There has been an increasing interest in assessing students’ learning progress across time points. With the ability to measure students’ mastery or nonmastery of multiple skills, Cognitive Diagnosis Models (CDMs) have been applied lately in the assessment of learning by a lot of researchers. Hidden Markov Models with covariates, with CDMs as the underlying measurement models, can be used to estimate both students’ learning trajectory over time and the strength of the influence of covariates, such as students’ learning ability and instructional materials’ effectiveness, on students’ learning outcome. It thus offers us a great tool to not only understand a learner’s strengths and weaknesses at each stage of learning, but also identify factors that may contribute to the probability of acquiring a new skill, which can be used to design optimal learning paths and materials for each student.

The half-day workshop intends to cover the following:

- An introduction to Hidden Markov Model and Cognitive Diagnosis Models;
- A brief overview of selected recent literature on the use of HMM in the CDM context;
- Detailed discussion of a current learning model (Multilevel HMM) that simultaneously assesses students’ learning trajectory and effectiveness of different intervention materials;
- An introduction to Cognitive Diagnostic-Computerized Adaptive Testing (CD-CAT) and the Viterbi algorithm for real-time update of class membership under HMM;
- An algorithm for using CD-CAT under the current learning model for real-time assessment of learners’ skill mastery.