



THE UNIVERSITY OF  
**CHICAGO**

Department of Statistics  
**STATISTICS COLLOQUIUM**

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**Statistical Inference for Diagnostic  
Classification Models**

**MONDAY, February 18, 2013 at 4:00 PM**

133 Eckhart Hall, 5734 S. University Avenue

*Refreshments following the seminar in Eckhart 110*

**ABSTRACT**

Diagnostic classification models (DCM) are an important recent development in educational/psychological testing. Instead of an overall test score, a diagnostic test provides each subject with a profile detailing the concepts and skills (often called “attributes”) that he/she has mastered. Central to many DCMs is the so-called Q-matrix, an incidence matrix specifying the item-attribute relationship. It is common practice for the Q-matrix to be specified by experts when items are written, rather than through data-driven calibration. Such a non-empirical approach may lead to misspecification of the Q-matrix and substantial lack of model fit, resulting in erroneous interpretation of testing results. This talk is concerned with data-driven construction (estimation) of the Q-matrix and related statistical issues of DCMs. I will first give an introduction to DCMs and an overview of recent developments, followed by a discussion of key issues and challenges. I will then present some fundamental results on the learnability of the Q-matrix, including sufficient and necessary conditions for it to be identifiable from data. I will also present a data-driven construction of the Q-matrix and estimation of other model parameters, and show that they are consistent under certain identifiability conditions.

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