CS 461
Project 4 – neural networks
Due FRIDAY NIGHT, Dec. 8.

Our neural networks project will be using Google TensorFlow to do image recognition on a standard data set. TensorFlow is installed on all Flarsheim labs and is available as a free download at https://www.tensorflow.org/install/.

Go through the tutorials beginning with https://www.tensorflow.org/get_started/mnist/beginners using the MNIST dataset of hand-written digits. In addition to the walkthrough in the tutorial, carry out the following modifications:

- The tutorial uses a Gradient Descent optimizer. Try this, then change to another optimizer (your option as to which) and observe any differences. (Report the accuracy at each stage using each optimizer.)
    - The initial stochastic model has an expected accuracy of "about 92%." What do you observe for each?

Move on to the Deep MNIST for Experts tutorial at https://www.tensorflow.org/get_started/mnist/pros. This tutorial starts with a more detailed walkthrough of the first tutorial, explaining in detail what the code is doing.

- The tutorial uses ReLU neurons. Modify the network to use sigmoids instead. How do results change?
- Complete the tutorial, building a full convolutional model. Make ONE other change to the network (number of features, number of layers, etc).

So to summarize, you will be doing the following:

- Complete both tutorials as written.
- Replace Gradient Descent optimization with one other optimization; compare results.
- Replace ReLU neurons with sigmoids; compare results.
- Change some other parameter (layer dimensions, optimizer, dropout rate, etc) to a convolutional model & compare results. (If the tutorial as written takes an unreasonably long time for the convolutional model, your modification may be to reduce the number of iterations.)

Prepare a report discussing your findings, citing data from your sample runs. (You can easily modify the python code to save logs to a file as well as printing to the screen.) Upload your report and source code files to Blackboard.