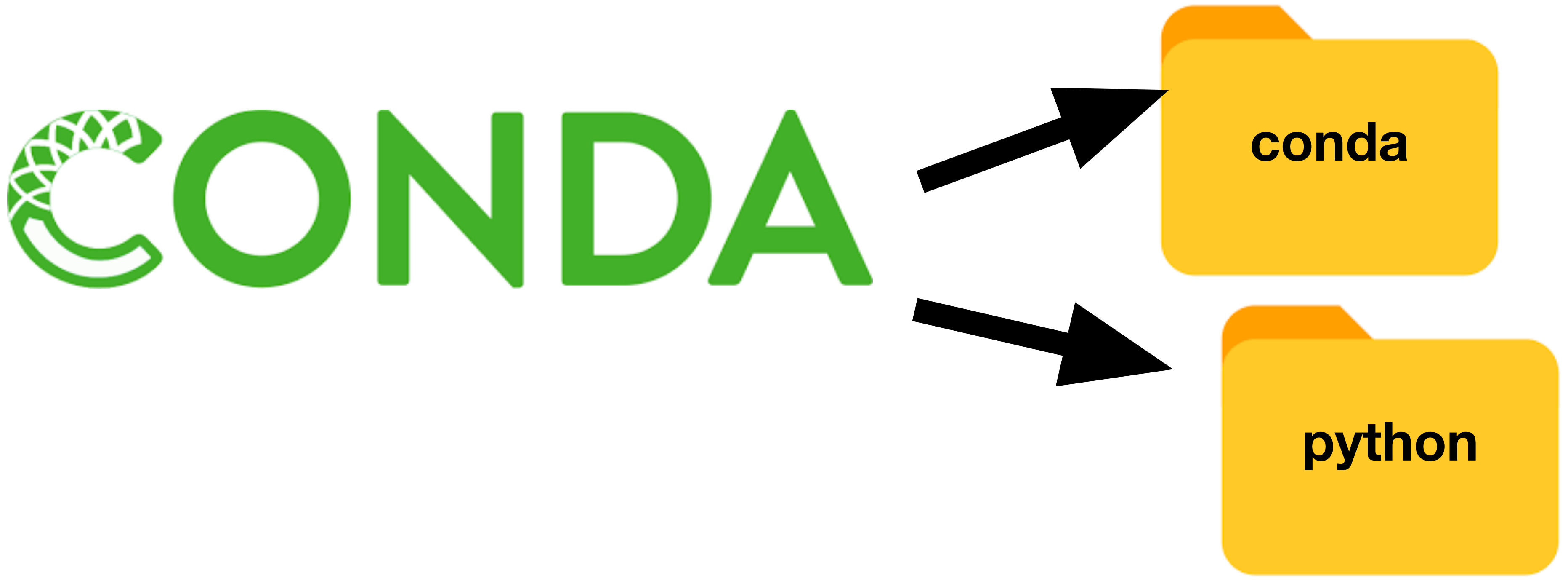
Introduction to Python for Scientific Programming

Step 1: Installing Python tools on your machine

We are going to use a package manager called mamba
https://github.com/conda-forge/miniforge

Go ahead and download the appropriate miniforge (mamba) installer on to your machine
on unix-like systems copy and paste:

```
curl -L -O "https://github.com/conda-forge/miniforge/releases/latest/download/Miniforge3-$(uname)-$(uname -m).sh"
bash Miniforge3-$(uname)-$(uname -m).sh
```



Step 2: Install Jupyter Notebooks

For this we are going to use the mamba installation that we just performed

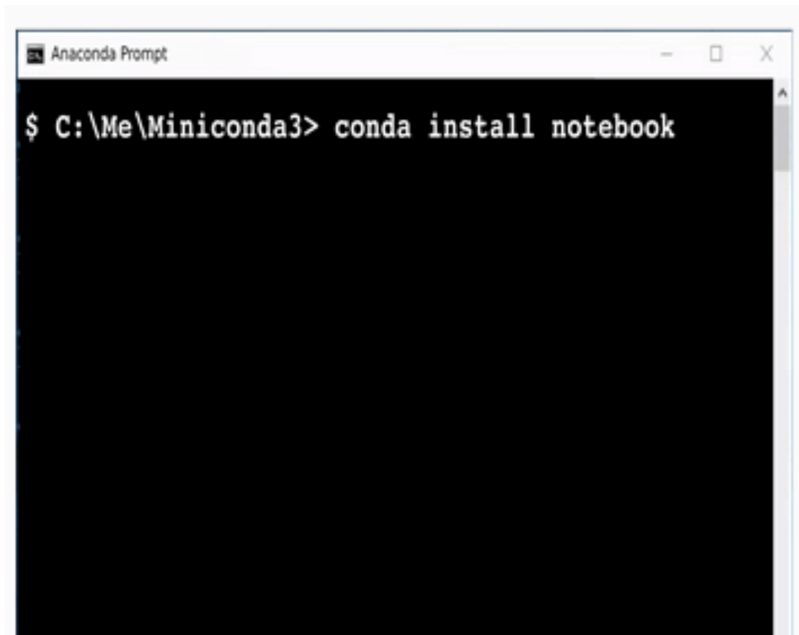
We will need to open up a command line interface (CLI) for this

If you have a mac, open the Terminal app; If you have a windows box you will use the Anaconda prompt that was just installed by mamba

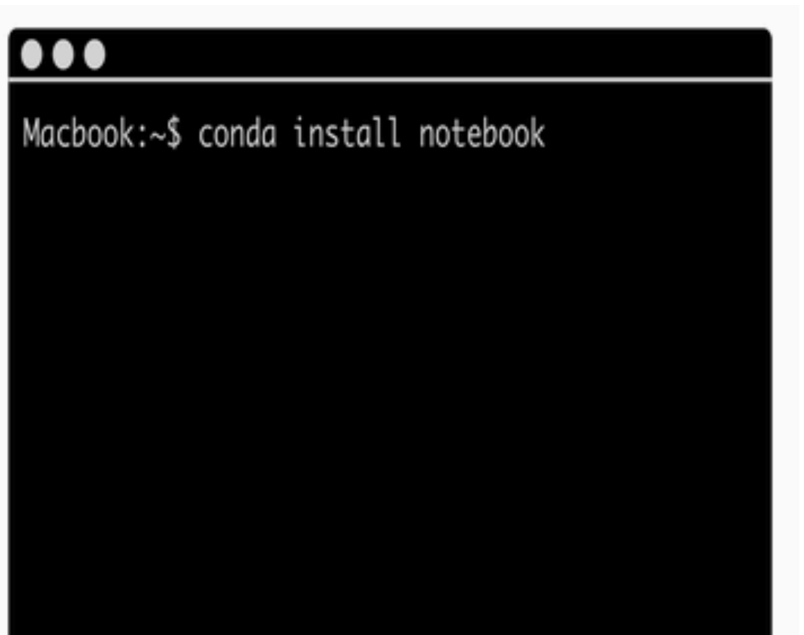
For a windows app use the command line prompt (search for cmd or use desktop shortcut to mamba)

`` `mamba install jupyterlab` ``

Windows **Mac**



```
$ C:\Me\Miniconda3> conda install notebook
```



```
Macbook:~$ conda install notebook
```

Step 3: Install more libraries

Again we are going to use mamba for this. We let the package manager do all the hard work for us and it will just give us the libraries that we need

The basic call is `mamba install some_package`

Here is the list of packages that we want for now:

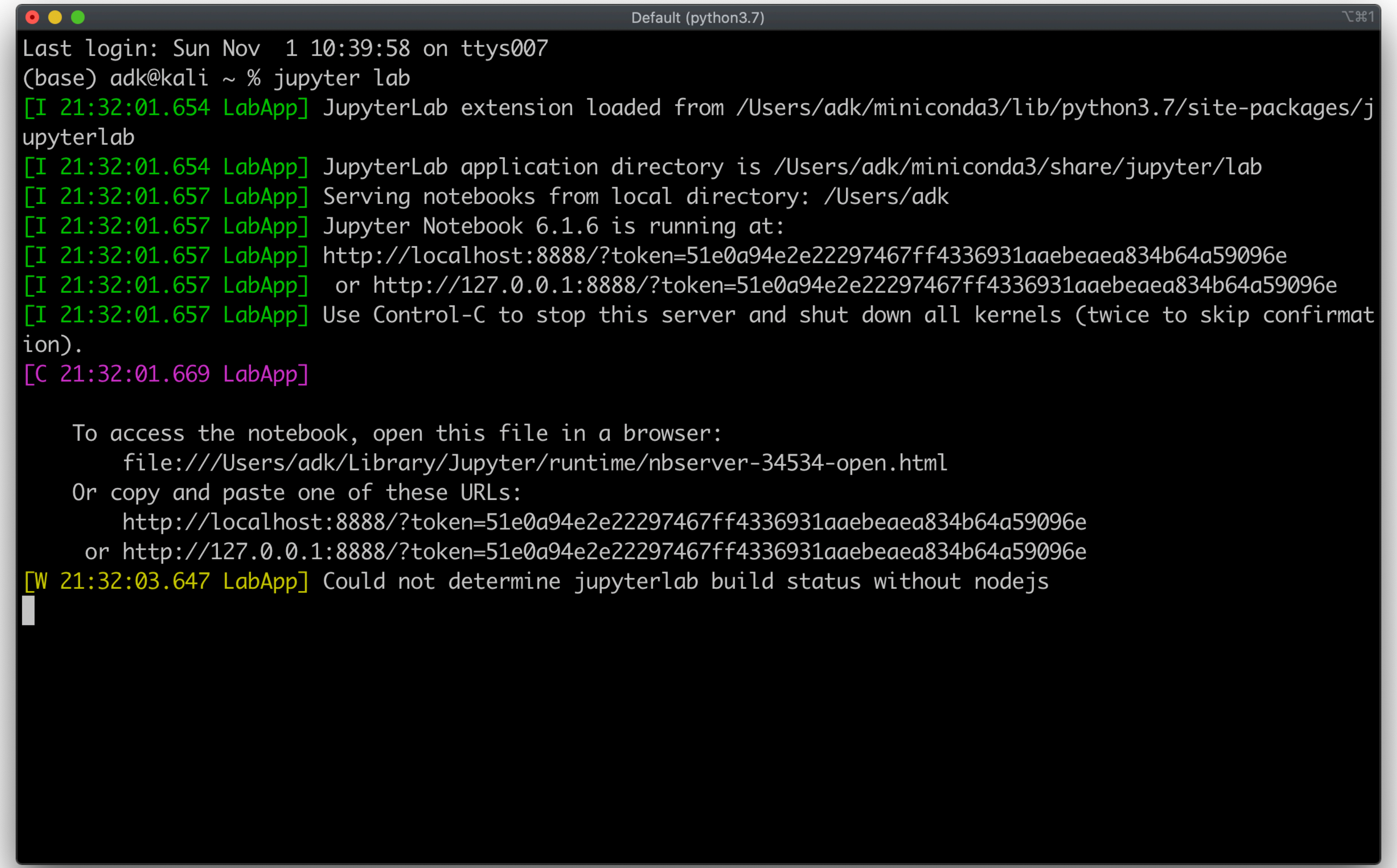
- numpy
- scipy
- matplotlib

Go ahead and install all three of those using `mamba install` now

Step 4: Start a Jupyter lab server

Working from the CLI still, type `jupyter lab`

That will bring up a bit of text in your command like so, and a browser window should appear



```
Last login: Sun Nov  1 10:39:58 on ttys007
(base) adk@kali ~ % jupyter lab
[I 21:32:01.654 LabApp] JupyterLab extension loaded from /Users/adk/miniconda3/lib/python3.7/site-packages/j
upyterlab
[I 21:32:01.654 LabApp] JupyterLab application directory is /Users/adk/miniconda3/share/jupyter/lab
[I 21:32:01.657 LabApp] Serving notebooks from local directory: /Users/adk
[I 21:32:01.657 LabApp] Jupyter Notebook 6.1.6 is running at:
[I 21:32:01.657 LabApp] http://localhost:8888/?token=51e0a94e2e22297467ff4336931aaebeaea834b64a59096e
[I 21:32:01.657 LabApp]  or http://127.0.0.1:8888/?token=51e0a94e2e22297467ff4336931aaebeaea834b64a59096e
[I 21:32:01.657 LabApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmat
ion).
[C 21:32:01.669 LabApp]

    To access the notebook, open this file in a browser:
        file:///Users/adk/Library/Jupyter/runtime/nbserver-34534-open.html
    Or copy and paste one of these URLs:
        http://localhost:8888/?token=51e0a94e2e22297467ff4336931aaebeaea834b64a59096e
     or http://127.0.0.1:8888/?token=51e0a94e2e22297467ff4336931aaebeaea834b64a59096e
[W 21:32:03.647 LabApp] Could not determine jupyterlab build status without nodejs
```

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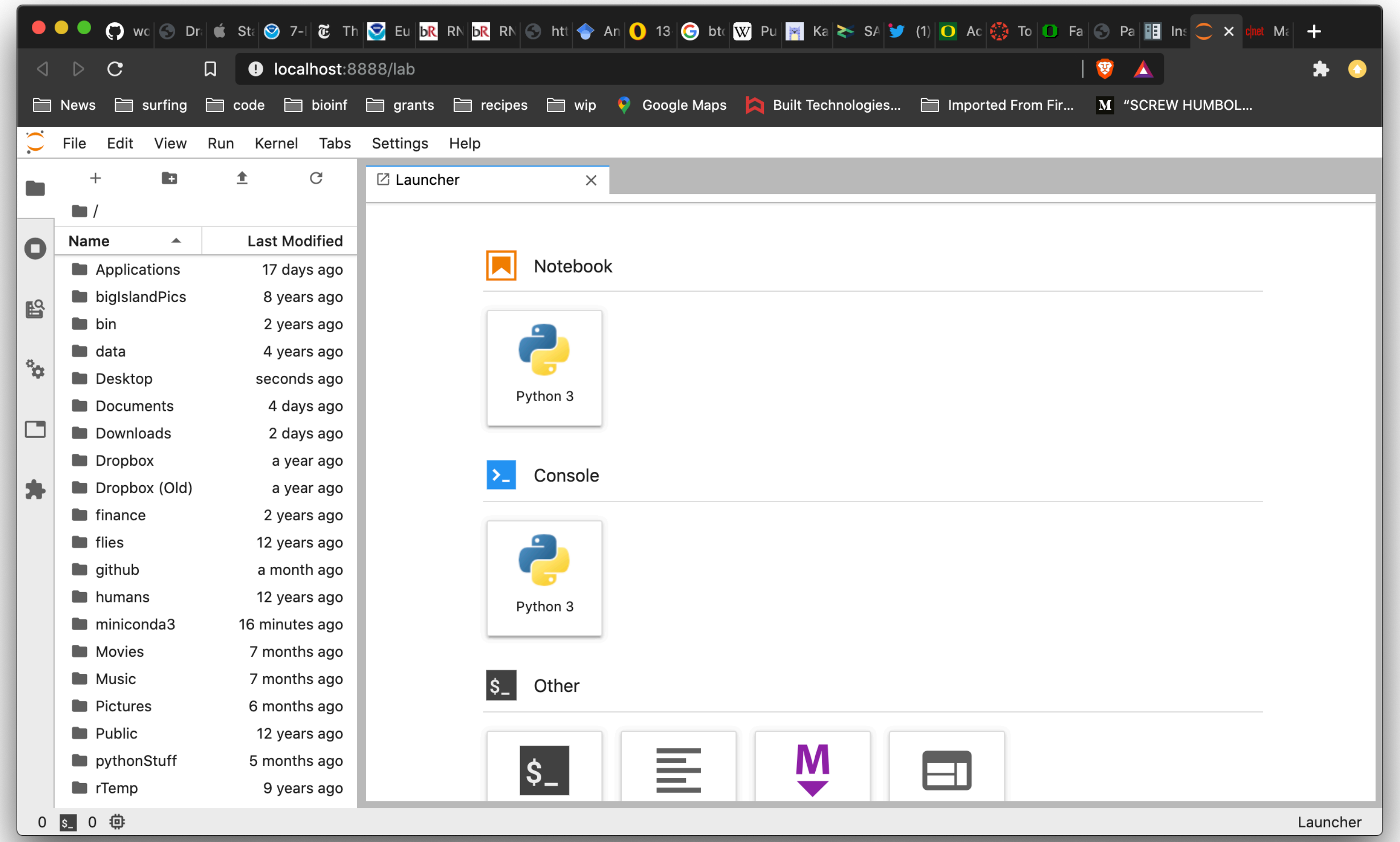
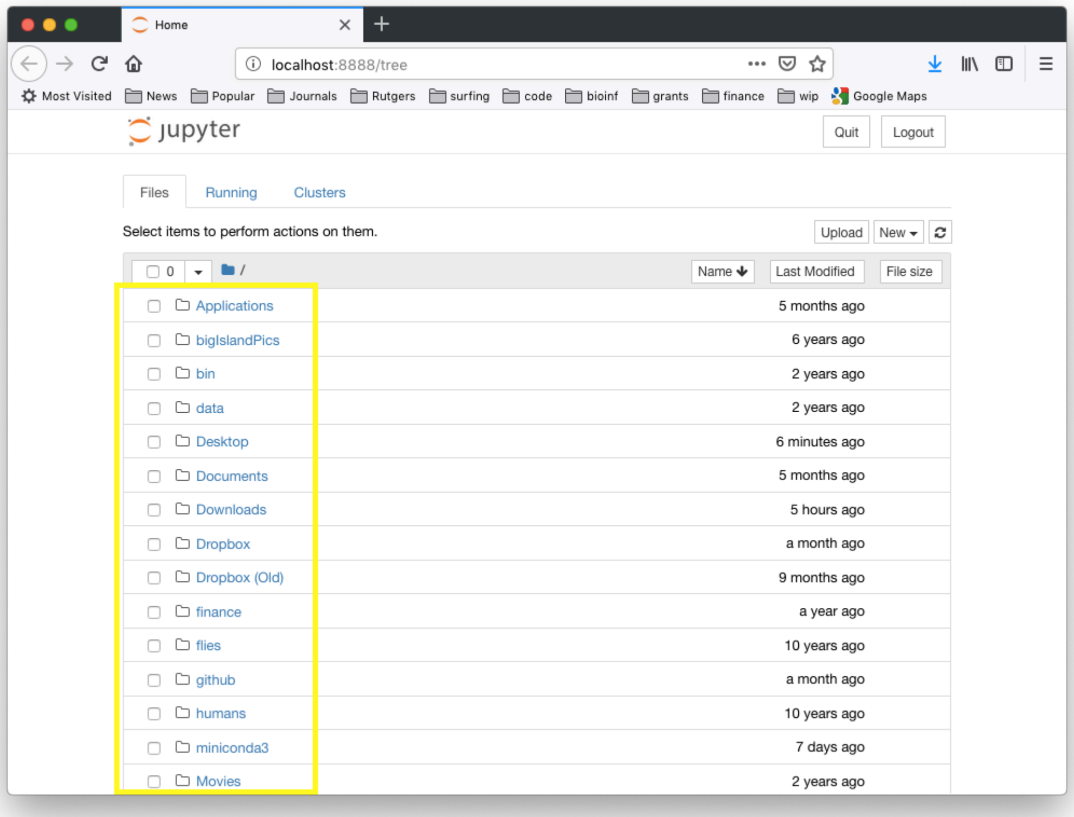


Name	Last Modified
Applications	17 days ago
bigIslandPics	8 years ago
bin	2 years ago
data	4 years ago
Desktop	seconds ago
Documents	4 days ago
Downloads	2 days ago
Dropbox	a year ago
Dropbox (Old)	a year ago
finance	2 years ago
flies	12 years ago
github	a month ago
humans	12 years ago
miniconda3	16 minutes ago
Movies	7 months ago
Music	7 months ago
Pictures	6 months ago
Public	12 years ago
pythonStuff	5 months ago
rTemp	9 years ago

Step 5: Pat yourself on the back

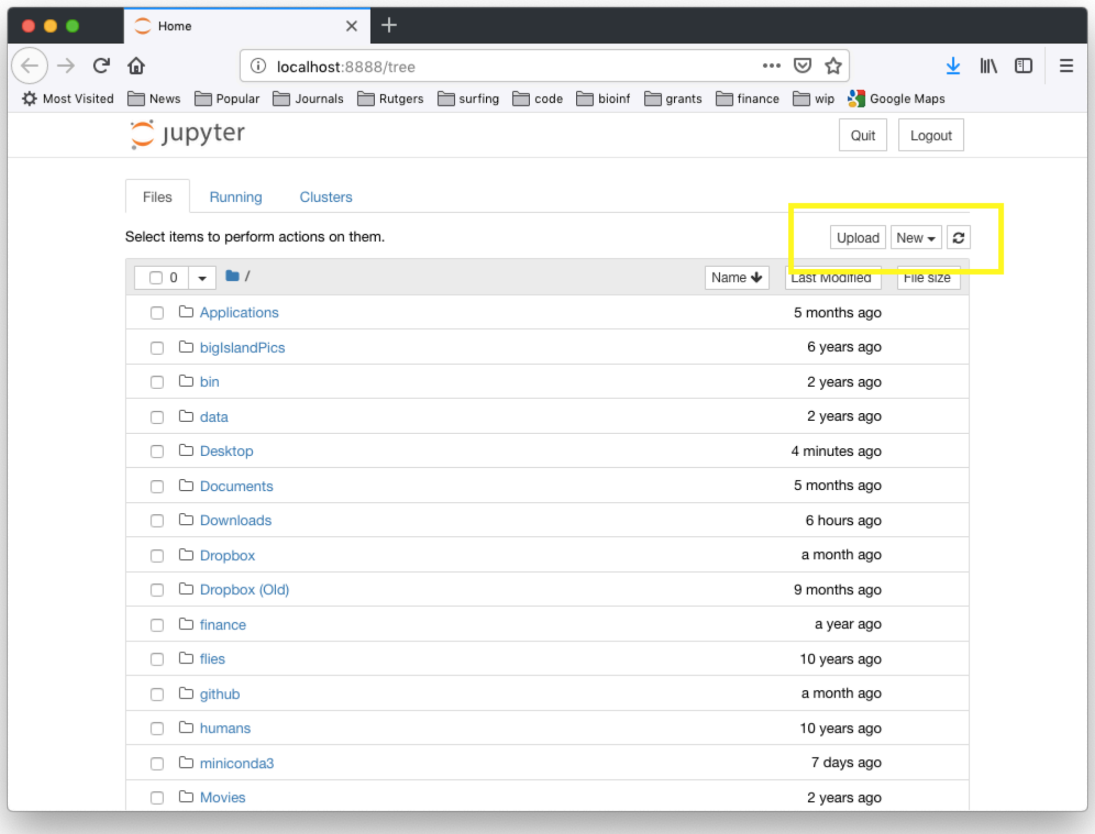
Python and the associated tools we need are installed. Nice.

Now let's get familiar with the jupyter lab and Jupyter notebooks a bit



Select items to perform actions on them.

Name	Last Modified
Applications	5 months ago
bigIslandPics	6 years ago
bin	2 years ago
data	2 years ago
Desktop	6 minutes ago
Documents	5 months ago
Downloads	5 hours ago
Dropbox	a month ago
Dropbox (Old)	9 months ago
finance	a year ago
flies	10 years ago
github	a month ago
humans	10 years ago
miniconda3	7 days ago
Movies	2 years ago



Select items to perform actions on them.

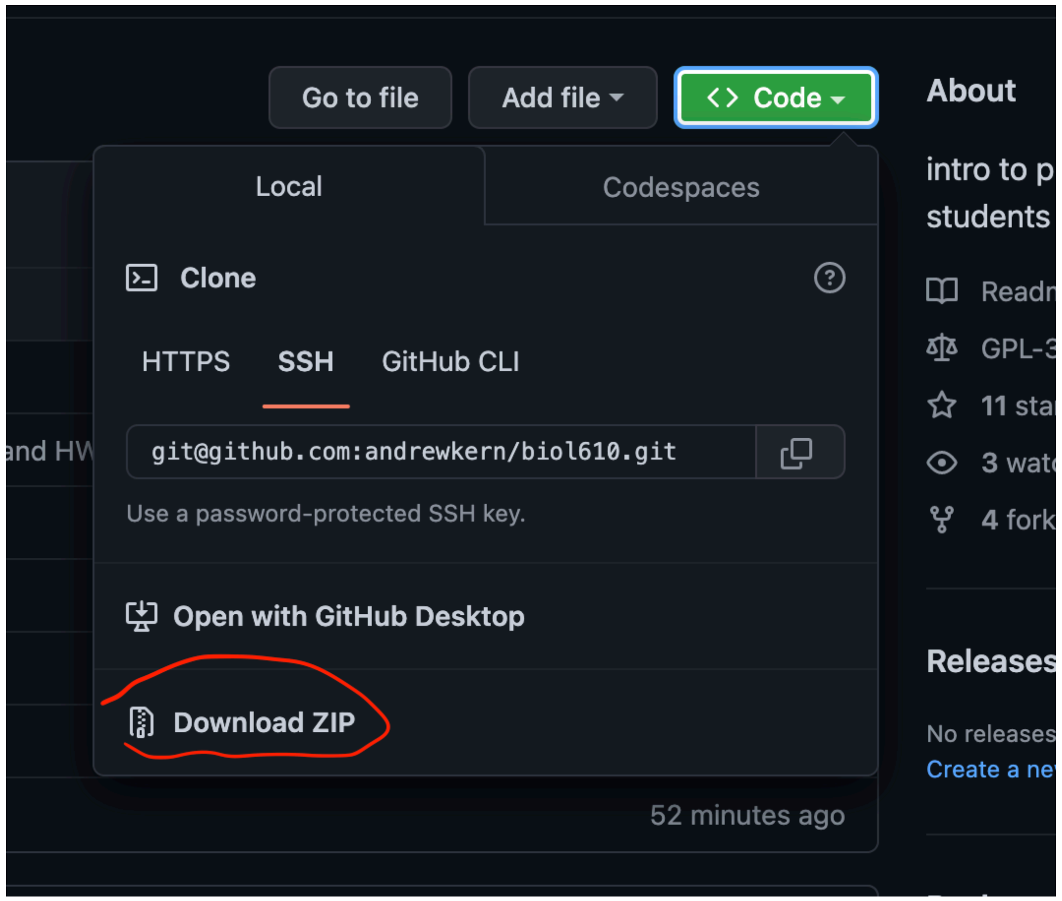
Name	Last Modified
Applications	5 months ago
bigIslandPics	6 years ago
bin	2 years ago
data	2 years ago
Desktop	4 minutes ago
Documents	5 months ago
Downloads	6 hours ago
Dropbox	a month ago
Dropbox (Old)	9 months ago
finance	a year ago
flies	10 years ago
github	a month ago
humans	10 years ago
miniconda3	7 days ago
Movies	2 years ago

Step 6: Download class materials

This class will be delivered all through Jupyter notebooks that I've put on GitHub for them to be freely available.

Navigate a browser to https://github.com/andrewkern/biol610

Easiest way to get the class materials— download zip



```
git@github.com:andrewkern/biol610.git
```

Use a password-protected SSH key.

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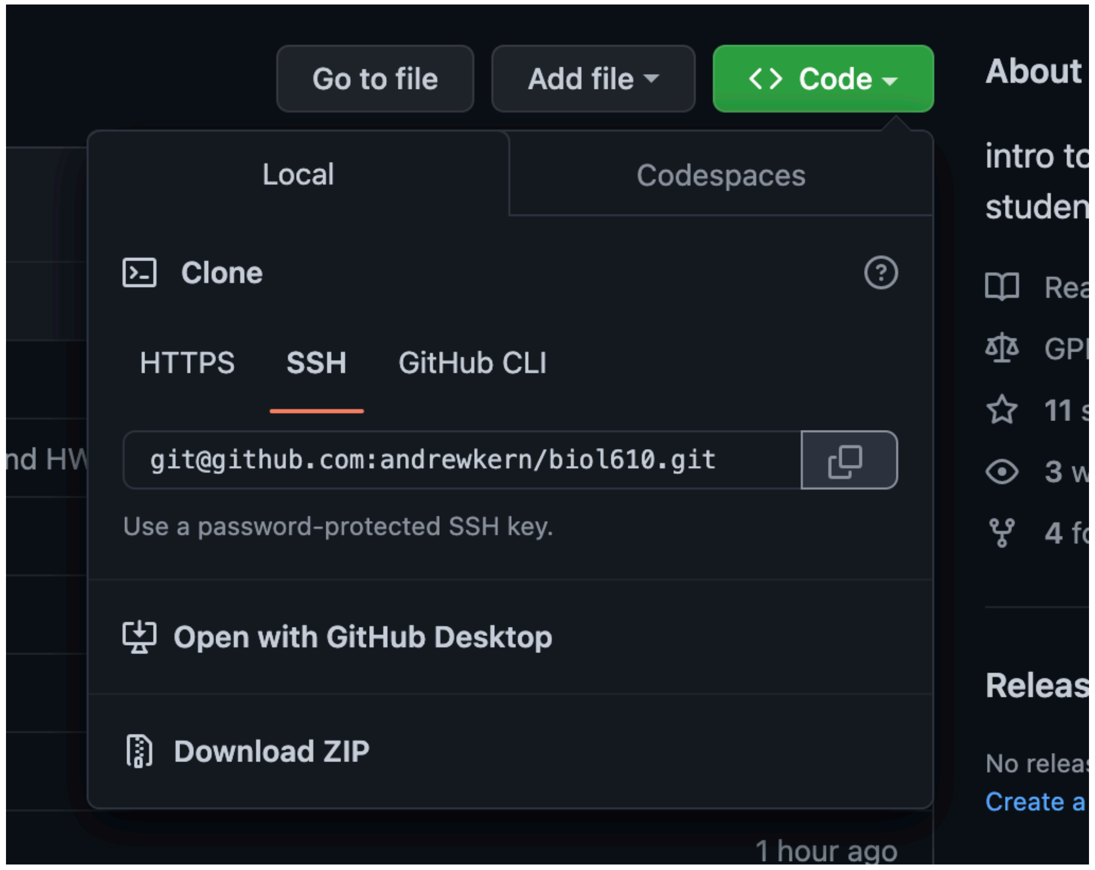
Navigate a browser to
https://github.com/andrewkern/biol610

Or…. use git to "clone the repo"



```
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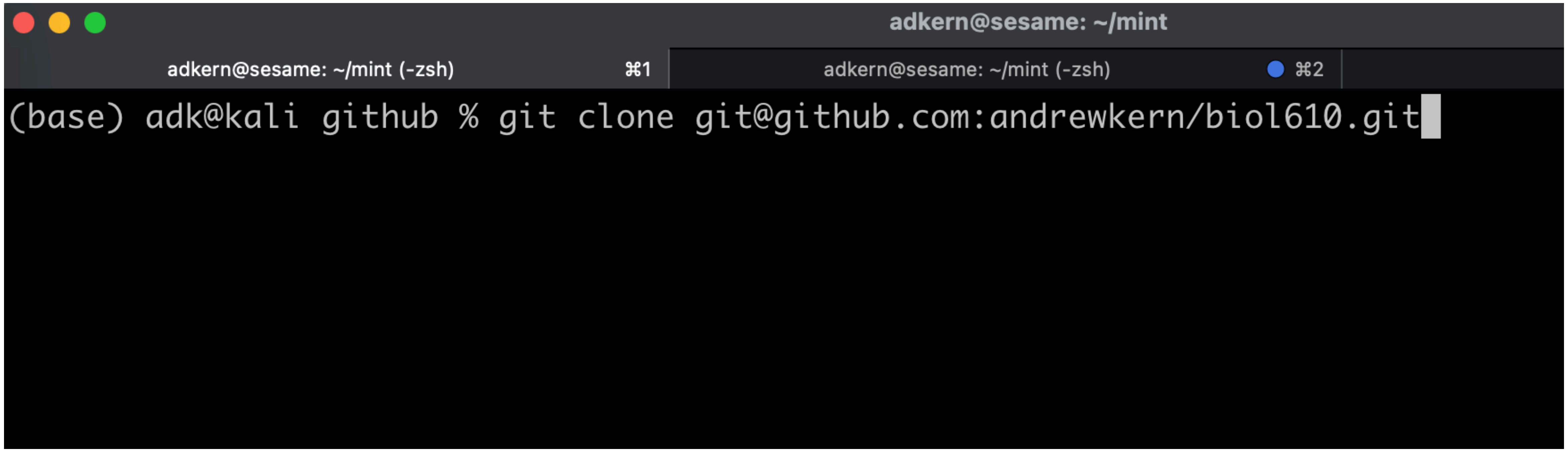
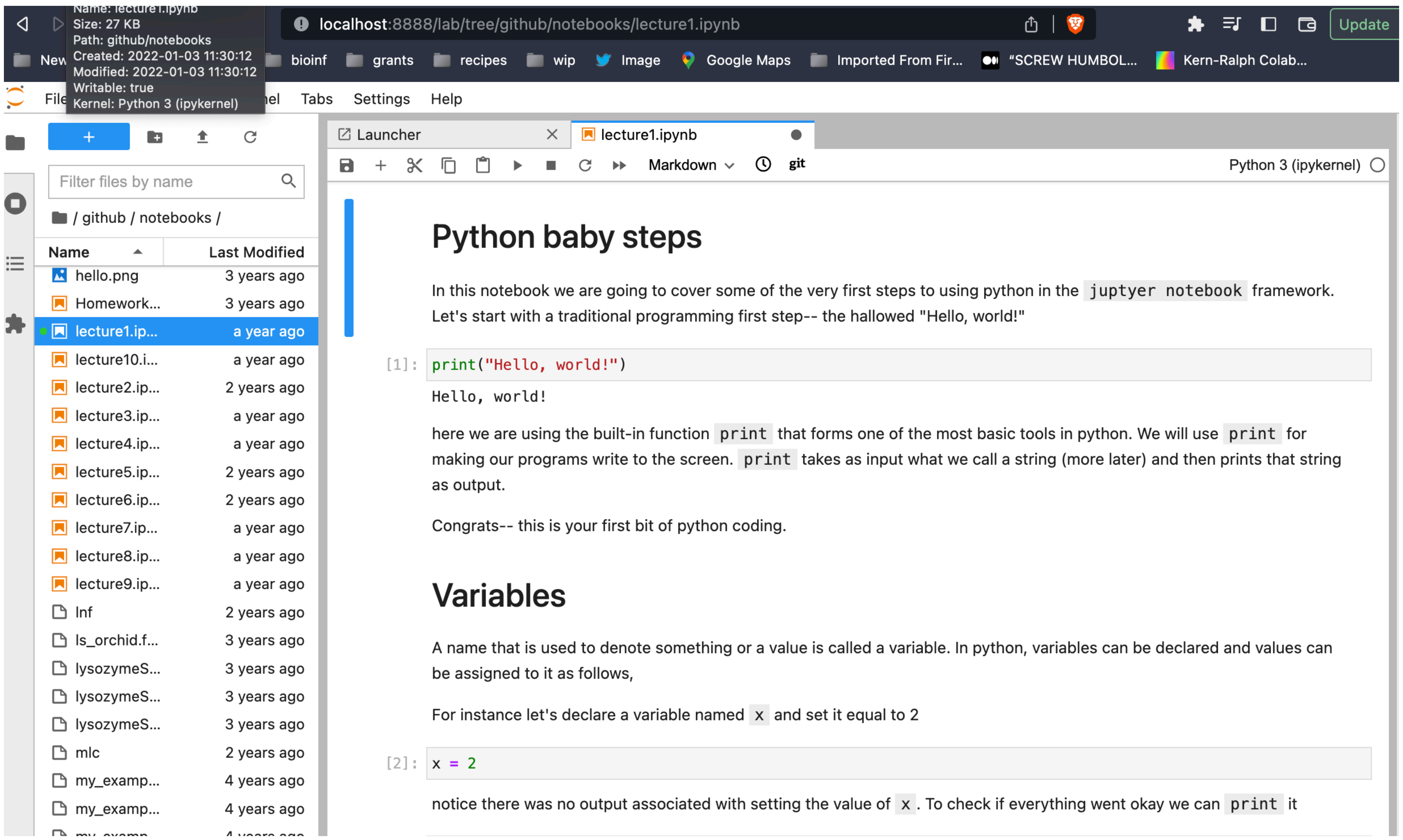


adkern@sesame: ~/mint
adkern@sesame: ~/mint (-zsh) ⌘1
adkern@sesame: ~/mint (-zsh) ⌘2

```
(base) adk@kali github % git clone git@github.com:andrewkern/biol610.git
```

This will make a copy of the materials that is linked to mine on the internet (GitHub)

Step 7: Use Jupyter and find lecture 1 notebook



Name: lecture1.ipynb
Size: 27 KB
Path: github/notebooks
Created: 2022-01-03 11:30:12
Modified: 2022-01-03 11:30:12
Writable: true
Kernel: Python 3 (ipykernel)

localhost:8888/lab/tree/github/notebooks/lecture1.ipynb

Name	Last Modified
hello.png	3 years ago
Homework...	3 years ago
lecture1.ip...	a year ago
lecture10.i...	a year ago
lecture2.ip...	2 years ago
lecture3.ip...	a year ago
lecture4.ip...	a year ago
lecture5.ip...	2 years ago
lecture6.ip...	2 years ago
lecture7.ip...	a year ago
lecture8.ip...	a year ago
lecture9.ip...	a year ago
lnf	2 years ago
ls_orchid.f...	3 years ago
lysozymeS...	3 years ago
lysozymeS...	3 years ago
lysozymeS...	3 years ago
mlc	2 years ago
my_examp...	4 years ago
my_examp...	4 years ago

Python baby steps

In this notebook we are going to cover some of the very first steps to using python in the `juptyer notebook` framework. Let's start with a traditional programming first step-- the hallowed "Hello, world!"

```
[1]: print("Hello, world!")
Hello, world!
```

here we are using the built-in function `print` that forms one of the most basic tools in python. We will use `print` for making our programs write to the screen. `print` takes as input what we call a string (more later) and then prints that string as output.

Congrats-- this is your first bit of python coding.

Variables

A name that is used to denote something or a value is called a variable. In python, variables can be declared and values can be assigned to it as follows,

For instance let's declare a variable named `x` and set it equal to 2

```
[2]: x = 2
```

notice there was no output associated with setting the value of `x`. To check if everything went okay we can `print` it