Package ‘aspect’

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Type Package

Title A General Framework for Multivariate Analysis with Optimal Scaling

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Description
Contains various functions for optimal scaling. One function performs optimal scaling by maximizing an aspect (i.e. a target function such as the sum of eigenvalues, sum of squared correlations, squared multiple correlations, etc.) of the corresponding correlation matrix. Another function performs implements the LINEALS approach for optimal scaling by minimization of an aspect based on pairwise correlations and correlation ratios. The resulting correlation matrix and category scores can be used for further multivariate methods such as structural equation models.

Depends R (>= 3.0.0)

Suggests sem, polycor

Imports stats, graphics, grDevices

License GPL-2

URL http://R-forge.R-project.org/projects/psychor/

LazyData yes

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R topics documented:

`corAspect` *Scaling by Maximizing Correlational Aspects*

Description

This function performs optimal scaling by maximizing a certain aspect of the correlation matrix.

Usage

```
corAspect(data, aspect = "aspectSum", level = "nominal", itmax = 100, eps = 1e-06, ...)
```

Arguments

`data`	Data frame or matrix
`aspect`	Function on the correlation matrix (see details)
`level`	Vector with scale level of the variables ("nominal" or "ordinal"). If all variables have the same scale level, only one value can be provided
`itmax`	Maximum number of iterations
`eps`	Convergence criterion
`...`	Additional parameters for aspect

Details

We provide various pre-specified aspects:

`"aspectAbs"` takes the sum of the absolute values of the correlations to the power `pow`. The optional argument `pow = 1`.

`"aspectSum"` the sum of the correlations to the power of `pow`. Again, as default `pow = 1`.

`"aspectDeterminant"` computes the determinant of the correlation matrix; no additional arguments needed.

`"aspectEigen"` the sum of the first p eigenvalues (principal component analysis). By default the argument `p = 1`.

`"aspectSMC"` the squared multiple correlations (multiple regression) with respect to a target variable. By default `targvar = 1` which implies that the first variable of the dataset is taken as response.

"aspectSumSMC" uses the sum of all squared multiple correlations (path analysis).

Alternatively, the user can write his own aspect, e.g. the function myAspect(r, ...) with r as the correlation matrix. This function must return a list with the function value as first list element and the first derivative with respect to r as the second. Then aspect = myAspect and additional arguments go into ... in maxAspect().

Value

loss	Final value of the loss function
catscores	Resulting category scores (after optimal scaling)
cormat	Correlation matrix based on the scores
eigencor	Eigenvalues of the correlation matrix
indmat	Indicator matrix (dummy coded)
scoremat	Transformed data matrix (i.e with category scores resulting from optimal scaling)
burtmat	Burt matrix
niter	Number of iterations

Author(s)

Jan de Leeuw, Patrick Mair

References

Mair, P., & de Leeuw, J. (2010). Scaling variables by optimizing correlational and non-correlational aspects in R. Journal of Statistical Software, Volume 32, Issue 9.

de Leeuw, J. (1988). Multivariate analysis with optimal scaling. In S. Das Gupta and J.K. Ghosh, Proceedings of the International Conference on Advances in Multivariate Statistical Analysis, pp. 127-160. Calcutta: Indian Statistical Institute.

See Also

lineals

Examples

```
## maximizes the first eigenvalue
data(galo)
res.eig1 <- corAspect(galo[,1:4], aspect = "aspectEigen")
res.eig1
summary(res.eig1)

## maximizes the first 2 eigenvalues
res.eig2 <- corAspect(galo[,1:4], aspect = "aspectEigen", p = 2)
res.eig2

## maximizes the absolute value of cubic correlations
```

```
res.abs3 <- corAspect(galo[,1:4], aspect = "aspectAbs", pow = 3)
res.abs3

## maximizes the sum of squared correlations
res.cor2 <- corAspect(galo[,1:4], aspect = "aspectSum", pow = 2)
res.cor2

## maximizes the determinant
res.det <- corAspect(galo[,1:4], aspect = "aspectDeterminant")
res.det

## maximizes SMC, IQ as target variable
res.smc <- corAspect(galo[,1:4], aspect = "aspectSMC", targvar = 2)
res.smc

## maximizes the sum of SMC
res.sumsmc <- corAspect(galo[,1:4], aspect = "aspectSumSMC")
res.sumsmc

## some user-defined non-sense aspect
## first list element corresponds to function value, second to first derivative
myAspect <- function(r, a = 1, b = 1) list(a*b*r, matrix(a*b, nrow = nrow(r), ncol = ncol(r)))
res.my <- corAspect(galo[,1:4], aspect = myAspect, a = 2, b = 4)
res.my
```

---

duncan *Duncan dataset*

Description

At 4 points in time the objects (n = 1204 adolescents) were asked to rate cigarette, marijuana, and alcohol consumption on a 5-point scale.

Usage

```
galo
```

Format

Data frame with marijuana (POT), cigarette (CIG), and alcohol (ALC) consumption.

Category labels:

1 ... never consumed

2 ... previous but no use over the last 6 months

3 ... current use of less than 4 times a month

4 ... current use of between 4 and 29 times a month

5 ... current use of 30 or more times a month

References

Duncan, S. C., Duncan, T. E., and Hops, H. (1998). Progressions of alcohol, cigarette, and marijuana use in adolescence. Journal of Bahavioral Medicine, 21, 375-388.

Examples

```
data(duncan)
duncan
```

`galo` *GALO dataset*

Description

The objects (individuals) are 1290 school children in the sixth grade of elementary school in the city of Groningen (Netherlands) in 1959.

Usage

```
galo
```

Format

Data frame with the five variables Gender, IQ, Advice, SES (fathers occupation) and School. IQ (original range 60 to 144) has been categorized into 9 ordered categories and the schools are enumerated from 1 to 37.

SES:

LoWC = Lower white collar; MidWC = Middle white collar; Prof = Professional, Managers; Shop = Shopkeepers; Skil = Schooled labor; Unsk = Unskilled labor.

Advice:

Agr = Agricultural; Ext = Extended primary education; Gen = General; Grls = Secondary school for girls; Man = Manual, including housekeeping; None = No further education; Uni = Pre-University.

References

Peschar, J.L. (1975). School, Milieu, Beroep. Groningen: Tjeek Willink.

Examples

```
data(galo)
galo
```

`lineals` *Linearizing bivariate regressions*

Description

This function performs optimal scaling in order to achieve linearizing transformations for each bivariate regression.

Usage

```
lineals(data, level = "nominal", itmax = 100, eps = 1e-06)
```

Arguments

`data`	Data frame or matrix
`level`	Vector with scale level of the variables ("nominal" or "ordinal"). If all variables have the same scale level, only one value can be provided
`itmax`	Maximum number of iterations
`eps`	Convergence criterion

Details

This function can be used as a preprocessing tool for categorical and ordinal data for subsequent factor analytical techniques such as structural equation models (SEM) using the resulting correlation matrix based on the transformed data. The estimates of the corresponding structural parameters are consistent if all bivariate regressions can be linearized.

Value

`loss`	Final value of the loss function
`catscores`	Resulting category scores (after optimal scaling)
`cormat`	Correlation matrix based on the scores
`cor.rat`	Matrix with correlation ratios
`indmat`	Indicator matrix (dummy coded)
`scoremat`	Transformed data matrix (i.e with category scores resulting from optimal scaling)
`burtmat`	Burt matrix
`niter`	Number of iterations

Author(s)

Jan de Leeuw, Patrick Mair

References

Mair, P., & de Leeuw, J. (2008). Scaling variables by optimizing correlational and non-correlational aspects in R. Journal of Statistical Software, Volume 32, Issue 9..

de Leeuw, J. (1988). Multivariate analysis with linearizable regressions. Psychometrika, 53, 437-454.

See Also

corAspect

Examples

```
data(galo)
res.lin <- lineals(galo)
summary(res.lin)
```

---

plot.aspect *Plot method for aspect solutions*

Description

This method provides regression plots and transformation plots for objects of class "aspect", i.e. solutions of corAspect and lineals

Usage

```
## S3 method for class 'aspect'
plot(x, plot.type, plot.var = c(1,2), xlab, ylab, main, type, ...)
```

Arguments

x	Object of class "aspect".
plot.type	Type of plot to be produced (details see below): "regplot", "transplot".
plot.var	For plot.type = "regplot" only. Vector of length 2 with variables to be plotted. Either variable names of column number.
xlab	Label x-axis.
ylab	Label y-axis.
main	Plot title.
type	Whether points, lines or both should be plotted.
...	Additional graphical parameters.

Details

The regression plot ("regplot") provides two plots. First, the unscaled solution is plotted. A frequency grid for the categories of the first variable (var1; x-axis) and the categories of the second variable (var2; y-axis) is produced. The regression line is based on the category weighted means of the relative frequencies: the blue line on the var1 means on the x-axis and the var2 categories on the y-axis, the red line is based on the var1 categories on the x-axis and the var2 means on the y-axis. In a second device the scaled solution is plotted. The frequency grid is determined by the var1 scores (x-axis) and the var2 scores(y-axis). Now, instead of the var1/var2 categories, the var1 scores (blue line y-axis) and the row scores (red line x-axis) are used.

The transformation plot ("transplot") plots the raw categories against the computed scores.

See Also

lineals, corAspect

Examples

```
##Regression plots using galo data
data(galo)
res <- lineals(galo[,1:4])
#plot(res, plot.type = "regplot", plot.var = c("advice","SES"))
#plot(res, plot.type = "transplot")
```

---

wurzer *Internet terminals*

Description

The dataset is about the use of public Internet terminals. For this package we extracted a subset of 8 items.

Usage

```
wurzer
```

Format

A data frame (n = 215) with the following items:

Do you know at least one place where you can finnd such a terminal? (yes/no)

Have you already used such a terminal? (yes/no)

How often do you use the Internet on each of the following locations: home, work, cafe, terminal, cellphone? (5-point scales; see below)

Which of the following descriptions fits you best? (I'm here on vacation/I am from here/I'm here on business travel)

The 5-point items we have the following categories: daily (1), almost daily (2), several times a week (3), several times a month (3), once a month (4), less frequently (5).

References

Wurzer, M. (2006). An Application of Configural Frequency Analysis: Evaluation of the Usage of Internet Terminals. Master's thesis, University of Vienna, Austria.

Examples

```
data(wurzer)
wurzer
```

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