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Title of the talk: Rough Set Approaches to Imprecise Modeling

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. The lower approximation of each decision class has been majorly used for obtaining attribute reduction and rule induction, so far. However, as is known in the literature, the replacement of the lower approximation with the upper approximation provides a different aspect of the analysis.

In this presentation, we assume that a decision table with multiple decision classes (more than two decision classes) is given. From the speaker's study on rough set and imprecise modeling, we show some results obtained by using the lower approximation of each union of k decision classes instead of the lower approximation of each decision class. This approach can be seen as a rough set approach to imprecise modeling because it provides the analysis based on the preservation of imprecise classification, i.e., correct classification up to k possible decision classes. We describe the following recent results obtained by the replacement of the lower approximation of each decision class with that of each union of k decision classes:

(1) The attribute reduction based on the lower approximation of each union of k decision classes provides an intermediate between two extreme attribute reductions using the lower and upper approximations of each decision class. The two extremes are obtained by the special selections of parameter k.
(2) The evaluation of attribute importance changes drastically by the selection of parameter k. It implies that we cannot evaluate the attribute importance univocally.
(3) The classifier build with decision rules induced based on each union of k decision classes achieves a better performance than the classifier with decision rules of each decision class.
(4) We may utilize the imprecision and the bigger support of decision rules of each union of k decision classes for the protection of data privacy.

Finally, we conclude this presentation by giving some topics for future studies.

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), and at Osaka University (1997-2003). From 2003, he is a Full Professor at Osaka University. His interests include possibility theory, fuzzy optimization, rough sets, multiple criteria decision analysis and imprecise modeling. He wrote more than 130 journal papers and more than 200 international conference papers, and edited seven books. He won the Sawaragi Commemoration Award for Encouragement from the Institute of Systems, Control and Information Engineers in 1991, Encouragement Award from Japan Society for Fuzzy Theory and Systems in 1993, Best

Paper Award from Japan Society for Fuzzy Theory and Systems in 1997 & 2013, Best Paper Award at the 2013 Joint Rough Set Symposium in 2013 and so on. He was elected to the grade of IRSS Senior Member from The International Rough Set Society in 2015. He works as an area editor of Fuzzy Sets and Systems, Fuzzy Optimization and Decision Making and Journal of Multi-Criteria Decision Analysis, associate editor of International Transactions in Operational Research, and as an editorial board member of European Journal of Operational Research, LNCS Transactions on Rough Sets, Journal of Mathematical Modelling and Algorithms in Operations Research, and many other International Journals.