



The University of Chicago
Department of Statistics

Seminar Series

LI CAI

Graduate School of Education & Information Studies
University of California at Los Angeles

**A Two-tier Item Factor Analysis
Model with Applications**

WEDNESDAY, January 5, 2011, at 4:00 PM

133 Eckhart Hall, 5734 S. University Avenue

Refreshments following the seminar in Eckhart 110.

ABSTRACT

Motivated by full-information item bifactor analysis (Gibbons & Hedeker, 1992; Gibbons et al., 2007), I develop a two-tier item factor model in this research. The modeling framework subsumes standard multidimensional IRT models, bifactor IRT models, and testlet response theory models as special cases. Features of the model lead to a reduction in the dimensionality of the latent variable space and consequently significant computational savings. Based on the dimension reduction results, I implement an efficient EM algorithm for full-information maximum marginal likelihood estimation. To illustrate the model's broad range of applicability, a number of real data sets are analyzed. I use student-level data from the Program for International Student Assessment, a large-scale educational survey that contains numerous content clusters/testlets to show that the two-tier model can potentially help increase measurement precision in the presence of nuisance dimensions. Using a public health survey administered to adolescents, I demonstrate how the two-tier model can effectively handle longitudinal item response data. I discuss a linking study (Thissen et al., 2010) that uses the two-tier model to produce a projection linking of a legacy pediatric asthma impact scale with the PROMIS (Patient Reported Outcomes Measurement Information System) scale. Issues related to statistical inference, model fit testing, differential item functioning, and IRT scoring are discussed.

Joint seminar with Departments of Statistics and Health Studies, and Committee on Education.

For further information and about building access for persons with disabilities, please contact Laura Rigazzi at 773.702.8333 or send email (lrigazzi@galton.uchicago.edu). If you wish to subscribe to our email list, please visit the following web site: <https://lists.uchicago.edu/web/info/statseminars>.