



ECE 5370 Machine Learning

Project 4 Report

Spring 2025

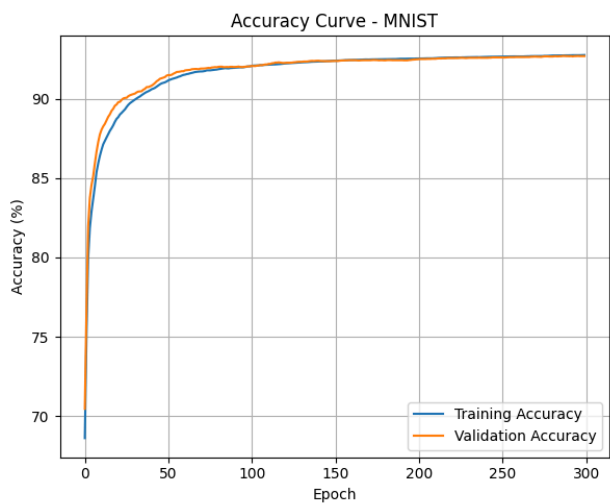
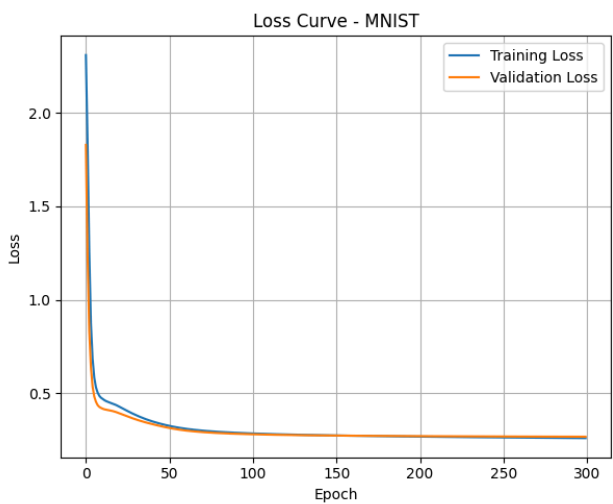
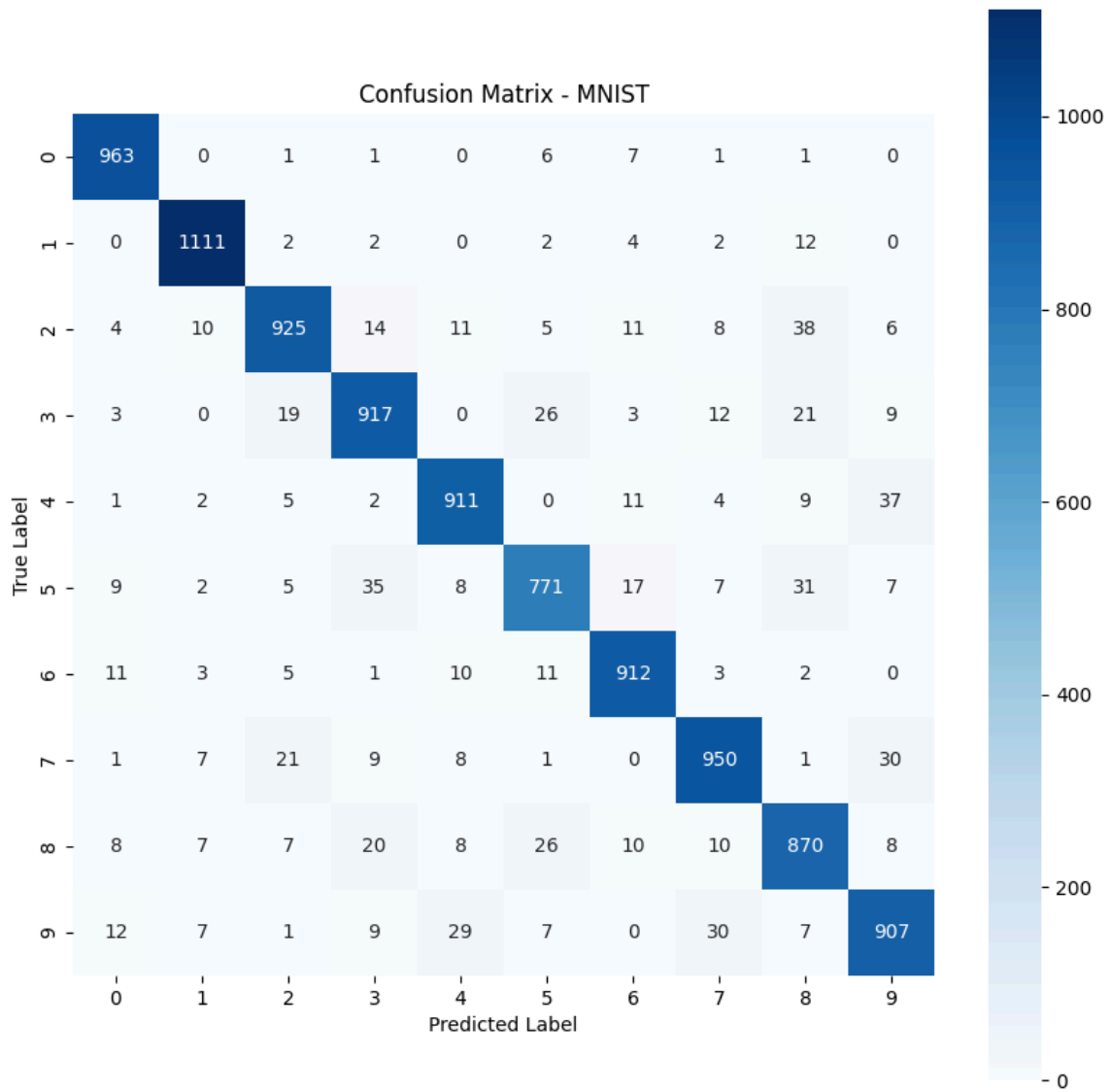
1. MNIST

Visual Verification of Input Data	N/A
Training, Validation, and Testing Data Split	MNIST: 80% train / 20% val, separate test
Input image size user for training/testing	28x28 pixels
Image Processing	None
Parameters of Logistic Regression	Random weight init, zero bias, L2 regularization ($\lambda=0.01$)
Optimizer Type and Corresponding Parameters	Gradient descent with momentum ($\beta=0.9$), learning rate (MNIST: 0.5)

Training Time: 91.97 seconds

Testing Time: 7.03 seconds

Train Accuracy: 92.72%, Val Accuracy: 92.64%



2. C. ELEGANS

Visual Verification of Input Data	N/A
Training, Validation, and Testing Data Split	MNIST: 80% train / 20% val, separate test
Input image size user for training/testing	101x101 pixels
Image Processing	CLAHE → median-blur(3) → Canny edges blended (0.8/0.2)
Parameters of Logistic Regression	learning-rate=0.1, epochs=100, batch=256, weights init $\sim \mathcal{N}(0, 0.01)$
Optimizer Type and Corresponding Parameters	Stochastic Gradient Descent (hand-coded)

precision recall f1-score support

0 0.8609 0.8891 0.8748 1100

1 0.8824 0.8527 0.8673 1073

accuracy 0.8711 2173

macro avg 0.8716 0.8709 0.8710 2173

weighted avg 0.8715 0.8711 0.8711 2173

Confusion matrix

[[978 122]

[158 915]]

