Package ‘ClusterBootstrap’

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Title Analyze Clustered Data with Generalized Linear Models using the Cluster Bootstrap

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Description Provides functionality for the analysis of clustered data using the cluster bootstrap.

Depends R (>= 3.0), stats, utils, graphics, parallel

License GPL-3

URL https://github.com/mathijsdeen/ClusterBootstrap

BugReports https://github.com/mathijsdeen/ClusterBootstrap/issues

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**clusbootglm**  
*Fit generalized linear models with the cluster bootstrap*

**Description**

Fit a generalized linear model with the cluster bootstrap for analysis of clustered data.

**Usage**

```r
clusbootglm(model, data, clusterid, family = gaussian, B = 5000,
confint.level = 0.95, n.cores = 1)
```

**Arguments**

- `model`: generalized linear model to be fitted with the cluster bootstrap.
- `data`: dataframe that contains the data.
- `clusterid`: variable in data that identifies the clusters.
- `family`: error distribution to be used in the model, e.g. `gaussian` or `binomial`.
- `B`: number of bootstrap samples.
- `confint.level`: level of confidence interval.
- `n.cores`: number of CPU cores to be used.

**Details**

Some useful methods for the obtained `clusbootglm` class object are `summary.clusbootglm`, `coef.clusbootglm`, and `clusbootsample`.

**Value**

`clusbootglm` produces an object of class "clusbootglm", containing the following relevant components:

- `coefficients`: A matrix of `B` rows, containing the parameter estimates for all bootstrap samples.
- `bootstrap.matrix`: `n*B` matrix, of which each column represents a bootstrap sample; each value in a column represents a unit of `subjectid`.
- `lm.coefs`: Parameter estimates from a single (generalized) linear model.
- `boot.coefs`: Mean values of the parameter estimates, derived from the bootstrap coefficients.
- `boot.sds`: Standard deviations of cluster bootstrap parameter estimates.
- `ci.level`: User defined confidence interval level.
- `percentile.interval`: Confidence interval based on percentiles, given the user defined confidence interval level.
clusbootsample

parametric.interval
Confidence interval based on lm.coefs and column standard deviations of coefficients, given the user defined confidence interval level.

BCa.interval
Confidence interval based on percentiles with bias correction and acceleration, given the user defined confidence interval level.

samples.with.NA.coef
Cluster bootstrap sample numbers with at least one coefficient being NA.

failed.bootstrap.samples
For each of the coefficients, the number of failed bootstrap samples are given.

Author(s)
Mathijs Deen, Mark de Rooij

Examples

```
## Not run:
data(opposites)
clusbootglm(score~time*cog, data=opposites, clusterid=subject)
## End(Not run)
```

clusbootsample

Return data for specified bootstrap sample

Description
Returns the full data frame for a specified bootstrap sample in a clusbootglm object.

Usage

```r
clusbootsample(object, samplenr)
```

Arguments

- **object**
  object of class clusbootglm, created with the clusbootglm function.

- **samplenr**
  sample number for which the data frame should be returned.

Author(s)
Mark de Rooij, Mathijs Deen

Examples

```
## Not run:
data(opposites)
cbglm.1 <- clusbootglm(SCORE~Time*COG, data=opposites, clusterid=Subject)
clusbootsample(cbglm.1, samplenr=1)
## End(Not run)
```
coef.clusbootglm  Obtain coefficients from cluster bootstrap object

Description

Returns the coefficients of an object of class clusbootglm.

Usage

## S3 method for class 'clusbootglm'
coef(object, estimate.type = "bootstrap", ...)

Arguments

- **object**: object of class clusbootglm.
- **estimate.type**: type of coefficient (bootstrap or glm).
- **...**: other arguments.

Author(s)

Mathijs Deen

Examples

```r
## Not run:
data(opposites)
cbglm1 <- clusbootglm(SCORE~Time*COG, data=opposites, clusterid=Subject)
coef(cbglm1, estimate.type="bootstrap")
## End(Not run)
```

confint.clusbootglm  Confidence intervals for cluster bootstrap model parameters

Description

Computes confidence intervals for one or more parameters in a fitted GLM with the cluster bootstrap.

Usage

## S3 method for class 'clusbootglm'
confint(object, parm = "all", level = 0.95, interval.type = "BCa", ...)

```
Arguments

object object of class clusbootglm.

parm a specification of which parameters are to be given confidence intervals, either a vector of numbers or a vector of names. Defaults to all parameters.

level the required confidence level

interval.type type of confidence level. Options are BCa, percentile, and parametric.

Other arguments.

Author(s)

Mathijs Deen

Examples

## Not run:
data(opposites)
cbgml.1 <- clusbootglm(SCORE~Time*COG, data=opposites, clusterid=Subject)
confint(cbgml.1, parm=c("Time","COG"), level=.90, interval.type="percentile")
## End(Not run)

medication Medication data

Description

The medication data frame consists of 1242 observations within 73 individuals that were part of a placebo controlled clinical trial, as reported in Tomarken, Shelton, Elkins, and Anderson (1997).

The data were retrieved from the accompanied website of Singer & Willett (2003), at https://stats.idre.ucla.edu/other/examples/alda/.

Usage

medication

Format

the following variables are available:

- id: subject indicator
- treatment: either placebo (0) or antidepressant (1)
- time: number of days since trial start.
- pos: positive affect. Higher scores indicate a more positive mood.
References


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**opposites**

*Opposes naming data*

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**Description**

The *opposites* dataframe consists of 144 observations within 36 individuals that completed an inventory that assesses their performance on a timed cognitive task called "opposites naming".

The dataset does not contain the empirical data within 35 individuals from the experiment by Willett (1988), but a simulation based on the multilevel model from Singer & Willett (2003) within 36 individuals.

**Usage**

*opposites*

**Format**

The following variables are available:

- **Subject**: subject indicator
- **Time**: a time variable, ranging 0-3
- **C0G**: cognitive skill, measured once (at time=0)
- **SCORE**: score on opposites naming task

**References**

**summary.clusbootglm**  
*Summarize output of cluster bootstrap GLM*

**Description**

Returns the summary of an object of class `clusbootglm`.

**Usage**

```r
## S3 method for class 'clusbootglm'
summary(object, estimate.type = "bootstrap",
         interval.type = "BCa", ...)
```

**Arguments**

- `object`: object of class `clusbootglm`.
- `estimate.type`: specify which type of estimate should be returned, either bootstrap means (default) or GLM estimates from model fitted on original data.
- `interval.type`: which confidence interval should be used. Options are `parametric`, `percentile`, and `BCa` intervals.
- `...`: other arguments.

**Author(s)**

Mathijs Deen

**Examples**

```r
## Not run:
data(opposites)
cbglm.1 <- clusbootglm(SCORE~Time*COG, data=opposites, clusterid=Subject)
summary(cbglm.1, interval.type="percentile")
## End(Not run)
```
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