Assignment 3: Deep Neural Networks

ABE 6033

Due: November 1, 2024

1 Introduction

This assignment is slightly different from the others. You will be working through a series of Jupyter notebooks, which will teach you how to construct neural networks in Python and Numpy. The notebooks for this assignment are located in the provided zip file. They include the following

1. **Numpy Introduction (Optional)**: This optional first notebook will introduce you to the basics of Jupyter, Python and Numpy. If you do not have much experience with these tools, I suggest that you complete it before moving on. It will not count towards your grade.

2. **Logistic Regression**: In this notebook, you will create a simple logistic regression classifier.

3. **Simple MLP**: In this notebook, you will train an MLP with a single hidden layer.

4. **Deep MLP**: In this notework, you will write the code to train MLPs with multiple hidden layers.

5. **Deep MLP Applications**: In this notebook, you will use what you wrote in the previous notebook to classify images.

For this assignment, you will need a working installation of Python and Jupyter. You can complete these assignments on HiperGator if you are having trouble getting this set up.

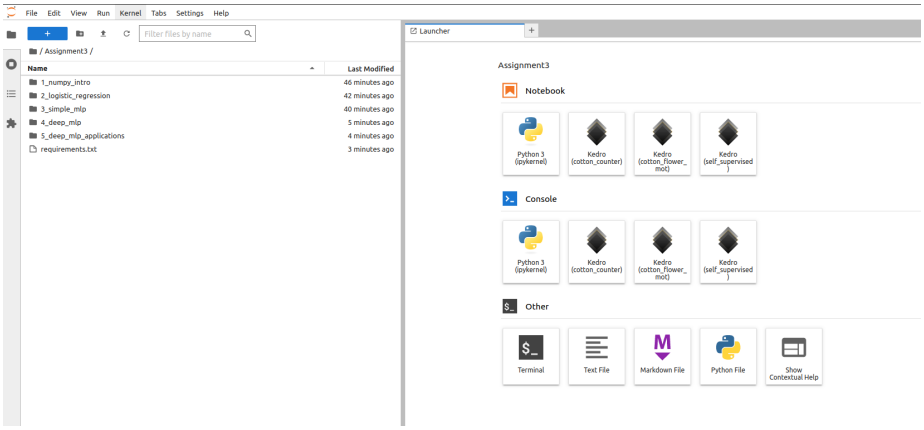

Figure 1: Jupyter launcher

2 Running the Notebooks

First, you will need to install the required dependencies. The provided zip file includes a *requirements.txt* file which should contain all the Python dependencies that you need for this assignment.

Once the dependencies are installed, you can run Jupyter:

```
~$ jupyter lab
```

This should automatically open a new tab in your browser (if it doesn't, it should give you a link to click). In the browser, you should see an interface like in fig. 1.

In the panel on the left, navigate to the notebook you want to work on, and double click to open it.

2.1 Running on HiperGator

You should be able to run these notebooks locally. However, if you want to run them on HiperGator, you can also do that. Notebooks that use TensorFlow can take advantage of GPU resources on HiperGator.

1. Upload the code for this assignment to HiperGator.
2. Go to Open On Demand and start a new "Jupyter" session.
3. In the left-hand panel, navigate to the directory containing the notebook you want to work on, and double click to open the notebook.
4. On the right hand side, click on the name of the kernel (fig. 2). In the menu that appears, select "UFRC Python-3.10"

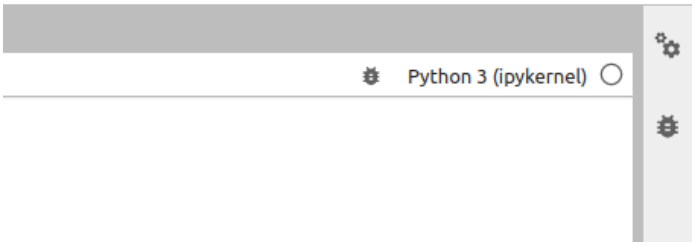

Figure 2: Click here to select the kernel used for running the notebook.

5. Each notebook has a cell right before the module imports with a commented-out *pip install* command. Uncomment and run this cell. (It is only necessary to do this for one notebook.)

3 What to Turn In

You should turn in your completed notebooks. Include all your notebooks in a single zip file that you submit to Canvas. Note that you do **not** have to write a separate report for this assignment.

4 Grading

This assignment is worth 100 points. To receive full credit for a notebook, all of the included tests must pass. The grading for each notebook breaks down as follows:

- Logistic Regression (20 points)
- Simple MLP (20 Points)
- Deep MLP (40 Points)
- Deep MLP Applications (20 Points)