

CSA 250 : Deep Learning Project II

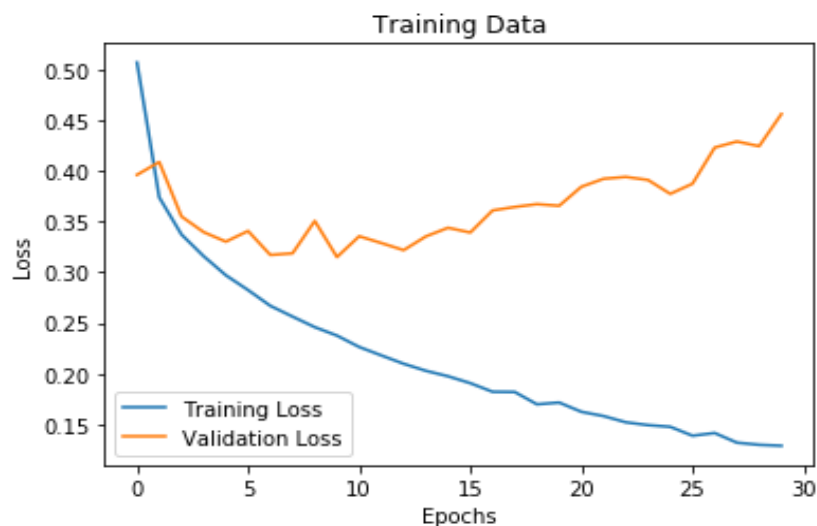
Report

Dhaval Parmar

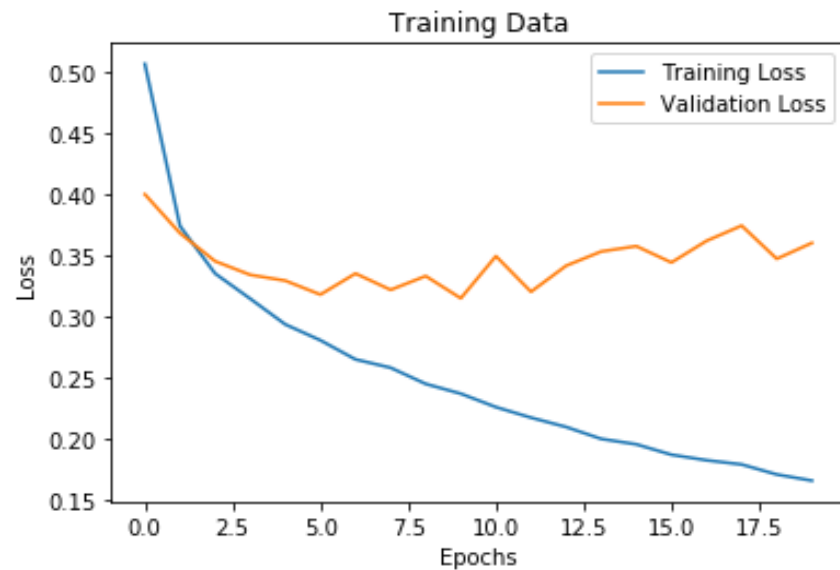
February 21, 2020

➤ Multi Layer Neural Network:

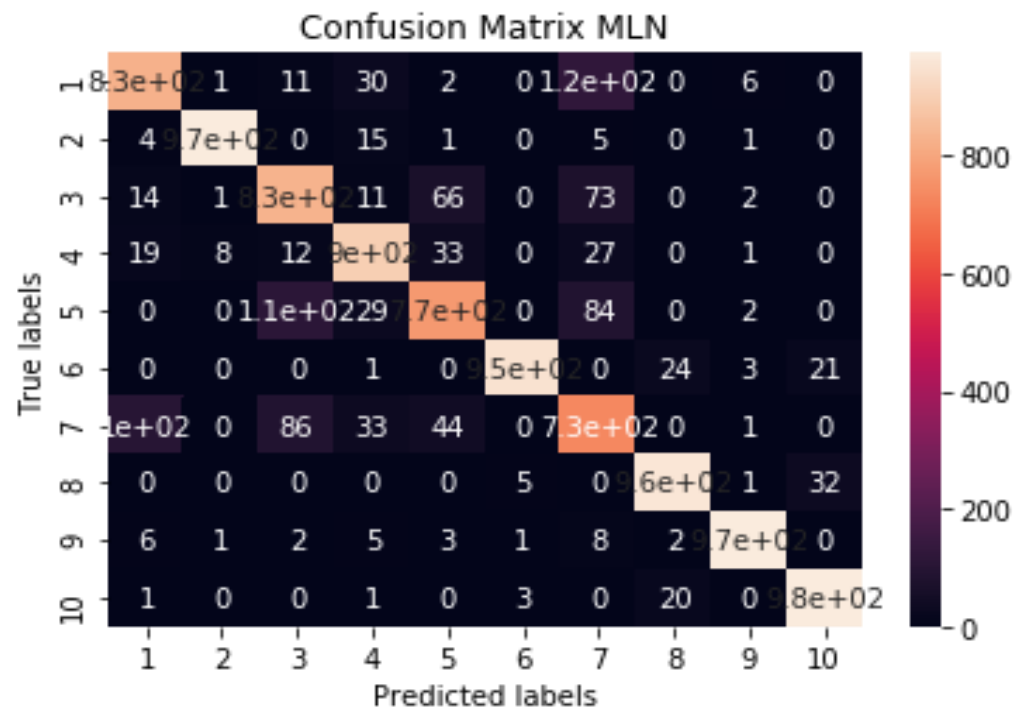
- I am using 80% and 20% split of training data for training and validation.
- I have used 2 hidden layer with 128 perceptron in each and Relu activation function. I have tried applying multiple hidden layer with different width but performance is not improving or even getting worst.
- Then to improve performance I tried to augment training data different ways.
- I tried applying normal and uniform noise and using normalized train image but performance is deteriorating.
- I tried augmenting image by applying horizontal flip, vertical flip and rotation but it is giving poor results.
- For all this trial training error is going beyond 95% but test error is fluctuating between 86% to 88%.
- I have run the program for 30 epoch. For most of the case validation training loss is decreasing continuously but validation loss decreases initially and then increases.
- I have tried using different batch size ranging from few thousand to few hundred but does not work.
- Finally I am using 20 number of epoch without any data augmentation and batch size that given me 93.65% training accuracy and 89.01% test accuracy.
- Training loss and validation loss for 30 epoch is shown in figure.



- Training loss and validation loss for submitted model is shown in figure.



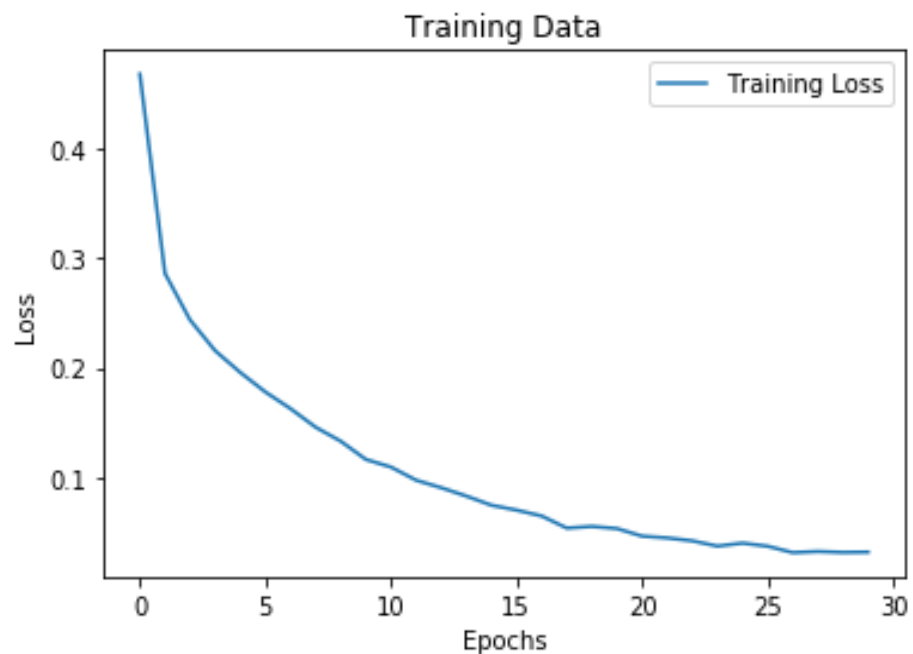
- Confusion matrix For this model is given below.



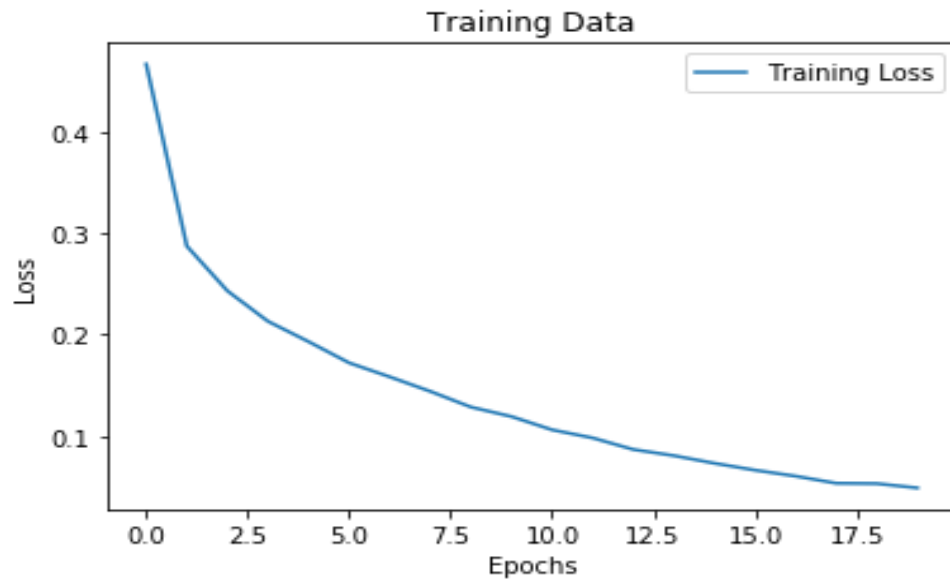
- Here we can see that many class 1 images are classified as 7 and many class 7 images are classified as class 1.
- Also many times class 5 is classified as class 3.

➤ Convolution Neural Network:

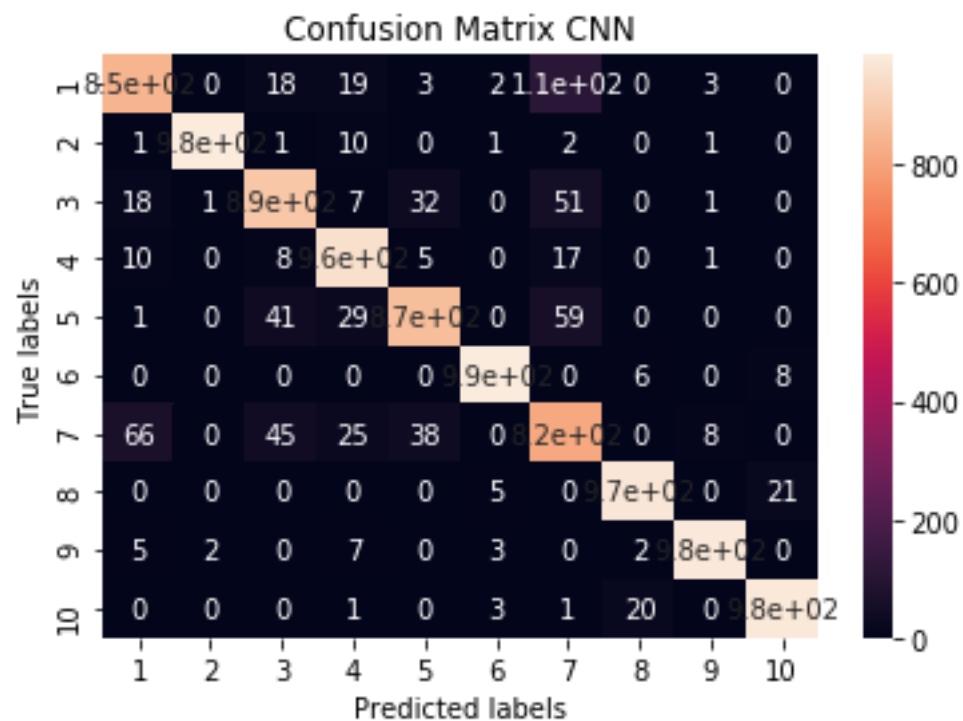
- In this model I have used 8 layers 2 convolution layer with 128 filters and kernel size of 4 with Relu activation function. I have tried with different number of filters for each layer like 32, 64, 256 but this is giving best performance.
- I have used two layer of max pooling with pool size of 2 and stride equal to 2. I have tried with increased pool size to reduce dimension but performance is reduces. I have tried using different value of strides or even without strides but 2 is giving better performance.
- Then I have flatten images and applied multilayer neural network.
- I have used two hidden layer with 128 perceptron and Relu activation function and one output layer with softmax activation function to convert output in probability. I have tried with single hidden layer also but 2 hidden layer performs well. Further increase in hidden layer is not helping much.
- I have tried adding normal and uniform noise in image but accuracy is deteriorating.
- I have tried different augmentation technique like horizontal, vertical flip and rotation. Horizontal flips is giving good results.
- In terms of number of epoch I tried running it for 30 epochs but after 20 epochs training accuracy is remaining between 98% to 99% and also test accuracy is not affecting much .
- So I am using 20 epochs that is giving me 98.28% of training accuracy and 92.84% of test accuracy.
- Below is graph of training loss for 30 epochs.



- Below is graph for training loss of submitted model



- Confusion matrix for this model is given below.



- Here we can see that CNN is doing well in classifying class 7 compare to MLN but still class 1 is classified as class 7 lot of time.
- Class 5 is also correctly classified with CNN compare to MLN.