

# Deep Learning Assignment 3 Report

Avirup Saha, Roll No. 17CS91P01

February 4, 2018

## 1 Introduction

This document is a report on Assignment 3 of the Deep Learning course, CS60010. The objective of this assignment was to train a neural network using Tensorflow (using the latest version, viz. 1.5) and to get an intuition about the output of each of those hidden layers.

The dataset used was the same as that in Assignment 2 (i.e. a dataset of labeled images divided into training and test images). A neural network with 3 hidden layers and final output layer over all possible classifications was created. It was trained end to end using relu activations in all layers.

After training the above NN, the hidden layer representation of layer 1 for the data-points was obtained and used as input for training a logistic regression based classifier for the data. The same train-test split was used for training the logistic regression classifier. The results on the test set for it are reported. The same procedure was followed for hidden layers 2 and 3.

## 2 Results

In this section we report the accuracy on the test set for all methods followed. The number of training epochs of the neural network was set to 50. The training data was divided into train-set and validation-set using a train-test split. The representation giving the best validation accuracy was used to get the accuracy on the test set. These learned weights were stored in the "weights/" folder to be loaded whenever necessary, for the logistic regression classifiers as well as to reproduce the results of the NN. The results are tabulated in Table 1.

## 3 Inference

We see that the Neural Network performs reasonably well. The logistic regression classifiers all perform rather poorly. The one which uses hidden layer 1 gives the best accuracy, the one using hidden layer 3 gives the second-best accuracy and the one using hidden layer 2 gives the worst accuracy. This seems to indicate that the representation obtained in the first layer is good, that obtained in the last layer is intermediate whereas that obtained in the middle layer is bad. Since the first layer is closest to the image inputs, it provides the best representation of the data. Since the last layer is used to predict the labels, it gives the second-best representation. The middle layer detects the subfeatures of the images and so it cannot give a good representation of the data.

Method	Test accuracy
Fully Connected Neural Network	0.87650001
Logistic Regression with 1st hidden layer	0.2366
Logistic Regression with 2nd hidden layer	0.1323
Logistic Regression with 3rd hidden layer	0.1862

Table 1: Results on the test set for all approaches