

Seminario de Estadística e Investigación Operativa I



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Transitivity of reciprocal relations

The purpose of this lecture is twofold. First, we present a general framework for studying the transitivity of reciprocal relations. The key feature is the cyclic evaluation of transitivity: triangles are visited in a cyclic manner. An upper bound function acting upon the ordered weights encountered provides an upper bound for the `sum minus 1' of these weights. Commutative quasi-copulas allow to translate a general definition of fuzzy transitivity (when applied to reciprocal relations) elegantly into the framework of cycle-transitivity. Similarly, a general notion of stochastic transitivity corresponds to a particular class of upper bound functions. Ample attention is given to self-dual upper bound functions. Second, we establish a pairwise comparison method for random variables. This comparison results in a reciprocal relation on the given set of random variables. The transitivity of this reciprocal relation is investigated in the case of independent random variables, as well as when these random variables are pairwisely coupled by means of a copula, more in particular the minimum operator or the Lukasiewicz t-norm. A deeper understanding of this transitivity, which can be captured only in the framework of cycle-transitivity, allows to identify appropriate strict or weak cutting levels, depending upon the copula involved, turning the reciprocal relation, but is always one-way compatible with the classical concept of stochastic dominance. The proposed method can therefore also be seen as a way of generating graded as well as on-graded variants of that popular concept.

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