

Package ‘aMNLFA’

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Title Automated Fitting of Moderated Nonlinear Factor Analysis Through the 'Mplus' Program

Version 0.1

Description Automated generation, running, and interpretation of moderated nonlinear factor analysis models for obtaining scores from observed variables. This package creates 'Mplus' input files which may be run iteratively to test two different types of covariate effects on items: (1) latent variable impact (both mean and variance); and (2) differential item functioning. After sequentially testing for all effects, it also creates a final model by including all significant effects after adjusting for multiple comparisons. Finally, the package creates a scoring model which uses the final values of parameter estimates to generate latent variable scores.

Depends R (\geq 3.1.0),

Imports grDevices, graphics, stats, utils, ggplot2, MplusAutomation, reshape2, gridExtra, stringr, plyr, devtools

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R topics documented:

aMNLFA.final	2
aMNLFA.initial	2
aMNLFA.itemplots	3
aMNLFA.object	4
aMNLFA.sample	5
aMNLFA.scoreplots	6
aMNLFA.scores	6
aMNLFA.simultaneous	7
xstudy	8

Index**10**

aMNLFA.final	<i>aMNLFA final model fitting function</i>
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Description

This function generates the final aMNLFA model on which scores will be based. Can only be run after a model containing all impact and DIF effects – i.e., after the aMNLFA.simultaneous function.

Usage

```
aMNLFA.final(input.object)
```

Arguments

input.object	The aMNLFA object (created using the aMNLFA.object function) which provides instructions for the function.
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Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)
ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrdata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)

aMNLFA.final(ob)
```

aMNLFA.initial	<i>aMNLFA initial model fitting function</i>
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Description

This function generates the initial itemwise aMNLFA models.

Usage

```
aMNLFA.initial(input.object)
```

Arguments

input.object	The aMNLFA object (created using the aMNLFA.object function) which provides instructions for the function.
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Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)
ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrddata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)

aMNLFA.initial(ob)
```

aMNLFA.itemplots

aMNLFA item plotting function

Description

This function generates plots of item endorsement by time, and by each covariate. This is necessary for determining which covariates to use in the MNLFA.

Usage

```
aMNLFA.itemplots(input.object)
```

Arguments

input.object The aMNLFA object (created using the aMNLFA.object function) which provides instructions for the function.

Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)
ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrddata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)

aMNLFA.itemplots(ob)
```

aMNLFA.object	<i>aMNLFA object function</i>
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Description

This function creates an aMNLFA object based on user specifications to pass to aMNLFA functions.

Usage

```
aMNLFA.object(
  dir,
  mrdata,
  indicators = NULL,
  catindicators = NULL,
  countindicators = NULL,
  meanimpact = NULL,
  varimpact = NULL,
  measinvar = NULL,
  factors = NULL,
  time = NULL,
  auxiliary = NULL,
  ID = NULL,
  thresholds = NULL
)
```

Arguments

<code>dir</code>	The directory in which data, inputs, and outputs are to be stored. Must be supplied.
<code>mrdata</code>	The R dataframe containing the multiple-record dataset. Must be supplied.
<code>indicators</code>	The names of all indicators (items, observed variables) in the MNLFA.
<code>catindicators</code>	The list of indicators which are categorical. Defaults to NULL.
<code>countindicators</code>	The list of indicators which are count. Defaults to NULL.
<code>meanimpact</code>	The list of covariates (predictors) which may generate impact on the latent variable mean. Defaults to NULL.
<code>varimpact</code>	The list of covariates (predictors) which may generate impact on the latent variable variance. Defaults to NULL.
<code>measinvar</code>	The list of covariates (predictors) which may generate DIF. Defaults to NULL.
<code>factors</code>	The list of covariates which are categorical. Defaults to NULL.
<code>time</code>	The variable which indexes time (or multiple records within a single case). If left blank, assumes single-record data. Defaults to NULL.
<code>auxiliary</code>	The list of variables to be considered as auxiliary (i.e., retained in the dataset but not used in the analysis). Defaults to NULL.
<code>ID</code>	The variable which identifies cases. Defaults to NULL.
<code>thresholds</code>	A Boolean operator indicating whether to test for threshold DIF.

Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)

ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrdata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)
```

aMNLFA.sample

aMNLFA sampling function

Description

This function generates a single-record dataset using a random sample of time points from the multiple-record sample.

Usage

```
aMNLFA.sample(input.object)
```

Arguments

input.object The aMNLFA object (created using the aMNLFA.object function) which provides instructions for the function.

Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)

ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrdata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)

aMNLFA.sample(ob)
```

aMNLFA.scoreplots	<i>aMNLFA score plotting function</i>
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Description

This function creates plots of scores generated using aMNLFA. Can only be run after the aMNLFA.scores function.

Usage

```
aMNLFA.scoreplots(input.object)
```

Arguments

input.object The aMNLFA object (created using the aMNLFA.object function) which provides instructions for the function.

Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)

ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrdata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)

aMNLFA.scoreplots(ob)
```

aMNLFA.scores	<i>aMNLFA score generating function</i>
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Description

This function creates scores generated using aMNLFA. Can only be run after the final model has been fit – i.e., after the aMNLFA.final function.

Usage

```
aMNLFA.scores(input.object)
```

Arguments

input.object The aMNLFA object (created using the aMNLFA.object function) which provides instructions for the function.

Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)

ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrdata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)

aMNLFA.scores(ob)
```

aMNLFA.simultaneous	<i>aMNLFA simultaneous model fitting function</i>
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Description

This function generates the simultaneous aMNLFA model from all the initial inputs.

Usage

```
aMNLFA.simultaneous(input.object)
```

Arguments

input.object The aMNLFA object (created using the aMNLFA.object function) which provides instructions for the function.

Examples

```
wd <- tempdir()
first<-paste0(system.file(package='aMNLFA'),"/examplefiles")
the.list <- list.files(first,full.names=TRUE)
file.copy(the.list,wd,overwrite=TRUE)

ob <- aMNLFA::aMNLFA.object(dir = wd,
  mrdata = xstudy,
  indicators = paste0("BIN_", 1:12),
  catindicators = paste0("BIN_", 1:12),
  meanimpact = c("AGE", "GENDER", "STUDY"),
  varimpact = c("AGE", "GENDER", "STUDY"),
  measinvar = c("AGE", "GENDER", "STUDY"),
  factors = c("GENDER", "STUDY"),
  ID = "ID",
  thresholds = FALSE)

aMNLFA.simultaneous(ob)
```

xstudy

Simulated cross-study data

Description

Data are simulated as part of a larger study (Curran et al., 2016; Curran et al., under review). Meant to simulate a dataset pooled across two studies, with 12 indicators and 3 moderators (age, gender, and study). Impact and DIF exist on the basis of these moderators.

Usage

```
data(xstudy)
```

Format

A data frame with 500 rows and 25 columns. The 25 variables are:

ID Unique identifier

AGE Age in years, centered around age 13

GENDER Effect-coded gender

STUDY Effect-coded study membership

STUDYAGE Interaction between age and study

TRUEETA True score on latent variable for each subject – not used in analysis

STUDYETA Interaction between study and score – not used in analysis

ZETA Deviation score – not used in analysis

W External covariate for original simulation – not used in analysis

Z1 External outcome for original simulation – not used in analysis

Z2 External outcome for original simulation – not used in analysis

Z3 External outcome for original simulation – not used in analysis

Z4 External outcome for original simulation – not used in analysis

BIN_1 Binary item 1

BIN_2 Binary item 2

BIN_3 Binary item 3

BIN_4 Binary item 4

BIN_5 Binary item 5

BIN_6 Binary item 6

BIN_7 Binary item 7

BIN_8 Binary item 8

BIN_9 Binary item 9

BIN_10 Binary item 10

BIN_11 Binary item 11

BIN_12 Binary item 12

Source

Curran et al., 2016 ([PubMed](#))

References

Curran et al., 2016 Structural Equation Modeling 23(6), 827-844. ([PubMed](#))

Index

* MNLFA

- aMNLFA.final, [2](#)
- aMNLFA.initial, [2](#)
- aMNLFA.itemplots, [3](#)
- aMNLFA.object, [4](#)
- aMNLFA.sample, [5](#)
- aMNLFA.scoreplots, [6](#)
- aMNLFA.scores, [6](#)
- aMNLFA.simultaneous, [7](#)

* datasets

- xstudy, [8](#)

- aMNLFA.final, [2](#)
- aMNLFA.initial, [2](#)
- aMNLFA.itemplots, [3](#)
- aMNLFA.object, [4](#)
- aMNLFA.sample, [5](#)
- aMNLFA.scoreplots, [6](#)
- aMNLFA.scores, [6](#)
- aMNLFA.simultaneous, [7](#)

- xstudy, [8](#)