

Department of Computer Science and Engineering (AI-ML)

Deep Learning: Principles and Practices

(EICDT24404)

Lab 2: Single Layer Perceptron and Multi-Layer Perceptron

2. Prerequisites

Students are required to install necessary libraries. Install Keras and Tensor flow if necessary.

3. Exercise & Tasks

Task 1 — Single Layer Perceptron (from scratch)

Objective: Train a perceptron to classify points based on a linear boundary using Python from first principles.

- a. Setup Python Environment
- b. Define Perceptron Function
- c. Generate Synthetic Training Data
- d. Train with Perceptron Learning Rule
- e. Visualize Decision Boundary

Task 2 — Multi-Layer Perceptron (MLP)

Objective: Build an MLP classifier using **NumPy** (from scratch) to learn non-linear decision boundaries.

(For context: an MLP adds “hidden layers” and trains using backpropagation.

- a. Define Network Architecture

For simplicity:

- Input layer: 2 neurons

- Hidden layer: 4 neurons (ReLU activation)
 - Output layer: 1 neuron (sigmoid)
- b. Define Activation Functions
 - c. Initialize Weights & Biases
 - d. Train with Backpropagation
 - e. Evaluate the Model

Task 3 — Perform following tasks:

1. Compare single layer vs MLP on linearly separable vs non-linear data (e.g., XOR).
2. Explore how hidden layer size impacts learning.
3. Plot loss over training epochs.

Submission:

Students are required to upload the model on GitHub, submit a hard copy of the practical. Models to be explained in detail while submitting hard copy.