

# Homework assignment

## L7: IRT models for ordinal and nominal items

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**Assignment date:** 01.12.2020  
**Deadline:** 07.12.2020 23:59  
**Slides:** <http://www.cs.cas.cz/martinkova/NMST570>  
**Note:** Send answers and R script to [hladka@cs.cas.cz](mailto:hladka@cs.cas.cz) and [martinkova@cs.cas.cz](mailto:martinkova@cs.cas.cz) (in CC)  
Include NMST570 in subject of your e-mails

**Name:**

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### Lecture presentation

Watch lecture presentation (online Zoom, or video shared on course webpage) and provide answer(s) to question(s) posed in the presentation.

### Reading with Perusall (alternative)

It is possible to skip up to 4 HW assignments and to provide satisfactory feedback (10 relevant annotations, each may gain up to 1 point) to readings instead (Chapter 7 and relevant R code this week).

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#### 1 Reading with Perusall

Provide 1 annotation in Czech or in English to assigned reading (Chapter 7 and relevant R code this week) [1].

#### 2 Training in ShinyItemAnalysis

Run `ShinyItemAnalysis` online or locally.

**Ex. 2.1** Finish Exercise in IRT/Training/Polytomous models tab for graded response model. Provide proof (screenshot). [3.5]

**Ex. 2.2** Finish Exercise in IRT/Training/Polytomous models tab for generalized partial credit model. Provide proof (screenshot). [1]

#### 3 Real data analysis

Consider neuroticism data `neuroticism500.csv` available at

[https://github.com/patriciamar/psychometrics\\_intro/blob/master/datasets/Neuroticism/neuroticism500.csv](https://github.com/patriciamar/psychometrics_intro/blob/master/datasets/Neuroticism/neuroticism500.csv)

Use pseudo R code

[http://www.cs.cas.cz/hladka/documents/NMST570\\_HW7.R](http://www.cs.cas.cz/hladka/documents/NMST570_HW7.R)

modify it and answer the following questions

**Ex. 3.1** Describe basic properties of the dataset:

1. How many items and how many respondents are in the data? [0.125]
2. How are the items rated? [0.125]

**Ex. 3.2** Consider graded response model and use the `mirt` package.

1. Fit graded response model with the same discrimination for all items. Provide table with the discrimination and location parameter estimates for each item. [0.5]
2. Fit graded response model with no constrain. Provide table with the discrimination and location parameter estimates for each item. [0.5]
3. Use some information criteria to decide between these two models. Briefly comment [0.5]
4. For the better fitting model, plot category response curves for all items. [0.25]
5. For the better fitting model, plot item information curves for all items in one plot. [0.25]
6. For the better fitting model, plot test information function. For which type of respondents is the instrument the most informative? [0.5]

## 4 Reading

Read "Empirical Example" in chapter 7 "Partial Credit Model" of Handbook of Item Response Theory, volume 1 and answer the following questions.

**Ex. 4.1** Describe data used in empirical example

1. How many markers judged the quality of essays? [0.125]
2. What was the grade scale used by markers? [0.125]
3. How many essays did each marker mark? [0.125]

**Ex. 4.2** Read "Measuring Essay Quality" and answer the following questions:

1. Briefly describe how was the quality of essays estimated. [0.25]
2. What was the best quality essay? [0.125]
3. What was the lowest quality essay? [0.125]
4. Briefly describe marking patterns in Essay 22 (Figure 7.2). [0.5]

**Ex. 4.3** Read "Calibrating Markers".

1. Briefly describe how was the behavior of markers assessed. [0.25]
2. Markers 57, 25, 43, and 24 are describes as "typical", "harsh", "lenient", and "noncommittal". Briefly describe why. [0.75]
3. Explain why different uses of grades does not have to be source of misfit. [0.125]
4. How could the different use of grades be avoided? Provide some examples. [0.25]

## 5 Provide feedback

Here you can provide feedback on lecture, lab session and/or materials (slides, video presentation, HW assignment, ShinyItemAnalysis application, etc.) [1pt bonus] :)