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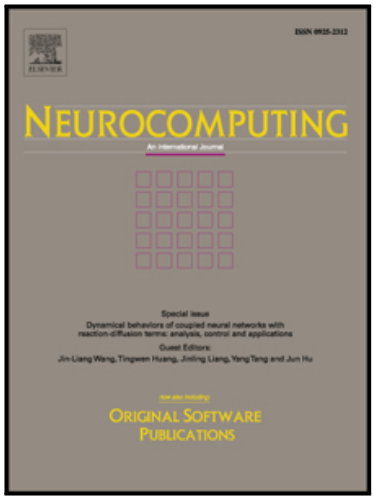

Group Feature Selection with Multiclass Support Vector Machine

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Group Feature Selection with Multiclass Support Vector Machine

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Abstract

Feature reduction is nowadays an important topic in machine learning as it reduces the complexity of the final model and makes it easier to interpret. In some applications, the features arise from multiple sources and it is not so important to select the individual features as to select the important sources. This leads to a group feature selection problem. In this paper, we consider the group feature selection in the multiclass classification setting based on the framework of support vector machines. We reformulate it as a sparse problem by prescribing the maximum number of active groups and propose a novel method based on the ADMM algorithm. We proposed the method in such a way that the main computational load is performed in the first iteration and the remaining iterations can be computed fast. This allows us to handle large problems. We demonstrate the good performance of our method on several real-world datasets.

Keywords: Group feature selection, Support vector machine, Multiclass support vector machine, Alternating direction method of multipliers, EEG channel selection

1. Introduction

Feature selection is an important procedure in many machine learning applications such as text classification or DNA analysis. It aims at selecting a small number of features which contain no irrelevant or redundant features. Besides identifying the important features, it helps to reduce the computational load and may improve the classification performance. In this work, we focus on supervised feature selection. They can be roughly grouped into three categories: Filter, wrapper, and embedded methods [13]. Filter methods evaluate the relevance of features via univariate statistics. The wrapper approach repeatedly uses a classifier to search for relevant features. Embedded methods perform variable selection as part of the learning procedure. Since filter methods usually evaluate all features independently they perform worse than wrapper or

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