Package 'GRShiny'

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Type Package

Title Graded Response Model

Description Simulation and analysis of graded response data with different types of estimators. Also, an interactive shiny application is provided with graphics for characteristic and information curves. Samejima (2018) <doi:10.1007/978-1-4757-2691-6_5>.

Depends R (>= 3.6.0)

Imports shiny, shinyWidgets, bslib, DT, lavaan, mirt, sirt, ggplot2 (>= 3.4.0), dplyr, readr, tidyr, stringr, magrittr, purrr, data.table, MASS, utils, stats, flextable, gt, officer, openxlsx, sass

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License GPL (>= 3)

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Contents

GRShiny-package   *Full information maximum likelihood estimation of IRT models.*

Description

Graded response models with different estimators

Details

Analysis of polytomous response data using unidimensional and multidimensional latent trait models under the Structure Equation Modeling paradigm. Confirmatory graded response models can be estimated with ML and WLS estimators. GRM data can be simulated and analyzed. Finally, an interactive Shiny application for running a GRM analysis is supported.l

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ESplot   *Plot expected scores by items*

Description

Plot expected scores by items

Usage

```
ESplot(
  fit,
  selected_item,
  theta = seq(-4, 4, 0.1),
  base_size = 16,
  line_size = 1,
  cal_option = "D"
)
```

Arguments

`fit`	an object from [runGRM](#)
`selected_item`	a numeric indicating for what items the function makes plots
`theta`	a numeric indicating latent traits
`base_size`	a numeric indicating the base font size
`line_size`	a numeric indicating the size of line
`cal_option`	a character indicating the plot color specified in [scale_color_viridis_d](#) (default = D)

Details

This makes a expected score plot

Value

a [ggplot](#) object.

Examples

```
grm_dt <- genData(eta = genTheta(nsample = 500, nfac = 1),
                  ipar = genIRTpar(nitem = 10, ncat = 3, nfac = 1))

fit <- runGRM(dat = grm_dt,
              lav.syntax = genLavSyn(dat = grm_dt, nfac = 1),
              estimator = "WL")
ESplot(fit, 1)
```

---

extract_est	*Clean output to look like Mplus*

Description

Clean output to look like Mplus

Usage

```
extract_est(fit)
```

Arguments

fit   an object from `runGRM`

Details

This tidies the results in the CFA framework.

Value

a list of IRT parameter estimates

---

extract_fit   *Extract model fit*

Description

Extract model fit

Usage

```
extract_fit(fit)
```

Arguments

fit   an object from `runGRM`

Details

This extracts model fit.

Value

a list of IRT fit information

FSplot | *Plot Factor score*

Description

Plot Factor score

Usage

```
FSplot(
  fit,
  type = "histogram",
  hist_bins = 20,
  fill_colour = "grey70",
  base_size = 16
)
```

Arguments

fit	an object from [runGRM](#)
type	a character indicating the type of plots
	• histogram Histogram plot
	• density Density plot
hist_bins	a numeric indicating the number of bins for the histogram
fill_colour	a character indicating the color (default = grey70)
base_size	a numeric indicating the base font size

Details

This makes either histogram or density plot for individual factor scores.

Value

a [ggplot](#) object.

Examples

```
grm_dt <- genData(eta = genTheta(nsample = 500, nfac = 1),
                  ipar = genIRTpar(nitem = 10, ncat = 3, nfac = 1))

fit <- runGRM(dat = grm_dt,
              lav.syntax = genLavSyn(dat = grm_dt, nfac = 1),
              estimator = "WL")
FSplot(fit, type = "histogram", hist_bins = 20, base_size = 16)
```

---

genData   *Generate IRT data*

Description

Generate IRT data

Usage

```
genData(eta, ipar)
```

Arguments

eta	a matrix indicating individual true latent traits
ipar	a dataframe containing item parameters

Details

This generates GRM response data

Value

a data frame containing graded response model data

Examples

```
ipar <- genIRTpar(20, ncat = 3, 2)
eta <- genTheta(50, 2)
genData(eta, ipar)
```

---

genIRTpar   *Generate Item parameters*

Description

Generate Item parameters

Usage

```
genIRTpar(nitem = 25, ncat = 4, nfac = 3)
```

Arguments

nitem	a numeric indicating the number of items
ncat	a numeric indicating the number of categories
nfac	a numeric indicating the number of factors

Details

This generates item parameters for graded response models

Value

a data frame containing graded response item parameters

Examples

```
genIRTpar(20, 4, 3)
```

---

genLavSyn   *Generate lavaan syntax*

Description

Generate lavaan syntax

Usage

```
genLavSyn(dat, nfac = 1)
```

Arguments

dat	a data frame containing graded response data
nfac	a numeric indicating the number of factors

Details

This generates [lavaan](#) syntax

Value

a string indicating [lavaan](#) syntax.

---

genTheta   *Generate individual true latent traits*

Description

Generate individual true latent traits

Usage

```
genTheta(nsample, nfac, l.cov = NULL)
```

Arguments

nsample	a numeric indicating the number of people
nfac	a numeric indicating the number of factors
l.cov	a matrix containing latent covariances

Details

This generates individual latent scores

Value

a matrix containing individual latent scores

ICCplot   *Plot ICC or OCC*

Description

Plot ICC or OCC

Usage

```
ICCplot(
  fit,
  selected_item,
  theta = seq(-4, 4, 0.1),
  plot.occ = FALSE,
  addlabel = FALSE,
  base_size = 16,
  line_size = 1,
  cal_option = "D"
)
```

Arguments

`fit`	an object from [`runGRM`](#)
`selected_item`	a numeric indicating for what items the function makes plots
`theta`	a numeric indicating latent traits
`plot.occ`	a logical. If TRUE, OCC is made instead of ICC
`addlabel`	a logical indicating whether to add the b parameter as labels
`base_size`	a numeric indicating the base font size
`line_size`	a numeric indicating the size of line
`cal_option`	a character indicating the plot color specified in [`scale_color_viridis_d`](#) (default = D)

Details

This makes either item characteristic curve plots or operating characteristic curve plots

Value

a [ggplot](#) object.

Examples

```
grm_dt <- genData(eta = genTheta(nsample = 500, nfac = 1),
                  ipar = genIRTpar(nitem = 10, ncat = 3, nfac = 1))

fit <- runGRM(dat = grm_dt,
              lav.syntax = genLavSyn(dat = grm_dt, nfac = 1),
              estimator = "WL")
ICCplot(fit, 1, seq(-3, 3, .1), plot.occ = FALSE, base_size = 16)
```

---

infoPlot   *Calculate item information*

Description

Calculate item information

Usage

```
infoPlot(
  fit,
  selected_item,
  type = "icc",
  theta = seq(-4, 4, 0.1),
  base_size = 16,
  line_size = 1,
```

```
    cal_option = "D",
    facet = FALSE
)
```

Arguments

`fit`	an object from [runGRM](#)
`selected_item`	a numeric indicating for what items the function makes plots
`type`	a character indicating the type of plots
	• `icc` Test information
	• `tcc` Total Test information
`theta`	a numeric indicating latent traits
`base_size`	a numeric indicating the base font size
`line_size`	a numeric indicating the size of line
`cal_option`	a character indicating the plot colour specified in [scale_color_viridis_d](#) (default = D)
`facet`	a logical. If TRUE, the plot is faceted by items. (default = FALSE).

Details

This makes either item information plots or total information plot

Value

a [ggplot](#) object.

Examples

```
grm_dt <- genData(eta = genTheta(nsample = 500, nfac = 1),
                  ipar = genIRTpar(nitem = 10, ncat = 3, nfac = 1))

fit <- runGRM(dat = grm_dt,
              lav.syntax = genLavSyn(dat = grm_dt, nfac = 1),
              estimator = "WL")
infoPlot(fit, selected_item=1:4, type = "icc", base_size = 16)
```

---

runGRM   *Run graded response model*

Description

Run graded response model

Usage

```
runGRM(dat, lav.syntax, estimator)
```

Arguments

dat	a data frame containing graded response model data
lav.syntax	a character indicating [lavaan](#) syntax
estimator	a character indicating the type of estimator.

- ML Maximum likelihood estimation
- WL Weighted least squares mean and variance

Details

This conducts GRM. The second element of the return indicates the graded response parameters converted from the CFA parameters

Value

a list containing GRM results as follows:

- fit an object from either [SingleGroupClass](#) from [mirt](#) or code[lavaan](#) from from [lavaan](#).
- grm.par a data frame indicating graded response parameters.

---

startGRshiny   *Start GRShiny*

Description

An interactive Shiny application for running a GRM analysis.

Usage

```
startGRshiny()
```

Details

[startGRshiny](#) is a caller function to open the Shiny interface of GRM.

This starts the IRT Shiny application on the user's local computer.

Value

It launches the Shiny app for Graded Response Model.

Examples

```
if (interactive()) {
  startGRshiny()
}
```

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