Package 'lmap'

October 13, 2022

Type Package

Title Logistic Mapping

Version 0.1.1

Date 2022-09-09

Maintainer Mark de Rooij <rooijm@fsw.leidenuniv.nl>

Description Set of tools for mapping of categorical response variables based on principal component analysis (pca) and multidimensional unfolding (mdu).

Depends R (>= 3.5.0), ggplot2, ggrepel, ggforce, tidyverse, dplyr

Imports nnet, stats

License GPL-3

Encoding UTF-8

RoxygenNote 7.2.0

LazyData TRUE

Author Mark de Rooij [aut, cre, cph],
Frank Busing [aut],
Juan Claramunt Gonzalez [ctb]

NeedsCompilation yes

Repository CRAN

Date/Publication 2022-09-14 05:30:02 UTC

R topics documented:

`dataExample_lmdu` *Dummy data for lmdu example*

Description

Dummy data for lmdu example

Usage

```
dataExample_lmdu
```

Format

A data frame with 234 observations on the following variables:

`Y1` Dichotomous variable 1.

`Y2` Dichotomous variable 2.

`Y3` Dichotomous variable 3.

`Y4` Dichotomous variable 4.

`Y5` Dichotomous variable 5.

`Y6` Dichotomous variable 6.

`Y7` Dichotomous variable 7.

`Y8` Dichotomous variable 8.

`X1` Continuous variale 1.

`X2` Continuous variale 2.

`X3` Continuous variale 3.

`X4` Continuous variale 4.

`X5` Continuous variale 5.

dataExample_lpca *Dummy data for lpca example*

Description

Dummy data for lpca example

Usage

```
dataExample_lpca
```

Format

A data frame with 234 observations on the following variables:

- `Y1` Dichotomous variable 1.
- `Y2` Dichotomous variable 2.
- `Y3` Dichotomous variable 3.
- `Y4` Dichotomous variable 4.
- `Y5` Dichotomous variable 5.
- `Y6` Dichotomous variable 6.
- `Y7` Dichotomous variable 7.
- `Y8` Dichotomous variable 8.
- `X1` Continuous variale 1.
- `X2` Continuous variale 2.
- `X3` Continuous variale 3.
- `X4` Continuous variale 4.
- `X5` Continuous variale 5.

dataExample_mru *Dummy data for mru example*

Description

Dummy data for mru example

Usage

```
dataExample_mru
```

Format

A data frame with 234 observations on the following variables:

`y` Categorical variable.

`X1` Continuous variale 1.

`X2` Continuous variale 2.

`X3` Continuous variale 3.

`X4` Continuous variale 4.

`X5` Continuous variale 5.

`fastmbu` *Fast version of mbu. It runs mbu without input checks.*

Description

Fast version of mbu. It runs mbu without input checks.

Usage

```
fastmbu(
  Y = NULL,
  W = NULL,
  XU = NULL,
  BU = NULL,
  XV = NULL,
  BV = NULL,
  mains = TRUE,
  MAXITER = 65536,
  DCRIT = 1e-06,
  MAXINNER = 32,
  FCRIT = 0.001
)
```

Arguments

`Y`	matrix with dichotomous responses
`W`	matrix with weights for each entrance of Y or vector with weights for each row of Y
`XU`	in unsupervised analysis starting values for row coordinates; in supervised analysis matrix with predictor variables for rows
`BU`	for supervised analysis matrix with regression weights for the row coordinates
`XV`	in unsupervised analysis starting values for column coordinates; in supervised analysis matrix with predictor variables for columns

BV	for supervised analysis matrix with regression weights for the column coordinates
mains	whether offsets for the items should be estimated
MAXITER	maximum number of iterations in the outer loop
DCRIT	convergence criterion for the deviance
MAXINNER	maximum number of iterations in the inner loop
FCRIT	convergence criterion for STRESS in the inner loop

Value

U estimated coordinate matrix for row objects

BU for supervised analysis the estimated matrix with regression weights for the rows

V estimated coordinate matrix for column objects

BV for supervised analysis the estimated matrix with regression weights for the columns

Mu estimated offsets

Lastinner number of iterations in the last call to STRESS

Lastfdif last difference in STRESS values in the inner loop

lastouter number of iterations in the outer loop

lastddif last difference in deviances in outer loop

deviance obtained deviance

---

fastmru *Fast version of mru. It runs mru without input checks.*

Description

Fast version of mru. It runs mru without input checks.

Usage

```
fastmru(
  G = NULL,
  X = NULL,
  B = NULL,
  V = NULL,
  MAXITER = 65536,
  DCRIT = 1e-06,
  MAXINNER = 32,
  FCRIT = 0.001
)
```

Arguments

G	indicator matrix of the response variable
X	matrix with predictor variables
B	starting values of the regression weights
V	starting values for class locations
MAXITER	maximum number of iterations in the outer loop
DCRIT	convergence criterion for the deviance
MAXINNER	maximum number of iterations in the inner loop
FCRIT	convergence criterion for STRESS in the inner loop

Value

B estimated regression weights

V estimated class locations

Lastinner number of iterations in the last call to STRESS

Lastfdif last difference in STRESS values in the inner loop

lastouter number of iterations in the outer loop

lastddif last difference in deviances in outer loop

deviance obtained deviance

---

lmdu *The function lmdu performs logistic mdu with or without predictors to obtain a unsupervised or supervised mapping of binary response variables.*

Description

This function runs: logistic multidimensional unfolding (if X = NULL) logistic restricted multidimensional unfolding (if X != NULL)

Usage

```
lmdu(
  Y,
  f = NULL,
  X = NULL,
  S = 2,
  start = "svd",
  maxiter = 65536,
  dcrit = 1e-05
)
```

Arguments

Y	An N times R binary matrix .
f	Vector with frequencies of response patterns in Y (only applicable if (X = NULL))
X	An N by P matrix with predictor variables
S	Positive number indicating the dimensionality of the solution
start	Either user provided starting values (start should be a list with U and V) or a way to compute starting values (choices: random, svd, ca)
maxiter	maximum number of iterations
dcrit	convergence criterion

Value

deviance

Examples

```
data(dataExample_lmdu)
Y = as.matrix(dataExample_lmdu[1:20 , 1:8])
X = as.matrix(dataExample_lmdu[1:20 , 9:13])
# unsupervised
output = lmdu(Y = Y, S = 2)
```

---

lpca *The function lpca performs logistic pca with or without predictors to obtain a unsupervised or supervised mapping of binary response variables.*

Description

This function runs: logistic principal component analysis (if X = NULL) logistic reduced rank regression (if X != NULL)

Usage

```
lpca(
  Y,
  X = NULL,
  S = 2,
  dim.indic = NULL,
  eq = FALSE,
  lambda = FALSE,
  maxiter = 65536,
  dcrit = 1e-05
)
```

Arguments

Y	An N times R binary matrix .
X	An N by P matrix with predictor variables
S	Positive number indicating the dimensionality of teh solution
dim.indic	An R by S matrix indicating which response variable pertains to which dimension
eq	Only applicable when dim.indic not NULL; equality restriction on regression weighhts per dimension
lambda	if TRUE does lambda scaling (see Understanding Biplots, p24)
maxiter	maximum number of iterations
dcrit	convergence criterion

Value

This function returns an object of the class `lpca` with components:

Y	Matrix Y from input
Xoriginal	Matrix X from input
X	Scaled X matrix
mx	Mean values of X
sdx	Standard deviations of X
ynames	Variable names of responses
xnames	Variable names of predictors
probabilities	Estimated values of Y
m	main effects
U	matrix with coordinates for row-objects
B	matrix with regression weight (U = XB)
V	matrix with vectors for items/responses
iter	number of main iterations from the MM algorithm
deviance	value of the deviance at convergence

Examples

```
data(dataExample_lpca)
Y = as.matrix(dataExample_lpca[1:20 , 1:8])
X = as.matrix(dataExample_lpca[1:20 , 9:13])
# unsupervised
output = lpca(Y = Y, S = 2)
```

mru — *The function mru performs multinomial restricted unfolding for a nominal response variable and a set of predictor variables.*

Description

The function mru performs multinomial restricted unfolding for a nominal response variable and a set of predictor variables.

Usage

```
mru(y, X, S = 2, start = "da", maxiter = 65536, dcrit = 1e-05)
```

Arguments

y	An N vector of the responses (categorical).
X	An N by P matrix with predictor variables
S	Positive number indicating the dimensionality of teh solution
start	Type of starting values (da: discriminant analysis, random or list with B and V)
maxiter	maximum number of iterations
dcrit	convergence criterion

Value

Y Matrix Y from input

Xoriginal Matrix X from input

X Scaled X matrix

G class indicator matrix

ynames class names of response variable

xnames variable names of the predictors

mx means of the predictor variables

sdx standard deviations of the predictor variables

U coordinate matrix of row objects

B matrix with regression coefficients

Class coordinate matrix

iters number of iterations

deviance value of the deviance at convergence

Examples

```
data(dataExample_mru)
y = as.matrix(dataExample_mru[1:20 , 1])
X = as.matrix(dataExample_mru[1:20 , 2:6])
output = mru(y = y, X = X, S = 2)
```

`plot.lmdu` *plots the results of a logistic multidimensional unfolding (X = NULL) logistic restricted multidimensional unfolding (X != NULL)*

Description

plots the results of a logistic multidimensional unfolding (X = NULL) logistic restricted multidimensional unfolding (X != NULL)

Usage

```
## S3 method for class 'lmdu'
plot(
  x,
  dims = c(1, 2),
  ycol = "darkgreen",
  xcol = "lightskyblue",
  ocol = "grey",
  ...
)
```

Arguments

`x`	an object of type lmdu
`dims`	which dimensions to visualize
`ycol`	colour for representation of response variables
`xcol`	colour for representation of predictor variables
`ocol`	colour for representation of row objects
`...`	additional arguments to be passed.

Value

Plot of the results obtained from lmdu

Examples

```
data(dataExample_lmdu)
Y = as.matrix(dataExample_lmdu[1:20 , 1:8])
X = as.matrix(dataExample_lmdu[1:20 , 9:13])
# unsupervised
output = lmdu(Y = Y, S = 2)
plot(output)
```

`plot.lpca` *plots the results of a logistic principal component analysis (X = NULL) logistic reduced rank regression (X != NULL)*

Description

plots the results of a logistic principal component analysis (X = NULL) logistic reduced rank regression (X != NULL)

Usage

```
## S3 method for class 'lpca'
plot(
  x,
  dims = c(1, 2),
  type = "pca",
  ycol = "darkgreen",
  xcol = "lightskyblue",
  ocol = "grey",
  ...
)
```

Arguments

`x`	an object of type lpca
`dims`	which dimensions to visualize
`type`	either pca or dist
`ycol`	colour for representation of response variables
`xcol`	colour for representation of predictor variables
`ocol`	colour for representation of row objects
`...`	additional arguments to be passed.

Value

Plot of the results obtained from lpca

Examples

```
data(dataExample_lpca)
Y = as.matrix(dataExample_lpca[1:20 , 1:8])
X = as.matrix(dataExample_lpca[1:20 , 9:13])
# unsupervised
output = lpca(Y = Y, S = 2)
plot(output)
```

`plot.mru` *plots the results of a multinomial restricted unfolding*

Description

plots the results of a multinomial restricted unfolding

Usage

```
## S3 method for class 'mru'
plot(
  x,
  dims = c(1, 2),
  ynames = NULL,
  ycol = "darkgreen",
  xcol = "lightskyblue",
  ocol = "grey",
  ...
)
```

Arguments

`x`	an object of type mru
`dims`	which dimensions to visualize
`ynames`	names of the response variables
`ycol`	colour for representation of response variables
`xcol`	colour for representation of predictor variables
`ocol`	colour for representation of row objects
`...`	additional arguments to be passed.

Value

Plot of the results obtained from mru

Examples

```
data(dataExample_mru)
y = as.matrix(dataExample_mru[1:20 , 1])
X = as.matrix(dataExample_mru[1:20 , 2:6])
output = mru(y = y, X = X, S = 2)
plot(output)
```

`slowmru` *Slow version of mru. It runs mru with input checks.*

Description

Slow version of mru. It runs mru with input checks.

Usage

```
slowmru(
  G = NULL,
  X = NULL,
  B = NULL,
  V = NULL,
  MAXITER = 65536,
  DCRIT = 1e-06,
  MAXINNER = 32,
  FCRIT = 0.001
)
```

Arguments

`G`	indicator matrix of the response variable
`X`	matrix with predictor variables
`B`	starting values of the regression weights
`V`	starting values for class locations
`MAXITER`	maximum number of iterations in the outer loop
`DCRIT`	convergence criterion for the deviance
`MAXINNER`	maximum number of iterations in the inner loop
`FCRIT`	convergence criterion for STRESS in the inner loop

Value

B estimated regression weights

V estimated class locations

Lastinner number of iterations in the last call to STRESS

Lastfdif last difference in STRESS values in the inner loop

lastouter number of iterations in the outer loop

lastddif last difference in deviances in outer loop

deviance obtained deviance

Index