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A novel network framework using similar-to-different learning strategy

Bhanu Prakash Battula · R. Satya Prasad

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Abstract Most of the existing classification techniques concentrate on learning the datasets as a single similar unit, in spite of so many differentiating attributes and complexities involved. However, traditional classification techniques are required to analyze the datasets prior to learning, and if not doing so, they loss their performance in terms of accuracy and AUC. To this end, many of the machine learning problems can be very easily solved just by carefully observing human learning and training nature and then mimicking the same in the machine learning. In response to these issues, we present a comprehensive suite of experiments carefully designed to provide conclusive, reliable, and significant results to the problem of efficient learning. This paper proposes a novel, simple, and effective machine learning paradigm that explicitly exploits this important similar-to-different (S2D) human learning strategy and implements it based on two algorithms (C4.5 and CART) efficiently. The framework not only analyzes the data sets prior to implementation, but also carefully allows classifier to have a systematic study so as to mimic the human training technique designed for efficient learning. Experimental results show that the method outperforms the state-of-the-art methods in terms of learning capability and breaks through the gap between human and machine learning. In fact, the proposed similar-to-different (S2D) strategy may also be useful in efficient learning of real-world complex and high-dimensional data sets, especially which are very typical to learn with traditional classifiers.

B. P. Battula (✉) · R. Satya Prasad
Acharya Nagarjuna University, Guntur, India
e-mail: Battulaphd@gmail.com

R. Satya Prasad
e-mail: profrsp@gmail.com

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1 Introduction

One of the research hotspots in the field of machine learning is classification. There are different types of classification models, such as decision trees, SVM, neural networks, Bayesian belief networks, and genetic algorithm. The simple structure, wide applicability to real-time problems, high efficiency, and high accuracy are the strengths for decision trees. In recent years, many authors proposed improvements to the learning strategy of decision trees (Mahmood et al. 2011; Mahmood and Kuppa 2010). The use of expert knowledge in pruning decision trees for applicability in medical analysis is proposed by (Mahmood and Kuppa 2012). A large number of classifiers build the model of data sets for classification by using the traditional learning strategies. On the other hand, traditional learning techniques are the bottleneck of performance of the data sets. However, several investigations also suggest that there are other factors that contribute to such performance degradation, for example size of the data set, density of the data set, and overall complexity of the data set. This work focuses on the analysis of improved learning strategy for the open problems related to complex and high-dimensional data sets.

In this paper, we propose a novel, simple, and effective machine learning paradigm that explicitly exploits this important similar-to-different learning strategy, called S2D (similar to different). We explicitly exploit and implement this similar-to-different learning strategy, a ubiquitous human learning strategy, in the machine learning research. Its applications in human-oriented learning tasks, especially

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