Fuzzy and crisp binary relation reduction: applications for data summarization and anomalies detections

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Starting from fuzzy or crisp binary relations, in this research, we use fuzzy formal concept analysis to reduce the relation size to only keep the minimal domain or range size, without losing knowledge (i.e., association or implications extracted from reduced binary relations are identical at given precision level to the initial relations ones). More specifically, we develop a fuzzy extension of a previously proposed algorithm for crisp relation reduction without "loss of knowledge". The fuzzy Galois connection based on the Lukasiewicz implication is mainly used in the definition of the closure operator according to a precision level (1). The proposed published reduction algorithms have extensively been used these 20 years for machine learning, data sampling, image processing, anomaly detection of software during its normal execution, and extractive text summarization (2,3,4,5,6,7). The perspectives and applications are even larger than the already published domains citing the initial paper (1). Relational Algebraic methods might be used for better mathematization of the structures of the different levels of reductions of a binary relation. Intelligence behind it might be used in the future in the new era of AI.

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