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Consensus proximal support vector machine for classification problems with sparse solutions. (English) Zbl 1308.90105

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Summary: Classification problem is the central problem in machine learning. Support vector machines (SVMs) are supervised learning models with associated learning algorithms and are used for classification in machine learning. In this paper, we establish two consensus proximal support vector machines (PSVMs) models, based on methods for binary classification. The first one is to separate the objective functions into individual convex functions by using the number of the sample points of the training set. The constraints contain two types of the equations with global variables and local variables corresponding to the consensus points and sample points, respectively. To get more sparse solutions, the second one is l_1-l_2 consensus PSVMs in which the objective function contains an ℓ_1-norm term and an ℓ_2-norm term which is responsible for the good classification performance while ℓ_1-norm term plays an important role in finding the sparse solutions. Two consensus PSVMs are solved by the alternating direction method of multipliers. Furthermore, they are implemented by the real-world data taken from the University of California, Irvine Machine Learning Repository (UCI Repository) and are compared with the existed models such as ℓ_1-PSVM, ℓ_p-PSVM, GEPSVM, PSVM, and SVM-light. Numerical results show that our models outperform others with the classification accuracy and the sparse solutions.

MSC:

90C10 Integer programming
90C20 Quadratic programming
49M20 Numerical methods of relaxation type
65K05 Numerical mathematical programming methods

Keywords:

classification problems; support vector machine; proximal support vector machine; consensus; alternating direction method of multipliers

Software:

RSVM; UCI-ml

Full Text: DOI

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