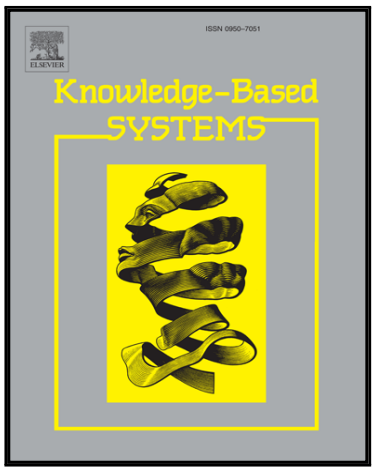

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PII: S0950-7051(18)30071-6
DOI: 10.1016/j.knosys.2018.02.025
Reference: KNOSYS 4233

To appear in: *Knowledge-Based Systems*

Received date: 12 November 2017
Revised date: 12 January 2018
Accepted date: 10 February 2018

Please cite this article as: Sebastián Maldonado, José Merigó, Jaime Miranda, Redefining Support Vector Machines with the Ordered Weighted Average, *Knowledge-Based Systems* (2018), doi: 10.1016/j.knosys.2018.02.025

Redefining Support Vector Machines with the Ordered Weighted Average

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Abstract

In this work, the classical soft-margin Support Vector Machine (SVM) formulation is redefined with the inclusion of an Ordered Weighted Averaging (OWA) operator. In particular, the hinge loss function is rewritten as a weighted sum of the slack variables to guarantee adequate model fit. The proposed two-step approach trains a soft-margin SVM first to obtain the slack variables, which are then used to induce the order for the OWA operator in a second SVM training. Originally developed as a linear method, our proposal extends it to nonlinear classification thanks to the use of kernel functions. Experimental results show that the proposed method achieved the best overall performance compared with standard SVM and other well-known data mining methods in terms of predictive performance.

Keywords: OWA operators, OWA quantifiers, Support vector machines, Hinge loss.

1. Introduction

Support Vector Machines (SVMs) [31] has gained popularity among researchers and practitioners thanks to its theoretical advantages, such as superior predictive performance, adequate generalization to new samples thanks to the Structural Risk Minimization (SRM) principle[32], and the absence of local minima via convex quadratic optimization [21, 31]. Support Vector Machines has been successfully applied in various domains, including computer vision [3], medical diagnosis [27], bioinformatics [7, 9, 22], and document classification [45], among others.

When dealing with data, it is necessary many times to aggregate the information in order to provide a representative view. In the literature, there are

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