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DOUBLE RULE LEARNING IN BOOSTING

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Abstract. *Boosting is an effective methodology for classification problems. AdaBoost is the most successful boosting algorithm that solved many practical difficulties of the earlier boosting algorithms. In this paper, we propose an improvement of AdaBoost, called DR-AdaBoost, in which a double-rule learning technique is used for improving the performance of AdaBoost. The DR-AdaBoost algorithm is evaluated with some classification problems of the UCI repository and it is also applied to a natural language processing task, text chunking. All experimental results show DR-AdaBoost outperforms AdaBoost. The improvement is significant, especially for those classification problems in which features are relevant.*
Keywords: Boosting, AdaBoost, Machine learning, Classification

1. **Introduction.** Recently, the boosting method has been received a great deal of attention in machine learning field. The main idea of boosting is to combine many simple and moderately accurate classification rules (hypotheses) into a single, highly accurate rule (the final or combined hypothesis). The simple classification rules are trained sequentially and, conceptually, each of them is trained on the examples which were the most difficult to classify by the preceding rules.

The most successful boosting algorithm is AdaBoost first introduced by Freund and Schapire [1]. AdaBoost solves many practical difficulties of the earlier boosting algorithms. Since its publication, AdaBoost has been the focus of considerable study and in addition a large number of related boosting algorithms have been put forward, such as [2, 3, 4].

Practically, Adaboost has many advantages. It is fast, simple and easy to program. It requires no prior knowledge about the weak learner and so can be flexibly combined with any method for finding weak classification rules.

AdaBoost has been tested on a set of UCI benchmark datasets [1]. The results of these experiments show boosting simple weak hypotheses such as decision stumps can usually give good results. In another set of experiments, it has been used for text categorization tasks [5]. In nearly all of these experiments and for all of the performance measures tested, AdaBoost performs as well as or significantly better than the other methods tested.

Boosting has also been applied to "ranking" problems [6], image retrieval [7], medical diagnosis [8], and some learning problems arising in natural language processing such as part-of-speech tagging [9], word sense disambiguation [10], named entity recognition [11], parsing [12].

It is widely recognized that AdaBoost provides superior results for classification tasks by combining many weak hypotheses into the final hypothesis. Since the weak hypotheses