

SUPERVISED FEATURE EXTRACTION BASED ON ONE-AGAINST-ALL SCHEME

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Abstract. Support vector machines (SVMs) as being good tools for classification problems has been proposed by Vapnik. This paper proposes a supervised feature extraction method based on One-against-All scheme for the multi-class classification problems. In this approach, after embedding all the classes into one feature space and constructing hyperplanes based on One-against-All scheme, we extract the orientation distance features between the examples and every hyperplanes in the space, and then map the new features into another feature space, finally utilize other algorithms to classify them. In order to examine the performance of the proposed approach, One-against-All, One-against-One and the introduced approach are compared using three UCI data sets. From the results, we reported that after mapping the examples two times, the training accuracy and generalization performance is enhanced more or less.

Keywords. Support Vector Machine; Multi-Class Classification; Supervised Feature Extraction; One-against-All Scheme; One-against-One Scheme.

AMS (MOS) subject classification: This is optional. But please supply them whenever possible.

1 Introduction

In recent years, support vector machines (SVMs) [1] have been introduced for solving pattern recognition problems because of their superior performance. The SVMs were developed based on the idea of structural risk minimizations, which guarantee the good general performance of the method. In this approach, one need to map the original data into the feature space and construct an optimal separating hyperplane with maximal margin in this space. The standard support vector machines (SVMs) were originally designed for binary classifications, as for multi-class classification problem, they are usually converted into binary ones. [2]

In the previous work, Vapnik [3] first proposed One-against-All scheme, in which a C -class problem is transformed into C binary classification problems. However, there exist some unclassifiable regions in it and the accuracies are very low. To overcome this drawback, Vapnik [4] introduced the