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MIDPOINT VALIDATION METHOD FOR SUPPORT VECTOR MACHINES WITH MARGIN ADJUSTMENT TECHNIQUE

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Abstract. *In this paper, we propose a midpoint-validation method and margin adjustment technique which improves the generalization of Support Vector Machine. Margin adjustment technique enables the nearly effect as soft margin Support Vector Machine by adjusting parameter. The midpoint-validation method creates midpoint data, as well as a turning adjustment parameter of Support Vector Machine using midpoint data and previous training data. We compare its performance with the Support Vector Machine, soft margin Support Vector Machine, Multilayer Perceptron, Radial Basis Function Neural Network and also tested our proposed method on fifth benchmark problems. The results obtained from the simulation shows the effectiveness of the proposed method.*

Keywords: Support vector machine, Midpoint-validation method, Hill climbing technique, Margin adjustment technique

1. **Introduction.** Support vector machine (abbr. SVM) proposed by Vapnik [1] is one of the most influential and powerful tools for solving classification [2,13,14]. The main concept is based on the formation of a Lagrange multiplier equation combining both objective terms and constraints. The most attractive notions are the idea of the large margin and kernel. It has produced a remarkable performance in a number of difficult learning tasks without requiring prior knowledge and with guarantee on its generalization behavior due to the method of structural risk minimization.

A number of improved implementations of quadratic programming problems have been proposed to overcome problems such as decomposing into smaller problems like chunking, SVMLight [3], and Sequential Minimal Optimization. Other approaches of implementations to find the maximal margin are the Successive Over Relaxation, Relaxed Online Maximum Margin Algorithm, Active Support Vector Machine (abbr. ASVM) [4], and Lagrangian Support Vector Machines (abbr. LSVM) [5]. Also another category of implementation converts the problem to a problem of computing the nearest point between two convex polytopes and finding the closest points of opposite class like DirectSVM. Weston [9] proposed an algorithm to leverage the Universum by maximizing the number of observed contradictions, and showed experimentally that this approach delivers accuracy improvements over using labeled data alone.

We proposed a midpoint-validation method which improves the generalization of neural network [10]. This method creates midpoint data in input space, and calculates criteria using the midpoint data and previous training data. We stop training as soon as the criteria is higher than it was the last time it was checked. Further, we proposed the adjustment method of SVM from the result obtained from the SVM that used the midpoint data in input space [11]. This method updates the threshold value of SVM. SVM is