

Polytopes in mathematical psychology

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Abstract

Polytopes are the multidimensional analogues of convex polygons and polyhedra. In mathematical psychology, they often appear as the sets of real vectors satisfying a given model. Starting from the celebrated example of the multiple choice polytope as it was characterized by Falmagne (1978), we consider several other illustrations. One of the main questions is to obtain an efficient description of the model. In geometric terms, the question amounts to the search of a complete list of the facet-defining inequalities of the resulting polytope (plus maybe some linear equations). Some cases turn out to be tractable, others are not. We also briefly mention other polytopes, formed by all the representations of a semiorder (a term introduced by Luce, 1956) or of a biorder (a term introduced by Doignon, Ducamp and Falmagne, 1984).