DEEP LEARNING (696-04)

ASSIGNMENT - 1

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DESIGN OF THE PROGRAM

The Program Consists of two classes : Layer() class and the Neural_Network() class.

The Layer class is to initialize the number of input and output layer neurons and initialize the activation functions and the initialization of weights associated with it using Xavier or He weight initialization methods.

The activation functions use in this program are : Sigmoid, Relu and Softmax.

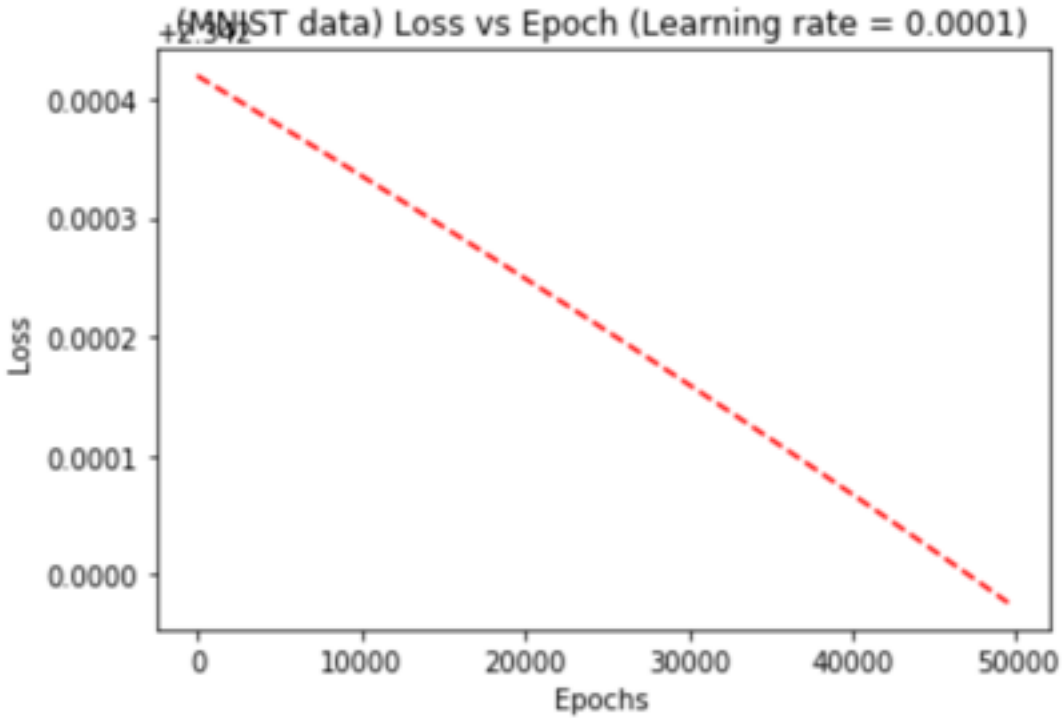
The Neural_network class is to initialize the starting parameters, weights and bias. It contains of layer function which gives the program the flexibility to add any number of hidden layers. The class also contains the forward and back propagation functions.
It has the oneHotIt function which Encodes Target Label IDs to one hot vector of size m where m is the number of unique labels. The accuracy function is to compute the training and test data with the predicated value and loss_graph function is to plot the Training loss versus the number of iterations/epochs.

RESULT

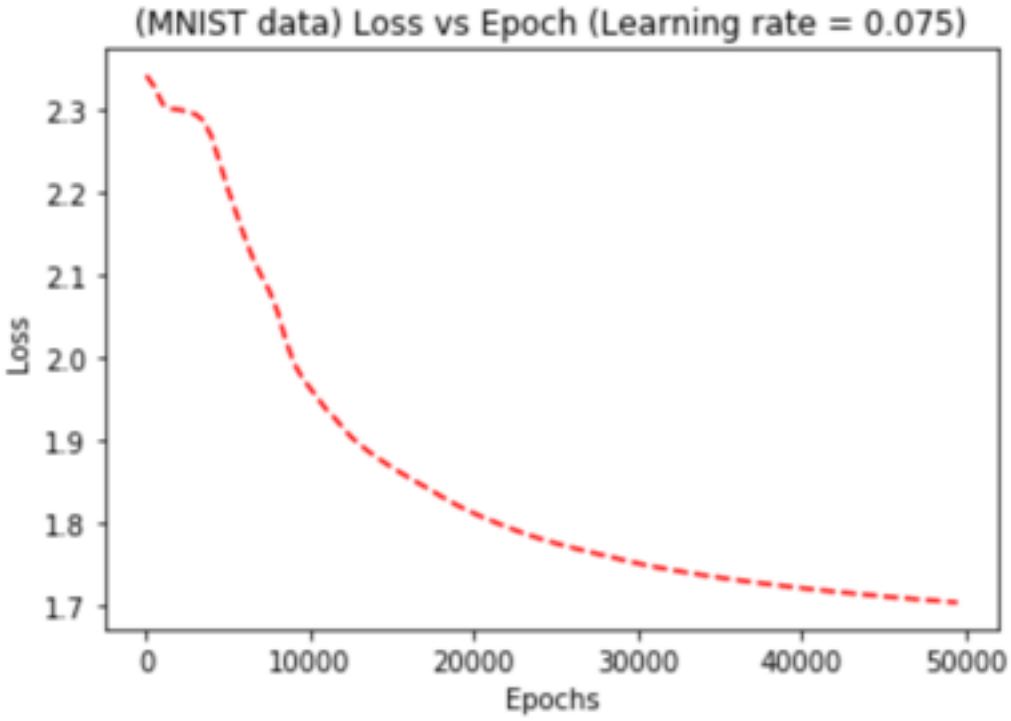
The following figures given below are the plots of loss versus epochs for different learning rates.

MNIST DATA

```
Training Accuracy: 9.20 %
Test Accuracy: 14.00 %
```

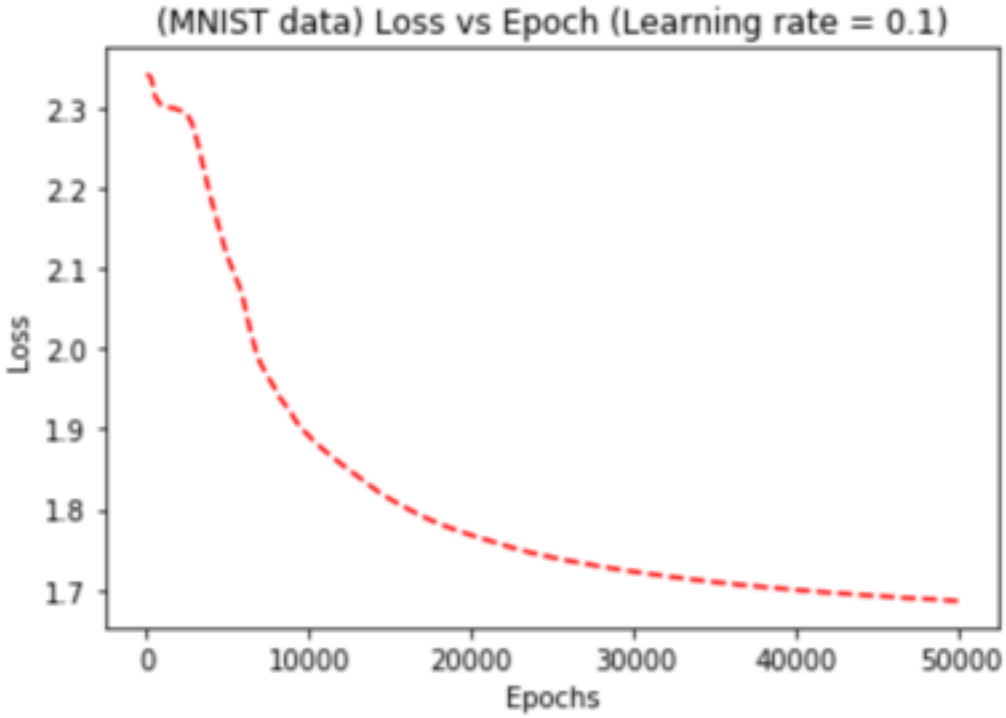


```
Training Accuracy: 94.90 %
Test Accuracy: 81.00 %
```

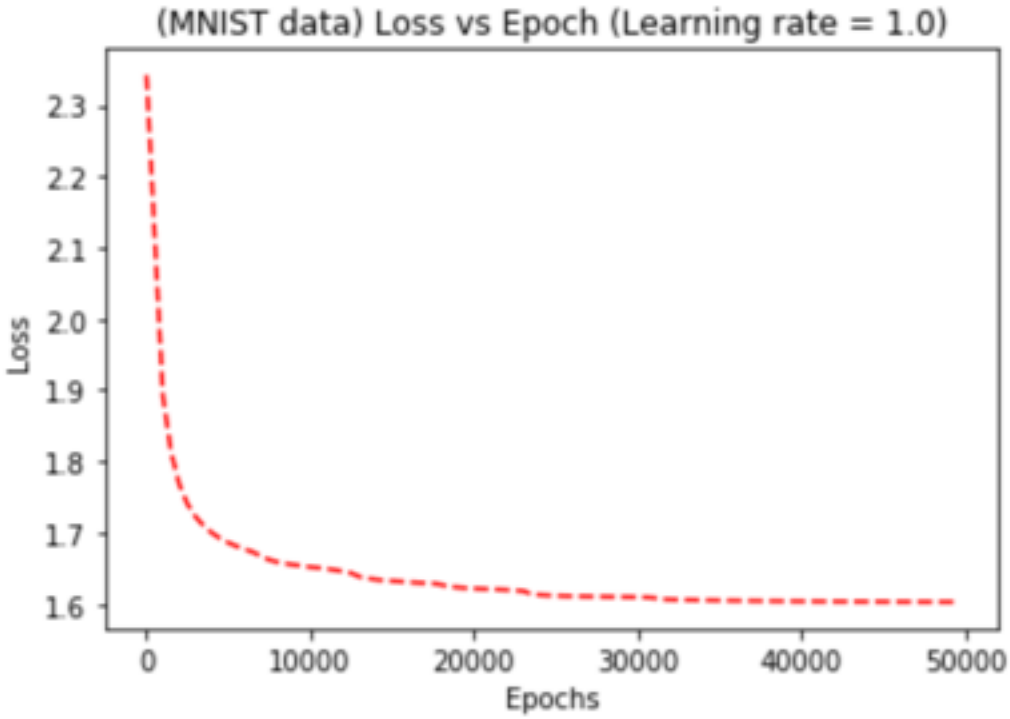



```
Training Accuracy: 73.40 %
Test Accuracy: 66.00 %
```

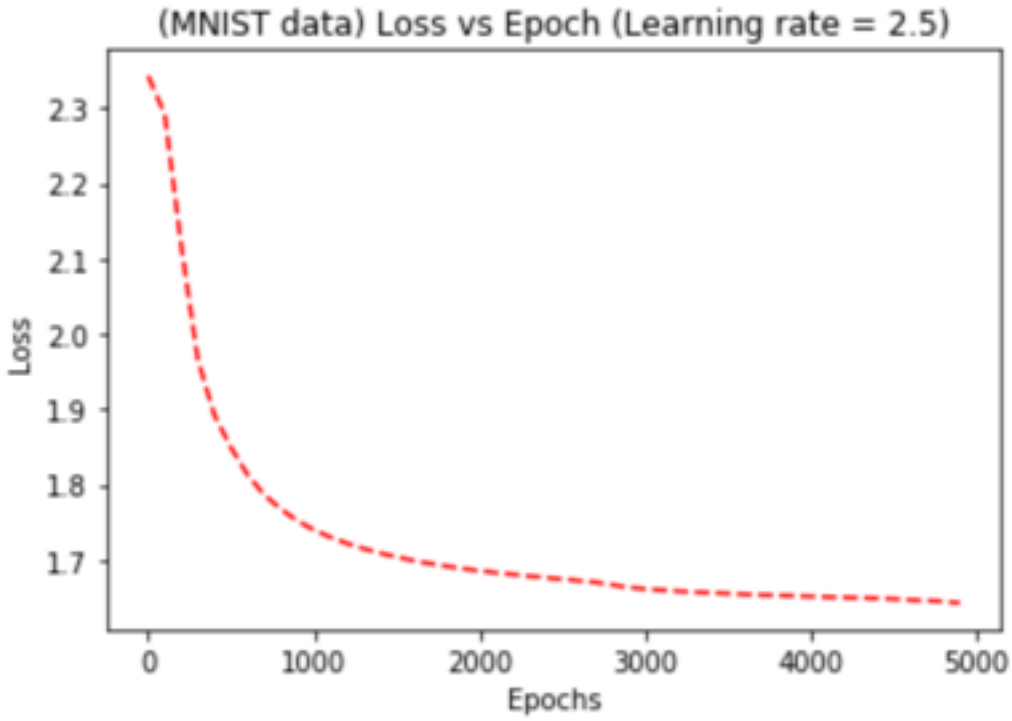
```
Training Accuracy: 96.70 %
Test Accuracy: 84.00 %
```




```
Training Accuracy: 100.00 %
Test Accuracy: 88.00 %
```

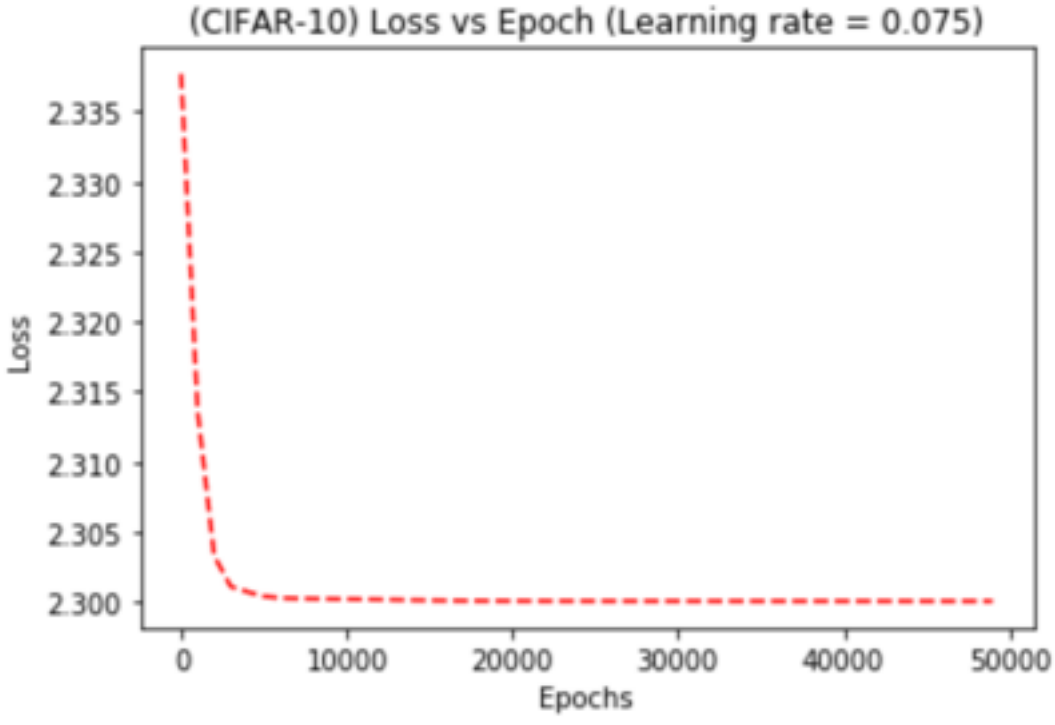


```
Training Accuracy: 99.10 %
Test Accuracy: 84.00 %
```

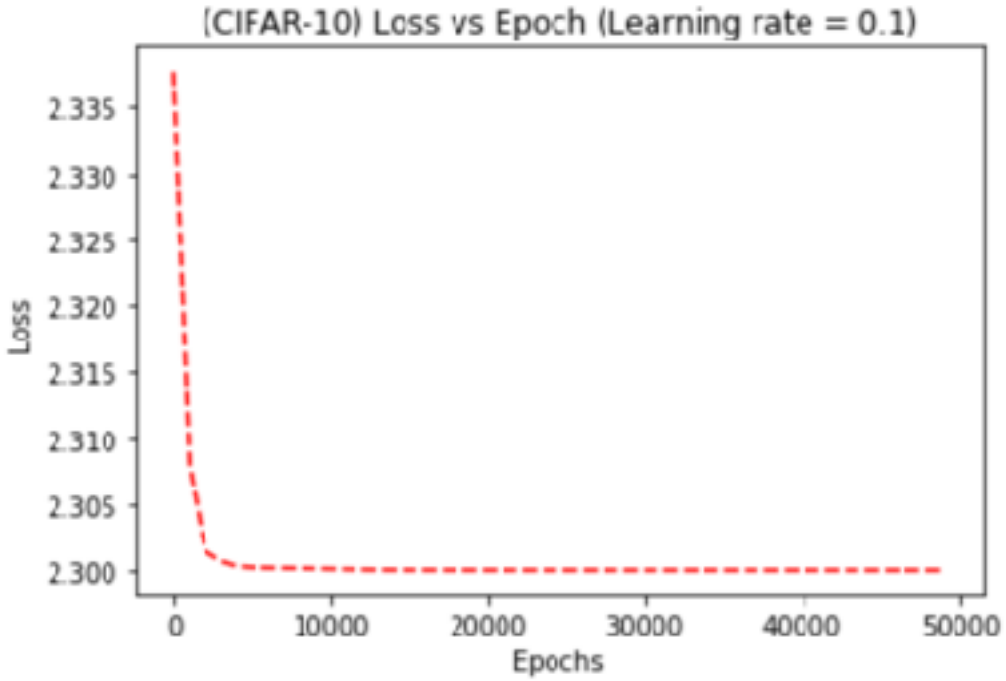


CIFAR-10 DATA

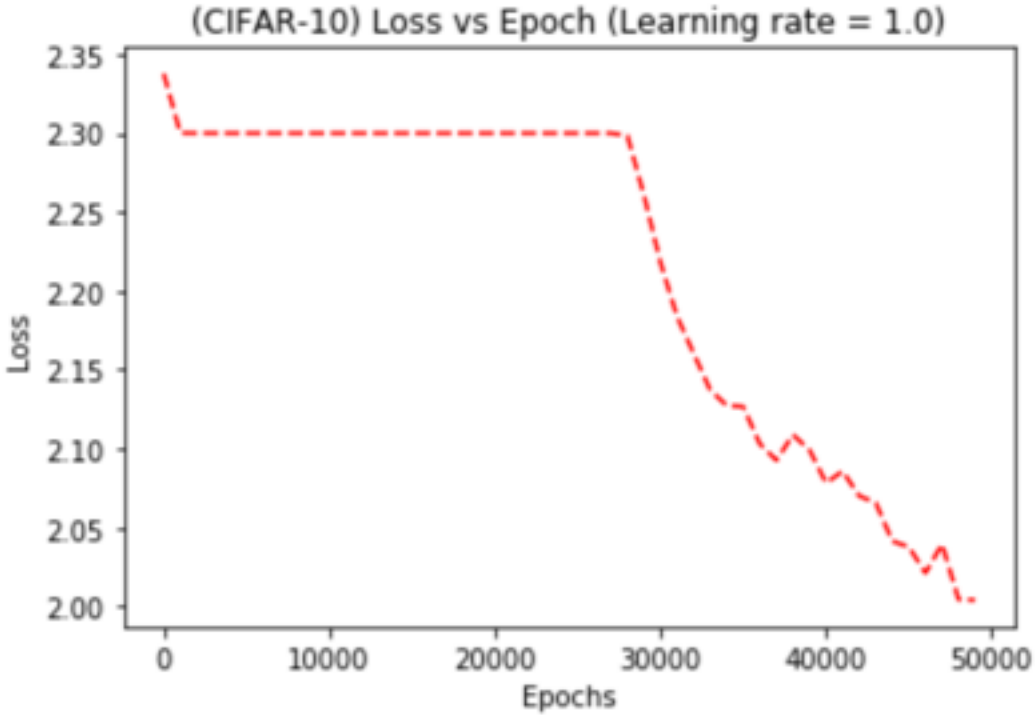
```
Training Accuracy: 11.20 %
Test Accuracy: 6.00 %
```



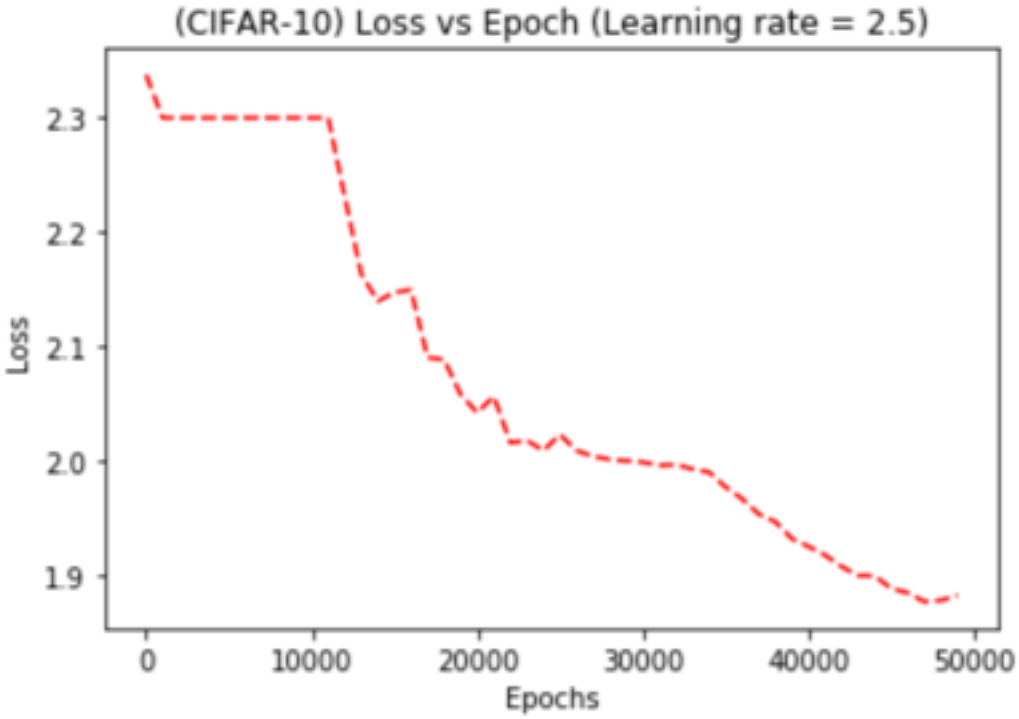
```
Training Accuracy: 11.20 %
Test Accuracy: 6.00 %
```




```
Training Accuracy: 48.70 %
Test Accuracy: 19.00 %
```



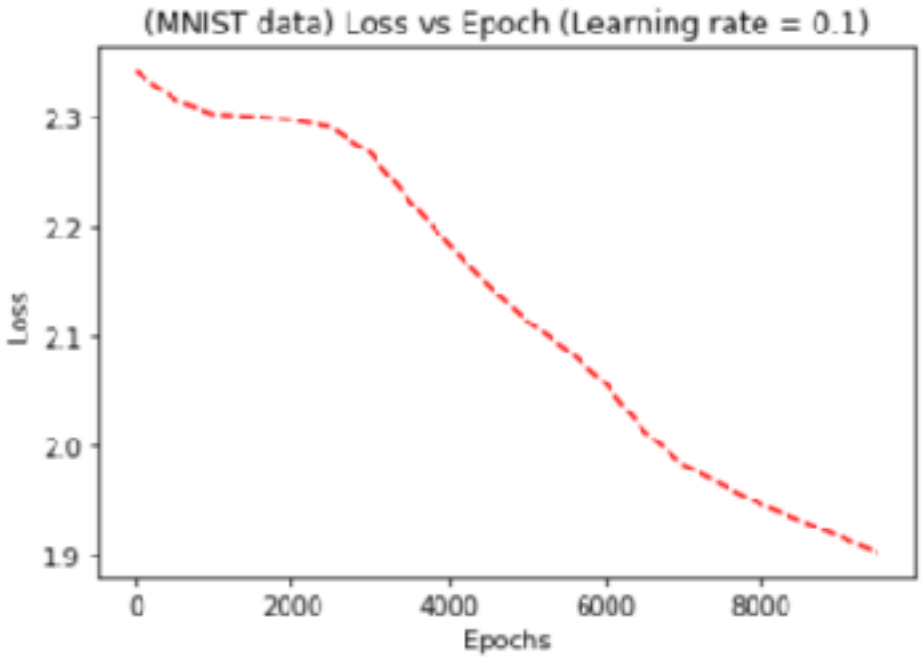
```
Training Accuracy: 76.30 %
Test Accuracy: 27.00 %
```



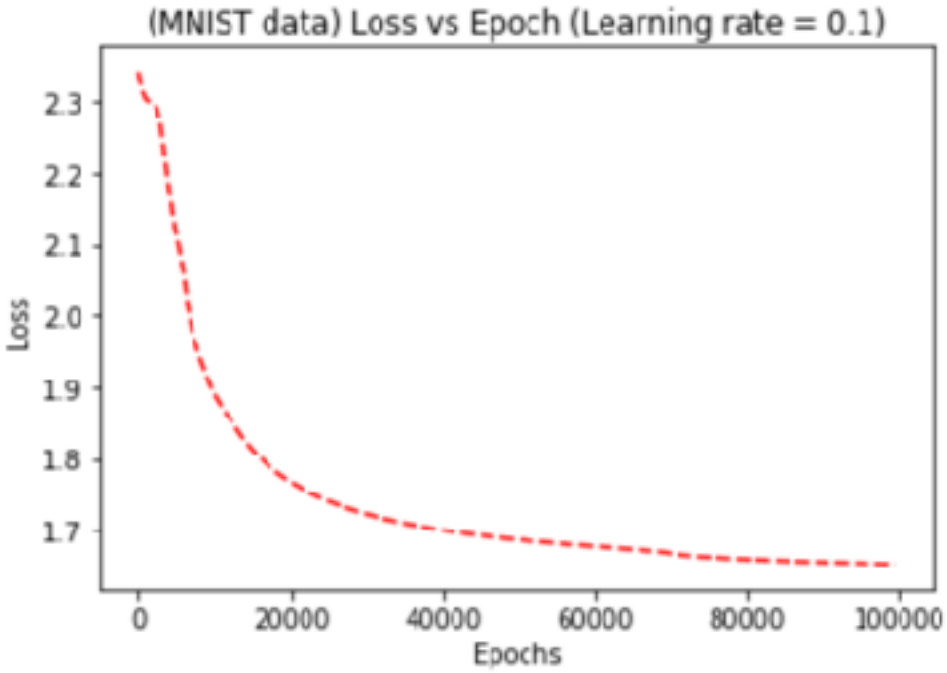
The figures given below depicts the loss vs epochs with different number of iterations but the same learning rate. Also, it shows the Training and test data accuracy with the different number of iterations.

MNIST DATA

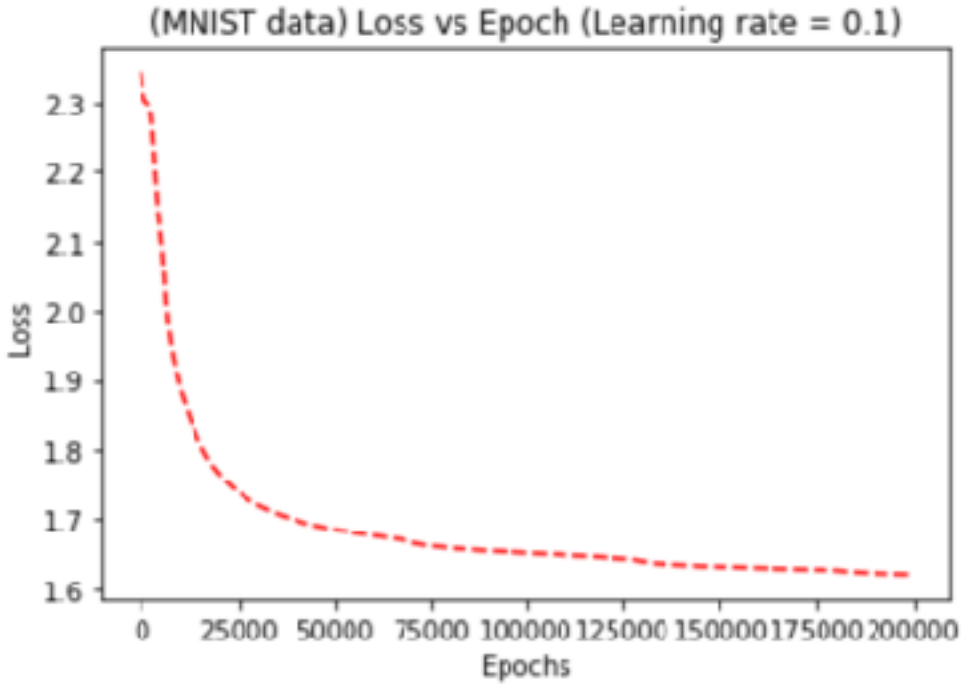
```
Training Accuracy: 65.90 %
Test Accuracy: 64.00 %
```




```
Training Accuracy: 98.40 %
Test Accuracy: 85.00 %
```

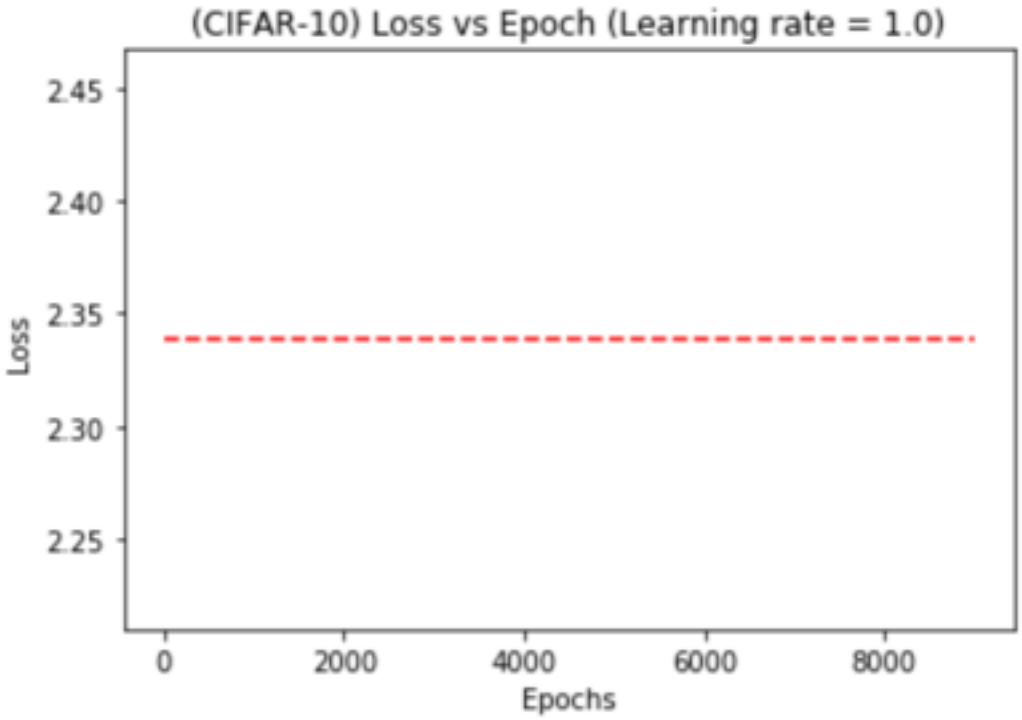


```
Training Accuracy: 99.60 %
Test Accuracy: 87.00 %
```

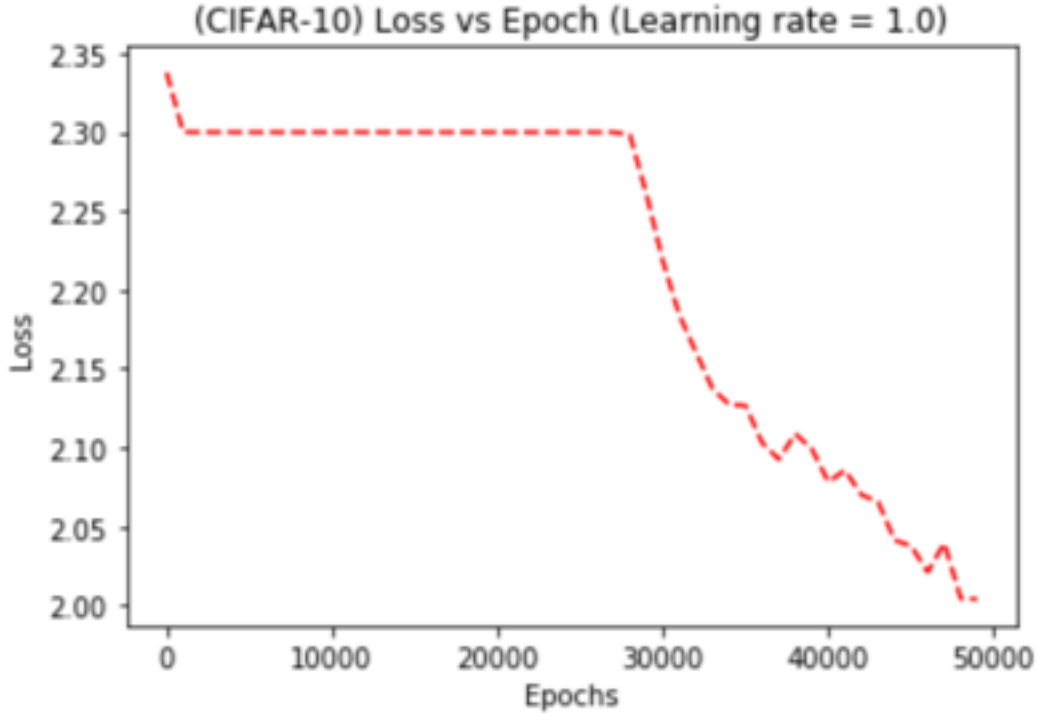


CIFAR-10 DATA

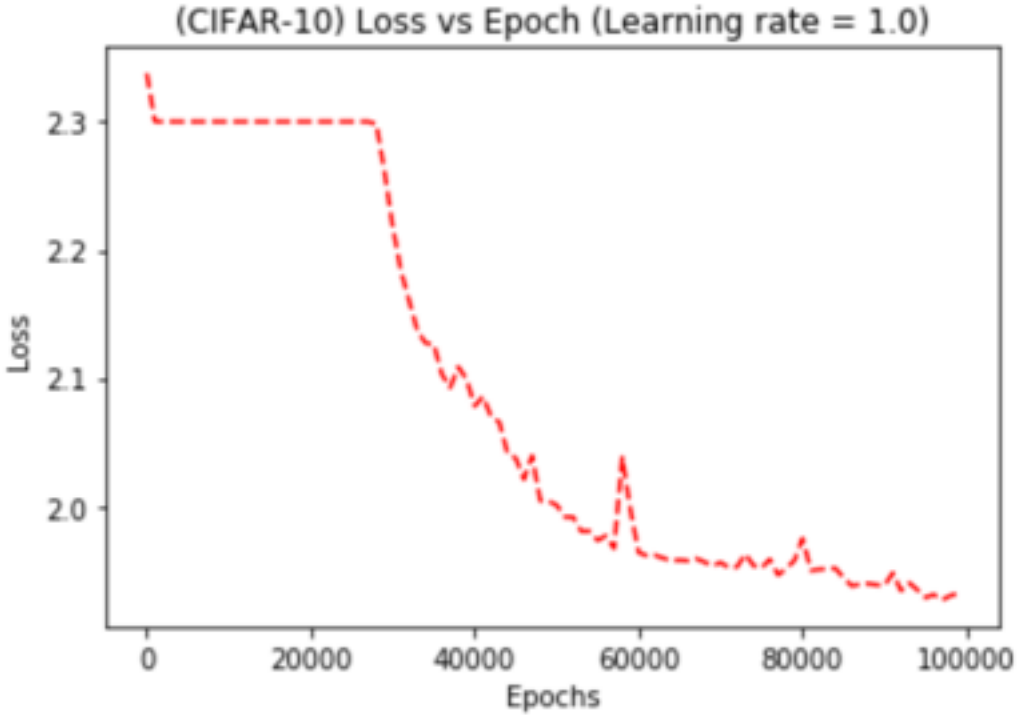
```
Training Accuracy: 9.90 %
Test Accuracy: 13.00 %
```



```
Training Accuracy: 48.70 %
Test Accuracy: 19.00 %
```




```
Training Accuracy: 60.40 %
Test Accuracy: 22.00 %
```



```
Training Accuracy: 78.30 %
Test Accuracy: 24.00 %
```