Random Utility Representations of Finite m-ary Relations
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Block and Marschak (1960) discussed the relationship between a probability distribution over the class of strict linear rankings on a given set and a family of jointly distributed random variables. The present paper generalizes this random variable (random utility) representation to m-ary relations. It specifies conditions on an N-dimensional random vector that allow us to induce a probability distribution over a given collection of m-ary relations on an N element set. Vice versa conditions are presented for a probability distribution on such a collection of m-ary relations to induce an N-dimensional random vector. In particular, random utility representations of betweenness relations, weak orders and semi-orders are reported in examples. It is shown that in these specific cases the conditions on the random vector are either trivial or they reduce to the noncoincidence of the corresponding family of random variables. Noncoincidence (Falmagne & Regenwetter, 1993) means that the probability of two random variables taking the same value is zero. The paper thus extends the concept of random utility to more general preference relations than strict linear orders.