Application of Binary Search Algorithms to Item Exposure Control in Cognitive Diagnostic Computerized Adaptive Testing

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Abstract
Cognitive diagnosis has emerged as a new generation of testing theory for educational assessment after item response theory. One distinct feature of cognitive diagnostic models (CDMs) is that they assume the latent traits to be discrete instead of continuous. From this perspective, cognitive diagnosis bears a close resemblance to search problems in computer science; thus, item selection problem in cognitive diagnostic computerized adaptive testing (CD-CAT) can be considered as a dynamic search problem. Previous item selection algorithms in CD-CAT were developed from an information science perspective that attempt to achieve a balance among several objectives using differential weights. In addition to the challenges associated with determining the optimal weights, satisfying competing goals make these algorithms inefficient. Based on the search problem perspective, this article adapts the binary search algorithm to item selection in CD-CAT. The two new methods, the stratified dynamic binary search algorithm for fixed-length CD-CAT and the dynamic binary search algorithm for variable-length CD-CAT, can achieve multiple goals without any of the aforementioned issues. Simulation studies indicate that their performances are comparable, if not superior to that of previous methods.

About the Speaker
Dr. Russel Chanjin Zheng is an associate professor at the Department of Educational Psychology of the East China Normal University. He received his PhD degree from the University of Illinois at Urbana-Champaign in 2015. His primary research interests include item response theory and cognitive diagnostic models, and their applications in computerized adaptive testing (CAT and CD-CAT). Since 2011, he has authored/co-authored over 15 refereed journal articles in high-ranking journals, including Applied Psychological Measurement and Journal of Educational and Behavioral Statistics.

Everyone is welcome to attend!

If interested, please confirm your attendance by sending an email to xqliu@hku.hk.