RISK CLASSIFICATION BY FUZZY CLUSTER

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Abstract

In this paper, an algorithm for risk classification is proposed. This algorithm is based on the concepts of fuzzy cluster. For a given set of n risks $R = \{v_1, \ v_2, \ ..., \ v_n\}$, each of which is described by a feature vector $v_i = (a_{i1}, \ a_{i2}, \ ..., \ a_{im})$, we first determine the similarity s_{ij} between the pair of risks v_i and v_j, and obtain an $n \times n$ similarity matrix $S^{(0)} = \left[s_{ij}^{(0)} \right]$, which is a fuzzy matrix. Then we propose the following iterative algorithm

$$s_{ij}^{(k)} = s_{ij}^{(k-1)} \vee \left(s_{ik}^{(k-1)} \wedge s_{kj}^{(k-1)} \right) \qquad \text{for } k \geq 1,$$

to obtain a sequence of fuzzy matrices
$S^{(0)}, \ S^{(1)}, \ S^{(2)}, \ ..., \ S^{(k)}, ...,$ where $S^{(k)} = \left[s_{ij}^{(k)} \right]$. We prove that there exists a number $\overline{K} \leq n$ such that for any $k \geq \overline{K}$, $S^{(k)} = S^{(\overline{K})}$. The fuzzy matrix $S^{(\overline{K})}$ is the transitive closure of $S^{(0)}$, and a fuzzy equivalence matrix. Each α-cut of the matrix $S^{(\overline{K})}$ represents a classification among the risks in R, with different values of α yielding different classifications. We test our algorithm with two examples, the results are very promising.