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Xue, Hui; Chen, Songcan; Yang, Qiang

Structural support vector machine.

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Summary: Support Vector Machine (SVM) is one of the most popular classifiers in pattern recognition, which aims to find a hyperplane that can separate two classes of samples with the maximal margin. As a result, traditional SVM usually more focuses on the scatter between classes, but neglects the different data distributions within classes which are also vital for an optimal classifier in different real-world problems. Recently, using as much structure information hidden in a given dataset as possible to help improve the generalization ability of a classifier has yielded a class of effective large margin classifiers, typically as Structured Large Margin Machine (SLMM). SLMM is generally derived by optimizing a corresponding objective function using SOCP, and thus in contrast to SVM developed from optimizing a QP problem, it, though more effective in classification performance, has the following shortcomings: 1) large time complexity; 2) lack of sparsity of solution, and 3) poor scalability to the size of the dataset. In this paper, still following the above line of the research, we develop a novel algorithm, termed as Structural Support Vector Machine (SSVM), by directly embedding the structural information into the SVM objective function rather than using as the constraints into SLMM, in this way, we achieve: 1) to overcome the above three shortcomings; 2) empirically better than or comparable generalization to SLMM, and 3) theoretically and empirically better generalization than SVM.

Keywords: support vector machine; structural information; Rademacher complexity; pattern recognition
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