NN Report

Introduction

In this assignment, a three hidden layer neural network for multi-class classification will be implemented. A synthetic dataset containing five distinct classes will be generated to train and test the neural network model. The task involves modifying the provided codebase to accommodate multi-class classification, evaluating the model's performance, and documenting the process.

Dataset Generation

A synthetic dataset with five classes will be generated for training and testing the neural network. Each class will have input features suitable for training a neural network.

Task

The task involves implementing a neural network with three hidden layers to classify the generated dataset. The provided code will be modified to support multi-class classification with five classes. The network architecture and parameters will be adjusted as necessary for handling the multi-class problem.

Code Modification

1. NeuralNetwork Class Extension: The NeuralNetwork class will be extended to support multi-class classification. The output layer will have five neurons, each corresponding to one class.

2. Activation Function and Loss Calculation: The activation function and loss calculation will be modified to suit the multi-class scenario. The softmax activation function will be used for the output layer, and cross-entropy loss will be calculated to measure the difference between predicted and true class probabilities.

3. Backpropagation Algorithm: The backpropagation algorithm will be adapted to handle multiple classes. The gradients will be computed for each class and used to update the weights accordingly.

Training and Testing

The generated dataset will be split into training and testing sets. The neural network will be trained using the training data, and its performance will be evaluated using the testing data. Relevant evaluation metrics such as accuracy, precision, recall, and F1-score will be calculated for each class and overall.

Results

Confusion Matrix