ECE 491 Homework #5

Weekly learning objectives are:

1. Observe layers and blocks forming deep neural network structures. (LO3, LO4)
2. Interpret the significance of parameter management in neural networks. (LO3, LO4)
3. Perform file I/O in an efficient manner. (LO3, LO4)
4. Utilize the processing capabilities of GPUs to implement deep networks. (LO3, LO4)
5. (WLO1, WLO2) Given the training data with two classes

{ ([0 1]T , y=1); ([1 2]T , y=1); ([0 -1]T , y=-1); ([-1 0]T , y=-1)}.

Train a single neuron o=f( w1 x1 + w2 x2) where f is the tanh activation function with . The loss function is the squared error. Assume that the initial weight vector is w=[-1 1] T. Implement the backpropagation algorithm for two epochs. Determine the weight vector and the accuracy on the training dataset.

1. (WLO2, WLO3) Design a 3-fully-connected-layer-network using TensorFlow-Keras or other frameworks you are familiar with. Use the Fashion MNIST dataset.

In your report, you should include:

* the accuracy on the testing dataset, and the confusion matrix, and
* your network structure.
* What loss function do you use (MSE, cross-entropy, etc)?
* What training parameters did you use? What kind of optimizer did you use and what is the initial learning rate?)

1. (WLO3, WLO4) Now, increase the number of connected layers to 5. Use the same loss function, parameters and the same optimizer. Use a GPU to observe speed up the implementation. Did your accuracy improve? If yes, what is the reason?

Append your codes at the end of your report. Please submit a single pdf file.