

L4: Polytomous IRT Models

Selected topics in psychometrics, NMST570
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Exercise 1: Polytomous IRT models

Consider item following Graded Response Model rated 0-1-2-3, with

- discrimination $a = 1$
- difficulties (location parameters of cumulative probabilities) $b_1 = -0.5$, $b_2 = 1.0$, and $b_3 = 1.5$.

Use newest ShinyItemAnalysis at <https://cemp.shinyapps.io/ShinyItemAnalysis/> (or download from GitHub). In section **IRT models/Training - Polytomous models**:

- Calculate probability of obtaining 0 and more points for latent abilities $\theta = -2, -1, 0, +1, +2$.
- Calculate probability of obtaining 1 and more points for latent abilities $\theta = -2, -1, 0, +1, +2$.
- Calculate probability of obtaining 2 and more points for latent abilities $\theta = -2, -1, 0, +1, +2$.
- Calculate probability of obtaining exactly 0-1-2-3 points for latent abilities $\theta = -2, -1, 0, +1, +2$.
- What is expected item score for latent abilities $\theta = -2, -1, 0, +1, +2$?

Exercise 2: Data analysis with dichotomous IRT models

Consider neuroticism data `neuroticism500.csv`. Use sample R code `PolytomousNeuroticism500.R`

- How many items and how many respondents are in the data? How are the items rated?
- Fit GRM. How many parameters are estimated? Provide table with discrimination and location parameters for each item.
- Fit 1PL version of GRM (with equal discriminations for all items). Provide table with discrimination and location parameters for each item.
- Use some criteria to decide between these two models.
- Plot Category Response Curves for all items.
- Plot Item Information Curves. Which item is the most informative for average respondent?
- Plot Test information Function. For what type of respondents is the instrument most informative?
- Provide table with response patterns, estimated latent trait scores (factor scores) and their standard errors for first 10 respondents.

- Fit GPCM, PCM, NRM. Interpret as above. Compare the results.

- Download and install student version of IRTPRO from <http://www.ssicentral.com/irt/student.html>
- Run in IRTPRO. Compare results.