

CSCE 584 - Neural Networks and Their Applications Fall 2025

Homework 2

September 28th, 2025

Introduction:

This homework assignment delves into a comprehensive review of **backpropagation**, starting with the foundational concepts presented in two influential papers. Furthermore, I delved into applying these principles to the design, training, and practical implementation of both one- and two-layer neural networks, with Part-C covering the derivative for the **weight update rules** of the back propagation algorithm for 2-layer feed-forward neural network architectures.

Solutions:

Following the guidance, a one-pager has been created. The table below links to the **Pseudocode** and **Code** from the Colab Notebook.

Topics	Reference	Code
Part A: 1. Learning representations by back-propagating errors 2. Efficient backprop. In Neural networks: Tricks of the trade	Link Link	[1] - Link [2] - Link
Part B: 1. One-layer Neural Network 2. Two-layer Neural Network 3. Course project	[1] - Link [2] - Link	[1] - Link [2] - Link [3] - Link
Part C: Backpropagation algorithm for a 2-layer feedforward NN	N/A	Link

Conclusion:

Homework 2 helped with an in-depth exploration of foundational neural network concepts, including **backpropagation**, **gradient descent**, and activation functions like the **hyperbolic tangent (tanh)**. I've gained practical experience by applying backpropagation to build and train both single- and two-layer neural networks. This hands-on work, particularly the derivation of weight update rules, has been instrumental in bridging the gap between theoretical principles and practical application.