R Package MAT: Simulation of Multidimensional Adaptive Testing for Dichotomous IRT Models

Applied Psychological Measurement
2015, Vol. 39(3) 239–240
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DOI: 10.1177/0146621614567940
apm.sagepub.com

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Keywords

computerized adaptive testing, item response theory, computer program

Multidimensional adaptive testing (MAT) is ideal for testing situations that require the estimation of two or more distinct, albeit correlated latent abilities. MAT offers a number of advantages over unidimensional adaptive testing, such as more adequate coverage of content (Segall, 1996), increased measurement efficiency for variable-length tests (Segall, 1996), and increased measurement precision for fixed-length tests (Wang, Chen, & Cheng, 2004). Simulation of MAT on both empirical and generated data is useful for developing computerized adaptive testing (CAT) systems and for teaching the principles of MAT.

Program Description

The R package MAT simulates MAT for the multidimensional three-parameter logistic model (Reckase, 2009) and its nested variants. The program supports several item selection criteria (Mulder & van der Linden, 2009), content balancing (Kingsbury & Zara, 1989), content ordering, exposure control (Revuelta & Ponsoda, 1998), and stopping criteria. Person parameters are estimated using the maximum a posteriori estimator. Users may request diagnostic plots of individual-level CAT audit trails and group-level correlations between latent abilities.

The back-end engine of the program was developed in C++ for computational efficiency and the front-end input/output options were developed in R. Packages Rcpp (Eddelbuettel et al., 2011) and RcppArmadillo (Francois, Eddelbuettel, & Bates, 2012) were used for seamless integration between R and C++ code.

Availability, Documentation, and Distribution

The R package MAT can be downloaded at no charge from the Comprehensive R Archive Network (CRAN) at <http://www.cran.r-project.org> and is compatible with Windows, Mac OS, and Linux platforms.

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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