**REPORT**

The training data in text files folder is read in a string and converted to an array of size 784\*1. Since the neural network has a hidden and an output layer, two weight matrixes were made and assigned random values between 1 and -1. The first weight array was of size 30\*784. This is multiplied by the input array and applied sigmoid function. This happens for the hidden layer and now the results are between 0 and 1. The second weight array of size 10\*30 is mutiplied with this hidden layer array and again passed through the sigmoid function. This is how the output of size 10\*1 is achieved. Once Feed forwarding is complete, the labels are read from the file and converted to one hot vectors. The output and labels are compared and errors calculated. These errors are derivated with repect to activations and the results are propagated to the layers. Weights are updated and process done for all 60000 inputs and 2 epochs. The saved weights file is read and used for test data set using the same procedure of feed forwarding. The weight matrix is extracted and multiplied by the input of test data and passed through the sigmoid function this gives us activations. This hidden layer activations are then multiplied by the second set of weight arrays which gives us the output. This output is compared with the test labels and accuracy is calculated. The maximum accuracy was achieved by using learning rate 0.75. Anything less than 0.05 showed less than 80% accuracy. 0.05 was used as average testing.

**NOTE:** The accuracies and excecution times were stored in lists and graphs were saved for learning rates 0.02, 0.5 and 0.05. The plot is for 2 epochs. After saving the plot, I’ve commented out the function call. Maximum accuracy of **91.29%** at **0.75** learning rate.