Systems & Toolchains for AI Engineers: Apple Silicon Installation Guide

Disclaimer: this guide aims to help you get a high-level idea of required software installations. The provided steps in this guide may get outdated over time and/or may not match your exact operating system file hierarchy. Please use this document as a high-level guide and not a strict document to follow.

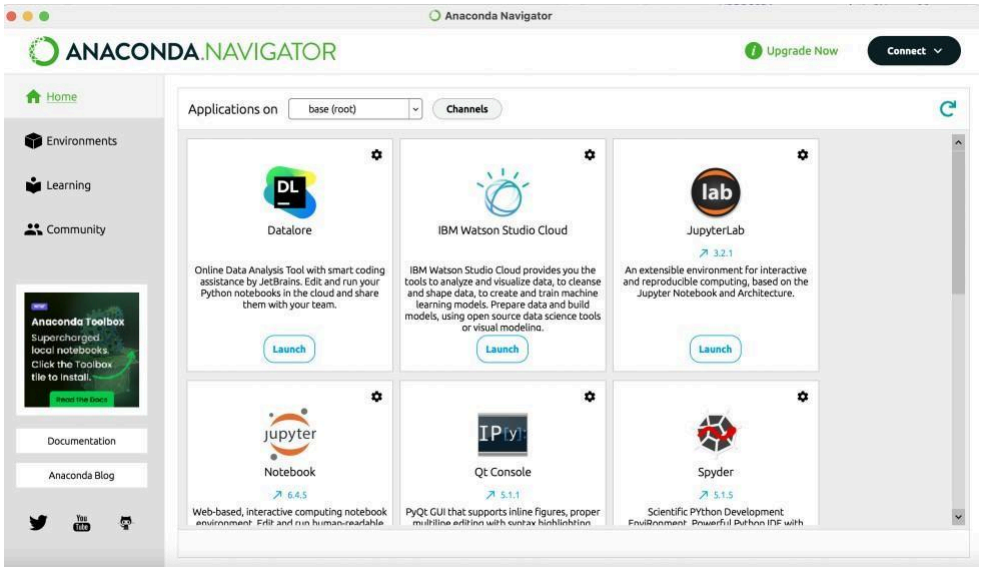
Overview

The following applications and frameworks need to be installed for this class:

1. Anaconda Python 3.x
2. Jupyter
3. PostgreSQL DB
4. PgAdmin4
5. Apache Spark
6. TensorFlow
7. PyTorch
8. Docker

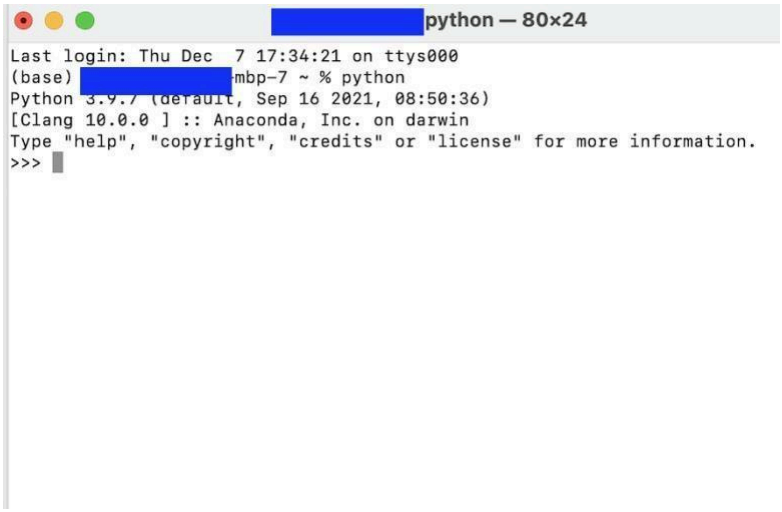
Anaconda Python 3.x

1. Install the Anaconda Desktop App, *called Anaconda Navigator*, here. This is a step-bystep guide on how to install Anaconda on Mac.
2. Once it has been installed, the interface should look like this:



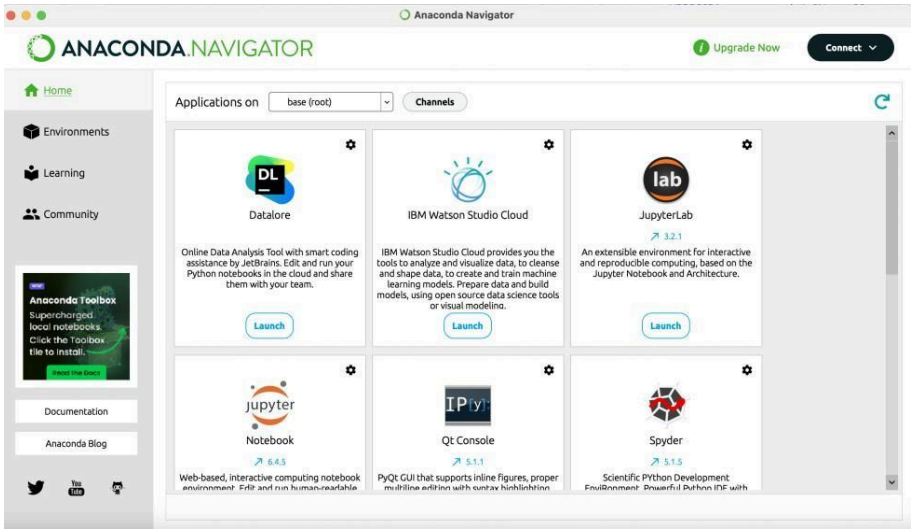
3. Verify the install on Terminal by opening Terminal and ensuring the command line starts with “(base)” as below. This means you are in the *base* Anaconda environment. More “virtual environments” can be created. Read more here.

4. Python should be installed when you installed Anaconda Navigator. Type *python* in Terminal to confirm. The output should be similar below. Ensure the version is 3.x.

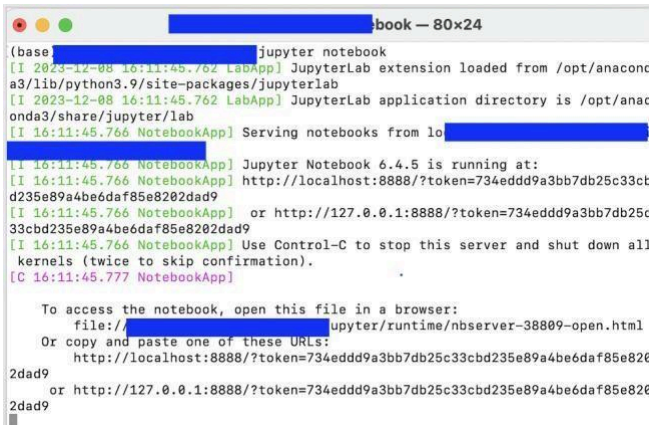


Jupyter Notebook

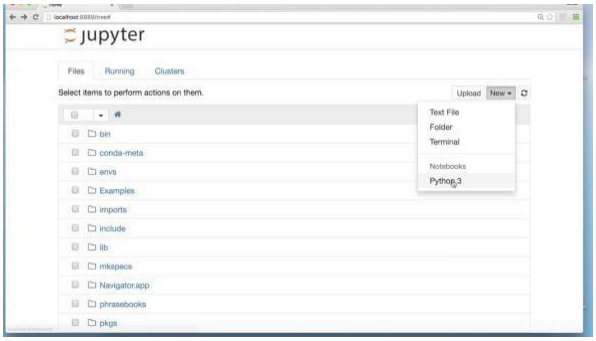
1. When Anaconda was installed, Jupyter Notebook should have also been installed. This can be verified in two ways:
    a. See if there is a Jupyter Notebook option on the Navigator as below. Press "Launch".



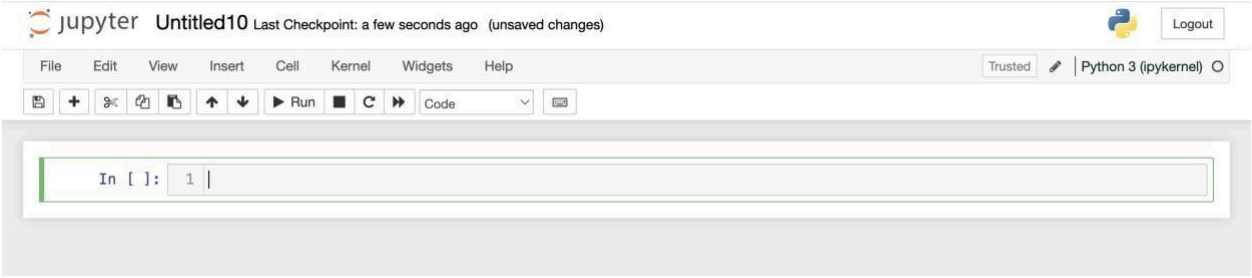
    b. Go to Terminal, and type *jupyter notebook*. This should launch a notebook server as below.



2. In both cases, a notebook should have opened in your browser as below.

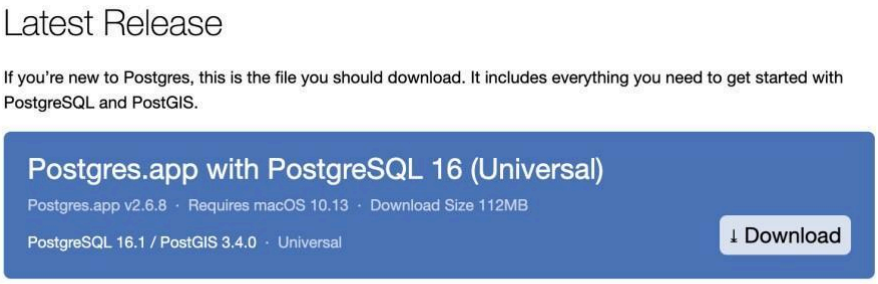


3. Create a new notebook, by clicking “New” and choosing “Python 3”. A notebook should open as below.

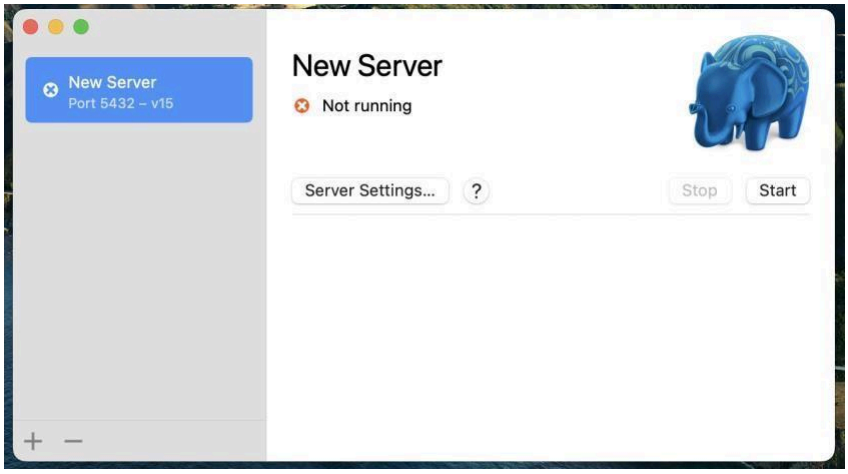


PostgreSQL DB

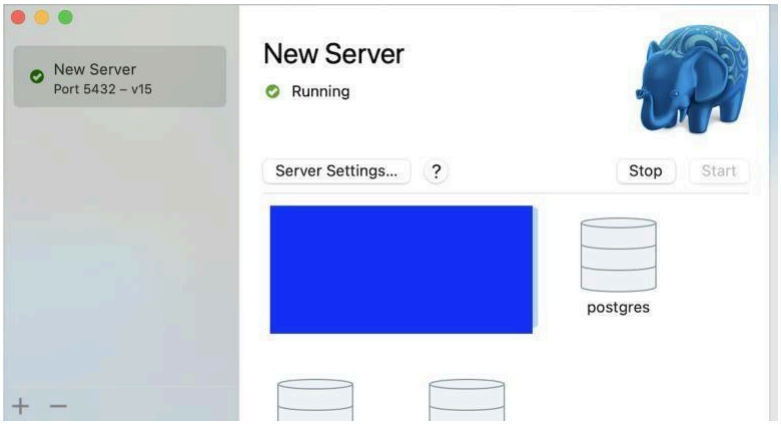
1. To download Postgres, go here and download the latest release. This will download the Postgres desktop application.



2. Once you have installed the application, open it. It should look like this.



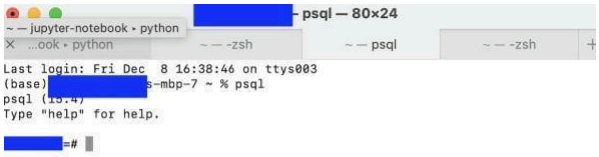
3. Click on “Start’, to start the server.



4. Double click on any of the servers to connect to it. A Terminal window should launch and look like this.

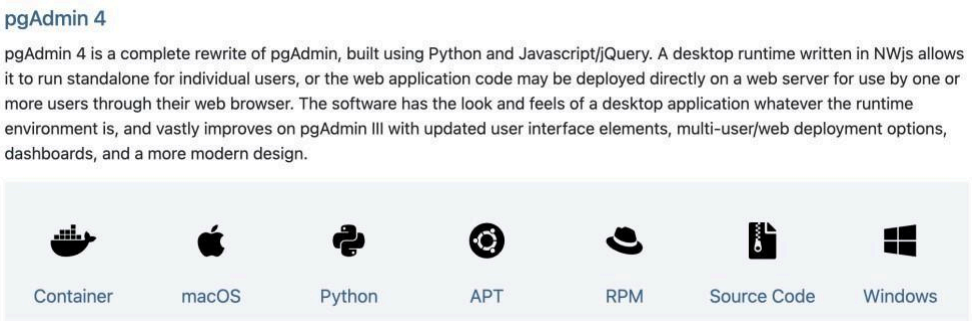
5. Configure your $PATH using the instructions here.

6. After you have started the server through the app, you can directly go to Terminal and type *psql*. This should connect to the server too.

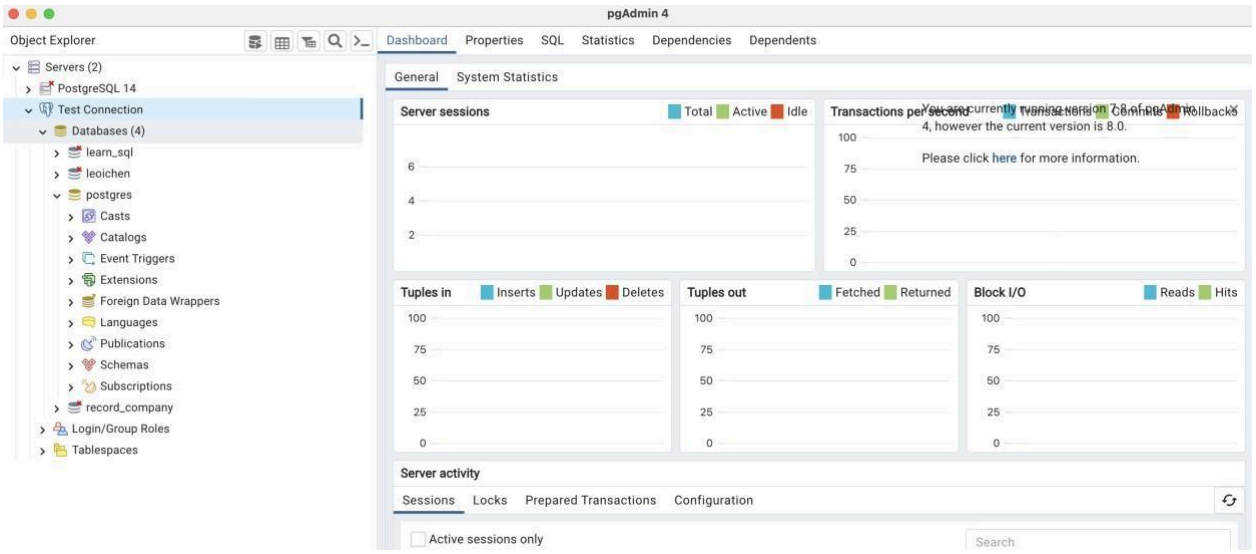


PgAdmin4

1. Go to here and download the Mac version for PgAdmin4.
   (Note: arm64 refers to the apple chip while x86_64 refers to the intel chip)

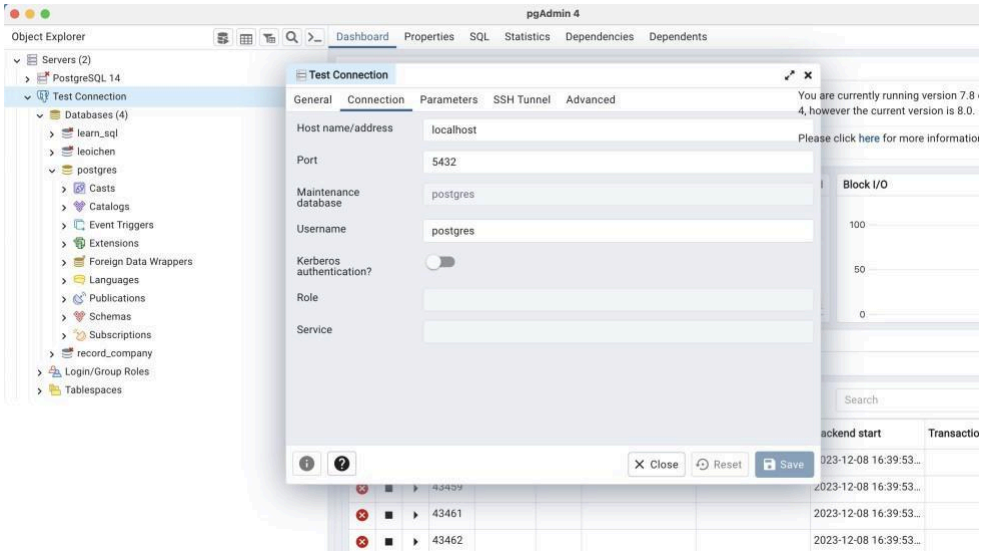


2. Open the app once it has been downloaded.
3. Click the add new server button and create a server with the configuration shown in step-6. Make sure that Postgres is running.
4. Go to the left toolbar and press the downward arrows for “Test Connection”, “Databases” and “postgres”. Your left toolbar should be configured as below.



5. Right click on “Test Connection”, and press “Properties”.

6. Once the “Properties” window opens, click on the “Connection” tab to see the connection details.



Apache Spark

You may find the steps in this link useful. Please note you won't need to reinstall python if you have already installed it with Anaconda and read the information below before following the steps in the document.
https://medium.com/@koushik5586/apache-spark-on-apple-silicon-4f346fa1298f

NOTE: Before you start installing Spark, create an Anaconda virtual environment. It is NOT recommended to install this on your base environment. If you install on your base environment and you mess up, it will be hard to return to your initial starting point. With a virtual environment, you can always just delete it and start over.

So, **CREATE A VIRTUAL ENVIRONMENT FIRST.**

To create a virtual environment, go to Terminal and type: *conda create -n env_name python=3.7.*

The *env_name* can be whatever you want. I have chosen python=3.7 because this is the version that has worked for me. However, I think 3.8 and 3.9 should work too.

After the environment has been created, activate it with the command *conda activate env_name*.
Then, the key steps are:

1. Install Homebrew.
    - You *may* need to add brew to your ~/.zprofile using these commands:
        i. echo 'eval "$(/opt/homebrew/bin/brew shellenv)"' >> ~/.zprofile
        ii. source ~/.zprofile
        iii. eval "$(/opt/homebrew/bin/brew shellenv)"
2. Install Java.
3. Install Scala.
4. You don't need to Install Python.
5. Install Spark.
6. Verify Spark – Scala.
7. Verify Spark – Python

8. Once you get PySpark working, try the test_spark.ipynb provided in class.

A few other things:

The below environment variables need to be set in your ~/.zshrc file. To access your .zshrc file, enter in Terminal *nano ~/.*zshrc or *vim ~/.*zshrc depending on the Terminal editor you prefer. Make sure these paths *exist* on your machine or find the equivalent ones.
Also, note that the command to find your JAVE_HOME is: **/usr/libexec/java_home**
Also, the command to find your python3 is: **which python3**

<u>Important Note: Verify that the paths below are real paths on your machine. If not, make sure to find the real paths prior to proceeding with adding them to your environment file.</u>

```
#java
export JAVA_HOME=/Library/java/JavaVirtualMachines/adoptopenjdk-8.jdk/contents/Home/
export JRE_HOME=/Library/java/JavaVirtualMachines/openjdk-13.jdk/contents/Home/jre/
#spark export
SPARK_HOME=/usr/local/Cellar/apache-spark/2.4.4/libexec
export PATH=/usr/local/Cellar/apache-spark/2.4.4/bin:$PATH
#pyspark
export PYSPARK_PYTHON=/usr/bin/python3 # or your path to python
export PYSPARK_DRIVER_PYTHON=jupyter
export PYSPARK_DRIVER_PYTHON_OPTS='notebook --no-browser --port=8889'
```

For java, JAVA_HOME should be the path of your java installation above. JRE_HOME should not be necessary. But this could depend on the computer.

For spark, SPARK_HOME should be the installation path. To find spark installation directory, enter in Terminal *echo 'sc.getConf.get("spark.home")' | spark-shell.* PATH should be like SPARK_HOME, but instead of the libexec folder, it is the bin folder.

For PYSPARK_PYTHON, this is just the path of your python installation.
PYSPARK_DRIVER_PYTHON and PYSPARK_DRIVE_PYTHON_OPTS should be exactly as above.

ALSO: After you update the ~/.zshrc, make sure you source it by typing in Terminal
source ~/.zshrc
This will rerun the ~/.zshrc file, making your changes go into effect.

Normally, when you open a new Terminal instance, the ~/.zshrc file is run, so you don't need to source everytime. But, if there is an error, just source it again. You may need to source it every time you run PySpark.

TensorFlow
To install TensorFlow, follow the guide here.

NOTE: I would use the same virtual environment as Spark so you can use them together in the same notebook. If you are afraid the TensorFlow installation will get messed up, you can test the installation on a new virtual environment and come back to install it again on the Spark environment once you are sure you can install TensorFlow successfully.

The key steps are:

1. Install Xcode command line tools.
2. Install Miniforge.
3. Install TensorFlow-MacOS.
4. Install base TensorFlow.
5. Install metal plugin.

At this point, it should be installed. Test it on a Jupyter notebook, by typing *import tensorflow as tf*.

PyTorch
To install PyTorch, follow the guide here.

NOTE: Again, I would install it on the same environment as Spark.

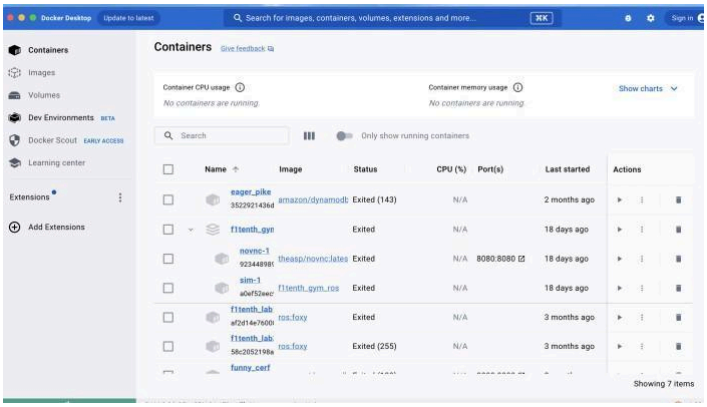
The key steps are:

1. Install Xcode
2. Install PyTorch Packages

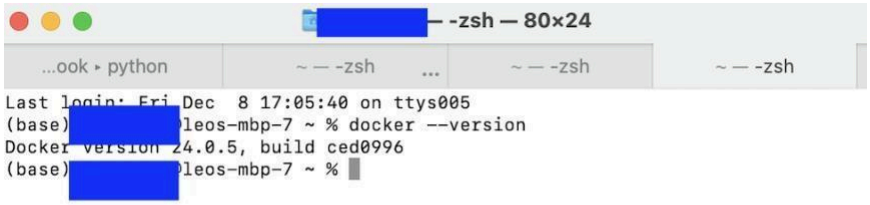
At this point, it should be installed. Test it on a Jupyter notebook by typing *import torch*.

Docker

1. To install Docker, go here and choose the version for Mac Silicon.
2. Once installed, open the application. It should look like this.



3. Test it Terminal by typing *docker --version*. The version should appear as



FAQ

Q: Do you need to run the Postgres app every time to launch the server?
A: No, but that is the easiest way. To launch the server through the command line, read more here.

Q: What is the /.zshrc file?
A: This file is a configuration file for your Terminal session. It essentially contains some commands or scripts that are executed every time you start a bash session. This can help to avoid you typing in the same commands every single time you start a new bash session.

Q: Is there a way to quickly switch between Anaconda virtual environments when on a single notebook?
A: Yes. Virtual environments can be added to Jupyter notebooks. See the guide here. You can then open a Jupyter notebook in any environment and easily switch to it without having to launch that environment and creating a new notebook there.

Q: Is there a difference between M1 and M2 in terms of the above installation?
A: All the guides I have provided should work for both M1 and M2. I know they work for M1 since I have a M1 Mac. I have not tested this for M2. However, even if this doesn't work, I am sure you can easily find a guide for M2, or even M3 in the future.

Q: What if everything has been attempted (i.e., this guide, any online guide, instructor assistance), and you still can't get everything to work?
A: In this case, Google Colab can be used. PyTorch and TensorFlow are built in, so installation is not needed. Just directly import with *import torch* and *import tensorflow as tf*.

For PySpark, installation can be done with the commands below:

!pip install pyspark
!pip install -U -q PyDrive
!apt install openjdk-8-jdk-headless -qq import
os
os.environ["JAVA_HOME"] = "/usr/lib/jvm/java-8-openjdk-amd64"