Rough Set Approaches to Data Mining

Abstract: Rough set theory provides useful tools for reasoning from data. Attribute reduction and rule induction are well developed techniques based on rough set theory. They are applied to various fields including data analysis, signal processing, knowledge discovery, machine learning, artificial intelligence, medical informatics, decision analysis, granular computing, Kansei engineering, and so forth. In the approach, the lower approximation (a set of objects whose classification is consistent in all given data) and upper approximation (a set of possible members in view of given data) are calculated for each decision class.

In this talk, we introduce rough set approaches to data analysis. After describing fundamentals of the classical rough sets, several methods for attribute reduction and minimal length rule induction are introduced. Then generalization and extension of rough set approaches are shown. First, we describe relation-based generalizations of rough sets and data analysis based on them. In these approaches, the indiscernibility relation which is an equivalence relation in the classical rough sets is generalized to any relation. General approaches from two different viewpoints are described. Two special cases, i.e., rough set approaches under dominance relation and missing values, demonstrate the usefulness of the approaches. Second, we extend the classical rough set approaches to the analysis of imprecise decisions. By considering the imprecise decisions, we show that a hierarchy of attribute reduction and a different aspect of attribute importance can be analyzed. Moreover, we demonstrate that a set of imprecise decision rules works better than a set of precise decision rules. This property is applied to a privacy protection in data publication. Throughout this talk, we show the ideas of rough set approaches potentially applicable to various fields involving data analysis.

Biography: Masahiro Inuiguchi received B.E., M.E. and D.E. degrees in industrial engineering at Osaka Prefecture University, in 1985, 1987 and 1991. He worked as a Research Associate at Osaka Prefecture University (1987-1992), Associate Professor at Hiroshima University (1992-1997), Associate Professor at Osaka University (1997-2003). At present, he is a Full Professor at Osaka University. His interests include possibility theory, fuzzy programming, rough sets and multiple criteria decision analysis with interval models. He works as area editor of Fuzzy Sets and Systems (FSS), Fuzzy Optimization and Decision Making (FODM), and Journal of Multiple Criteria Decision Analysis (MCDA), as the associate editor of ITOR and 4OR, and members of editorial boards of several other Journals including EJOR.