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On the construction of shortened, yet maximally informative tests

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Abstract

Cognitive diagnostic models (CDMs) and the competence-based extension of knowledge space theory (KST) provide the frameworks for identifying individuals skill profiles from their responses to test items. Tests pertaining to broad disciplinary domains might consist of large numbers of items, thus resulting in long and exhausting assessments. Nevertheless, resorting to computerized adaptive testing might not be the solution (e.g., the necessary hardware may not be available, fairness issues could be raised in high-stakes testing). The talk deals with the construction of shortened forms of tests that are as informative about individuals skill profiles as the original full-length forms. Given a certain test, the procedure will allow the construction of shortened forms of this test that may differ from one another with respect to the items that are selected from the original test, but are the same with respect to the assessment of individuals skill profiles. In addition, the procedures will allow the construction of tests that are minimal, in the sense that no item can be deleted from these tests without the accuracy of the assessment being impaired. The construction of shortened forms of conjunctive (each item is associated with a unique set of skills that is minimally sufficient for solving it) and disjunctive (for all the items, each of the skills assigned to a certain item is sufficient for solving it) tests is considered. The functioning of the shortened and full-length tests is investigated through the application of probabilistic models (DINA, DINO, and their KST counterpart CBLIM) to simulated and real data.

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