Item Response Theory

ICPSR Summer Workshop at the University of Colorado Boulder
July 9, 2012 – July 13, 2012

Presented by:

Dr. Jonathan Templin
Department of Educational Psychology
University of Georgia
email: jtemplin@uga.edu
http://projects.coe.uga.edu/jtemplin

Course Overview

Item Response Theory (IRT) is used in a number of disciplines including sociology, political science, psychology, human development, business, and communications, as well as in education where it began as a method for the analysis of educational tests. This course is geared to individuals who are interested in the foundations and applications of item response models as tools for measurement of latent traits across disciplines. The course is designed to acquaint students with the basics of the field of item response theory (IRT).

To be successful in understanding analyses using IRT, two factors are important: (1) familiarity with various IRT models, and (2) the ability to interpret and apply these models appropriately. This course will begin with presentation of popular item response models, their estimation, and proper interpretation, and then continue reinforcing these lessons throughout the week with numerous examples and applications using data from different disciplines (including political science, education, and psychology). Additional topics will include test equating, test development with IRT, differential item functioning, and computerized adaptive testing. All topics will be taught in a manner which emphasizes a modern approach to IRT by comparing and contrasting IRT with other statistical methods that use latent variables or random effects (e.g., confirmatory factor analysis, diagnostic classification models). The course will be focused on accessibility, with technical detail presented only when necessary for responsible application of the methods and techniques discussed. Participants should be familiar with basic statistical models (e.g., ANOVA and regression) and basic psychometrics (e.g., classical test theory), but no prior experience with item response or other psychometric models is assumed.

The course will utilize software developed for estimation of general latent variable models (Mplus). In addition to a course packet, you will have electronic access to all course materials, including overhead slides, analysis scripts, output files, relevant supporting documentation, and recommended readings.
**Tentative Course Schedule**

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>9:00-10:15</td>
<td>Foundations of Item Response Theory</td>
</tr>
<tr>
<td></td>
<td>10:30-11:45</td>
<td>Lecture 2: Basic IRT Concepts, Models, and Assumptions</td>
</tr>
<tr>
<td></td>
<td>1:15-2:30</td>
<td>Lecture 2, Continued</td>
</tr>
<tr>
<td></td>
<td>2:45-4:00</td>
<td>Lecture 3: Model Specifications and Scale Characteristics</td>
</tr>
<tr>
<td></td>
<td>4:00-5:00</td>
<td>Lab Activity 1: Introduction to Mplus Software for IRT</td>
</tr>
<tr>
<td></td>
<td>10:00-11:15</td>
<td>Estimation of IRT Models</td>
</tr>
<tr>
<td></td>
<td>10:30-11:45</td>
<td>Lecture 5: Estimation of Item Response Models</td>
</tr>
<tr>
<td></td>
<td>1:15-2:30</td>
<td>Lecture 5, Continued</td>
</tr>
<tr>
<td></td>
<td>2:45-4:00</td>
<td>Lecture 6: Assessment of Model Fit</td>
</tr>
<tr>
<td></td>
<td>4:00-5:00</td>
<td>Lab Activity 2: Polytomous IRT Models</td>
</tr>
<tr>
<td>Wednesday</td>
<td>9:00-10:15</td>
<td>Reliability in IRT/Test Development/Computerized Adaptive Testing</td>
</tr>
<tr>
<td></td>
<td>10:30-11:45</td>
<td>Lecture 8: Test Development with IRT</td>
</tr>
<tr>
<td></td>
<td>1:15-2:30</td>
<td>Lecture 8, Continued</td>
</tr>
<tr>
<td></td>
<td>2:45-4:00</td>
<td>Lecture 9, Computerized Adaptive Testing</td>
</tr>
<tr>
<td></td>
<td>4:00-5:00</td>
<td>Lab Activity 3: Scale Development</td>
</tr>
<tr>
<td>Thursday</td>
<td>9:00-10:15</td>
<td>Equating/Item and Test Bias/Differential Item Functioning</td>
</tr>
<tr>
<td></td>
<td>10:30-11:45</td>
<td>Lecture 10: Equating</td>
</tr>
<tr>
<td></td>
<td>1:15-2:30</td>
<td>Lecture 10, Continued</td>
</tr>
<tr>
<td></td>
<td>2:45-4:00</td>
<td>Lecture 11, Continued</td>
</tr>
<tr>
<td></td>
<td>4:00-5:00</td>
<td>Lab Activity 4: Equating</td>
</tr>
<tr>
<td>Friday</td>
<td>9:00-10:15</td>
<td>Advanced IRT Models and Topics</td>
</tr>
<tr>
<td></td>
<td>10:30-11:45</td>
<td>Lecture 12: Multidimensional IRT</td>
</tr>
<tr>
<td></td>
<td>1:15-2:30</td>
<td>Lecture 13, Continued</td>
</tr>
<tr>
<td></td>
<td>2:45-4:00</td>
<td>Lecture 14: Conclusions: Comparing IRT with Other Models</td>
</tr>
</tbody>
</table>
References on Applications and Extensions of IRT

Good General References:


Parameter Estimation:


Bayesian Statistics (General, Not IRT-based):

TEST DEVELOPMENT:


POLYTOPOUS IRT MODELS:


ASSESSING MODEL-DATA FIT:


TEST SCORE EQUATING:


**Differential Item Functioning (DIF):**


**Multidimensional IRT:**


**Diagnostic Classification Models:**
