IMAGe Seminar

Institute for Mathematics Applied to Geosciences at NCAR

Support Vector Machines for Classification Purposes: Recent Advances in Kernel Combination

Javier Gonzalez Hernandez
Escuela Politécnica Superior, Universidad Carlos III de Madrid

Abstract:

Support Vector Machines (SVM) have proven to be a successful method for the solution of a wide range of classification problems like classification, regression or density region estimation since they appeared in the early nineties.

By the choice of a class of functions known as kernels, Support Vector Machines map the data into a high dimensional space for estimating a linear decision function. This procedure can be studied within the framework of regularization theory and related with the original idea of the SVMs. The choice of the kernel is essential for the good performance of the technique, and kernel combinations have proven to outperform single kernel elections.

The motivation of this work is supported by the fact that in classification problems linear SVMs are optimal in the classical setting in which two normally distributed populations have to be separated. This assertion is supported by the fact that the SVM classifier approaches the optimal Bayes rule, and its generalization error converges to the optimal Bayes risk. Our aim in this work is to build a global kernel for general nonlinear classification problems that locally behaves as a linear (optimal) kernel. Within this approach we expect to avoid the problems due to the use of a general purpose kernel like the RBF kernel: in this latter case, the data are embedded in a high dimensional feature space, and problems of overfitting and poor generalization may appear.
Since the proposed kernel behaves locally as a linear kernel, the good properties of the SVM classifier will be inherited by our method. In particular, the number of support vectors will be much lower and, therefore, the generalization capability will be higher than that obtained using RBF kernels.

NCAR Mesa Laboratory, Chapman Room
1850 Table Mesa Drive, Boulder
Friday, July 20, 2007
10:00am
(Refreshments at 9:45am)

sgentile@ucar.edu