

Approximation of Proximities by Aggregating T -indistinguishability Operators

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Abstract

For a continuous Archimedean t -norm T a method to approximate a proximity relation R (i.e. a reflexive and symmetric fuzzy relation) by a T -transitive one is provided.

It consists of aggregating the transitive closure \bar{R} of R with a (maximal) T -transitive relation B contained in R using a suitable weighted quasi-arithmetic mean to maximize the similarity or minimize the distance to R .

Keywords: Proximity, Transitive Closure, Transitive Opening, T -indistinguishability Operator, Aggregation Operator.

1 Introduction

T -indistinguishability operators are one of the most important kind of fuzzy relations since they fuzzify the concept of crisp equality and crisp equivalence relation. They were introduced by Zadeh in 1971 [14] and have been the subject of many papers ([3],[6],[10],[13]).

Proximity matrices, also called tolerance relations (i.e., reflexive and symmetric fuzzy relations on a finite universe X) appear in many situations, such as cluster analysis, information systems, image clustering,....

Reflexivity and symmetry are important properties in Decision Making problems when the knowledge is modeled by a fuzzy relation. Tolerance relations contain information related to how close or similar the objects of a universe are and can be built from a decision table. However, when the relation must be used as a similarity or indistinguishability to compare or classify objects, some coherence between their relations is needed. T -transitivity becomes then relevant and must