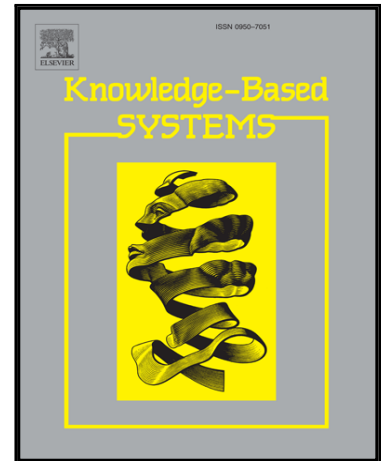


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A Novel Three-way Decision Model with Decision-theoretic Rough Sets using Utility Theory

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Abstract

In the classical three-way decision (3WD) model with decision-theoretic rough sets (DTRSs), the classification correct rate (CCR) is an important issue. As one of the risk measurement methods, loss functions have been used to calculate thresholds. Using risk measurement methods relevant research has yielded many results. However, for improving the CCR, few research studies have focused on the risk measurement by considering the difference among the equivalence classes. In this paper, from the viewpoint of the difference among the equivalence classes, to improve the CCR, a novel model is proposed to derive the 3WD model with DTRSs by considering the new risk measurement functions through the utility theory. First, the weight of each attribute is calculated based on the knowledge distance. Then, with the aid of utility theory, the improved utility function, which can score the attribute values, is defined. Further, a reasonable model for constructing the utility-based scoring functions is proposed. Then, a decision procedure for calculating the exclusive thresholds is designed and the rules of three-way decisions (3WDs) are deduced. An example is presented to illustrate the proposed model and the trend of change for exclusive thresholds. Finally, our experimental results show that the performance of the proposed model is better than that of current existing models.

Keywords: Decision-theoretic rough sets, Three-way decisions, Risk

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