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MIDPOINT-VALIDATION METHOD OF NEURAL NETWORKS FOR PATTERN CLASSIFICATION PROBLEMS

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Abstract. *In this paper, we propose a midpoint-validation method, which improves the generalization of neural networks. The problem associated with the former cross validation method is that efficiency is affected due to the separation of training data into two or more set. As for the proposed method, it creates midpoint data from the known training data and calculates a set of criteria using the newly created midpoint data and the previous training data. The implementation is easy since there is no unnecessary processing involved in separating the data into two or more sets. The advantage of the proposed method is that the method becomes much more efficient compared to the former method due to the numerical simulation used.*

We compare its performance with those of the Support Vector Machine (abbr. SVM), Multilayer Perceptron (abbr. MLP), Radial Basis Function (abbr. RBF) and the proposed method was tested on several benchmark problems. The results obtained from the simulation carried out shows the effectiveness of the proposed method.

Keywords: Midpoint-validation method, Neural networks, Pattern classification problems

1. **Introduction.** The domains of neural network applications can be classified into two broad categories of recognition and generalization [1]. As for generalization, it resembles a black box of input-output relationship and it is expected to correctly predict the output for a particular input from the model it has learned through the training. Neural network based on generalization is an important field since there are many applications that can be benefit from such efforts. Thus, many related works on this area have been carried out by various authors. The main approach for generalization of neural networks is over fitting problem and appropriate training data [2][3].

Cross-validation method is typical technique used in order to prevent the occurrence of over fitting [4] and an evaluation method that has proven to be better than residuals. The disadvantage of using a residual evaluation is that it does not provide any indication of how well the learner will do when it is asked to make new predictions for data which has not already seen. This is resolved by refraining from using the entire data set when training a learner. Instead some of the data is removed before training begins and when training is done, the data that has been removed, are used to test the performance of the learned model on "new" data.

Training neural networks with additive noise is a typical technique that learns the appropriate training data [5]. This kind of training utilizes the empirical result and as a result the generalization improves when training with additive random noise as it does in training data or teacher signal.