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Intelligent Optimization Methods for High-Dimensional Data Classification for Support Vector Machines

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ABSTRACT

Support vector machine (SVM) is a popular pattern classification method with many application areas. SVM shows its outstanding performance in high-dimensional data classification. In the process of classification, SVM kernel parameter setting during the SVM training procedure, along with the feature selection significantly influences the classification accuracy. This paper proposes two novel intelligent optimization methods, which simultaneously determines the parameter values while discovering a subset of features to increase SVM classification accuracy. The study focuses on two evolutionary computing approaches to optimize the parameters of SVM: particle swarm optimization (PSO) and genetic algorithm (GA). And we combine above the two intelligent optimization methods with SVM to choose appropriate subset features and SVM parameters, which are termed GA-FSSVM (Genetic Algorithm-Feature Selection Support Vector Machines) and PSO-FSSVM(Particle Swarm Optimization-Feature Selection Support Vector Machines) models. Experimental results demonstrate that the classification accuracy by our proposed methods outperforms traditional grid search approach and many other approaches. Moreover, the result indicates that PSO-FSSVM can obtain higher classification accuracy than GA-FSSVM classification for hyperspectral data.

KEYWORDS

Support Vector Machine (SVM), Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Feature Selection, Optimization

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