# ASSIGNMENT 7 - IIT2016039

Problem Statement:

Implement binary SVM to classify MNIST digits 3 and 8 using SMO Algorithm. Use different kernel functions(RBF, Polynomial at least) and generate ROC curve. Strictly divide(60:20:20) the data into train, validation and test splits. Perform all hyper parameter tuning/feature selection on validation data and report accuracy on test split.

Procedure:

- First we took Mnist data and removed all numbers except 3's and 8's.

- Then we assigned label as -1 to 3 and 1 to 8.

- As number are features are very high (here features = pixels) we reduced the number of features with Linear Discriminant Analysis(LDA).

- We then separated the data into 60:20:20 train : test : validation respectively.

- Then Taking http://cs229.stanford.edu/materials/smo.pdf this paper as reference we have implemented the SVM algorithm with SMO.

- We changed the C parameter and maximum tolerance and Checked how the accuracy varies.

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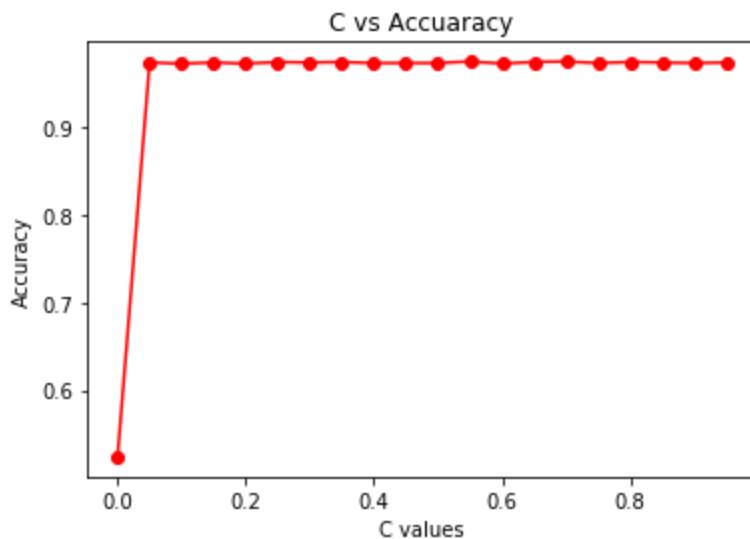
- We applied 3 different kernels linear, Polynomial and RBF kernel.

- We changed the Threshold value of separating data and took true positive and false positive values and plotted the ROC curve.