MCHE 474: Control Systems
Fall 2017 – Lab 0

Assigned: Thursday, August 31st
Report Due: Tuesday, September 5th, 12:30pm

Assignment: Run the Jupyter Notebook associated with this assignment to check that all components of the software needed for future class assignments is installed correctly.

Submission: The Jupyter Notebook file should be submitted via email:

- to joshua.vaughan@louisiana.edu
- with subject line `CLID-MCHE474-Lab0` where the `CLID` is your CLID.

The email should include the Jupyter Notebook file (`.ipynb` extension) with file name `CLID-MCHE474-Lab0.ipynb` where the `CLID` is your CLID.

Note: Submissions with incorrect filenames or submitted as multiple images/pdfs will be rejected.

1 Assignment Details

The exercises in this class use Python and heavily leverage the scientific Python ecosystem. Most of the tools we'll use are included in the Anaconda Python Distribution. This Lab will walk through the installation of a few packages that are not included in that distribution and run a Jupyter Notebook to verify that they are installed correctly.

1.1 Installation

To begin, youll need to install the Python distribution that we're using:

https://www.anaconda.com/download/

Be sure to grab the Python 3.x version, currently 3.6. There are versions available for Windows, macOS, and Linux. The default installation options will be sufficient for our work in *MCHE474*.

We will also be using the Python Control System Library and the watermark Jupyter Notebook extension.

To install the Control Systems Library and watermark, you will have to issue commands from the Anaconda Command Prompt on Windows or the Terminal on macOS. On Windows, the command prompt can be accessed through the *Start Menu. . . Anaconda3 (64-bit) . . . Anaconda Prompt*, as shown in Figure 1. On macOS, the Terminal application can be launched from *Applications. . . Utilities. . . Terminal*, as shown in Figure 2. On Windows, a
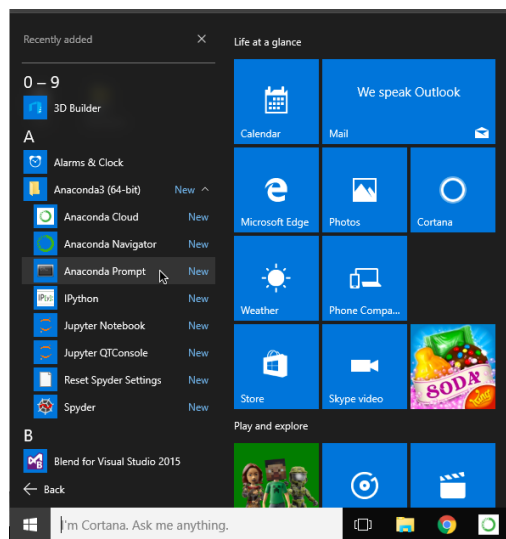

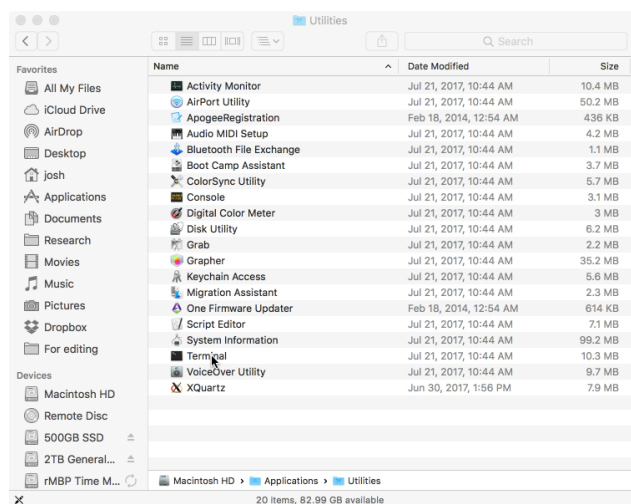Figure 1: Launching the Command Prompt on Windows
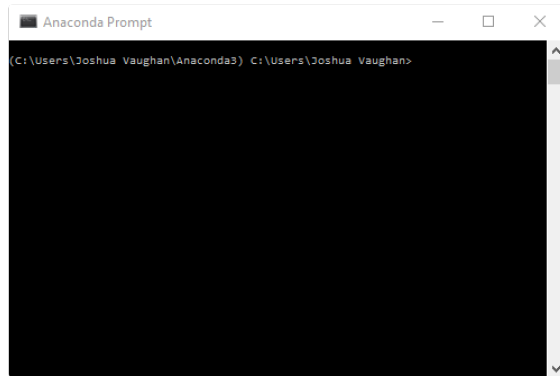

Figure 2: Launching the Terminal on macOS

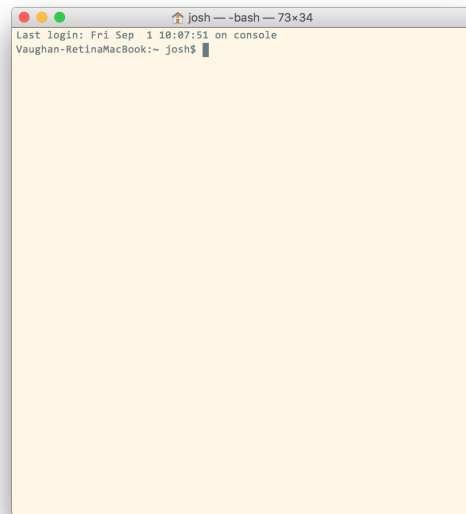**Figure 3: The Anaconda Prompt on Windows 10**

Figure 4: The macOS Terminal

window like the one in Figure 3 will appear. On macOS, the terminal should look something like the one in Figure 4.

The commands outlined in the following sections should be typed and entered in one of these windows. For the remainder of the document, the command prompt will represent either the Anaconda Command Prompt for Windows 10 users or the Terminal for macOS users.

1.1.1 Control Systems Installation

The installation instructions for the Control Systems Library are outlined at:

http://python-control.readthedocs.io/en/latest/intro.html#installation

To summarize, you'll issue the following command from the command line:

```
$ pip install control
```

where $ represents the command prompt; do not type the $.

1.1.2 watermark Installation

The installation instructions for watermark are outlined at:

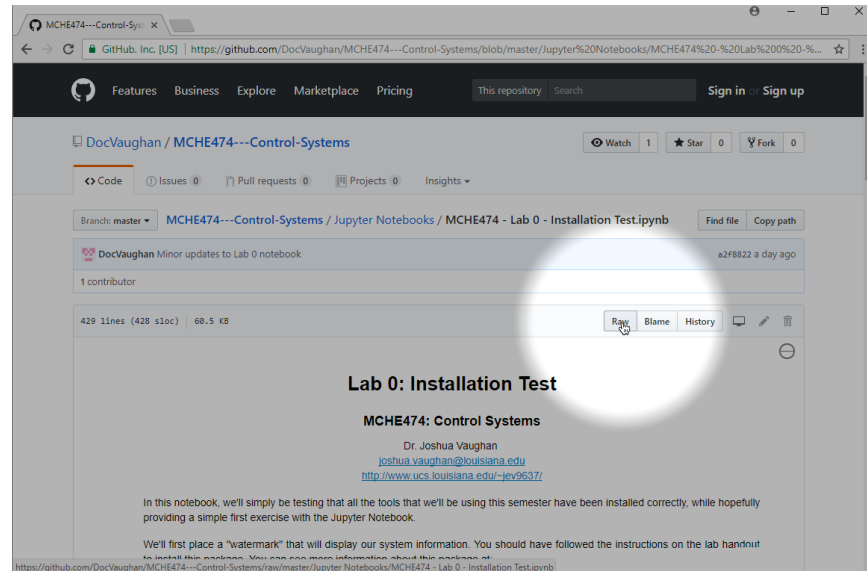https://github.com/rasbt/watermark#installation-and-updating

Figure 5: Right Click on the Raw Button to Download the Notebook

Similar to the Control Systems Library, you'll issue a `pip install` command from the command line:
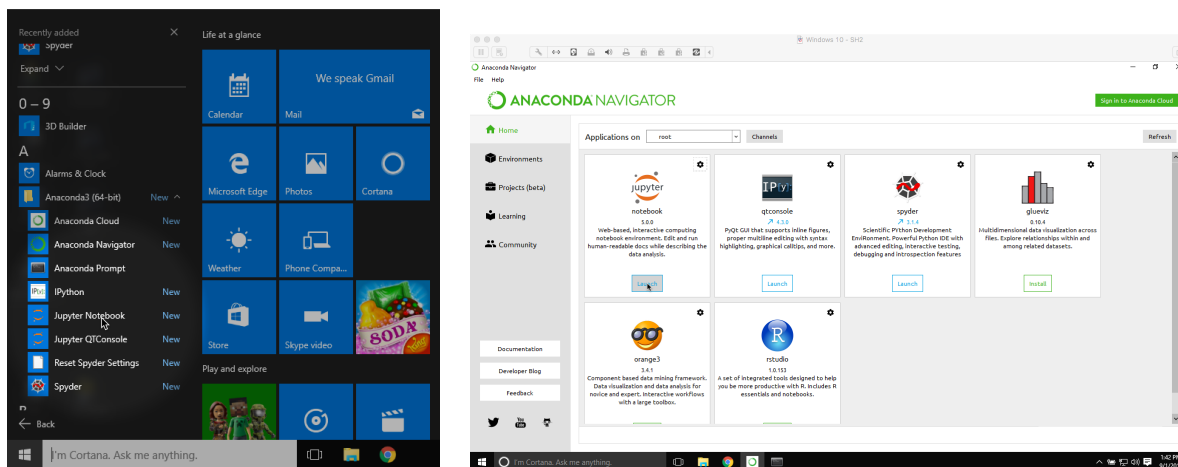
```
$ pip install watermark
```

where `$` represents the command prompt. As before, you do not need to type the `$`.

1.2   Jupyter Notebook Download

The Jupyter Notebook for this assignment can be downloaded from the class GitHub Repository, from within the Jupyter Notebooks folder there. Inside that folder is a Jupyter Notebook file named `MCHE474 - Lab 0 - Installation Test.ipynb`. The easiest way to get this file is to click on it from the web. A statically-rendered version of the Notebook will show up on the GitHub page. On the top right of that sub-window of the page, will be a button that says *Raw*, as shown in Figure 5. Right-click on the button and save the file to your computer. It should be saved with the `.ipynb` extension. If a `.txt` extension gets added, remove it and/or change the extension to `.ipynb`.

1.3   Launching the Jupyter Notebook

On Windows 10, you can launch the Jupyter Notebook directly from the *Start Menu* as shown in Figure 6(a). On both Windows 10 and macOS, you can also launch the Notebook by first launching the *Anaconda Navigator* application, the clicking on the launch button for the Notebook, as shown in Windows 10 in Figure 6(b).

(a) From the Start Menu   (b) From Anaconda Navigator

Figure 6: Launching the Jupyter Notebook on Windows 10

For both Windows 10 and macOS, you can also launch the Jupyter Notebook by issuing the command below at the command line:

```
$ jupyter notebook
```

where `$` represents the command prompt. As before, you do not need to type the `$`.

No matter how you launch the notebook, it should open a new window in your default browser that looks something like the one in Figure 7. From here, navigate to the folder in which you saved the `MCHE474 - Lab 0 - Installation Test.ipynb` file. Once there, click on it to open it.

More information on using the Jupyter Notebook can be found at:

http://nbviewer.jupyter.org/github/jupyter/notebook/blob/master/docs/source
/examples/Notebook/Notebook%20Basics.ipynb

1.4   Running the Notebook

Once a notebook is open, shift-enter will run a Jupyter Notebook cell. The text cells in the notebook explain what it is doing in each code cell. For this assignment, you'll only need to change this line of the notebook:

```
my_random_generator = np.random.RandomState(seed=1234)
```

so that the `1234` in `...(seed=1234)` matches the numerical portion of your CLID. Once you've done that, you can run the entire notebook by using the *Cell. . . Run All* option from the menu bar, as shown in Figure 8.
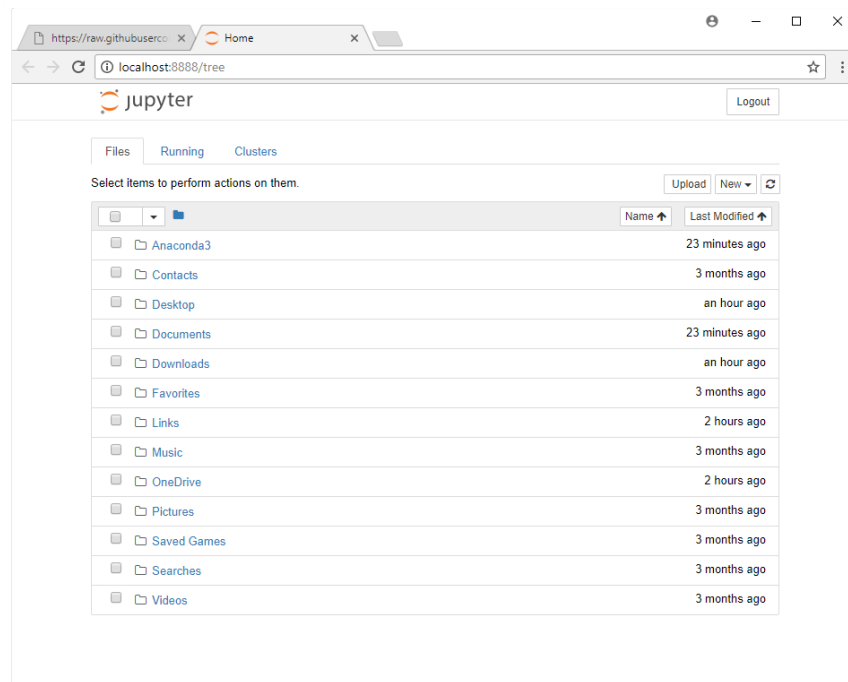
Figure 7: Jupyter Notebook After Launch on Windows 10

2   Submission Details

Once you have done this, and have no errors in the Notebook, exit the Notebook using *File. . . Close and Halt* from the menubar, as shown in Figure 9. Once you've closed the notebook, you can rename the file to `CLID-MCHE474-Lab0.ipynb` where the `CLID` is your CLID. Then, submit it via an email to joshua.vaughan@louisiana.edu with subject line `CLID-MCHE474-Lab0` where the `CLID` is your CLID.
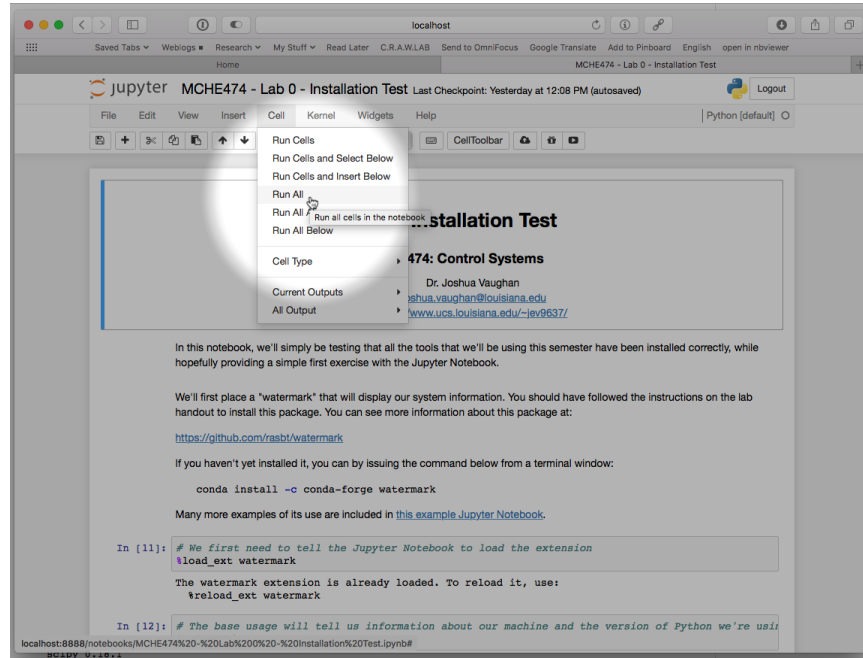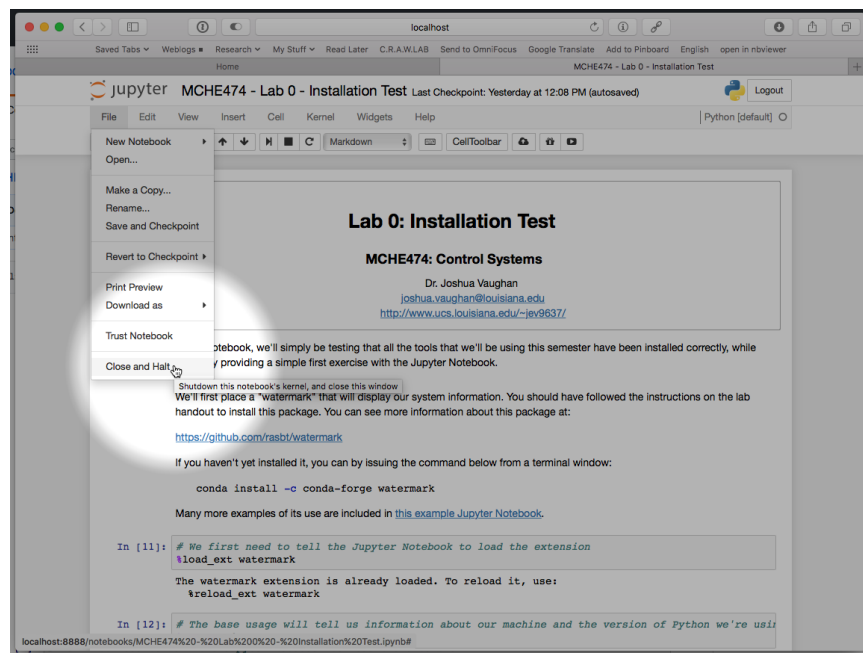
Figure 8: The Run All Option in the Cell Menu

Figure 9: Closing a Notebook