Package ‘lmap’

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

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 variable 1.
X2  Continuous variable 2.
X3  Continuous variable 3.
X4  Continuous variable 4.
X5  Continuous variable 5.
**dataExample_lpca**

**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 variable 1.
- X2  Continuous variable 2.
- X3  Continuous variable 3.
- X4  Continuous variable 4.
- X5  Continuous variable 5.

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**dataExample_mru**

**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 variable 1.
- **X2**: Continuous variable 2.
- **X3**: Continuous variable 3.
- **X4**: Continuous variable 4.
- **X5**: Continuous variable 5.

### fastmbu

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

### Description

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

### Usage

```r
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
fastmru

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<th>Argument</th>
<th>Description</th>
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<tr>
<td>BV</td>
<td>for supervised analysis matrix with regression weights for the column coordinates</td>
</tr>
<tr>
<td>mains</td>
<td>whether offsets for the items should be estimated</td>
</tr>
<tr>
<td>MAXITER</td>
<td>maximum number of iterations in the outer loop</td>
</tr>
<tr>
<td>DCRIT</td>
<td>convergence criterion for the deviance</td>
</tr>
<tr>
<td>MAXINNER</td>
<td>maximum number of iterations in the inner loop</td>
</tr>
<tr>
<td>FCRIT</td>
<td>convergence criterion for STRESS in the inner loop</td>
</tr>
</tbody>
</table>

**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

**Description**

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

**Usage**

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

Fast version of mru. It runs mru without input checks.
The function `lmdu` performs logistic MDU with or without predictors to obtain a unsupervised or supervised mapping of binary response variables.

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

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

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)

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)  

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

- **Y**: An N times R binary matrix .
- **X**: An N by P matrix with predictor variables.
- **S**: Positive number indicating the dimensionality of the 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 weights 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

```r
data(dataExample_lpc)
Y = as.matrix(dataExample_lpc[1:20, 1:8])
X = as.matrix(dataExample_lpc[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 the 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

Example 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

```r
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 \((X = \text{NULL})\)
logistic reduced rank regression \((X \neq \text{NULL})\)

---

**Description**

plots the results of a logistic principal component analysis \((X = \text{NULL})\) logistic reduced rank regression \((X \neq \text{NULL})\)

**Usage**

```r
## 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

```r
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)
```

Description

plots the results of a multinomial restricted unfolding

Usage

```r
## 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
- Lastddfif last difference in deviances in outer loop
- Deviance obtained deviance
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