

Track Nº3 Cognitive Diagnosis Modeling

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Course description:

The course provides in-depth overview of cognitive diagnosis modeling, a novel psychometric framework for developing assessments and analyzing item-response data. The models in this framework are specifically designed to generate diagnostic output, that is, to classify individuals being assessed into a discrete profile of latent attributes. This output is of particular interest for researchers and practitioners in educational or clinical contexts. In addition to the rationale, bases, and frameworks for cognitive diagnosis modeling, the course covers some of the most recent developments in the area.

The primary aim of the course is to provide students with the necessary practical experience to use cognitive diagnosis models (CDMs) in applied settings. Moreover, it aims to highlight the theoretical underpinnings needed to ground the proper use of CDMs in practice.

The course will cover the fundamentals of cognitive diagnosis modeling and some of the most recent developments in the area, which include approaches to and models for cognitive diagnosis, model estimation and evaluation, Q-matrix validation, differential item functioning, computerized adaptive testing, model identifiability, and more advanced CDMs. The different sessions will present in-depth the details of each of these topics. Moreover, students will learn how to use a number of CDM-related R packages developed by the instructors (i.e., GDINA, cdmTools, and cdcater) to conduct various CDM analyses. To this end, illustrative databases will be used to provide students with the opportunity to practice the different analyses covered in the course.

Learning Objectives

Discuss the following topics and practice them during hands-on sessions:

1. Introduction to cognitive diagnosis modeling

- Introduction to diagnostic modeling framework
- Development of a diagnostic assessment
- The G-DINA model framework

2. CDM estimation and applications

- Model calibration
- Model fit evaluation
- Q-Matrix validation
- Differential item functioning
- Classification accuracy
- Cognitive diagnostic computerized adaptive testing
- Methods for small sample sizes

3. Growing areas of interest

- Model identifiability
- Models for longitudinal data
- CDMs polytomous attributes and responses

† Hands-on activities and practice with the R packages

Learning outcomes

At the end of the course, students are expected to:

- Be acquainted with the major models and approaches to diagnostic modeling;
- Understand the issues involved in developing and analyzing cognitively diagnostic assessments;
- Have a deep familiarity with the major and recent areas of research in cognitive diagnosis modeling; and
- Have the requisite facility to implement various CDM analyses using a number of R packages.