

Homework assignment

L4: Traditional item analysis

Assignment date: 27.10.2020
Deadline: 02.11.2020 23:59
Slides: <http://www.cs.cas.cz/martinkova/NMST570>
Note: Send answers and R script to hladka@cs.cas.cz and martinkova@cs.cas.cz (in CC)
Include NMST570 in subject of your e-mails
Name:

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 5 and relevant R code this week).

1 Reading with Perusall

Provide 1 annotation in Czech or in English to assigned reading (Chapter 5 and relevant R code this week) [1].

2 Traditional item analysis

Run the `ShinyItemAnalysis` application (online or locally) and change data to HCI.

Ex. 2.1 For the HCI dataset answer the following questions:

1. Which item is the most difficult? [0.25]
2. Which item is the easiest? [0.25]
3. Which item does have the largest discrimination? (use ULI) [0.25]
4. Which item does have the smallest discrimination? (use ULI) [0.25]

Ex. 2.2 Describe properties of items from Ex. 2.1 using Traditional item analysis table.

1. What is the correlation between these items and total score (RIT)? Briefly comment. [0.75]
2. What is the correlation between these items and the rest of items (RIR)? Briefly comment. [0.75]
3. What is Cronbach's alpha of the test without given items? Compare with Cronbach's alpha of the test and briefly comment. [0.75]

Ex. 2.3 Try different settings for **number of groups** and different **groups to compare** for generalized ULI (gULI). Answer the following questions:

1. What does happen with the gULI when considering 5 groups (comparing the first and the fifth) instead of 3 groups (comparing the first and the third)? Try to explain. [0.5]
2. What does happen with the gULI when considering 5 groups and comparing the fourth and the fifth group instead of the first and the fifth group? Try to explain. [0.5]
3. When it would be desired to compare the fourth and the fifth group instead of the first and the fifth (and vice versa)? [0.25]
4. Consider 5 groups and calculate gULI for items 7, 17, and 18 comparing following groups

Groups to compare	Item 7	Item 17	Item 18
First - Second			
First - Third			
First - Fourth			
First - Fifth			
Second - Fifth			
Third - Fifth			
Fourth-Fifth			

Briefly comment the results and try to explain. [2]

HINT: You can also calculate discriminations in R using the function `gDiscrim()`, e.g. `gDiscrim(HCI[, 1:20], k = 5, l = 1, u = 5)`.

3 Distractor analysis

Ex. 3.1 Choose two items, one with some well functioning distractors and one with some not-so-well functioning distractors. Their wording can be found in a supplemental material of the paper by McFarland et al. (2017):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5459253/bin/supp_16.2.ar35_CombinedSupMats.pdf

Using the `ShinyItemAnalysis` application, display distractor plots of chosen items and try to describe the functioning of the distractors with respect to their wording. Besides description, attach also distractor plots of these items (you can use Download button under the figure in application) and wording of the items. [1]

4 Try it in R

Ex. 4.1 Using **Selected R code** from application, create an R script which loads the HCI datasets (you will need `HCI`, `HCItest`, and `HCIkey`) and include the following items:

1. Discrimination/Difficulty plot for 5 groups and comparing the second group and the fourth group [0.5]
HINT: Use the function `DDplot()` from the `ShinyItemAnalysis` package.

2. Traditional item analysis table including gULI with the same setting as above [0.5]
HINT: Use the function `ItemAnalysis()` from the `ShinyItemAnalysis` package.
3. Distractor plots for items from Ex. 3.1. [0.5]
HINT: Use the function `plotDistractorAnalysis()` from the `ShinyItemAnalysis` package.

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] :)