CS396: Natural and Artificial Vision

Homework #1

Objectives

For this assignment, we'll be downloading, installing, and setting up our virtual Python environment and development environment that we'll be utilizing for the remainder of the quarter. Only the last section of assignment is graded. However, I strongly recommend following it thoroughly as failure to do so may lead to compatibility issues in the coming weeks.

Disclaimers

- This guide was written with a Windows computer. However, these steps should be adaptable for use on a Mac or Linux-based computer as well. If you encounter any difficulties, please feel free to attend the next office hour for assistance.
- Keep in mind that there are alternatives to Anaconda and VS Code, and you are at liberty to use whichever you prefer, and you won't be graded for it. However, compatibility issues risen from not using the suggested environment manager and ide is your responsibility.

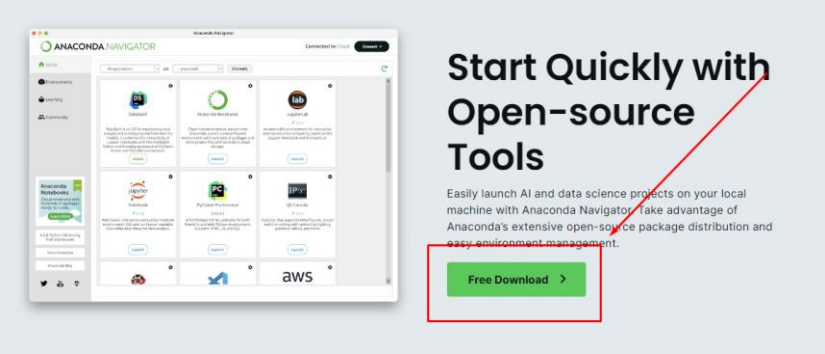
Anaconda

We will use Anaconda to create and automatically manage a Python virtual environment. If you already have Anaconda skip to section C.

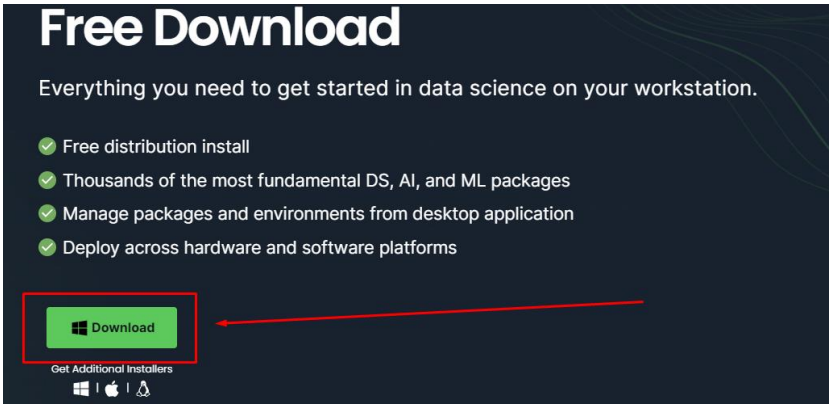
A- Downloading Anaconda.

1- Head to: https://www.anaconda.com/

2- Scroll down to find the download link.

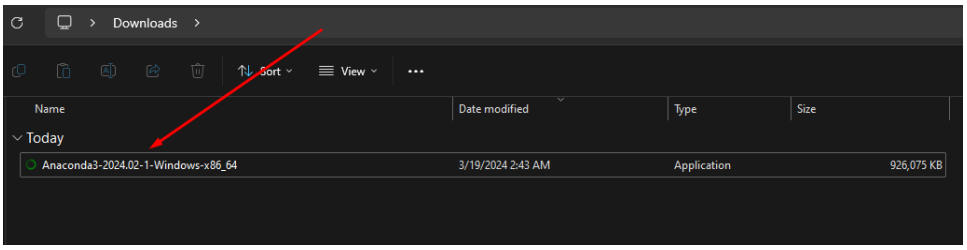


3- Download the suitable version of Anaconda to your computer.

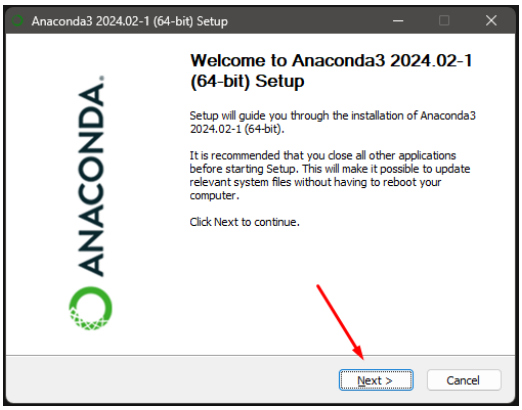


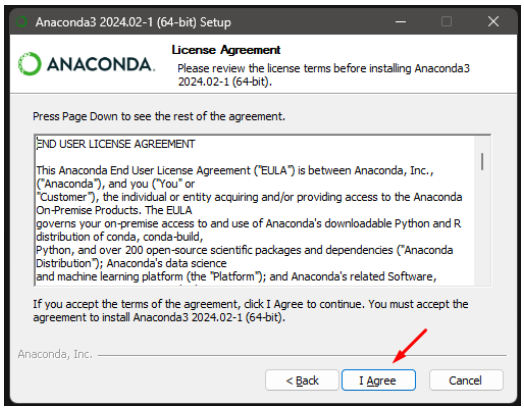
B- Installing Anaconda

1- Locate the installer and run it.

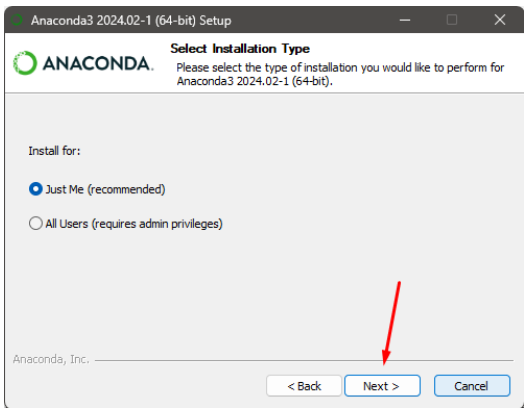


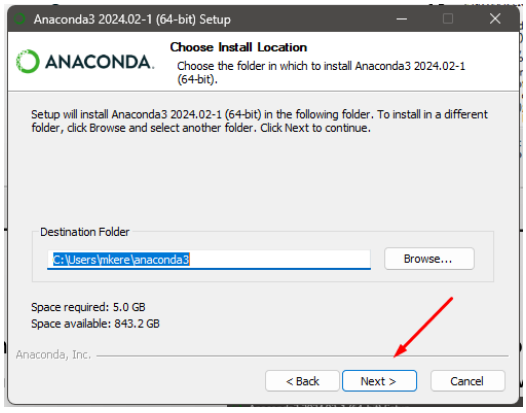
2- Select: Next, I Agree.



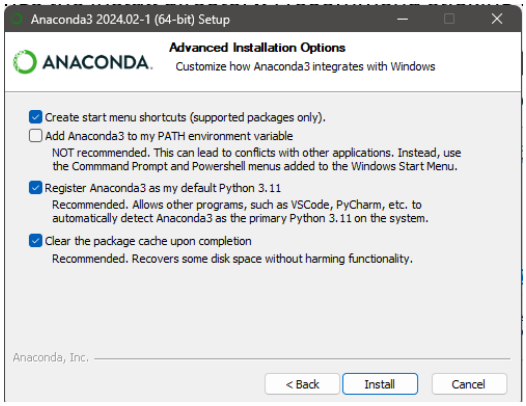


3- Install Anaconda for yourself, or optionally you can install it for every user on your device. Then, you can optionally change the install directory. I recommend sticking with the defaults.





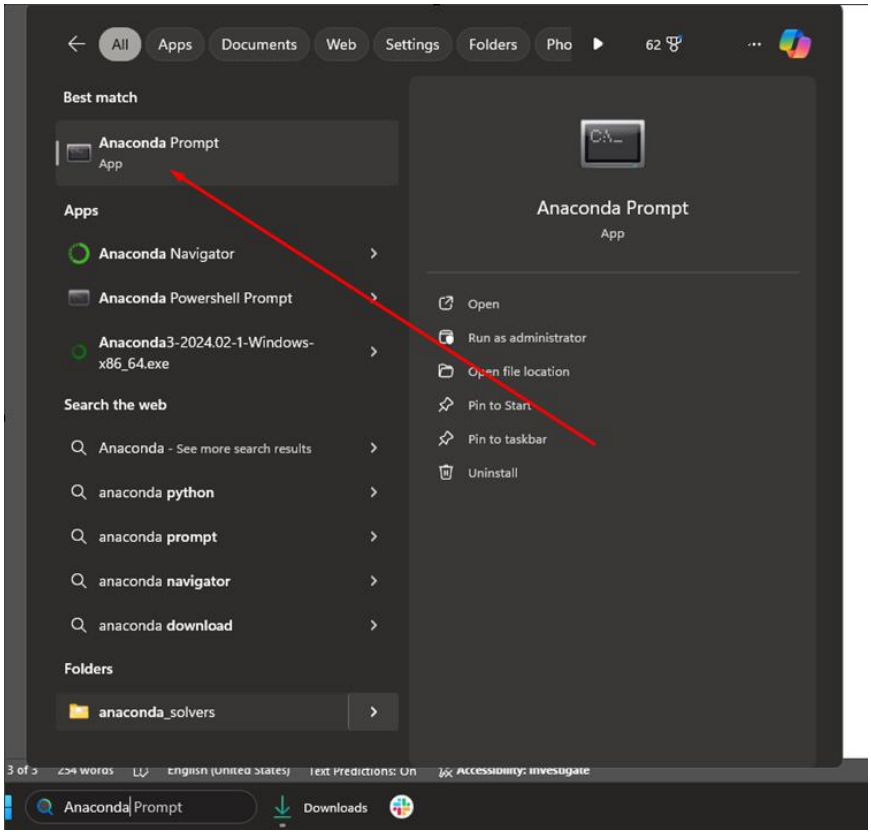
4- Check the boxes on the following screenshot. Finally click Install.



5- Once done, click next. Before you click Finish **uncheck** every box. We are not going to use Anaconda Navigator.

C- Setting up an Environment

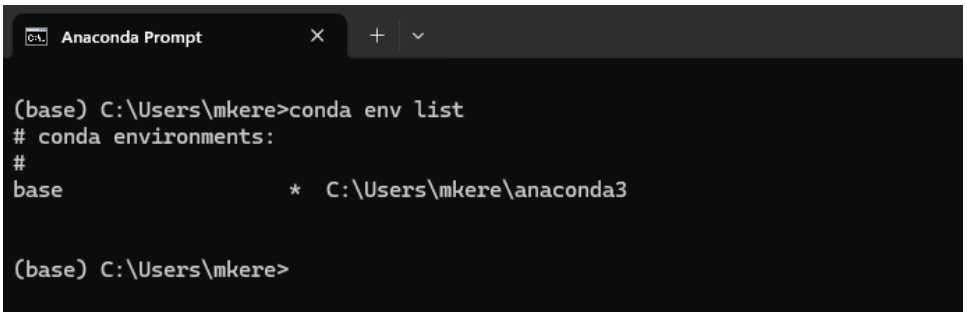
1- Launch Anaconda Prompt.



2- Get a list of environments with:

```
conda env list
```

If you have a fresh installation of Anaconda, you will get:



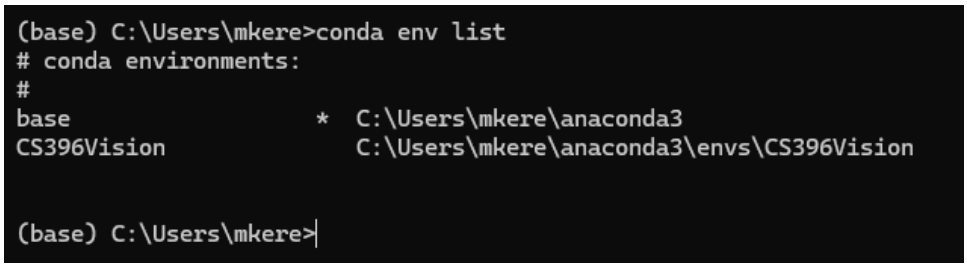
To learn more about the commands I use, you can refer to a cheat sheet.

3- Now we will create the environment. Use:

```
conda create --name CS396Vision python=3.11
```

Type 'y' and hit enter once prompted.

4- Run `conda env list` again.



5- Activate CS396Vision. Type:

```
conda activate CS396Vision
```

6- Now we will install the libraries. In this course we will use:

- Jupyter Notebooks
- NumPy
- Scipy
- MatPlotLib
- Scikit Learn
- Scikit-Image
- PyTorch

7- Instead of relying on the requirements.txt file, we'll opt to manually install the libraries. This approach will help us learn how to effectively manage an environment using Anaconda. In most cases usually just Googling: 'conda install library_name' works wonders. It's important to install the libraries from a suitable channel. anaconda:: and conda-forge:: are the most commonly used channels. To install your libraries run the following commands one by one.

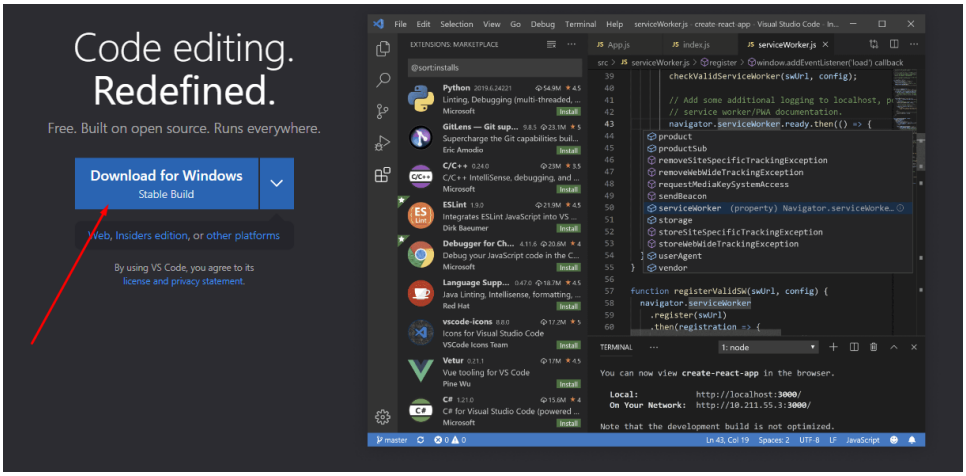
```
conda install anaconda::jupyter
conda install anaconda::numpy
conda install anaconda::scipy
conda install anaconda::matplotlib
conda install anaconda::scikit-learn
conda install anaconda::scikit-image
conda install pytorch torchvision torchaudio cpuonly -c pytorch
```

VS Code

You can view and edit Jupyter Notebooks on VS Code. You are free to pick another IDE too. If you already have VS Code but never used python or Jupyter notebooks skip to section C.

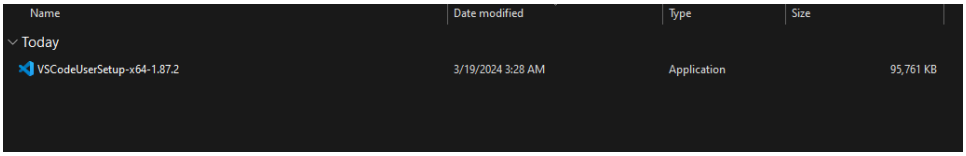
A- Downloading VS Code

1- Navigate to: https://code.visualstudio.com/. Click on Download.

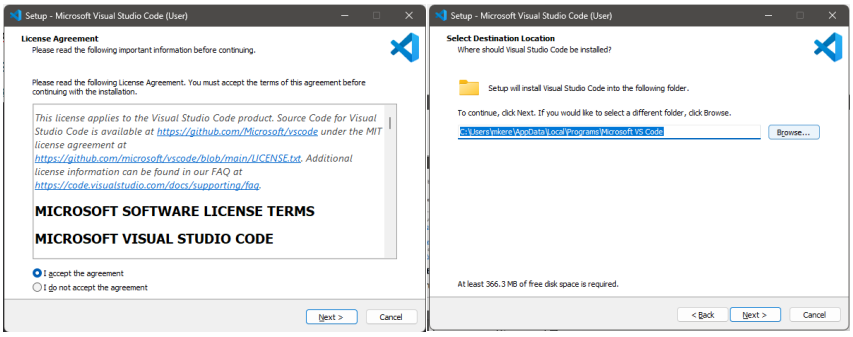


B- Installing VS Code

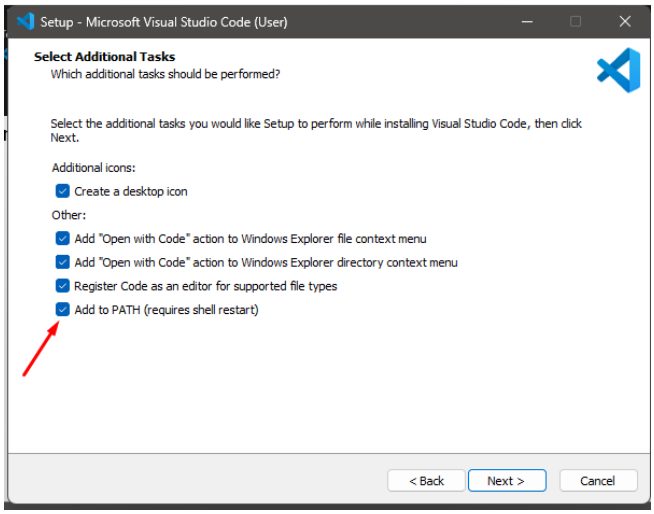
1- Locate the installer and run it.



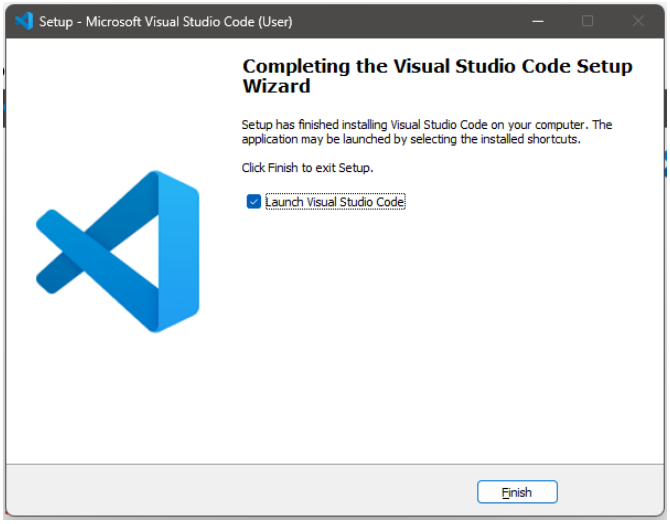
2- Accept the agreement and then click next. Here you can optionally change your install directory. Once done, click next.



3- Check the last box. Rest is optional.



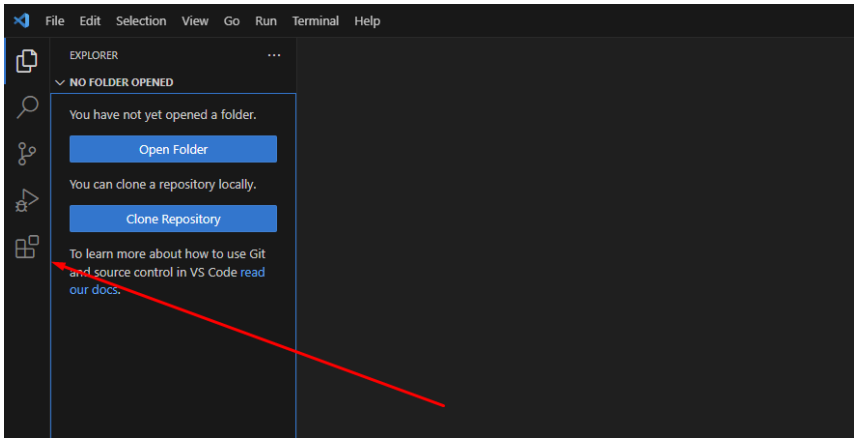
4- Click on Install. Once done, click Finish.



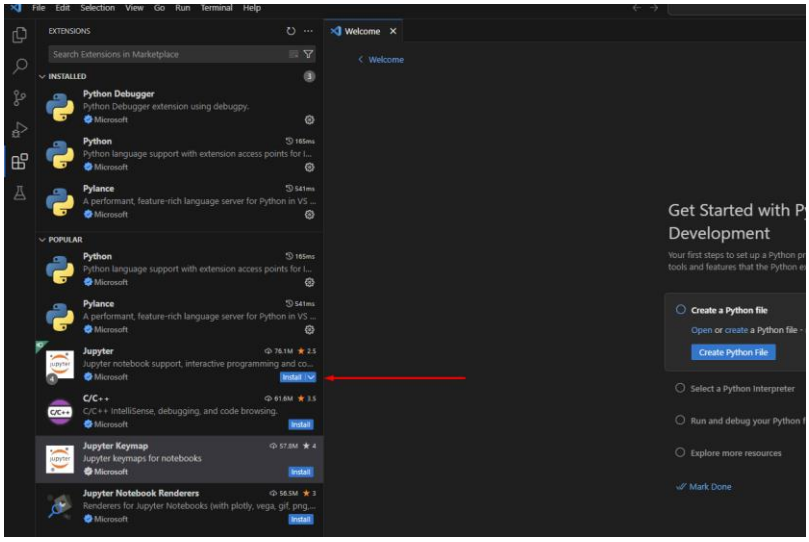
C- Setting up VS Code

1- If this is your first-time installing VS Code. Walk through the setup.

2- Click on extensions on top left.

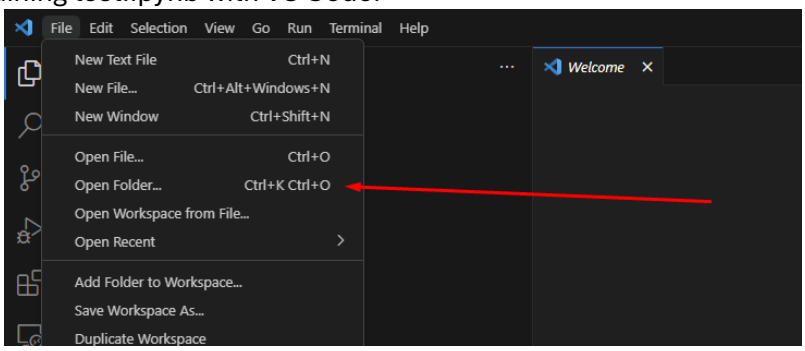


3- Install Python and Jupyter.



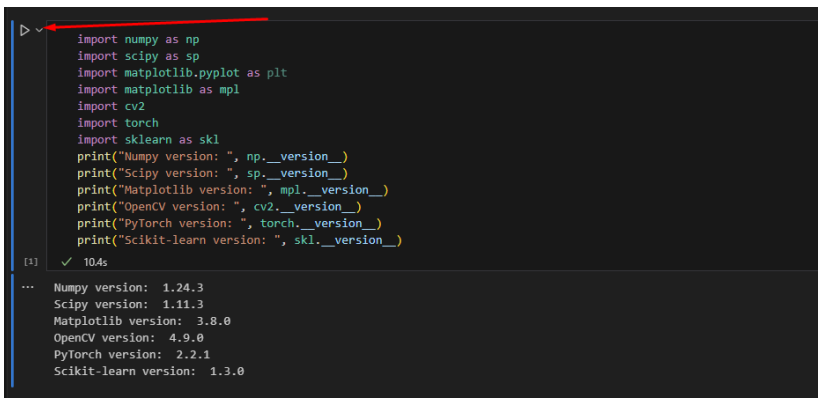
Putting Everything Together

1- Open the folder containing test.ipynb with VS Code.



2- Navigate to test.ipynb using the menu on your left. On top right, click 'Select Kernel'. Choose 'Python Environments', then 'CS396Vision'.

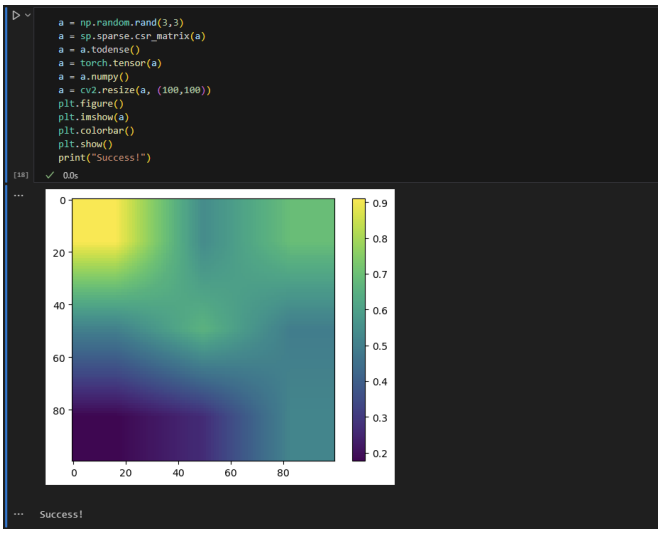
3- Run the first block of code. Your library versions don't need to match the image below. Based on your processor architecture and OS, you will get a different version. Also note that OpenCV is replaced by Scikit-Image.



```
import numpy as np
import scipy as sp
import matplotlib.pyplot as plt
import matplotlib as mpl
import cv2
import torch
import sklearn as skl
print("Numpy version: ", np.__version__)
print("Scipy version: ", sp.__version__)
print("Matplotlib version: ", mpl.__version__)
print("OpenCV version: ", cv2.__version__)
print("PyTorch version: ", torch.__version__)
print("Scikit-learn version: ", skl.__version__)
```

```
[1] ✓ 10.4s
Numpy version:  1.24.3
Scipy version:  1.11.3
Matplotlib version:  3.8.0
OpenCV version:  4.9.0
PyTorch version:  2.2.1
Scikit-learn version:  1.3.0
```

4- Confirm that libraries are working as expected as running the second block.



Learning the Basics (Graded)

- In the same folder as 'test.ipynb', there should be another file called HW1.ipynb. Open it. The rest of the directions are in that file.

Final Remarks

- Most of the functions you need to implement will be inside .py files. After implementing these, you need to 'refresh' the notebook so that the latest version of the file is imported. You can achieve this by restarting the notebook. However, in this class we will use a library called importlib. This library will automatically reload the functions for us. If you decide to play around the code on your own, and make changes to .py files, don't forget to run importlib.reload(). Documentation is here.
- Auto-graders provided you with your assignments are for your own test purposes. For your final score, a different grader will be used. So please avoid hardcoding variables as much as possible.
- If you are using tools such as GitHub Copilot, disable them for the duration of the assignment. Please see academic honesty in the syllabus.