E63.2141 Measurement: Modern Test Theory

Spring Term 2009
Wednesday 3:30-6:10 PM, Location TBA

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

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

Mon, January 19	Holiday: Martin Luther King Day
Tue, January 20	Spring Classes Begin
Wed, January 21 (Week 1)	**Topic:** Why IRT?, brief CTT review, "The New Rules of Measurement" **Readings:** ER 13-39, HSR 1-6
Wed, January 28 (Week 2)	**Topic:** 1, 2, and 3 parameter logistic models **Readings:** ER 40-54, 65-76, HSR 7-25
Wed, February 4 (Week 3)	**Topic:** Ability estimation **Readings:** ER 54-60, 158-182, HSR 32-40
Wed, February 11 (Week 4)	**Topic:** Parameter estimation, workshop on unidimensional IRT model estimation **Readings:** ER 187-219, HSR 41-50
Mon, February 16	Holiday: Presidents' Day
Wed, February 18 (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, February 25 (Week 6)	**Topic:** Model-data fit **Readings:** ER 72-76, 226-242, HSR 53-74
Wed, March 4 (Week 7)	**Topic:** Polytomous IRT models **Readings:** ER 95-124, Thissen and Steinberg (1986)
Wed, March 11 (Week 8)	**Topic:** Workshop on polytomous IRT model estimation **Readings:** None Take home midterm due at the beginning of class.
Fri, March 13	Midterm Grades Deadline
Mon, March 16 – Sat, March 21	Spring Recess
Wed, March 25 (Week 9)	**Topic:** Item bias **Readings:** ER 249-263, HSR 109-120, Holland and Thayer (1988)
Wed, April 1 (Week 10)	**Topic:** Test equating **Readings:** HSR 123-142, Kolen and Brennan (2004) 155-181, 201-207
Wed, April 8 (Week 11)	**Topic:** IRT applications in social science research **Readings:** Steinberg and Thissen (1988) Assignment #2 due at the beginning of class.
Wed, April 15 (Week 12)	**Topic:** Elective topics (Generalizability Theory?) **Readings:**
Wed, April 22 (Week 13)	**Topic:** Wrapping up **Readings:** Frisbie (2005), Linn (2000)
Wed, April 29 (Week 14)	**Topic:** Group presentations **Readings:** None
Mon, May 4	Last Day of Classes
Tue, May 5	Reading Day
Wed, May 6 – Wed, May 13	Spring Semester Exams

References

Frisbie, D. A. (2005). Measurement 101. *Educational Measurement: Issues and Practice, 24*(3), 21-28.

Holland, P. W., & Thayer, D. T. (1988). Differential item performance and the mantel-haenszel procedure. In H. Wainer & H. I. Braun (Eds.), *Test validity* (pp. 129-145). Hillsdale, NJ: Lawrence Erlbaum Associates.

Kolen, M. J., & Brennan, R. L. (2004). *Testing equating, scaling, and linking: Methods and pratices*. New York, NY: Springer.

Linn, R. L. (1990). Has item response theory increased the validity of achievement test scores? *Applied Measurement in Education, 3*(2), 114-141.

Lord, F. M. (1980). *Applications of item response theory to practical testing problems*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Thissen, D., & Steinberg, L. (1986). A taxonomy of item response models. *Psychometrika, 51*(4), 567-576.

Yen, W. M., & Fitzpatrick, A. R. (2006). Item response theory. In R. L. Brennan (Ed.), *Educational measurement* (4th ed., pp. 111-153). Westport, CT: Praeger Publishers.