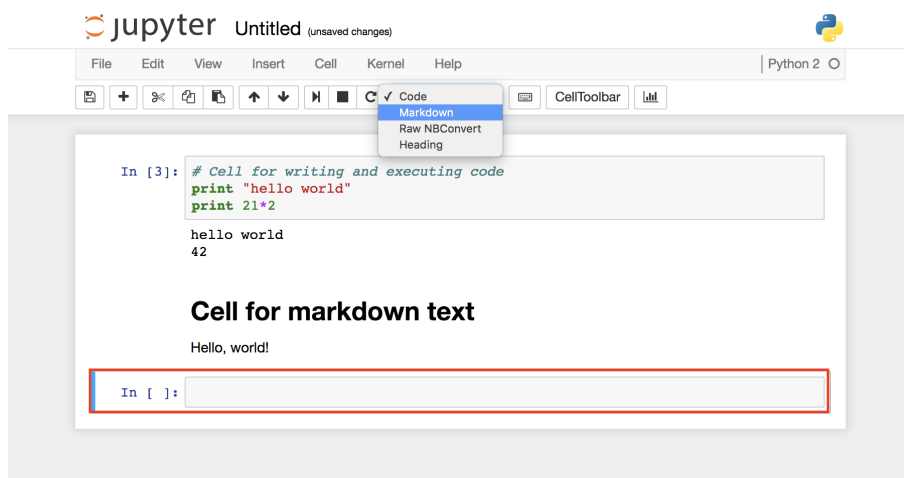


Your browser should have automatically opened to the Jupyter notebook server. If not, navigating to `localhost:8888/tree` on a browser of your choice will also

allow you access the application server. To create a notebook, navigate to a directory of your choice and select New as follows:



In your newly created notebook, you can create **cells** which may either contain code that can be dynamically executed (R interpreter style) or markdown text:



*It is highly recommended that the reader become familiarized with how to write notes and execute code in this notebook prior to attending the workshop!*

**If you are unable to successfully launch Jupyter on your computer, you can follow along (for the basic code demo) by creating a new notebook on <https://try.jupyter.org/>.**

## Appendix: Using the Command Line

The purpose of this section is to provide a basic overview of the command line, which is needed for successful installation of Anaconda (for Linux users) and the additional Python packages.

All modern operating systems have command line interfaces that can perform the same functions on the system as the graphical user interface (GUI) that users traditionally use. Both Linux and Mac OS can access this command line via the Terminal application, which share command line vocabulary and features from a common ‘ancestor’ called the Unix operating system. Windows users can access the command line through the DOS command prompt.

Some specific examples that motivate using the command line:

- Create single keystroke shortcuts to perform repetitive tasks like opening up a set of files or navigating to a project workspace.
- Write scripts to automate R or Python programs based on time of day / week.
- Accessing the file system or programs on a remote machine.

The following table describes some basic Unix commands for Mac and Linux users:

Command	Example	Description
ls	ls -l	Lists files in current directory
cd	cd tempdir	Change current directory to tempdir
mkdir	mkdir tempdir	Make a folder called tempdir
rmdir	rmdir tempdir	Remove folder called tempdir
cp	cp file1 file2	Copy file1 to file2
rm	rm file1	Remove or delete file1
mv	mv old.html new.html	Move old.html to new.html (rename)

The `ls` and `cd` command are sufficient for Linux users in the Anaconda installation procedure.

## Appendix: Resources

For more details on command line usage, Python, and Jupyter, we recommend the following resources:

- **Basic Unix commands** : <https://www.tjhsst.edu/~dhyatt/superap/unixcmd.html>.
- **Basic DOS (Windows) commands** : <http://commandwindows.com/command3.htm>.
- **“A Byte of Python”, a free online tutorial book on setting up and using Python.** : [https://python.swaroopch.com/about\\_python.html](https://python.swaroopch.com/about_python.html)
- **Installation and setup of Jupyter.** : <https://jupyter-notebook-beginner-guide.readthedocs.io>

- **Advanced configuration of Jupyter.** : <https://www.datacamp.com/community/tutorials/tutorial-jupyter-notebook>