Reduced Support Vector Machines: A Compressed Learning Viewpoint

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Abstract

The reduced support vector machine was proposed for the practical objective to overcome the computational burden in generating a nonlinear SVM for the large scale classification problems. The reduced (rectangle) kernel trick has been applied to many machine learning algorithms in cooperating with kernel functions. In this talk, we try to link the random selection small reduced set to random projection. It provides a new interpretation of RSVM via a compressed learning viewpoint. We utilized sparse coding to represent the kernel vectors in a high dimensional feature space and random project these sparse coded vectors into a lower dimensional compressed domain. Our empirical results show that the nonlinear SVM with full kernel, RSVM, linear SVM in the high dimensional feature space and linear SVM in the compressed space all of them have a very similar performance. We also find that solving a machine learning in compressed space is much easier than recovering a sparse signal. That means you can be more aggressively using a small reduced set in generating a classifier. However, if you want to reconstruct the original sparse vector from the compressed signal than the dimension of compressed space has to bigger than the size of reduced set.