COMP/EECE 7/8740 Neural Networks

Assignment 1

Fall 2021

Due: September 9, 2021

Total points: 50

Question 1 (Points: 20) : Draw a computational graph for the following function and calculate values for a forward pass and backward passes :

$$y = \text{sigmoid}\,\{(x_1 w_1 + \max\,(x_2, w_2)\}$$

Where, X_1 = 0.7, W_1 = -1.5, X_2 = 0.34, and W_2 = -0.35.

Question 2 (Points: 30) Design and evaluate Deep Neural Network (DNN) models considering the following criteria**:**

a) Design two DNN models with following configuration:
   I. 784 →150 →120 →10
   II. 784 →500 →250 → 100 →10
b) Activation functions: sigmoid
c) Use a SoftMax activation function for classification
d) Categorical Cross-Entropy loss
e) Number of epochs: 50 and
f) Batch-size is 64.

Evaluate the models with MNIST dataset:

a) Input image: 28x28 pixels (Gray scale images)
b) Number of training samples: 60,000
c) Number of testing samples: 10,000
d) Number of classes: 10 (Handwritten digits).

Write a report comparing two DNN models with training logs, testing errors, computational times etc.

Report outlines: the report will be included:

1. Title page includes course title, course number, your name, ID, and assignment number.
2. Introduction
3. Methodology
4. Deep Learning Architecture
5. Experiment and Results
   (a) Training and testing logs
   (b) Discussion and comparison (if available)
6. Conclusion
7. References (if available)