Package ‘nparMD’

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Type Package

Title Nonparametric Analysis of Multivariate Data in Factorial Designs

Version 0.1.0

Depends R (>= 3.1.0)

Imports matrixStats, matrixcalc, MASS, gtools, Formula, methods, stats

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Description Analysis of multivariate data with two-way completely randomized factorial design. The analysis is based on fully nonparametric, rank-based methods and uses test statistics based on the Dempster's ANOVA, Wilk's Lambda, Lawley-Hotelling and Bartlett-Nanda-Pillai criteria. The multivariate response is allowed to be ordinal, quantitative, binary or a mixture of the different variable types. The package offers two functions performing the analysis, one for small and the other for large sample sizes. The underlying methodology is largely described in Bathke and Harrar (2016) <doi:10.1007/978-3-319-319-319-37065-9_7> and in Munzel and Brunner (2000) <doi:10.1016/S0378-3758(99)00212-8>.

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R topics documented:

nparml ................................................................. 2
nparms ................................................................. 3
pseudostudy1 ......................................................... 4
pseudostudy2 ......................................................... 5

Index 6
Description

Analysis of multivariate data with two-way completely randomized factorial design - version for large samples. The analysis is based on fully nonparametric, rank-based methods and uses an F-approximation for 'Dempster’s ANOVA' criterion and a chi-square-approximation for 'Lawley-Hotelling's' criterion. This approximations are given by the asymptotic distribution of these statistics under true null-hypothesis. In contrast to the normal-approximated test (nrbtest2) it is designed for data with large samples (see details) while the number of factorial levels is allowed to be small. The multivariate response is allowed to be ordinal, quantitative, binary or a mixture of the different variable types. The test statistics are constructed using nonparametric relative effect estimators.

Usage

nparml(formula, data)

Arguments

- **formula**: an object of class "formula" with two explanatory variables (factors), see examples.
- **data**: an object of class "data.frame" containing the variables in the formula

Details

The data is analysed for main effects and interaction effect of the explanatory factors. In each case the null hypothesis "no effect" is tested. In order to obtain reliable results the considered data should include at least 7 observations per factor level combination. This method is only implemented for complete data sets without missing values.

Value

Returns a list of data frames providing the values of the test statistics, p-values, degrees of freedom, factor levels, and groupsize per factor level combination.

References


nparsms

Examples

data(pseudostudy1)
nparml(resp1|resp2|resp3~treatment*age, pseudostudy1)
	npargs Nonparametric Test For Multivariate Data With Two-Way Layout Factorial Design - Small Samples

Description

Analysis of multivariate data with two-way completely randomized factorial design - version for small samples. The analysis is based on fully nonparametric, rank-based methods and uses a N(0,1)-approximation for test statistics based on 'Dempster's ANOVA', 'Wilk's Lambda', 'Lawley-Hotelling' and 'Bartlett-Nanda-Pillai' criterion. This approximation is established by the asymptotic distribution of these four statistics under true null-hypothesis if one of the explanatory factors has a large number of levels. The multivariate response is allowed to be ordinal, quantitative, binary or a mixture of the different variable types. The test statistics are constructed using nonparametric relative effect estimators.

Usage

nparsms(formula, data)

Arguments

formula an object of class "formula" with two explanatory variables (factors), see examples.
data an object of class "data.frame" containing the variables in the formula

Details

This method is only implemented for complete data sets without missing values. The data is analysed for main effects and interaction effect of the explanatory factors. In each case the null hypothesis "no effect" is tested. The covariance matrix estimation requires at least 4 observations (observation vectors) per factor level combination. As the estimation is very time-consuming for large groups it is performed with a random selection of observations when a group exceeds a size of 6 observation vectors.

Value

Returns a list of data frames providing the values of the test statistics, p-values, degrees of freedom, factor levels, and groupsize per factor level combination.
References


Examples

```r
data(pseudostudy2)
nparms(resp1|resp2|resp3~treatment*age, pseudostudy2)
```

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**pseudostudy1**  
*pseudostudy dataset 1*

Description

Example data set in a two-way layout without effects (in terms of distribution) by factors "treatment" and "age". In constrast to the 'pseudostudy2' data set the number of factorial levels is low while the number of observations per factor level combination is large.

Usage

```r
data(pseudostudy1)
```

Format

pseudostudy consists of 56 cases (rows) and 5 variables where 'treatment'('age') is considered to be the explanatory factor 'A'('B') and the variables resp1, resp2, resp3 form the response vector.

Examples

```r
data(pseudostudy1)
```
Description

Example data set in a two-way layout without effects (in terms of distribution) by factors "treatment" and "age".

Usage

data(pseudostudy2)

Format

pseudostudy consists of 107 cases (rows) and 5 variables where 'treatment' ('age') is considered to be the explanatory factor 'A' ('B') and the variables resp1, resp2, resp3 form the response vector.

Examples

data(pseudostudy2)
Index

*Topic datasets
  pseudostudy1, 4
  pseudostudy2, 5

nparml, 2
nparms, 3

pseudostudy1, 4
pseudostudy2, 5