Chapter 15 [1]

MINING HUMAN INTERPRETABLE KNOWLEDGE WITH FUZZY MODELING METHODS: AN OVERVIEW

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Abstract: This chapter focuses on one particular class of data mining methodologies that expresses the mined knowledge in the form of fuzzy If-Then rules or fuzzy decision trees that can be easily understood by a human. Past studies on generating fuzzy If-Then rules (mostly from exemplar crisp data and a few from exemplar fuzzy data) are grouped into six major categories: grid partitioning, fuzzy clustering, genetic algorithms, neural networks, hybrid methods, and others. The representative method in each category is detailed. The latest improvements and advancements in each category are also reviewed. Similarly, past studies on generating fuzzy decision trees (from exemplar nominal and/or numeric data as well as from exemplar fuzzy data) are surveyed. The essence of each method is presented. Moreover, we discuss selected studies that address most of the necessary conditions for a fuzzy model to be interpretable and highlight areas for future studies. To give an idea of where fuzzy modeling methods have been applied, major application areas are also summarized.

Key Words: Data mining, Fuzzy modeling, Fuzzy clustering, Genetic algorithms, Neural networks, Fuzzy-neural networks, Fuzzy If-Then rules, Fuzzy decision trees.