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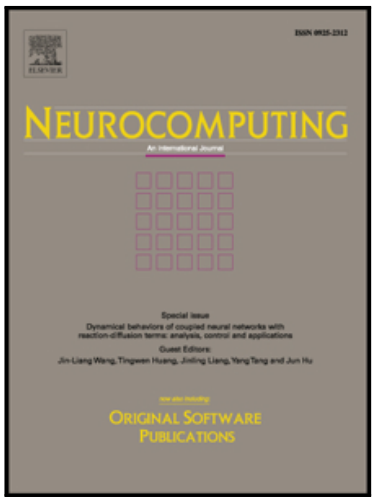

Twin Support Vector Machines: A Survey

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ACCEPTED MANUSCRIPT

Twin Support Vector Machines: A Survey

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Abstract Twin Support Vector Machines (TWSVM) is a new machine learning method based on the theory of Support Vector Machine (SVM). Unlike SVM, TWSVM would generate two non-parallel planes, such that each plane is closer to one of the two classes and is as far as possible from the other. In TWSVM, a pair of smaller sized quadratic programming problems (QPPs) is solved, instead of solving a single large one in SVM, making the computational speed of TWSVM approximately 4 times faster than the standard SVM. At present, TWSVM has become one of the popular methods because of its excellent learning performance. In this paper, the research progress of TWSVM is reviewed. Firstly, it analyzes the basic theory of TWSVM, then tracking describes the research progress of TWSVM including the learning model and specific applications in recent years, finally points out the research and development prospects. This helps researchers to effectively use TWSVM as an emerging research approach, encouraging them to work further on performance improvement.

Keywords Support vector machine, Twin support vector machines, Non-parallel planes, overview

1 Introduction

Support Vector Machine (SVM)[1-7] is a computationally powerful kernel-based tool for binary data classification and regression as our known. Based on the theory of structural risk minimization principle, SVM has successfully solved the high dimensionality and local minimum problems. Therefore, compared with other machine learning methods, such as artificial neural networks [8-35], SVM has better generalization performance. So far, SVM has achieved excellent performance in many real-world predictive data mining applications such as text categorization, time series prediction, pattern recognition and image processing, etc[36-51]. Although SVM research has made a lot of remarkable achievements, it still has many deficiencies with in-depth study. For example, those problems including the relationship between statistical learning theory and other theoretical system, the processing of big data, the choice of parameters, the generalization ability of a given problem and the limitations of the applications are still not well resolved[52-56]. Especially, with the rapid development of the internet and information systems, high dimension, distributed and dynamic complex data are quickly generated. However, SVM has encountered great difficulties in dealing with these complex data.

In order to reduce the computational complexity of SVM, at present, many improved algorithms

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