Package ‘HRM’

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Title High-Dimensional Repeated Measures
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Suggests RGtk2 (>= 2.8.0), cairoDevice, testthat
LinkingTo Rcpp
SystemRequirements C++11
Description Methods for testing main and interaction effects in possibly high-dimensional parametric or nonparametric repeated measures in factorial designs for univariate or multivariate data. The observations of the subjects are assumed to be multivariate normal if using the parametric test. The nonparametric version tests with regard to nonparametric relative effects (based on pseudo-ranks).
It is possible to use up to 2 whole- and 3 subplot factors.
License GPL-2 | GPL-3
RoxygenNote 7.0.2
URL http://github.com/happma/HRM
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NeedsCompilation yes
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**HRM-package**

Inference on low- and high-dimensional multi-group repeated-measures designs with unequal covariance matrices.

**Description**

Tests for main and simple treatment effects, time effects, as well as treatment by time interactions in possibly high-dimensional multi-group repeated measures designs. The groups are allowed to have different variance-covariance matrices but the observations must follow a multivariate normal distribution.

**Details**

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**Author(s)**

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**References**


Function to calculate confidence intervals

Description

Function to calculate simultaneous, asymptotic (1-alpha) confidence intervals for an object of class 'HRM'.

Usage

```r
## S3 method for class 'HRM'
confint(object, parm, level = 0.95, ...)
```

Arguments

- `object`: an object from class 'HRM' returned from the function `hrm_test`
- `parm`: currently ignored; all possible confidence intervals are calculated
- `level`: confidence level (FWER) used for calculating the intervals
- `...`: Further arguments passed to 'hrm_test' will be ignored

Value

Returns a data.frame with mean and 1-alpha confidence interval for each factor combination

Examples

```r
# hrm.test with a data.frame using a 'formula' object

# using the EEG dataset
?EEG

## Not run:
# z <- hrm_test(value ~ group*region*variable, subject = "subject", data = EEG)
# confint(z)
## End(Not run)
```
**EEG**

*EEG data of 160 subjects*

**Description**

A dataset containing EEG data (Staffen et al., 2014) of 160 subjects, 4 variables are measured at ten different locations.

**Usage**

data(EEG)

**Format**

A data frame with 6400 rows and 7 variables.

**Details**

The columns are as follows:

- **group.** Diagnostic group of the subject: Alzheimer's Disease (AD), Mild Cognitive Impairment (MCI), Subject Cognitive Complaints (SCC+, SCC-).
- **value.** Measured data of a subject at a specific variable and region.
- **sex.** Sex of the subject: Male (M) or Female (W).
- **subject.** A unique identification of a subject.
- **variable.** The variables measured are activity, complexity, mobility and brain rate coded from 1 to 4.
- **region.** Frontal left/right, central left/right, temporal left/right, occipital left/right, parietal left/right coded as 1 to 10.
- **dimension.** Mixing variable and region together, levels range from 1 to 40.

**hrm_GUI**

*Graphical User Interface for Testing Multi-Factor High-Dimensional Repeated Measures*

**Description**

Graphical User Interface (R Package RGtk2 needed) for the Function 'hrm_test': Test for main effects and interaction effects of one or two between-subject factors and one, two or three within-subject factors (at most four factors can be used).

**Usage**

hrm_GUI()
Value

The results can be saved as LaTeX Code or as plain text. Additionally a plot of the group profiles an be saved when using one whole- and one subplot factor.

hrm_test

Test for Multi-Factor High-Dimensional Repeated Measures

Description

Performing main and interaction effects of up to three whole- or subplot-factors. In total, a maximum of four factors can be used. There are two different S3 methods available. The first method requires a list of matrices in the wide table format. The second method requires a data.frame in the long table format.

Usage

hrm_test(data, ...)

## S3 method for class 'list'
hrm_test(data, alpha = 0.05, ...)

## S3 method for class 'data.frame'
hrm_test(
  data,
  formula,
  alpha = 0.05,
  subject,
  variable = NULL,
  nonparametric = FALSE,
  np.correction = NA,
  character.only = FALSE,
  ...
)

Arguments

data Either a data.frame (one observation per row) or a list with matrices (one subject per row) for all groups containing the data

... Further arguments passed to 'hrm_test' will be ignored

alpha alpha level used for calculating the critical value for the test

formula A model formula object. The left hand side contains the response variable and the right hand side contains the whole- and subplot factors.

subject column name within the data frame X identifying the subjects

variable if not 'NULL' then multivariate tests are applied. We assume that for each factor level of 'variable', we observe several repeated measurements. Currently only supports designs with 1 whole- and one sub-plot factor.
nonparametric Logical variable indicating whether the nonparametric version of the test statistic should be used.

np.correction Logical variable indicating whether a small sample size correction for the nonparametric test should be used (TRUE) or not (FALSE). By using NA, np.correction is used automatically in a high-dimensional setting.

character.only a logical indicating whether subject can be assumed to be a character string.

Value

Returns an object from class HRM containing:

result A dataframe with the results from the hypotheses tests.

formula The formula object which was used.

alpha The type-I error rate which was used.

subject The column name identifying the subjects.

factors A list containing the whole- and subplot factors.

data The data.frame or list containing the data.

Examples

```r
## hrm_test with a list of matrices

# number patients per group
n = c(10,10)
# number of groups
a=2
# number of variables
d=40

# defining the list consisting of the samples from each group
mu_1 = mu_2 = rep(0,d)
# autoregressive covariance matrix
sigma_1 = diag(d)
for(k in 1:d) for(l in 1:d) sigma_1[k,l] = 1/(1-0.5^2)*0.5^(abs(k-l))
sigma_2 = 1.5*sigma_1
X = list(mvrnorm(n[1],mu_1, sigma_1), mvrnorm(n[2],mu_2, sigma_2))
X=lapply(X, as.matrix)
hrm_test(data=X, alpha=0.05)

## hrm.test with a data.frame using a 'formula' object

# using the EEG dataset
?EEG

# Univariate Approach
hrm_test(value ~ group*region*variable, subject = "subject", data = EEG)

# Multivariate Approach: testing effects for each variable
```
hrm_test(value~group*region, subject=subject, variable=variable, data = EEG)

## S3 method for class 'HRM'
plot(x, xlab = "time", ylab = "mean", legend = TRUE, legend.title = "", ...)
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