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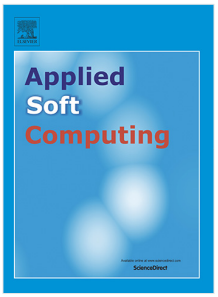

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Attribute Reduction in Incomplete Ordered Information Systems with Fuzzy Decision

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Abstract

Rough set theory has been applied extensively to attribute reduction. Classical rough sets provide a theoretical framework for attribute reduction based on complete data with regular attributes where the domains are not ordered by preference. However, their scope does not include incomplete data with fuzzy decisions under a preference-ordered domain, which are common in real real-world applications. Therefore, in this study, a general framework is proposed for attribute reduction from incomplete ordered information systems with fuzzy decisions by combining dominance-based rough sets with α-cut sets, where α is the fuzzy decision attribute value. First, the judgement theorems and discernibility functions are established by applying Boolean reasoning techniques to attribute reduction in consistent and inconsistent incomplete ordered information systems with fuzzy decision. In addition, forward and backward attribute reduction algorithms are designed for consistent and inconsistent systems, respectively, to find near-optimal attribute reducts. Finally, the experimental results based on different datasets, demonstrate that the proposed algorithms are more effective for attribute reduction in most cases than other reduction algorithms.

Keywords: Attribute reduction; Rough sets; Incomplete data; Information system; Fuzzy decision

1. Introduction

Previous studies have demonstrated that rough set theory generalised from classical set theory is a useful tool in fields such as knowledge discovery, decision analysis, and data mining [22, 23, 33, 34]. The rough set approach uses only internal knowledge, avoids external parameters, and does not rely on prior model assumptions such as a probabilistic distribution in statistical methods