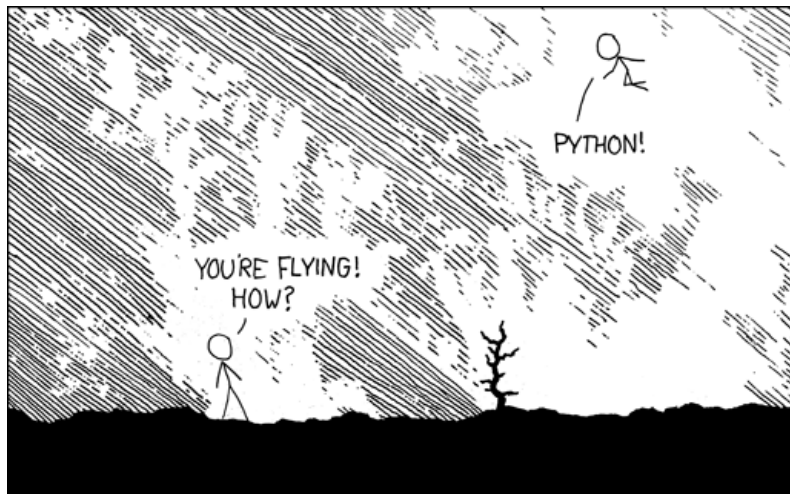


Lesson 0. Introduction and Setup

1 Overview of the course


- This course is about solving problems in applied mathematics and operations research using **computer programming**.
- No prior programming experience is assumed.
- We'll learn about programming through some interesting projects – for example:
 - analyzing social networks to identify central figures in terrorist networks
 - finding the shortest tour through all of the Major League Baseball stadiums
 - saving time and frustration by automating common tasks in spreadsheets
 - sending secret messages by hiding them inside images
- The goal is to get you comfortable enough with computer programming – not only for your future operations research courses – but also for small problems that arise in your everyday lives.
- We will be using the **Python** programming language in this course.

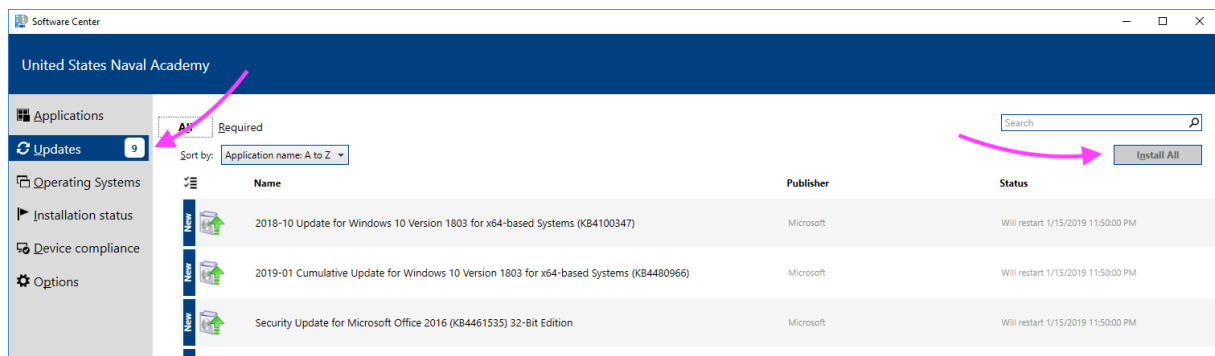
2 What is Python – and why?



- Python is a free, open-source, general-purpose programming language.
- Python is popular and used everywhere – just a few examples:
 - Automation, monitoring, data science, and more at Netflix:
<https://medium.com/netflix-techblog/python-at-netflix-86b6028b3b3e>
 - Special effects at Industrial Light and Magic:
<https://www.davincicoders.com/codingblog/2017/2/10/love-movies-learn-to-code-python-and-you-might-work-for-ilm>
 - Analysis of historical texts:
<https://digitalorientalist.com/2019/07/01/making-a-basic-textual-analysis-program-in-python/>
- Python is “beautiful”: its syntax was designed with an emphasis on readability.
- Python has become the language of choice for data science and machine learning

3 Getting your computer ready

- First, let’s make sure your computer has all the required software updates, in order to minimize the potential for issues when installing Python.
- To get to Software Center, first click on  in the bottom left corner of your screen, and type software. That should bring up a link to the Software Center app. Click on this link.
- Once Software Center is open, go to the Updates tab and click Install All at the top right corner (see the image below) to install all required updates.



- Once the updates have finished, restart your computer.
- **Optional but strongly, strongly suggested.** Make Google Chrome your default web browser, if it is not already. Follow the instructions for Windows 10 at the link below:

<https://support.google.com/chrome/answer/95417>

4 Installing Anaconda

- In this course, we will use the Anaconda Python distribution
- To install Anaconda, follow these instructions carefully!
 - These instructions that follow are based on the documentation found here:
<https://docs.anaconda.com/anaconda/install/windows/>

Step 1. Download the Anaconda installer. Go to the following URL to download the installer:

<https://www.anaconda.com/download/#windows>

You should select the Python 3.7 version, 64-Bit Graphical Installer.

Step 2. Once the installer is downloaded, find it. Double-click on the installer to launch.

Step 3. You should see a Welcome to Anaconda3 dialog box. Click **Next**.

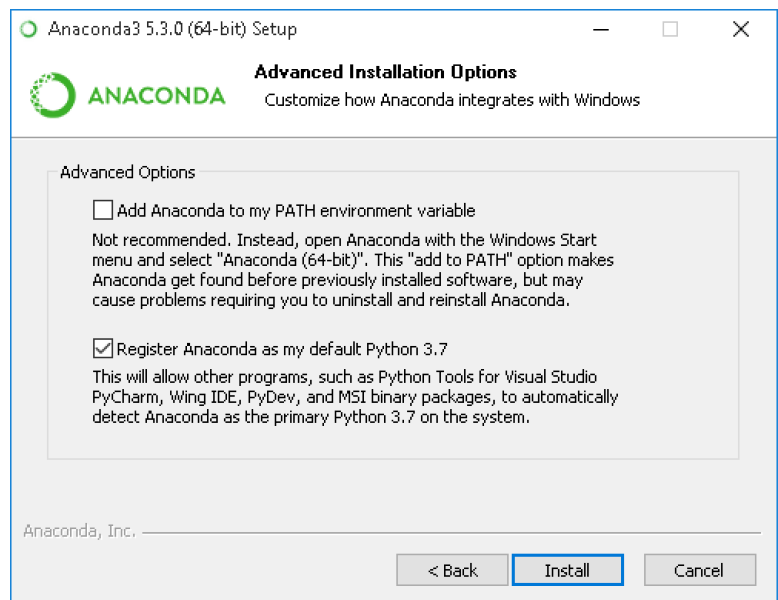
Step 4. Read the licensing terms and click **I Agree**.

Step 5. Select Just Me (recommended) and click **Next**.

Step 6. Leave the default destination folder as-is and click **Next**.

Step 7. You should now see the dialog box on the right.

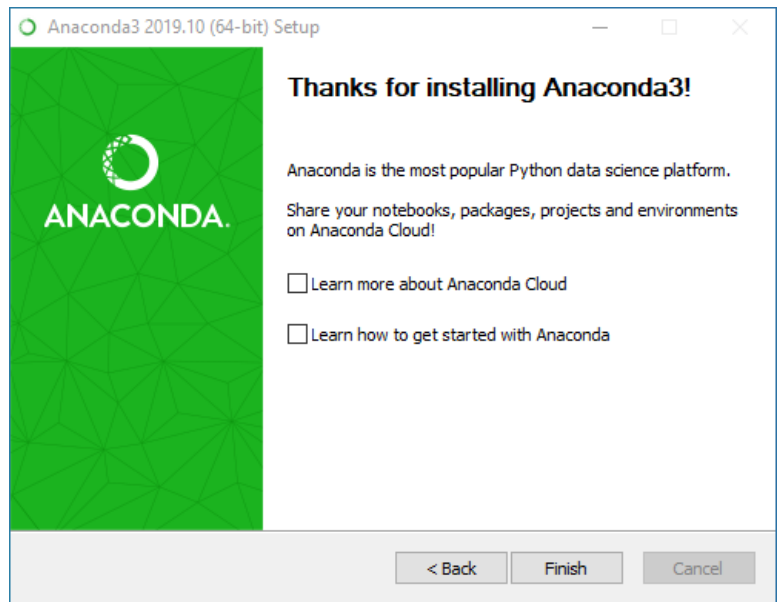
- Leave the first box unchecked: Do not add Anaconda to your system PATH environment variable. Adding Anaconda to the PATH environment variable can interfere with other software.
- Leave the second box checked: Register Anaconda as your default Python.
- Click the **Install** button.



Step 8. You should see a dialog box with a progress bar. This will take a while. When the progress bar is full, click **Next**.


Step 9. Ignore the message about JetBrains and PyCharm and click **Next**.

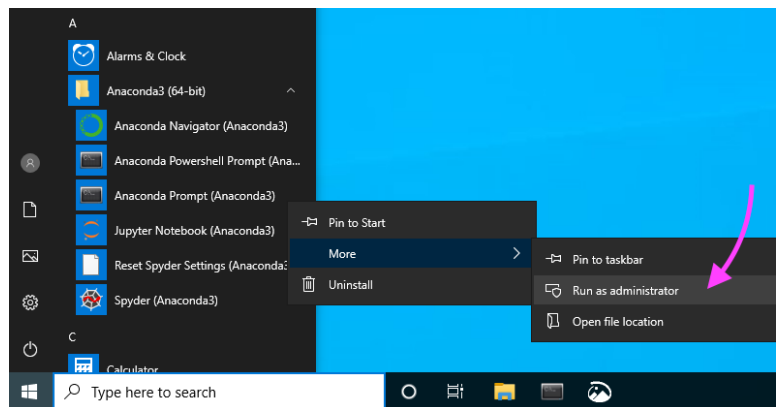
Step 10. After a successful installation, you will see the dialog box shown on the right. Uncheck the two boxes and click **Finish** to complete the installation.



5 Install packages you'll need for this class

- Now that Anaconda is installed, let's install some additional packages that you will need for the linear programming examples in this class (and SA305).

Step 1. Click on  in the lower left corner of your screen. Then click on **Anaconda3 (64-bit)** and **right-click** on **Anaconda Prompt (Anaconda3)**. Select **More >> Run as administrator**. See the image to the right.



Step 2. A command prompt window titled Administrator:Anaconda Prompt (Anaconda3) should now be open on your machine.

At the prompt, type the following and press **Enter**:


```
conda install -c conda-forge pyomo pyomo.extras glpk
```

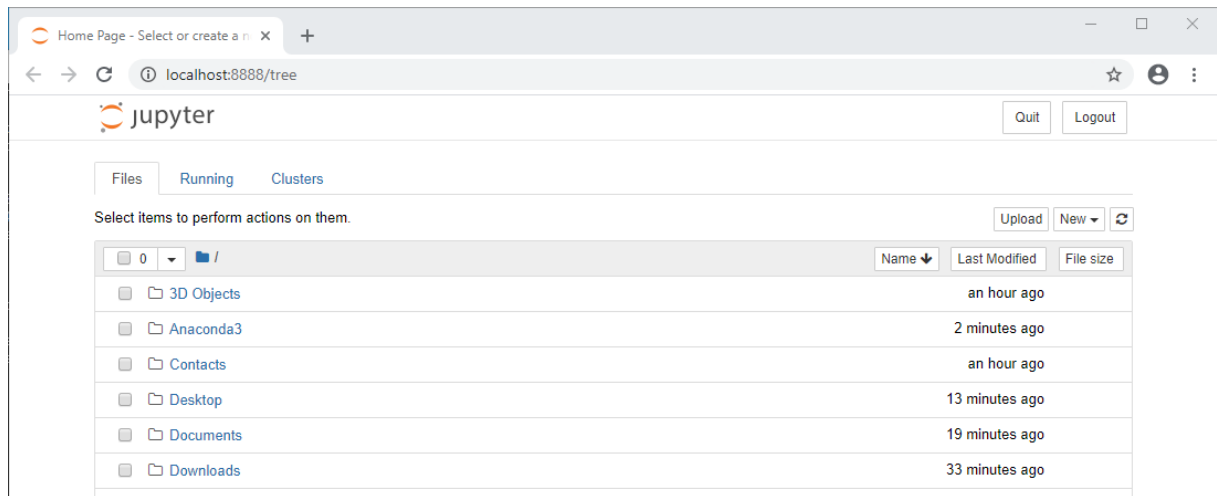
You will see the conda package installer solve the environment.

Step 3. The conda package installer will then ask you if you want to proceed. Type **y** and press **Enter**. The conda package installer will then download the packages and complete the installation.

Step 4. Close the terminal window.

6 Launching Jupyter

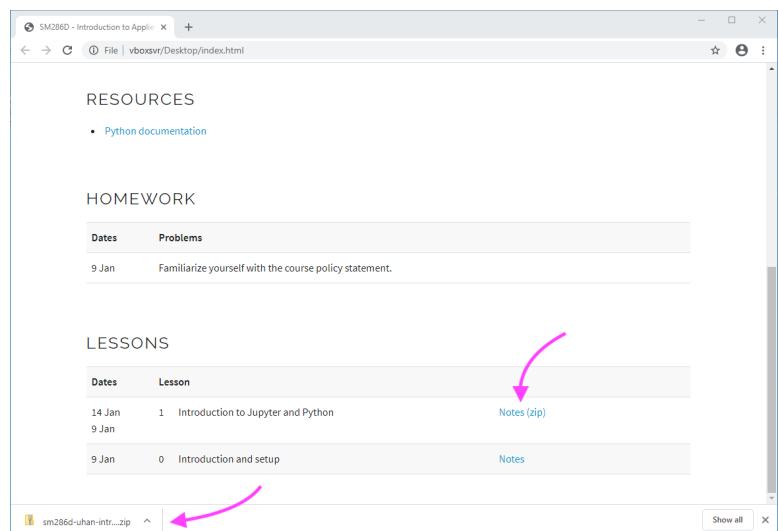
- We will be writing Python code in **Jupyter**. Let's open Jupyter.
- First, click on . Then click on **Anaconda3 (64-bit) >> Jupyter Notebook (Anaconda3)**.
- A command prompt window titled Jupyter Notebook (Anaconda3) should appear. Just leave this open while you use Jupyter. In addition, your default web browser should open with the Jupyter file browser. It should look like this:



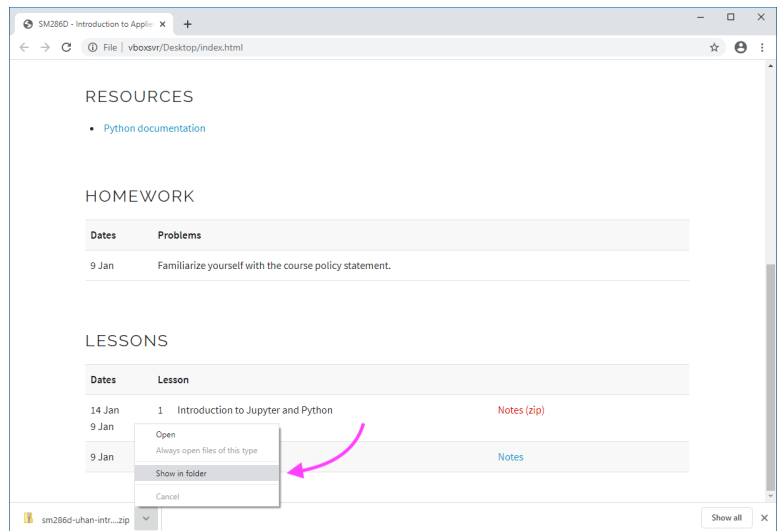
7 Downloading and opening Jupyter notebooks

- The class website is here:
<https://www.usna.edu/users/math/uhan/sm286d/>
- You will need to regularly download Jupyter notebooks from the class website and open them in Jupyter. Follow these instructions to download Lesson 1. These instructions assume you're using Google Chrome as your web browser.

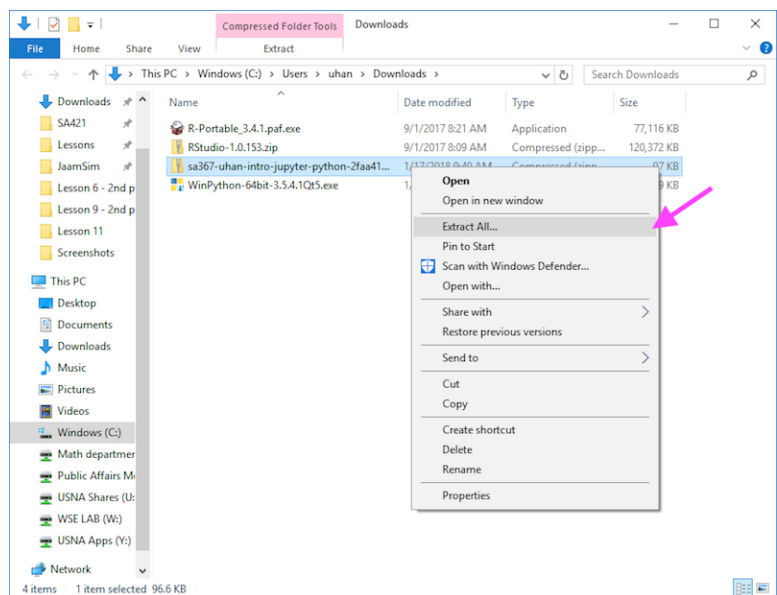
Step 1. Start by clicking the link for the Jupyter notebook you want to use. On the class website, these are labeled with zip (for a zip file). You'll see the file download appear at the bottom of the window.



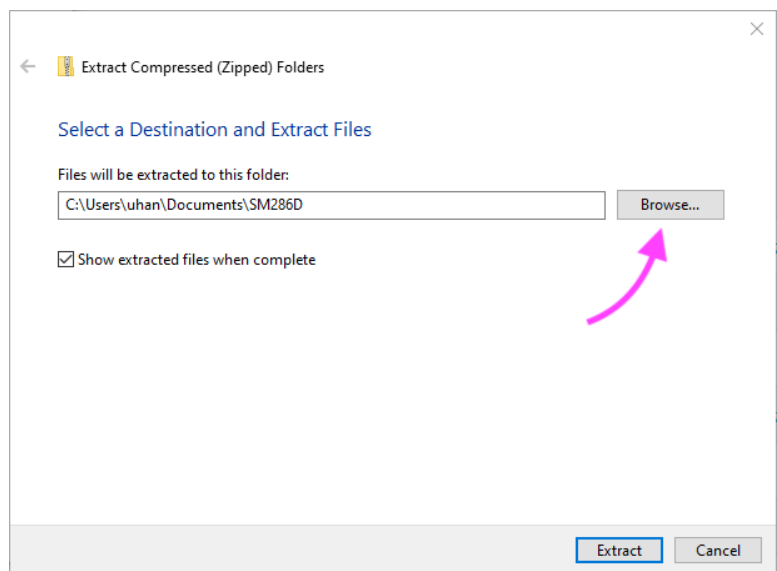
Step 2. Click on the arrow next to the file download, and select **Show in Folder**.



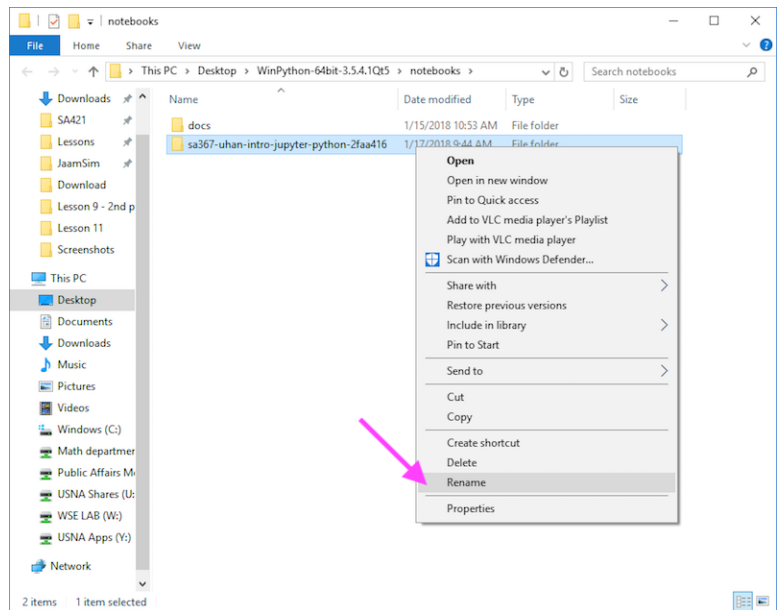
Step 3. An Explorer window should appear, highlighting the file you just downloaded. Do not double-click it. Instead, right-click the file, and select **Extract All...**



Step 4. A dialog box should appear, asking where you want to extract the contents of this file. Click on **Browse** and select where you want to put a new folder with the contents of the file. Then, click **Extract**.



Step 5. Once the extraction is done, an Explorer window should appear, showing you the newly created folder with the contents of the file. Rename the folder something easy to read.



Step 6. Now when you launch Jupyter, navigate the file browser to the location of this newly created folder.