

Properties of Homogeneity Analysis of Dichotomous Test Items

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Abstract

In general, dichotomous scores with a latent dominance structure are analyzed by unidimensional item response models, either parametric (Lord, 1952; Birnbaum, 1968) or nonparametric (Mokken, 1971). However, homogeneity analysis, a data-analytic approach with a long history and originating from Guttman's (1941) approach of principal component analysis of categorical variables, has demonstrated to be informative for unidimensional item response gauges in general and the item difficulties in particular. Gifi (1981) noted that under certain conditions the homogeneity quantifications for both the correct and incorrect group provide the correct ordering of the item difficulties. Gifi (1981) gave an outline of the proof, and Schriever (1985) formalized it. Schriever proved that the necessary conditions for correct ordering are double monotonicity, in the sense of Mokken (1971), and totally positivity of the tracelines of order 2, thereby deriving testable mathematical properties for the data. In the present paper we will present even stronger properties (compared to ordering) of homogeneity analysis with respect to location families, accompanied with the mathematical assumptions.

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