

Package ‘tuckerR.mmgg’

July 22, 2025

Type Package

Title Three-Mode Principal Components Analysis

Version 1.5.1

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Description Performs Three-Mode Principal Components Analysis,
which carries out Tucker Models.

Depends R (>= 3.3.0)

Suggests knitr, testthat

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 6.0.1

URL https://github.com/gusart/tuckerR_mmgg

BugReports https://github.com/gusart/tuckerR_mmgg/issues

NeedsCompilation no

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Repository CRAN

Date/Publication 2018-06-14 16:44:33 UTC

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 diffit

Aplication of the Diffit method.

Description

The diffit method is used to apply when we need to know the axis number to be gathered in the P mode, and Q mode. The third mode, K it is related to the environment numbers. The diffit method consist on fitting each value with the Tuckle algorithm.

Usage

```
diffit(datos, amb = 2, stand = TRUE, niter = 10000)
```

Arguments

datos	datos original data from data frames
amb	numbers of environment
stand	a boolean value, if it is TRUE (value set by default) each variable is centered and scale by variable.
niter	the iteration number for the Tuckals algorithm, by default 10000 iteration.

Details

The final result is the model which has the most coefficient diffits the greatest variability explained and the one which exceed the threshold.

Value

saldiffit a list with a combination numbers of axis, percentage of variability explained and Diffit rate. The critic value or threhold is also return.

Author(s)

Marta Marticorena, Gustavo Gimenez, Cecilia Gonzalez, Sergio Bramardi

References

- MARTICORENA, M.; BRAMARDI, S.; DEFACIO, R. 2010.** Characterization of maize populations in different environmental conditions by means of Three-Mode Principal Components Analysis. *Revista Ciencia e Investigacion Agraria*. 37(3): 93-105.
- Timmerman, M.E., and H. Kiers. 2000.** Three-mode principal components analysis. Choosing numbers of components and sensitivity to local optima. *The British Journal of the Mahematical and Statistical Psychology* 53: 1-16.

Examples

```
#Copy and paste this example in your console without the comment
#data(maize_pop,package = "tuckerR.mmgg")
#dif_sal <- diffit(maize_pop,amb=2)
#print(dif_sal) the best combination is 3 3 2
```

maize_pop

*31 Native Populations of Maize from Province of Buenos Aires***Description**

These populations are part of collection of local populations corresponding to different races that are conserved in the Active Germplasm Bank of INTA Pergamino Experimental Station, Argentina.

Usage

```
data("maize_pop")
```

Format

A data frame with 10 characteristics of 31 maize populations in two different conditions corresponding to production areas of Buenos Aires. Since the variables are repeated in both places the data frame has a total of 20 variables, 10 for an environment and evaluated them in the other conditions. First and second conditions the numerical vectors are the following:

LMZ a numeric vector with ear length(cm), in first condition
 DMZ a numeric vector with ear diameter (mm),in first condition
 AGR a numeric vector with grain width (mm),in first condition
 LGR a numeric vector with grain length (cm), in first condition
 PROL a numeric vector prolicicacy (ears/plant), in first condition
 GRXM a numeric vector with grains by meter in first condition
 PESO_1000 a numeric vector with weight of 1000 grains (grs)
 REND a numeric vector with yield (kg/ha), in first condition
 ALTPL a numeric vector height of the plant (cm) in first condition
 ALTMZ a numeric vector with height of ear insertion (cm) in first condition
 LMZ a numeric vector with ear length(cm), in second condition
 DMZ a numeric vector with ear diameter (mm),in second condition
 AGR a numeric vector with grain width (mm),in second condition
 LGR a numeric vector with grain length (cm), in second condition
 PROL a numeric vector prolicicacy (ears/plant), in second condition
 GRXM a numeric vector with grains by meter in second condition
 PESO_1000 a numeric vector with weight of 1000 grains (grs) in second condition
 REND a numeric vector with yield (kg/ha), in second condition
 ALTPL a numeric vector height of the plant (cm) in second condition
 ALTMZ a numeric vector with height of ear insertion (cm) in second condition

Details

Ten quantitative variables were evaluated in two tests conducted in the 2003/04 season in the localities Pergamino A INTA) and Ferre. These variables allowed for morphologic-agronomic characterization and may be influenced, to a certain extent, by environmental conditions.

References

MARTICORENA, M.; BRAMARDI, S.; DEFACIO, R. (2010). Characterization of maize populations in different environmental conditions by means of Three-Mode Principal Components Analysis. *Revista Ciencia e Investigacion Agraria*. 37(3): 93-105.

Examples

```
data(maize_pop,package = "tuckerR.mmgg")
str(maize_pop); summary(maize_pop)
```

matrition	<i>Concatenate data frame in array and matrix by cases, variables and environments</i>
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Description

Concatenate data frame in array and matrix by cases, variables and environments to performs three mode principal components with the function [tucker2R](#).

Usage

```
matrition(datos, I, J, K)
```

Arguments

datos	original data from data frames
I	the numbers of cases
J	the numbers of variables
K	the numbers of environment or conditions

Details

This process is also knowing as 'matricizing' or 'unfolding'.

Value

matrizlista return a list with: the array "m" with all the data concatenate in array. X1 the data is concatenate by cases, X2 the data concatenate by variables and X3 the data concatenate by environments.

Examples

```

data(maize_pop, package = "tuckerR.mmgg")
conc_matrix <- matrition(maize_pop, I=30, J=10, K=2)
conc_matrix$m #get m array
conc_matrix$X1 #get matrix by cases
conc_matrix$X2 #get matrix by variables
conc_matrix$X3 #get matrix by environments

```

plot

Plot an interactive Biplot

Description

The interactive Biplot consists of combining two of the modes, obtaining markers for the individuals and vectors for the variables that were concatenated with the conditions. To plot the interactive Biplot this function need the output for the tucker2R function.

Usage

```

plot(saltuck, ...)

## S3 method for class 'marta'
plot(saltuck)

```

Arguments

saltuck	is a list with the results of the algorithm to plot the biplot, where the names of the conditions are well kept.
...	Arguments to be passed to plot.

Details

The interactive Biplot allows for the visualization of the inter structure of the differents data tables.

Value

NULL

Author(s)

Marta Marticorena, Gustavo Gimenez, Cecilia Gonzalez, Sergio Bramardi

References

- MARTICORENA, M.; BRAMARDI, S.; DEFACIO, R. 2010.** Characterization of maize populations in different environmental conditions by means of Three Mode Principal Components Analysis. *Revista Ciencia e Investigacion Agraria*. 37(3): 93-105.
- Gabriel, K.R. 1971.** The biplot graphic display of matrices with appications to principal components analysis. *Biometrika*. 58, 453-467.

Examples

```
data(maize_pop,package = "tuckerR.mmgg")
prueba1 <- tucker2R(maize_pop, amb=2, stand=TRUE, nc1=3, nc2=3)
plot(prueba1)
```

tucker2R

*Three-Mode Principal Components: Tucker 2 Model***Description**

This function performs Three-Mode Principal Components using Tucker-2 Model. Compute all the output necessary to plot interactive Biplot. The Three-Mode Principal Component Analysis, provides both useful analytic and graphic tools to study and characterize phylogenetic resources, especially when the influence of environmental factors are possible.

Usage

```
tucker2R(datos, amb= 2, stand = TRUE, nc1 = 2, nc2 = 2, niter = 10000)
```

Arguments

datos	a data frame with n rows for individuals and p variable for columns. All the conditions must be the same variables names and individuals.
amb	The different conditions, in which the same variables and individuals had been studied. By default is 2.
stand	a boolean value, if it is TRUE (value set by default) each variable is centered and scale by variable.
nc1	number of components in the first mode, by default is 2
nc2	number of components in the second mode, by default is 2
niter	the iteration number for the Tuckals algorithm, by default 10000 iteration

Details

To determine the number of components that are going to be retained, we use previously to the algorithm applications, method called DifFit. The number of components in the third mode is obtained from the number of conditions. The labels of the variables must be the same for all conditions in the data frame.

Value

Resultado a list which stores the name of the individual and the variables, the number of iterations, the variability explained by the model, and the total variability. Proyeccion It is a list which holds the projection of individuals and variables to see if the biplot is difficult to understand because of the huge number of cases or plotted vectors. saltuck is a list with the results of the algorithm to plot the biplot, where the names of the conditions are well kept.

Author(s)

Marta Marticorena, Gustavo Gimenez, Cecilia Gonzalez, Sergio Bramardi

References

Marticorena, M.; Bramardi, S.; Defacio, R. 2010. Characterization of maize populations in different environmental conditions by means of Three-Mode Principal Components Analysis. *Revista Ciencia e Investigacion Agraria*. 37(3): 93-105.

Timmerman, M.E., and H. Kiers. 2000. Three-mode principal components analysis. Choosing numbers of components and sensitivity to local optima. *The British Journal of the Mathematical and Statistical Psychology* 53: 1-16.

See Also

The function `plot.marta` for a complete analysis.

Examples

```
data(maize_pop, package = "tuckerR.mmgg")
(output <- tucker2R(maize_pop, amb=2, stand=TRUE, nc1=3, nc2=3))
```

tuckerR.mmgg

Three-Mode Principal Components: Tuckers Models

Description

This package performs Three-Mode Principal Components using Tuckers Models and plot interactive Biplot. These Three-Mode Principal Component Analysis, provides both useful analytic and graphic tools to study and characterize phylogenetic resources, specially when the influence of environmental factors are possible.

Author(s)

Marta Marticorena, Gustavo Gimenez, Cecilia Gonzalez, Sergio Bramardi

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