Deep Learning

Programming Assignment 1

March 15, 2019

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Contents

1 MNIST dataset

1.1 Learning Curves
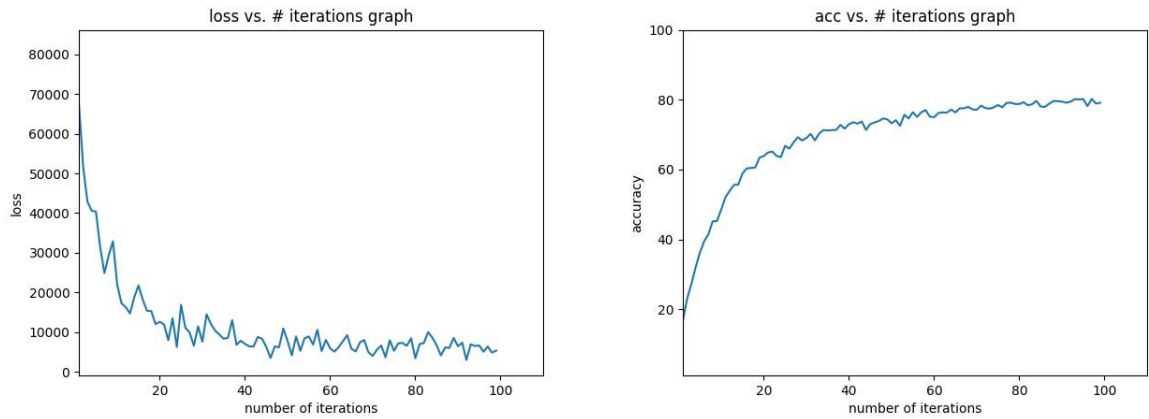
1.2 Accuracy on test data

	C_0	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
Precision	0.907	0.966	0.930	0.952	0.846	0.937	0.907	0.877	0.606	0.883
Recall	0.967	0.953	0.774	0.779	0.927	0.618	0.910	0.911	0.931	0.841
F-score	0.936	0.960	0.845	0.857	0.885	0.745	0.908	0.894	0.734	0.861

1.3 Confusion Matrix based on performance for test data:

$$
\begin{bmatrix}
948 & 0 & 0 & 0 & 1 & 1 & 10 & 3 & 17 & 0 \\
0 & 1082 & 3 & 1 & 0 & 1 & 3 & 2 & 43 & 0 \\
22 & 4 & 799 & 7 & 21 & 0 & 9 & 28 & 130 & 12 \\
12 & 0 & 28 & 787 & 4 & 24 & 8 & 18 & 117 & 12 \\
1 & 6 & 2 & 0 & 911 & 0 & 7 & 1 & 13 & 41 \\
16 & 3 & 1 & 21 & 21 & 552 & 42 & 17 & 208 & 11 \\
14 & 2 & 9 & 0 & 42 & 5 & 872 & 2 & 12 & 0 \\
1 & 15 & 12 & 4 & 14 & 0 & 0 & 937 & 16 & 29 \\
14 & 4 & 2 & 3 & 11 & 5 & 10 & 11 & 907 & 7 \\
17 & 3 & 3 & 3 & 51 & 1 & 0 & 49 & 33 & 849
\end{bmatrix}
$$

1.4   Variations Tried

Optiizers used - GradientDescent, Adam Initialization, - weight matrix to all ones, all zeroes, and random but in a normalized fashion learning rate - for one layer, 0.01 and for 2 layers, 0.0001

1.5   Inferences

For mnist data, as we have increased the no. of hidden layers, the accuracy starts falling down drastically, the main reason behind that the model is overfitted while training, so as a solution we have reduce the learning rate for model to very low value, like 0.0001 or something to have greater accuracy. For q1-data, accuracy is very poor and reason behind that is in the images there is some noise which is not letting model to train effeciently.