## HU Extension Assignment 01 E89 Deep Learning

### Handed out: 09/02/2022 Due by 12 noon EST on Saturday, 09/10/2022

School is asking that students demonstrate full mastery of prerequisites. The purpose of this assignment is to give you a chance to demonstrate your familiarity with Python. You might implement some of the problems using TensorFlow API but are not asked to build real neural networks.

It is our advice that you work with Anaconda and use Conda to create virual environments. If you know what you are doing, choose your environment as you please. The virtual environment for this course should have Python 3.8 or higher and TensorFlow 2.8 or higher. Most code in our examples will work with lower versions of TensorFlow, though.

**Problem 1.** Copy the code from the attached Jupyter notebook 0\_test\_install.ipynb into your solution notebook. Run all cells. It is alright if your machine does not have CUDA support. Just report your results. (10%)

**Problem 2.** Create logical functions OR, AND and NOT. Demonstrate that your logical functions generate proper logical tables. Do not spend time formatting your outputs. Any readable output is acceptable.

When testing your functions, as logical input values, True and False use integers 1 and 0.

Demonstrate that all three functions return proper logical values, i.e. values close to 1-s and 0-s.

Please declare all variable and constants using TensofFlow syntax and types. This is a bit of a drag. As input weights, you can use values suggested in the notes or you can experiment with smaller or larger values. This is not a programmatic challenge. We are just practicing use of TensorFlow types. You are using TensorFlow API for simple arithmetic operations. That is all. (30%)

**Problem 3**. Use three functions developed in the previous problem to demonstrate that you can implement NOT (XOR ) logical function. Feed into such function “logical” values of 0-s and 1-s and list the outputs. You do not have to write code that would print neatly formatted logical table. Displaying value by value is acceptable. You are not constructing a neural network in TensorFlow. You are just combining a few logical functions. (30%)

**Problem 4**. Consider attached tab delimited file auto-mpg.csv. It contains information about older models of cars. The columns represent:

| **MPG** | **Cylinders** | **Displacement** | **Horsepower** | **Weight** | **Acceleration** | **Model Year** | **Origin** |
| --- | --- | --- | --- | --- | --- | --- | --- |

MPG stands for mile per gallon. Import data contained in that file into a Panda and find which columns have the strongest positive and which the strongest negative correlation with MPG values. Display the covariance matrix and its heatmap equivalent.

(30%)

**Formatting Requirements:**

Solution of this assignment should be submitted as a single Jupyter notebook (ipynb file), as well as an HTML image of that notebook. To generate the HTML image, use the following command:

$ jupyter nbconvert yournotebook.ipynb –-to html

Please provide meaningful description of actions in all cells of your notebook. Include those descriptions either as Python comments (#) or contents of the adjacent markdown cells.

If your notebook(s) contain(s) excessively long outputs please copy a meaningful and illustrative number of initial and/or final lines and paste those in a markdown (comment) cell. Then, delete the long output(s). Thank you.

Please name your notebook as e89\_YourLastNameFirstName\_HW01.ipynb