Machine Learning for Applications in Computer Vision:Week 3

Neeraj Sujan - 03656452

May 15, 2015

1 Boosting

1.1 Introduction

Boosting consists of an iterative scheme, where at each step the base learner is optimally computed using a different training set; the set at the current iteration is generated either according to an iteratively obtained data distribution or, usually, via a weighting of the training samples, each time using a different set of weights. The latter are computed using in order to take into account the achieved performance up to the current iteration step. The final learner is obtained via a weighted average of all the hierarchically designed base learners. Thus, boosting can also be considered a scheme for combining different learners.

Dataset: The dataset used for training and testing is the MNIST dataset provided on `http://yann.lecun.com/exdb/mnist/`. The dataset is a 28x28 images, which is extracted through the matlab code provided on `http://ufldl.stanford.edu/wiki/index.php/Using_the_MNIST_Dataset`

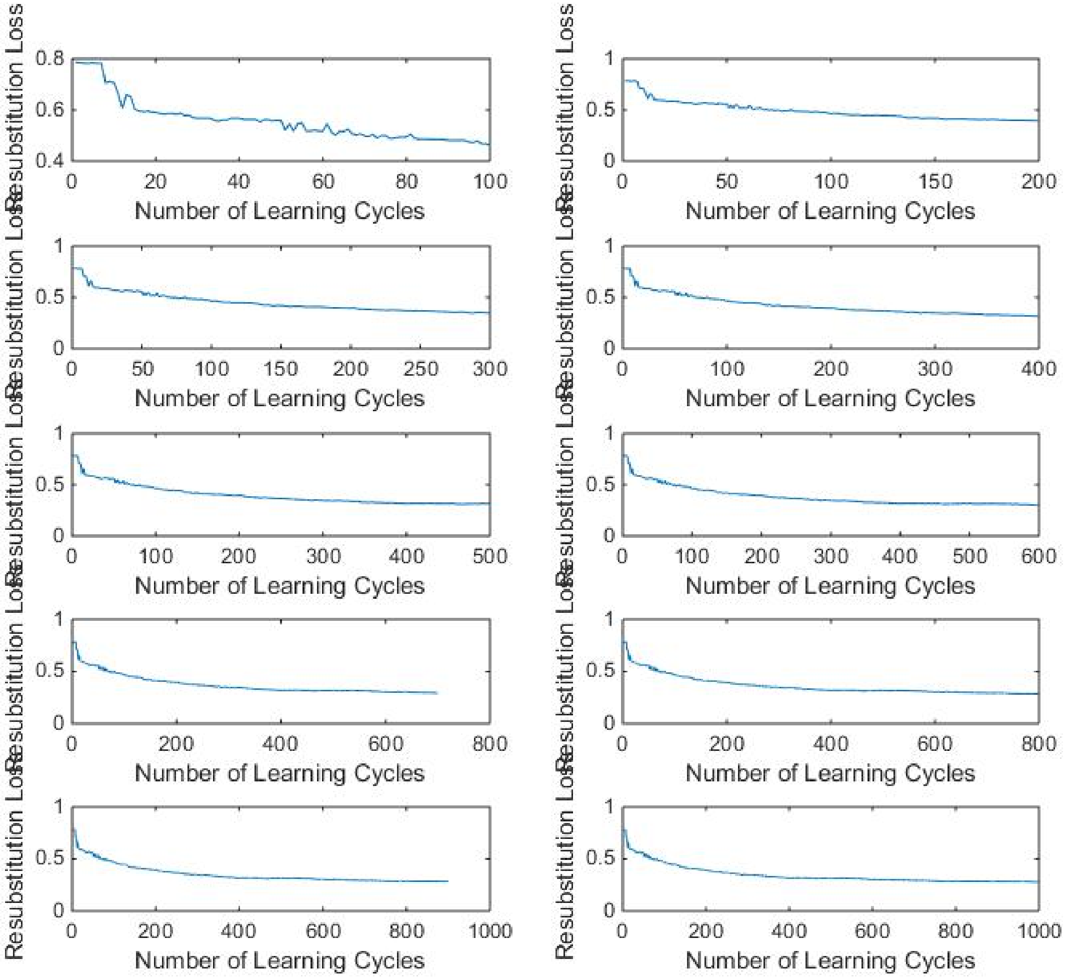
1.2 Results:

The results of the classification rate using both AdaBoost and LPBoost are show in the below table. The results were obtaing using the first 1000 samples of the training data set.

Number of learning rounds	100	200	300	400	500	600	700	800	900	1000
Classification Rate for AdaBoost	0.440	0.5050	0.5330	0.5530	0.5570	0.5640	0.5740	0.5760	0.5810	0.5840
Classification Rate for LPBoost	0.2980	0.2820	0.2820	0.2820	0.2820	0.2820	0.2820	0.2820	0.2820	0.2820

1.3 Conclusion

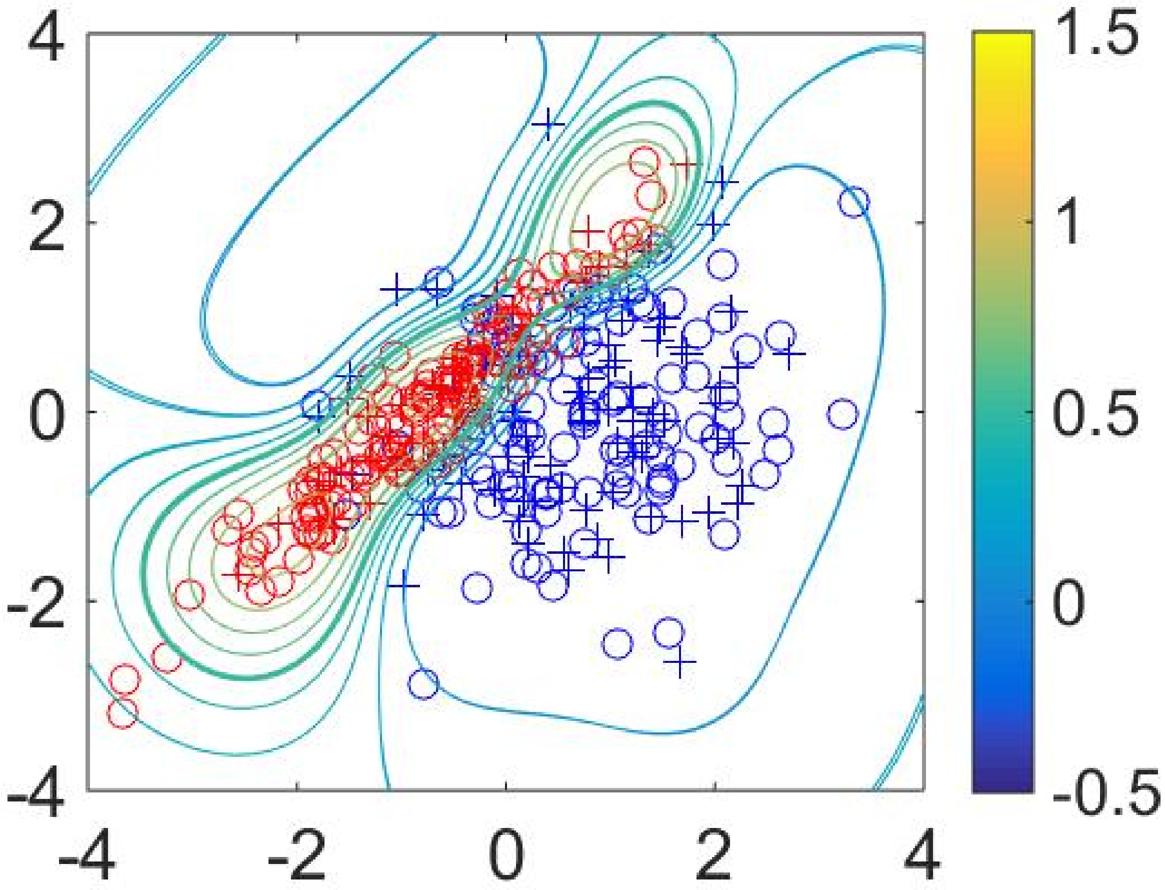
As shown in the table, the AdaBoost algorithm performs much better than the LPBoost algorithm. After 1000 learning rounds, the classification rate for the AdaBoostalgorithm was 58% while for the LPBoost algorithm the classification rate was 28.20%. The figure below compares the rsLoss for all the learning rounds i.e from 100 to 1000.



2 Gaussian Process Classification

2.1 Introduction

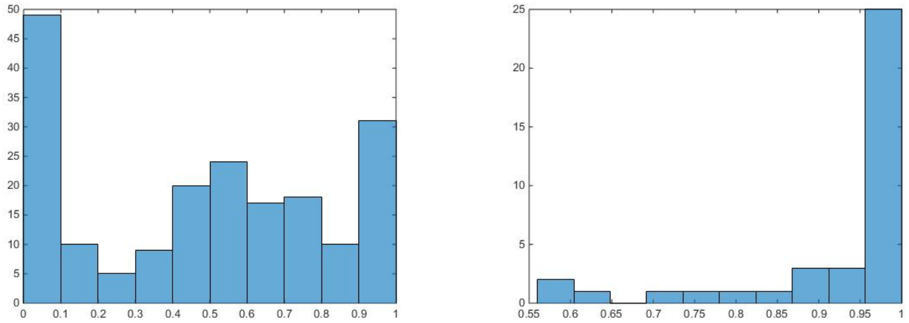
The tests were carried out using the code probided on `http://www.gaussianprocess.org/gpml/code/matlab/doc/demoClassification.m` The figure below displays the plot of the training data points and the test data points using KL inference method, exponential covariance function. and Logistic likelihhod



function

2.2 Results

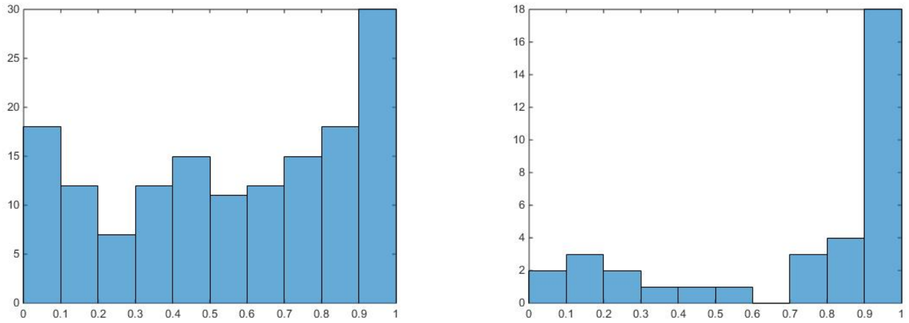
The classification rate for the test set generated using the Linear Kernel was found to be 82.73%, whereas the classification rate for the same test using the squared exponential covariance function was found to be 87.73%. The histogram of the uncertainities for both the classes is as shown in Figure 1 . When changing the inference method to KL i.e the Kullback-Leibler approximation, the same result i.e 87.73% was obtained.Changing the likelihood function to Logistic also did not make any signification difference, providing a classification rate of 87.73%.



(a) Correctly Classified

(b) Incorrectly Classified

Figure 1: HISTOGRAM for Gaussian Process.



(a) Correctly Classified

(b) Incorrectly Classified

Figure 2: Histogram for Boosting Classifier.

Using the Boosting Classifier, for the same set of data points, the following histogram plot was obtained as shown in Figure 2.