DMW Assignment-2

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***You have to understand the algorithm proposed in the paper "FAST RATES FOR SVM ''.***

***Run the algorithm on the shared given two datasets dataset and show the accuracy in terms of the attached image table: (make one more column in the last name FS\_SVM with the new algorithm and give the result).***

***Background:***

Support Vector Machine (SVM) is one of the most popular classification algorithms used in machine learning. However, in large-scale problems, where huge training data are available and must be used, such as road sign detection, the method’s training and test phases might be prohibitively demanding in terms of computations. Thus, for large-scale problems the reduction of computational complexity is essential.

***Algo:***

We use Letter Dataset[], it has 16 different features relating to 26 alphabets to be recognized.

First we segment the dataset into a train and test set with 14000 samples for training and 6000 for testing.

In very large datasets with a lot of features the reduction of computational complexity is essential. In order to increase the speed of both the training and test phases of kernel machines, we will map the input data to a randomized low-dimensional space wherein we use a feature selection algorithm and then existing fast linear methods are applied.

In order to do this We use a famous theorem, Bochner’s Theorem which says any kernelized (shift-invariant) classifier can be, to an arbitrary accuracy, approximated by a linear classifier in the appropriate transformed space. Through this we can achieve a great increase in speed as not all features are required for training.

A finite and small set of features is only used as the basis of the projection and, therefore, a significantly reduced dimensionality is achieved in the projection space. The algorithm, by Bochner’s Theorem, also achieves the linearization of the original nonlinear space of the data. These two properties, reduced dimensionality and linearization, lead to computational simplification in the training as well as the testing of a classifier.

***Observation***

Accuracy on Linear Kernel SVM

Accuracy on RBF Kernel SVM

Accuracy on Polynomial Kernel SVM

Misclassification Rate on Linear Kernel SVM

Misclassification Rate on RBF Kernel SVM

Misclassification Rate on Polynomial Kernel SVM

***References***

[1] H. Ozkan, “Fast support vector machines using random Fourier features,” Tech. Rep. 2009-08, Boston University, Dept. of Electr. and Comp. Eng., Dec. 2009.

[2] Letter Dataset https://archive.ics.uci.edu/ml/datasets/Letter+Recognition