01-07-2015

EDPSY 595: Item Response Theory Models of Tests

Course web page: http://faculty.washington.edu/patmar/IRT.html

Instructor: Patricia Martinkova, visiting lecturer
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Lectures: Wednesday, 4:30 – 6:50 PM, Savery Hall 138 (lectures), 121 (lab sessions)

Office hours: Monday, 2:00 – 3:00 PM or by appointment, Padelford Hall C 14F

Computational help: There is no TA for this course. For extra computational help, students are encouraged to contact CSSCR http://csscr.washington.edu/. Linda Liaw who is also a CSSCR consultant (M, Tu 8 AM – 1 PM, Th 8 AM – 2 PM), is volunteering to assist during the lab sessions.

Course description:

This course will provide fundamentals of Item Response Theory – a latent variable approach to scaling assessments. The students will develop familiarity with various aspects of IRT models for binary and polytomous data, including interpretation of parameters, parameter estimation methods, assessment of goodness of fit, and item and test information functions. The course also covers applications of IRT, such as scale development, computerized adaptive testing (CAT), detection of differential item functioning (DIF), or test equating. If time allows, we will also discuss more advanced topics in IRT modelling, such as multilevel and multidimensional IRT models. Although the primary focus of this course will be on the conceptual understanding of IRT, significant time will be dedicated to IRT software and analysis of real data sets, mainly from educational testing, patient reported outcomes, surveys, or voting.

Course Text:

De Ayala RJ (2009). The Theory and Practice of Item Response Theory. New York: The Guilford Press.

Additional course materials will be provided on course webpage.

Course Goals:

After taking this course, students should be able to

- understand essential concepts and terminology of IRT
- read with understanding papers on IRT
- distinguish between various IRT models (1-3PL, PCM, GRM, GPCM,…) and interpret them
- run computer programs for calibrating response data
- apply IRT to practical testing problems (test linking/equating, estimation of differential item functioning, and constructing assessments)

Grading Policy:

Final grades will be based on homework assignments (50%), project (30%), reading assignments (10%) and participation (10%). An accumulation of 98% of the total points will receive 4.0, and an accumulation of 68% of the points will receive a graduate passing grade of 2.7.

- **Homework (50%):** There will be roughly 4 homework packages that will be posted on course webpage. You will typically have 1-2 weeks to complete an assignment. Homework can be submitted as pdf file through Canvas or in hard copy either in the class or into my mailbox 35432 in Padelford Hall. You are encouraged to work in groups and discuss concepts together, however **each person is expected to turn in their own original solution and write up**. Unless specifically requested, never submit raw computer output pages. Instead, insert appropriate parts of the output and syntax into your write-up. Write in whole sentences, label all axes, variables, etc., appropriately.

  Homework late policy: I will accept late homework with a 10% deduction of points each calendar day it is late. Each student receives two grace days to be applied for the entire quarter. To receive any credit, late homework must be turned in by the last day of the class.
- **Project (30%):** You are welcome and encouraged to use your data for the project in lieu of the project assigned to the class. In such a case, you are expected to prepare **project proposal presentation** (15%) and a **poster** (15%).
  - **Individual project proposal presentations** are tentatively scheduled for 6th week during class time. There will be more information coming about format of the presentation.
  - **Poster sessions** are tentatively scheduled for the last week during class time. More information on poster format and useful links will be posted on course web page. I will invite faculty and students to the poster session.
- **Reading assignments (10%):** Reading assignments will be typically assigned on Thursday and will be due each week before class.
- **Participation (10%):** Active participation is an important feature of the learning process and is thus given a weight in your course grade. In addition to lab assignments, I will usually ask small groups to work together in class. If you know you will need to miss class, let me know via e-mail and I will provide a make-up assignment after you return. All make-ups must be submitted by the last day of class for credit consideration, no make-ups are available for the last day of class.

Computing:

We will be using statistical environment R and student trial version of IRTPRO 2.1. Demonstrations of IRT analyses in Winsteps and flexMIRT are planned as well. I encourage students to do their homework using either R or student version of IRTPRO. You are also welcome to use any other software, but it will be your responsibility to be able to discuss any discrepancies in the results.

R is a free and very powerful statistical environment and it can be downloaded at CRAN, e.g. here http://cran.fhcrc.org/. Throughout the year, we will be using some of its packages (for overview of psychometric packages in R see http://cran.r-project.org/web/views/Psychometrics.html). The free student edition and 15-days full version of IRTPRO 2.1 for Windows can be downloaded by clicking here: http://www.ssicentral.com/irt/downloads.html. User guide is available after downloading student or full version of IRTPRO. A User's guide to Winsteps is available at http://www.winsteps.com/a/winsteps-manual.pdf. User Manual for flexMIRT is available at https://flexmirt.vpgcentral.com/Support

Tentative Course Schedule

Lecture/Date	Topics	Reading
Week 1 01/07	Course overview, traditional item and sum-score statistics, basic IRT concepts and models, software	Ch1
Week 2 01/14	IRT models for dichotomous data (1PL – 4PL, normal ogive models). Interpretation of parameters. Item characteristic curve. Lab: Traditional item analysis. Empirical characteristic function. Logistic regression. IRT models – item characteristic curves.	Ch2, 5, 6, Appendix C
Week 3 01/21	Parameter estimation: item parameters, person location. Maximum likelihood. IRT models and factor analysis. IRT models as generalized random effect models. Lab: Estimation of parameters in IRT models using different software and methods – comparison (R, IRTPRO, Winsteps, flexMIRT)	Ch3-4, Appendix A,B
Week 4 01/28	Assessment of assumptions, goodness of fit. Item and test information function. Test development with IRT. Lab: Estimation of parameters (cont.), goodness of fit, item and test information function	Ch2, 5, 6
Week 5 02/04	Models for ordered polytomous data Lab: Polytomous data	Ch7-8
Week 6 02/11	Models for nominal polytomous data Project proposal presentations	Ch9
Week 7 02/18	Test score equating and linking. Lab: equating and linking	Ch11
Week 8 02/25	Differential Item Functioning (DIF) Lab: DIF	Ch12
Week 9 03/04	Multidimensional and multilevel IRT. Computerized Adaptive Testing (CAT).	Ch10, Appendix D
Week 10 03/11	Course summary: review of concepts Poster session	

Note: Journal articles and other handouts will be assigned throughout the quarter to support the material covered in the book.

Students with Disabilities

If you would like to request academic accommodations due to a disability, please contact Disabled Student Services, (206) 543-8924 (V/TTY) to create a plan and obtain a letter detailing the plan. Please present the letter to me so we can privately discuss the accommodations you might need for this class.