

# PROJECT PART-3

In this part, I built and trained a convolutional neural network for classification task. I took SVHN dataset which consists of printed digits cropped from the house plate pictures belonging to 10 classes. There are 73,257 training samples and 26,032 testing samples. The input image resolution is 32x32 and consists of 3 (RGB) channels.

## Steps Involved:

Step-1: We load the given training and testing datasets.

Step-2: We do normalization to X\_Train and X\_Test by dividing them with 255 so that the pixel values range from 0 to 1.

Step-3: We encode the labels by using one-hot vector encoding.

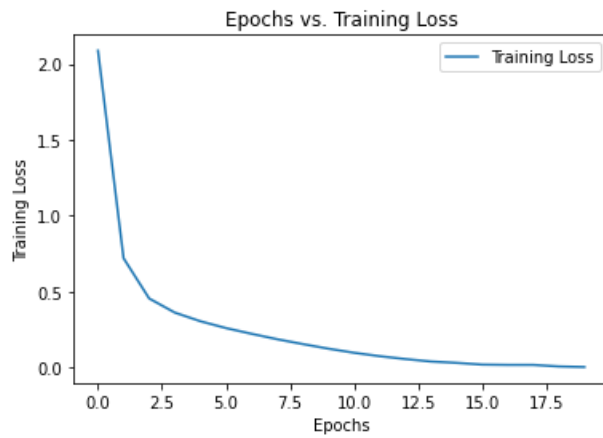
Step-4: We use CNN architecture and build the model using the below layers.

- First layer- A convolutional hidden layer with 64 output feature maps and the convolution kernels are of 5x5 in size. We use stride 1 for convolution and the activation is ReLU.
- Second Layer- A max pooling layer with pooling of 2x2 with stride 2.
- Third Layer- A convolutional layer with 64 output feature maps and the convolution kernels are of 5x5 in size. We use stride 1 for convolution and the activation is ReLU.
- Fourth Layer- A max pooling layer of pooling of 2x2 with stride 2.
- Fifth Layer- A convolutional layer, with 128 output feature maps and the convolution kernels are of 5x5 in size. We use stride 1 for convolution and the activation is ReLU.
- Sixth Layer- A Flattened layer is used to change the shape from (73257, 32, 32, 3) to (73257, 3072).
- Seventh Layer- A fully connected layer with 3072 nodes and ReLU activation function.
- Eight Layer- A fully connected layer with 2048 nodes and ReLU activation function.
- Ninth Layer- A fully connected layer with 10 output nodes (corresponding to the 10 classes) and we use SoftMax activation function.

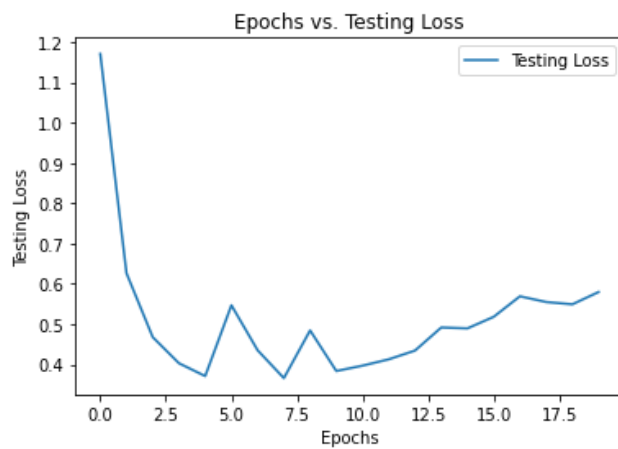
Step-5: We train the model using SGD optimizer on training set and test on the testing set.

Step-6: We plot the training and testing curves as a function of epochs.

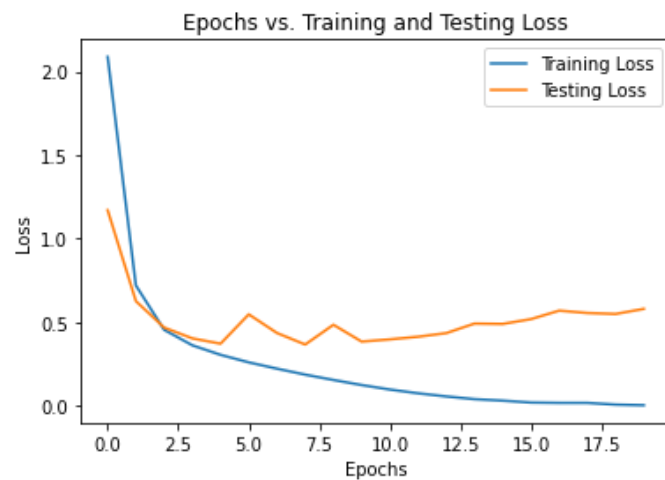
- The graph between Epochs and Training Loss.



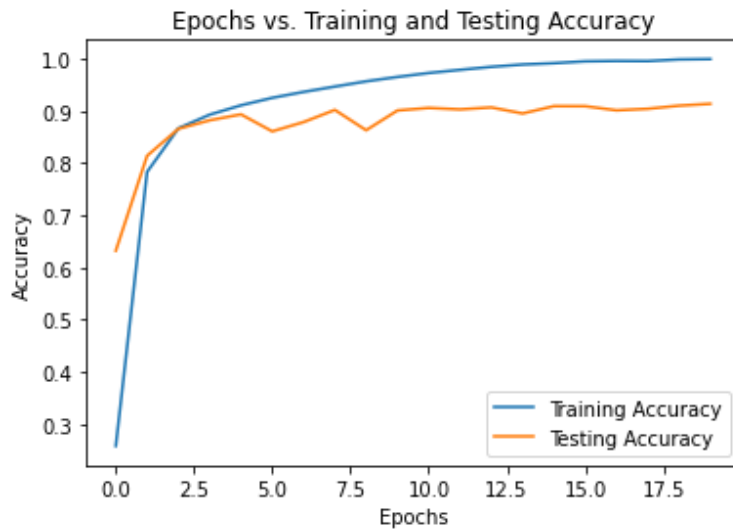
- The graph between Epochs and Testing Loss.



- The graph of Epochs vs Training and Testing Losses.



- Graph of Epochs vs Training and Testing Accuracy.



## Results:

The model is trained by using 20 epochs and the learning rate of 0.01. The optimization is done by using SGD optimizer and loss is calculated by categorical cross entropy.

The result obtained by evaluating the model on testing data is given below

**Test Accuracy is 91.4%**