Machine Learning CSE 574 Programming Assignment 2

Handwritten Digits Classification

Group 55

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Overview

The assignment aims at implementing a Multilayer Perceptron Neural Network for evaluating its performance for classifying handwritten digits and face recognition. Also, the performance of this Single Neural Network is compared with the Deep Neural Network and Convolution Neural Network using the TensorFlow library.

Implementation

The Neural Network implemented is evaluated on the real data. The data is loaded from the MNIST dataset containing the 10 matrices for training set and testing data. The training data is further split into training and validation data. Thus, the experiments have been carried out on the three datasets namely, training, validation and testing.

The Neural Network consists of three layers, the input layer, the hidden layer and the output layer. The data is preprocessed by ignoring the features which do not contribute in classifying the model. There are two weight vectors namely w1 and w2, which are initially assigned a random weight given the number of unit in the input and output layer. The data label is then predicted using the w1 and w2 weight vectors. Then the value of objective function and gradient are computed using the backpropagation algorithm.

By setting different values to the regularization hyper-parameters of the network, namely lambda and number of hidden unit nodes, various comparisons have been made determining the accuracy and the runtime of the neural network for the three data sets.

Comparisons

**Lambda vs Accuracy:**

1. λ versus Neural Network accuracy for hidden unit 50
2. λ versus Neural Network accuracy for hidden unit 40
3. λ versus Neural Network accuracy for hidden unit 25
4. λ versus Neural Network accuracy for hidden unit 10

**Hidden Units vs Training Time:**

1. Hidden units versus Training time

**Number of Layer (vs) Accuracy on Celeb Dataset:**

**Analysis of Convolutional Neural Network:**