E63.2141 Measurement: Modern Test Theory

Spring Term, 2011
Wednesday 3:30-6:10 PM, Location: KIMB 505W (246 Greene Street)

Instructor:
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Official Course Description:
Examines the principles of psychological measurement & testing & the technical interpretation of test scores using modern test models, including Item Response Theory, with an emphasis on the Rasch model. Considers matters of reliability & validity as related to modern test theory. Emphasizes the application of test theory to computerized &/or adaptive testing. Utilizes statistical software to conduct analyses.

Course Overview and Objectives:
Item Response Theory (IRT) comprises a collection of measurement models useful for analyzing test item data. Whereas, Classical Test Theory provides a measurement model for total scores on intact tests, IRT provides models for examinees' responses to individual items. IRT analyses provide information about stable traits of examinees and test items. That is, examinees' estimated ability levels do not depend on the particular test administered, and item parameters (e.g., difficulty and discrimination) do not depend on the ability level of a particular group of examinees. When applied properly, IRT provides better information about examinees and may improve the efficiency of test development and subsequent testing.

IRT models have been developed for a variety of applications (e.g., achievement tests, attitude surveys, and personality inventories). Much of this course will focus on unidimensional IRT models for dichotomous data (scored 0 or 1) because this content provides the necessary basis for understanding more advanced IRT models. Treatment will also be given to topics such as polytomous IRT models, test development, item bias, and test equating. Although significant time will be dedicated to discussing IRT concepts, this is intended to be an "applied" course. Several days worth of class time will be dedicated to examining examples and learning how to apply IRT to real data sets. It is expected that, by the end of the term, students will be able to apply their newfound knowledge and skills. Students will demonstrate this ability by presenting the results of a new IRT analysis or by teaching the class about an interesting area of IRT not covered in the course.

I will post my notes as PowerPoint slides on Blackboard prior to class. It would be helpful to bring either a hard copy of the notes or a notebook computer to class in order to follow along with lecture, take additional notes, engage with examples, and participate in learning activities. Grade breakdown is as follows: 20% Assignment #1, 25% Take-home midterm exam, 20% Assignment #2, 30% Final group presentation, and 5% Attendance and participation. Attendance and active participation in class are expected. More than two unexplained absences will result in a reduction of your "attendance and participation" grade.

Required Texts:

Embretson, S. E., & Reise, S. P. (2000). *Item response theory for psychologists*. New York, NY: Psychology Press.

NOTE: There is a new edition of this text to be released on January 11, 2011. The new edition will most likely be our course text.

Hambleton, R. K., Swaminathan, H., & Rogers, H. J. (1991). *Fundamentals of item response theory*. Newbury Park, CA: SAGE Publications, Inc.

Assignments

Problem Sets

During the semester, you will receive two assignments that reinforce the knowledge and skills taught in class. These assignments will be a mixture of questions, algebraic problems, and calculations. You may discuss these assignments with classmates, but the work you turn in must be your own. These assignments account for 40% of your final grade.

Mid-Term Examination

You can expect many of the exam questions to be similar to those seen in the problem sets. You will have about two weeks to complete the exam. You must work on the exam individually. Working on the exam with a classmate or receiving help from a consultant is a violation of ethical standards. A hard copy of your completed exam must be submitted to my mailbox on the 8th floor of Kimball Hall by 5:00 PM on Monday, March 28. This exam will account for 25% of your final grade.

Final Presentation

The final project for E63.2141 comprises a 20-minute individual or group presentation to the class on May 4 (no groups larger than 2). Please prepare PowerPoint slides and/or handouts to accompany your presentation. No formal write-up is required. There are two major options for your final project. First, you could read a few (about two) articles pertaining to a theoretical IRT topic or real-world IRT application of interest and lead a brief class session devoted to that topic. Second, you could use IRT to analyze some data to address some research question of interest. If you have a data set and a research question for which an IRT model is indicated, I will be happy to work with you to analyze it. If you elect for this option, be sure to present your research questions, methods, results, and conclusions.

You will be assessed on the extent to which you have successfully completed the task outlined above and your ability to present this information thoroughly, concisely, accurately, and clearly. Please email me your presentation at jsteedle@nyu.edu by noon on May 3. On the day of the presentation, you are to provide me with a hard copy of the talk. This assignment accounts for 30% of your final grade.

Grading:

F	D	C-	C	C+	B-	B	B+	A-	A
< 65	65-69	70-73	74-76	77-79	80-83	84-86	87-89	90-93	94-100

Academic Integrity:
Students in this course are subject to the policies set out in the NYU Steinhardt Statement on Academic Integrity. Violations of this policy include cheating on an examination, receiving help on an assignment that calls for independent work, and plagiarism. Please see https://steinhardt.nyu.edu/policies/academic_integrity for more information.

For Students with Disabilities:
Any student attending NYU who needs an accommodation due to a chronic, psychological, visual, mobility and/or learning disability, or is deaf or hard of hearing, should register with the Moses Center for Students with Disabilities at 212-998-4980, 719 Broadway, 2nd Floor, www.nyu.edu/csd.

Course Calendar:

Mon, January 17	Holiday: Martin Luther King Day
Mon, January 24	First Day of Classes
Wed, January 26 (Week 1)	**Topic:** Why IRT?, brief CTT review, "The New Rules of Measurement" **Readings:** ER 13-39, HSR 1-6
Wed, February 2 (Week 2)	**Topic:** 1, 2, and 3 parameter logistic models **Readings:** ER 40-54, 65-76, HSR 7-25
Wed, February 9 (Week 3)	**Topic:** Ability and item parameter estimation, distribute Assignment #1 **Readings:** ER 54-60, 158-70 (171-182 optional), HSR 32-50
Wed, February 16 (Week 4)	**Topic:** Workshop on unidimensional IRT model estimation **Readings:** ER 187-219
Mon, February 21	Holiday: Presidents' Day
Wed, February 23 (Week 5)	**Topic:** Information functions, standard errors, test construction, and CAT **Readings:** ER 183-185, 263-268, HSR 91-96, 99-106, 145-152 Assignment 1 due at the beginning of class.
Wed, March 2 (Week 6)	**Topic:** Model-data fit **Readings:** ER 72-76, 226-242, HSR 53-74
Wed, March 9 (Week 7)	**Topic:** Polytomous IRT models **Readings:** ER 95-124, Optional – Thissen and Steinberg (1986)
Mon, March 14 – Sat, March 19	Spring Recess
Wed, March 23 (Week 8)	**Topic:** Workshop on polytomous IRT model estimation **Readings:** None
Wed, March 30 (Week 9)	Take home midterm due Monday, March 28. **Topic:** Item bias **Readings:** ER 249-263, HSR 109-120, Thissen et al. (1988)
Wed, April 6 (Week 10)	**Topic:** Test equating **Readings:** HSR 123-142, Kolen and Brennan (2004) 155-181, 201-207
Wed, April 13 (Week 11)	**Topic:** IRT applications in social science research **Readings:** Steinberg and Thissen (1988) Assignment #2 due at the beginning of class.
Wed, April 20 (Week 12)	**Topic:** Generalizability Theory 1 **Readings:** Shavelson and Webb (1991) Chapters 1-2
Wed, April 27 (Week 13)	**Topic:** Generalizability Theory 2 **Readings:** Shavelson and Webb (1991) Chapters 3, 6, and 7
Wed, May 4 (Week 14)	**Topic:** Group presentations **Readings:** None
Mon, May 9	Last Day of Classes
Tue, May 10	Reading Day
Wed, May 11 – Tue, May 17	Final Exam Period