

Towards Designing Human Centric Systems: A New View at System Modeling with Granular Membership Grades

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Abstract. Modeling with the use of fuzzy sets (fuzzy modeling), rough sets (rough modeling) or information granules, in general, offers an interesting modeling alternative. Fuzzy modeling has been around for several decades and over this time there have been a number of interesting conceptual developments, modeling architectures, and algorithmic pursuits. Fuzzy sets used as integral components are regarded as numeric constructs. Subsequently, in light of this, models are inherently numeric. The objective here is to study a new avenue of fuzzy modeling - granular fuzzy modeling where instead of being numeric, fuzzy sets are represented by some granular counterparts such as e.g., interval fuzzy sets, shadowed sets, or fuzzy fuzzy (fuzzy²) sets. Several ways of constructing (transforming) numeric membership functions into granular constructs (granular mappings) are conceptualized along with the detailed algorithmic aspects.

Regarding granular fuzzy models in which granular membership functions are utilized, two representative studies are presented. The first one is concerned with a granular interpretation of temporal data where the role of information granularity is profoundly visible when effectively supporting human-centric description of relationships existing in data. In the second study, we focus on the Analytic Hierarchy Process (AHP) studied in decision-making.