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 (>= 3.5.2), dplyr, readr, tidyr, stringr, magrittr, purrr, data.table, MASS, utils, stats, flextable, gt, officer, openxlsx, sass

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URL https://github.com/sooyongl/GRShiny

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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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See Also

Useful links:

- https://github.com/sooyongl/GRShiny

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)
```

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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 (WLSMV).

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 of class SingleGroupClass (from **mirt**) or lavaan (from **lavaan**).

`grm.par` A data frame containing 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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