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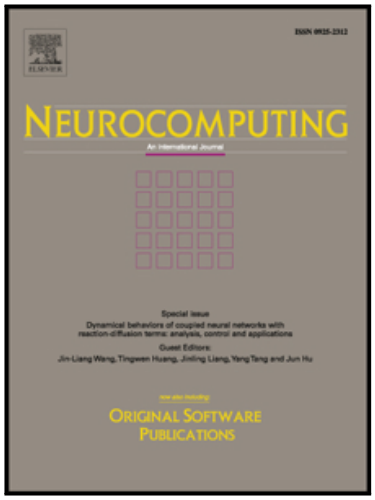

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Modified Frank–Wolfe Algorithm for Enhanced Sparsity in Support Vector Machine Classifiers

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Abstract

This work proposes a new algorithm for training a re-weighted ℓ_2 Support Vector Machine (SVM), inspired on the re-weighted Lasso algorithm of Candès *et al.* and on the equivalence between Lasso and SVM shown recently by Jaggi. In particular, the margin required for each training vector is set independently, defining a new weighted SVM model. These weights are selected to be binary, and they are automatically adapted during the training of the model, resulting in a variation of the Frank–Wolfe optimization algorithm with essentially the same computational complexity as the original algorithm.

As shown experimentally, this algorithm is computationally cheaper to apply since it requires less iterations to converge, and it produces models with a sparser representation in terms of support vectors and which are more stable with respect to the selection of the regularization hyper-parameter.

Keywords: Support Vector Machines, Sparsity, Frank–Wolfe, Lasso

1. Introduction

Regularization is an essential mechanism in Machine Learning that usually refers to the set of techniques that attempt to improve the estimates by biasing them away from their sample-based values towards values that are deemed to be

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