

CS89BD Deep Learning, Fall 2024

Assignment 1

Due: September 18, 2024

Total Points: 100

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

$$f(x) = (x_1 w_1 + x_2 w_2) * (x_3 w_3 + x_4 w_4),$$

Where $x_1 = 0.7, w_1 = -1.5, x_2 = 0.34, w_2 = -0.35, x_3 = 0.2, w_3 = -0.25, x_4 = -0.9, w_4 = 0.2$

Note: if you use handwritten image, please separate your steps by some indications.

Question 2 (80 Points): Design and evaluate the Deep Neural Network (DNN) models considering the following criteria:

- I. Design two DNN models with the following configuration:
 - a. $784 \rightarrow 64 \rightarrow 128 \rightarrow 64 \rightarrow 10$
 - b. $784 \rightarrow 256 \rightarrow 512 \rightarrow 128 \rightarrow 10$
- II. Activation Function: SoftMax
- III. Loss Function: Categorical Cross-Entropy
- IV. Number of Training Epoch: 500
- V. Batch-Size: 64

Evaluate your models with [MNIST](#) dataset.

- Input Image: 28 x 28 pixels (Gray scale images)
- Number of Training Samples: 60,000
- Number of Testing samples: 10,000
- Number of Classes: 10 (handwritten digits 0-9)

Write a report that represents a comparison of two models.

Report outlines: The report must contain:

- The title page includes course title, course number, your name, WSU ID, and assignment number
- Introduction
- Methodology
- Deep Learning Architecture
- Experiment and Results (graphs)
 - A graph that represents training error (y-axis) and training time(x-axis)
 - A graph that represents error (i.e., training error and testing error on y-axis) and training time (x-axis)
 - A graph that represents loss (training loss and testing loss) and number of epochs (x-axis)
 - Report **state-of-the-art** accuracy for this dataset
- Conclusion
- Reference

