

F-granulation, Generalized Rough Sets and Entropy: Uncertainty Analysis, Pattern Recognition and Applications

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Summary

The role of rough sets in uncertainty handling and granular computing is described. The significance of its integration with other soft computing tools and the relevance of rough-fuzzy computing, as a stronger paradigm for uncertainty handling, are explained. Different applications of rough granules and certain important issues in their implementations are stated. Three tasks such as class-dependent rough-fuzzy granulation for classification, rough-fuzzy clustering and defining generalized rough sets for image ambiguity measures and analysis are then addressed in this regard, explaining the nature and characteristics of granules used therein.

Merits of class dependent granulation together with neighborhood rough sets for feature selection are demonstrated in terms of different classification indices. Significance of a new measure, called "dispersion" of classification performance, which focuses on confused classes for higher level analysis, is explained in this regard. Superiority of rough-fuzzy clustering is illustrated for determining bio-bases (c-medoids) in encoding protein sequence for analysis. Generalized rough sets using the concept of fuzziness in granules and sets are defined both for equivalence and tolerance relations. These are followed by the definitions of entropy and different image ambiguities. Image ambiguity measures, which take into account both the fuzziness in boundary regions, and the rough resemblance among nearby gray levels and nearby pixels, have been found to be useful for various image analysis operations

The talk concludes with stating the future directions of research and challenges.