## BU MET College Assignment 01 cs767A1 Advanced ML & DL

### Handed out: 09/07/2023 Due by 11 AM EST on Saturday, 09/16/2023

The purpose of this assignment is to start your TensorFlow practice. You are expected to implement parts of the problems using TensorFlow API but are not asked to build real neural networks. You are also expected to find a way to manipulate virtual environments and perform the basic operations in Jupyter notebooks.

It is our advice that you work with Anaconda and use Conda to create virtual environment with TensorFlow. 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 2.10 or higher. Current Anaconda comes with Python 3.11.4 and the latest version of TensorFlow is TF2.13. You might choose to work with the latest versions or if you are confident in what you are doing use any version of Python and any version of TF higher than 2.10. Most code in our future examples will work with lower versions of TensorFlow, though.

**Problem 1.** Install Anaconda or Miniconda. Use Conda to create new virtual environment for this class. Call it cs767. When creating the environment, specify that you want Python 3.11.4. You may choose a different Python if you prefer it. Capture the dialog when creating and activating the environment. Open Python prompt and examine the version of Python. Test whether the ‘pip’ is there. If pip is not there, install the latest version**.** Find the Conda command that will list existing virtual environments. List them. (15%)

**Problem 2.** In your virtual environment cs767 install the latest version of TensorFlow. Open a Python prompt and examine the version of TensorFlow installed. (15%)

**Problem 3.** Exit Python command prompt and inside the virtual environment cs767 install Jupyter (notebook). Open a notebook by typing:

$ jupyter notebook

Rename your notebook into problemset01. Create a markup cell and copy all the results collected in Problem 1. Create another markup cell and copy all the results from Problem 2. The objective is to submit one notebook as the solution of this problem set. Demonstrate that you could import tensorflow as tf. Create two simple tensors of dimensions 2x2 and add them up. Please add two tensors using mathematical short hand symbol “+” and then operator tf.add(). Print the values of the resulting tensors. (15%)

**Problem 4.** Copy the code from the attached Jupyter notebook cpu\_vs\_gpu\_test.ipynb into your solution notebook. Copy and run each cell separately. Copy markup cells as well. Run all cells. It is alright if your machine does not have CUDA support. Just report your results. (15%)

**Problem 5.** Run two tests from the previous problem in Google Colab. <https://colab.research.google.com/?utm_source=scs-index> First measure the execution speed with CPU. Then create a paid subscription and use GPUs. Copy results of both tests in your local notebook: problemset01. Again, the objective is to have only one notebook for submission.(20%)

**Problem 6.** 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 Booleans or integers 1 and 0, whatever you find convenient.

Demonstrate that all three functions return proper logical values True or False or values close to 1-s and 0-s.

Please declare all variable and constants using TensorFlow 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. (20%)

**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.

Please name your notebook as cs767A1\_YourLastName\_FirstName\_HW01.ipynb. Upload to the Blackboard.