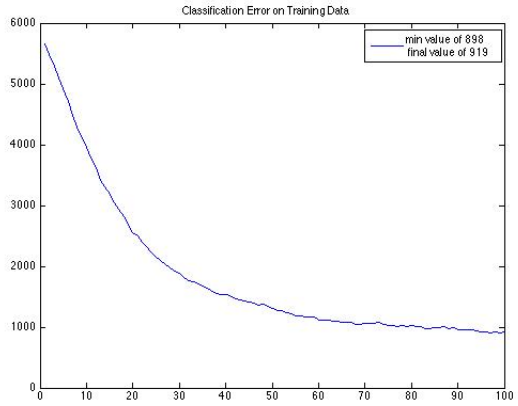
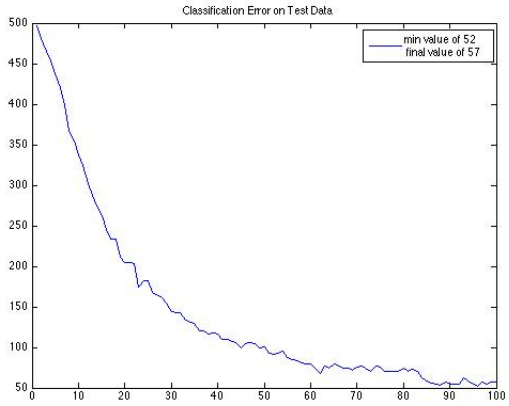
Neural Network

Implemented neural network with one hidden layer with 400 hidden units. Also, implemented backpropagation, momentum, and adaptive learning rate for each connection units to see the improvement on the performance. I tested neural network on subset of MNIST data where only considered 2,3,4.

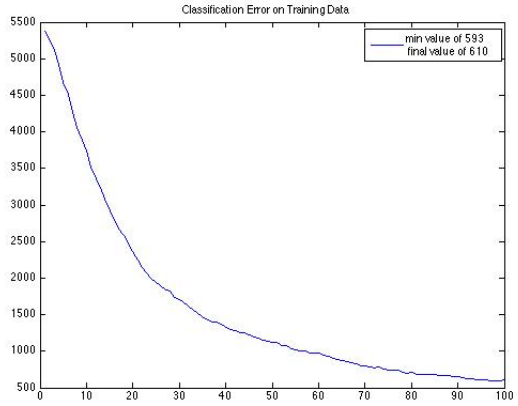
NN Using backpropagation Using epsilon = 0.00001 and 100 epoch.

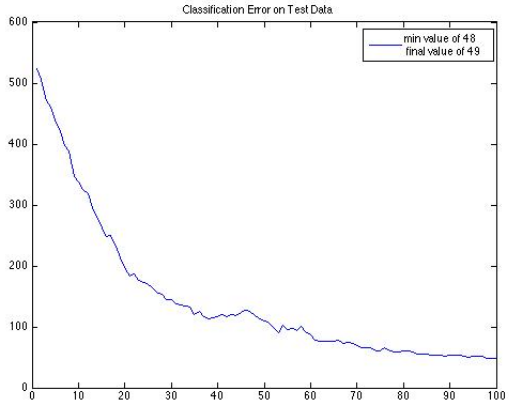




Classification Erro on train set: 0.102; Classification Error on test set: 0.073

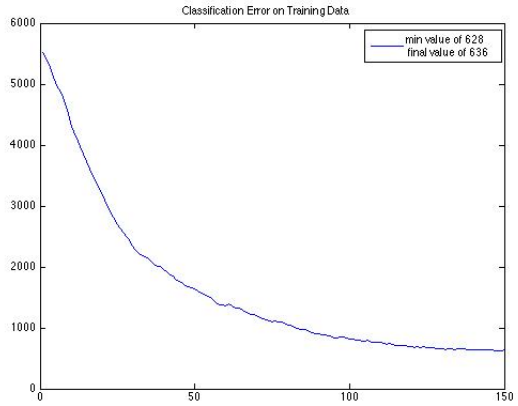
NN using backpropagation, momentum, adaptive learning rate for each connection units
Using epsilon = 0.00001, 100 epoch, and 0.8 momentum rate.

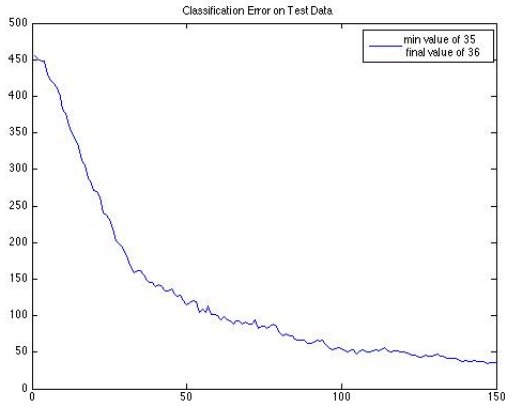




Classification Erro on train set: 0.068; Classification Error on test set: 0.063

NN using backpropagation, momentum, adaptive learning rate, Drop out Using epsilon = 0.00001, 100 epoch, and 0.8 momentum rate.





Classification Erro on train set: 0.071; Classification Error on test set: 0.0465. Noticed that after using dropouts, the error rate for test is generally lower and train set got higher. Comparing without using dropouts, train set error is actually higher than without dropouts, but test error is much lower.