FUZZY DEMPSTER-SHAFER MODELLING AND DECISION RULES

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Fuzzy modeling is regarded to be one of the possible classification architecture of machine learning and data mining. There have been a significant number of studies devoted to generating fuzzy decision rules from sample cases or examples. These include attempts to extend many classical machine learning methods to learn fuzzy rules. One very popular approach is decision trees [8]. Since the inception of this concept, it has been extended for the construction and interpretation of more advanced decision trees [1,3,4,5,7,10,11]. Although the decision trees based methods can extract a set of fuzzy rules which works well, a problem is that the lack of backtracking in splitting the node leads to lower learning accuracy comparing to other machine learning methods. Another widely used machine learning method is artificial neural network. In recent years enormous work has been done in attempt to combine the advantages of neural network and fuzzy sets. Hayashi [2] has proposed to extract fuzzy rules from trained neural net. Lin [6], on the other hand, introduced a method of directly generating fuzzy rules from self-organized neural network. The common weakness of neural network, however, is a problem of determination of the optimal size of a network configuration, as this has a significant impact on the effectiveness of its performance. The objective of this study is to employ the Dempster-Shafer theory (DST) as a vehicle supporting the generation of fuzzy decision rules. More specifically, we concentrate on the role of fuzzy operators, and on the problem of discretization of continuous attributes. We show how they can be effectively used in the quantization of attributes for the generation of fuzzy rules.

The material is arranged in the following way. First, we summarize the underlying concepts of the Dempster-Shafer theory and briefly discuss the nature of the underlying construction. By doing so, the intend is to make the presentation self-contained and help identify some outstanding design problems emerging therein. Next we explain essentials of our model and finally, we report exhaustive experimental studies.

This paper is a continuation of our earlier work [9]. Here we apply theoretical vehicle, introduced in previous research, to the new input data in order to find possible area of application. Our important objective here is to reveal a way in which this approach becomes essential to a more comprehensive treatment of continuous attributes.

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