Statistical Sciences
UNIVERSITY OF TORONTO

SEMINAR

March 27, 2014 at 3:30pm

Sidney Smith Hall, Room 1074

Refreshments will be served at 3:15pm

Statistical Inference for Diagnostic Classification Models

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Diagnostic classification models (DCM) are an important recent development in psychological/educational 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 the common practice that the Q-matrix is specified by experts when items are written rather than through data-driven calibration. Such a non-empirical approach may lead to mis-specification of the Q-matrix and substantial lack of model fitting, 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 discussions on 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 identifiability conditions.