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Evaluating Learner Performance in Online Platforms By Exploiting Waiting-Time Distributions

This paper presents a novel framework for designing adaptive testing procedures by leveraging the properties of waiting-time distributions. The proposed approach integrates temporal information - specifically, the time needed for a specific sequence of correct answers to be realized—into the testing process, enabling a more dynamic and individualized assessment of examinee performance. By modeling waiting times as probabilistic indices of latent ability, cognitive load, or engagement, the framework facilitates real-time adjustment of item difficulty or sequencing. The findings demonstrate that adaptive design leads to substantial reductions in the expected test length while maintaining statistical rigor, offering a practical and efficient tool for modern computerized adaptive testing systems.

Special/ Invited session

Classification

Both methodology and application

Keywords

Computerized adaptive testing; Markov decision models; stochastic modeling; three-level test structure; probabilistic transition matrices; educational measurement; performance evaluation; simulation in R

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Track Classification: Statistical/Stochastic Modelling