

Bayesian Item Selection Criteria in Constrained Adaptive Testing

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Abstract

Computerized adaptive testing (CAT) stands in the long tradition of individualized testing. It can be compared with an oral exam where a computer program acts as the examiner. Like such exams, the difficulty of the items is adapted to the ability of the candidate. So, the examinees do not get bored or frustrated due to items that are too easy or too hard. Several selection rules can be applied to guide this adaptive item selection.

In this paper, the focus is on Bayesian alternatives. Owen's criterion (Owen, 1975), Posterior Expected Kullback-Leibler information (Kullback, 1959), Maximum Posterior-Weighted information, and Maximum Expected information will be dealt with.

To compare these criteria in a realistic setting, constraints on test attributes were added to the problem. When constraints have been specified, the Shadow Test Approach (van der Linden, 2000) can be applied. For this problem it encounters a few problems. The approach had to be modified. The performances of the STA and the modified-STA were compared. No differences with respect to MSE and bias of resulting CATs were found. Besides, the results of Bayesian item selection criteria are compared to item selection based on Fisher Information. The results showed a substantial improvement of MSE and bias when the Bayesian selection criteria were applied.

References

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