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Pairwise meta-rules for better meta-learning-based algorithm ranking

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Abstract In this paper, we present a novel meta-feature generation method in the context of meta-learning, which is based on rules that compare the performance of individual base learners in a one-against-one manner. In addition to these new meta-features, we also introduce a new meta-learner called Approximate Ranking Tree Forests (ART Forests) that performs very competitively when compared with several state-of-the-art meta-learners. Our experimental results are based on a large collection of datasets and show that the proposed new techniques can improve the overall performance of meta-learning for algorithm ranking significantly. A key point in our approach is that each performance figure of any base learner for any specific dataset is generated by optimising the parameters of the base learner separately for each dataset.

Keywords Meta-learning · Algorithm ranking · Ranking trees · Ensemble learning

1 Introduction

Training a good model for a given dataset is one of the common tasks of a data analyst. The straightforward approach of simply applying and optimising all known learning algorithms is usually not feasible. Thus an experienced data analyst will generally perform some form of preliminary analysis and then focus on a few promising algorithms. This selection is guided by the prior experience of the analyst. Meta-learning tries to support and automate this process. It tries to predict the probably best or close to best algorithms, thus considerably reducing the amount of training and optimisation time needed for finding a good model on a given dataset. This reduction in resource consumption should be accompanied by no or only

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