Package: InDisc (via r-universe)

October 26, 2024

Type Package

Title Obtaining and Estimating Unidimensional and Multidimensional IRT Dual Models

Version 1.1.0

Date 2021-06-15

Description Performs a unified approach for obtaining and estimating unidimensional and multidimensional Item Response Theory (IRT) Dual Models (DMs), proposed by Ferrando (2019 <doi:10.1177/0146621618817779>).

Depends R (>= 3.5.0)

Imports psych, utils, matrixStats

License GPL-3

Encoding UTF-8

NeedsCompilation no

LazyData true

RoxygenNote 6.0.1

Author David Navarro-Gonzalez [cre, aut], Pere Joan Ferrando [aut]

Maintainer David Navarro-Gonzalez <david.navarro@urv.cat>

Repository CRAN

Date/Publication 2021-06-16 08:10:09 UTC

Contents

InDisc-package *A unified approach for obtaining and estimating unidimensional Item Response Theory (IRT) Dual Models (DMs)*

Description

Package consisting on a main function (InDisc) that calls all the sub-functions that implement the procedures described in Ferrando (2019) for fitting binary, graded, and continuous response DMs. Estimation is based on a two stage (calibration and scoring) random-regressors approach (McDonald, 1982). Item calibration at the first stage is the same as in the corresponding standard IRT models, is based on a factor-analytic Underlying-Variables approach, and uses an unweighted least squares, (ULS) minimum-residual criterion as implemented in the psych R package (Revelle, 2018). Individual trait scores and individual discriminations are obtained at the second stage using Expected a Posteriori (EAP) Bayes estimation. Overall, the combined ULS-EAP estimation procedure is simple, robust, and can handle large datasets, both in terms of sample size and test length.

Value

\link{InDisc} Performs the procedure proposed in Ferrando (2019).

Author(s)

Pere Joan Ferrando

David Navarro-Gonzalez

References

Ferrando, P. J. (2019). A Comprehensive IRT Approach for Modeling Binary, Graded, and Continuous Responses With Error in Persons and Items. Applied Psychological Measurement, 43(5), 339-359. doi: 10.1177/0146621618817779

McDonald, R. P. (1982). Linear versus models in item response theory. Applied Psychological Measurement, 6, 379-396. doi: 10.1177/014662168200600402

Revelle, W. (2018) psych: P Procedures for Personality and Psychological Research, Northwestern University, Evanston, Illinois, USA, https://CRAN.R-project.org/package=psych Version = 1.8.12.

Examples

```
## For speeding purposes, the number of observations and quadrature nodes have been
## reduced. For a proper use of InDisc, use the full dataset and the default quadrature
## nodes, and consider using the graded model.

InDisc(CTAC35[1:40,], nquad = 10, model = "linear", approp = FALSE, display = TRUE)
```

CTAC35 *CTAC 35 database.*

Description

A database to be used as example in the functions included on InDisc package.

Usage

```
data("CTAC35")
```

Format

A matrix with 758 observations and 35 variables corresponding to the CTAC questionnaire (Pallero, Ferrando, & Lorenzo-Seva, 1998).

Details

The CTAC questionnaire (Pallero, Ferrando, & Lorenzo-Seva, 1998) measures anxiety in situations related to visual deficit and which is intended to be used in the general adult population with severe visual impairment. The CTAC items use a 5-point Likert format.

References

Pallero, R., Ferrando, P.J., & Lorenzo-Seva, U. (1998). Questionnaire Tarragona of anxiety for blind people. In E. Sifferman, M. Williams, & B.B. Blasch, (eds.): The 9th Internacional Mobility Conference Proceedings, (pp 250-253). Atlanta: Rehabilitation Research and Development Center.

Examples

```
data(CTAC35)
```

InDisc *A unified approach for obtaining and estimating unidimensional and multidimensional Item Response Theory (IRT) Dual Models (DMs).*

Description

A unified approach for obtaining and estimating unidimensional and multidimensional Item Response Theory (IRT) Dual Models (DMs) has been proposed by Ferrando (2019) and Ferrando & Navarro-Gonzalez (2020, submitted). DMs are intended for personality and attitude measures, are based on a Thurstonian response process, and are, essentially, extended standard IRT models with an extra person parameter that models the discriminating power of the individual. So, both items and individuals are considered as sources of measurement error in DMs.

Usage

```
InDisc(SCO, nfactors = 1, nquad = 30, model = "linear", approp = FALSE, display = TRUE)
```

Arguments

SCO	Raw sample scores.
nfactors	Number of factors to be assessed, between 1 (default) and 4.
nquad	The number of quadrature points for EAP estimation (default is 30).
model	TThe model to be used: 'graded' (DTGRM) or 'linear' (DTCRM).
approp	Determines if the appropiateness indices will be computed and printed in the console (logical variable, FALSE by default).
display	Determines if the output will be displayed in the console, TRUE by default. If it is TRUE, the output is returned silently and if it is FALSE, the output is returned in the console.

Details

InDisc is based on the procedure proposed by Ferrando (2019) and Ferrando & Navarro-Gonzalez (2020, submitted) for estimating unidimensional and multidimensional Item Response Theory (IRT) Dual Models (DMs).Estimation is based on a two stage (calibration and scoring) random-regressors approach (McDonald, 1982). Item calibration at the first stage is the same as in the corresponding standard IRT models, is based on a factor-analytic Underlying-Variables approach, and uses an unweighted least squares, (ULS) minimum-residual criterion as implemented in the psych R package (Revelle, 2018). Individual trait scores and individual discriminations are obtained at the second stage using Expected a Posteriori (EAP) Bayes estimation. Overall, the combined ULS-EAP estimation procedure is simple, robust, and can handle large datasets, both in terms of sample size and test length.

Value

INDIES	Matrix including the theta scores, the PDDs, the PSDs (theta), the PSDs (PDD) and the reliabilities for the theta scores and the PDD for each participant.
degrees_of_freedom	Degrees of freedom for the model.
Model_Chi_Square	Chi Square statistic for assessing model-data fit, with the indicated degrees of freedom.
RMSR	Root Mean Square of the Residuals.
TLI	Tucker Lewis Index goodness-of-fit index.
RMSEA	Root Mean Squared Error of Approximation.
EVARI	Average of the PDDs.
reli_theta	Marginal reliability of the trait estimates.
aver_r_theta	Average of the individual reliability (trait level).
reli_PDD	Marginal reliability of the PDD estimates.

aver_r_PDD	Average of the individual reliability (PDD).
LR_stat	Likelihood ratio statistic.
Q_Chi_square	Approximate Chi Square with N degrees of freedom based on the LRT_stat.

Author(s)

Pere Joan Ferrando

David Navarro-Gonzalez

References

Ferrando, P. J. (2019). A Comprehensive IRT Approach for Modeling Binary, Graded, and Continuous Responses With Error in Persons and Items. Applied Psychological Measurement, 43(5), 339-359. doi: 10.1177/0146621618817779

Ferrando, P. J. & Navarro-Gonzalez, D.(2020). A multidimensional IRT model for continuous and graded responses with error in persons and items. Educational and Psychological Measurement (submitted).

McDonald, R. P. (1982). Linear versus models in item response theory. Applied Psychological Measurement, 6, 379-396. doi: 10.1177/014662168200600402

Revelle, W. (2018) psych: P Procedures for Personality and Psychological Research, Northwestern University, Evanston, Illinois, USA, https://CRAN.R-project.org/package=psych Version = 1.8.12.

Examples

```
## For speeding purposes, the number of observations and quadrature nodes have been
## reduced. For a proper use of InDisc, use the full dataset and the default quadrature
## nodes, and consider using the graded model.


InDisc(CTAC35[1:40,], nquad = 10, model = "linear", approp = FALSE, display = TRUE)
```

Index