

36-464/664 Special Topics: Psychometrics: A Statistical Modeling Approach

Description

Much of the social, educational, policy, and professional worlds involve measuring the skills, abilities, attitudes, decision-making, etc. of people -- from SAT's and GRE's for school, to 360-evaluations in business. This is the field of modern psychometrics, and it involves (at least) two kinds of craft: designing good sets of questions, and designing and fitting statistical models that extract the information we want from the responses to those questions. In this course we will touch on both kinds of craft, but we will concentrate on the second: what do statistical models for psychometric data look like, and how can we design, fit, and use them in practice? We will look at these models from a variety of statistical perspectives, but we will concentrate on the applied Bayesian point of view.

Key Topics

Overview of Assessment & Psychometrics, Applied Hierarchical Bayesian Statistics, Classical Test Theory, Factor Analysis, Item Response Theory, Special Topics, Current Literature

Prerequisite Knowledge

Practical knowledge of linear regression and a small amount of linear algebra, superficial understanding of calculus-based probability and statistics. Students with alternative backgrounds in experimental design, education research, psychology or social science can contact the instructor to see if they will be able to handle the class.

Course Relevance

These are key models and data analysis methodologies in frequent and widespread use in education research, psychology, social science and policymaking. The course will be of special interest to students interested in applied Bayesian statistics, quantitative psychology, quantitative social science, and/or testing and assessment in education research.

Course Goals

I hope that students can leave this course with: (a) skill in fitting traditional statistical psychometric models using classical and especially Bayesian methods; (b) some skill in building customized models and understanding current literature; (c) some understanding of how data collection is designed and implemented for these models.

Assessment Structure

Regular homework, class discussion (likely conducted on Canvas), one or two take-home tests, final projects or a final exam (depending on feasibility of projects; more on this will be announced near the beginning of the course).

Learning Resources

The course will draw from several texts, published papers, and my own experience, as well as searching for information on the world wide web. Some of the texts are available free of charge to CMU students through <https://link.springer.com/>; others may need to be purchased. A complete book list will be made available later in the fall.

Extra Time Commitments

Students will be expected to spend time outside of class doing assigned readings, reviewing lecture notes, completing work assignments, and participating in Canvas-based class discussion.

Course Tags (check mark = what should be/is selected for the course)

- Communication
- Discussion Intensive
- Ethics
- Interdisciplinary
- Reading Intensive
- Research
- Project
- Writing Intensive
- Quantitative modeling and analysis