HW 4 Report

Introduction:

The aim of this homework is to be able to detect the numbers from 0-9 using deep networks.Two types of networks,one using convolutional neural networks and another using multilayer perceptron were considered.Various experiments were performed by changing the hyper parameters and the architecture of the convolutional neural networks and multilayer perceptron.

Observations:

Convolutional Neural Network:

The convolutional neural network has a convolutional layer that convolves the input image using a filter and sending this as input to hidden layers. The maximum accuracy that was attainable was using two convolutional layers and dropout percentage of 0.2.The batch size was 200 and the number of epochs 15. The same accuracy was obtained in another instance with 10 epochs. The second convolutional layer had a filter of size 3 x 3 and the first one had a size of 5 x 5. It makes sense that the accuracy is increased when the number of convolutional layers in increased.

Multilayer Perceptron:

The multilayer perceptron just uses a normal fully connected layer as the top layer. The accuracy was pretty good but was not nearly as good as the convolutional neural network. The maximum accuracy that was obtained was 98.32 which was obtained in 2 occasions. IN both occasions the dropout was 0.5,the number of epochs 10, the only difference being that the batch size was 100 in one experiment and 150 in another. The number of neurons in the hidden layers were 500 for optimal performance. The inclusion of a dropout layer increased the accuracy.

Result:

The experiments were performed with different architectures and the accuracies were noted down. The convolutional neural network was much better than a multilayer perceptron in identifying the class of the test set.

Table : Experimental results

cnn							
test	no.of conv. layers	no of epochs	batch size	accuracy	CNN Error	loss	filter size
1	1	10	200	99.06	0.94	0.0326	5
2	2	10	200	99.23	0.77	0.0218	5
3	2	10	200	99.25	0.75	0.0221	5 and 3
4	2	10	200	99.19	0.81	0.0224	3and 3
5	2	15	200	99.25	0.79	0.0213	5 and 3
mlp							
test	layers	no of epochs	batch size	accuracy	loss	dropout	
1	2	10	200	98.15	0.0542	nil	
2	3	10	200	97.69	0.0964	nil	
2	3	10	200	98.24	0.07	0.2	
4	2	10	200	98.12	0.0637	0.2	
5	3	10	100	98.19	0.0721	0.2	
6	3	10	20	97.84	0.0969	0.2	
7	3	10	150	98.32	0.0599	0.5	
8	3	10	100	98.32	0.0592	0.5	