Package 'elgbd'

May 8, 2026

Type Package

Title Empirical Likelihood for General Block Designs

Version 0.9.0

Description Performs hypothesis testing for general block designs with empirical likelihood. The core computational routines are implemented using the 'Eigen' 'C++' library and 'RcppEigen' interface, with 'OpenMP' for parallel computation. Details of the methods are given in Kim, MacEachern, and Peruggia (2023) <doi:10.1080/10485252.2023.2206919>. This work was supported by the U.S. National Science Foundation under Grants No. SES-1921523 and DMS-2015552.

License GPL (>= 3)

URL https://github.com/markean/elgbd

BugReports https://github.com/markean/elgbd/issues

Depends R (>= 4.1.0)

Imports Rcpp, stats

Suggests melt, spelling

LinkingTo Rcpp, RcppEigen, RcppProgress

Config/testthat/edition 3

Encoding UTF-8

Language en-US

NeedsCompilation yes

RoxygenNote 7.3.1

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Repository CRAN

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Contents

`clothianidin` *Clothianidin concentration in maize plants*

Description

A dataset summarizing field experiments result of seed treatments on clothianidin concentration.

Usage

```
data("clothianidin")
```

Format

A data frame with 102 observations and 3 variables:

blk New blocks constructed from original data. The format is 'days post planting_original block_year'.

trt Seed treatment.

clo Log transformed clothianidin concentration (µg).

Details

The original data is provided by Alford and Krupke (2017). Only some of the shoot region observations are taken from the original data and processed for illustration.

Source

Alford A, Krupke CH (2017). "Translocation of the Neonicotinoid Seed Treatment Clothianidin in Maize." *PLOS ONE*, **12**(3), 1–19. doi:10.1371/journal.pone.0173836.

Examples

```
data("clothianidin")
clothianidin
```

el_aov *Analysis of variance with empirical likelihood*

Description

Fits an one-way analysis of variance model with empirical likelihood.

Usage

```
el_aov(formula, data, maxit = 10000, abstol = 1e-08)
```

Arguments

formula	An object of class formula (or one that can be coerced to that class) for a symbolic description of the model to be fitted. It must specify the variables for response and treatment as response ~ treatment.
data	A data frame containing the variables in formula.
maxit	A single integer for the maximum number of iterations for optimization. Defaults to 10000.
abstol	A single numeric for the absolute convergence tolerance for optimization. Defaults to 1e-08.

Value

A list containing the model fit and optimization results.

References

Owen, A (1991). "Empirical Likelihood for Linear Models." *The Annals of Statistics*, **19**(4), 1725–1747. doi:10.1214/aos/1176348368.

Examples

```
data("clothianidin")
el_aov(clo ~ trt, clothianidin)
```

el_pairwise *Pairwise comparisons for general block designs with empirical likelihood*

Description

Tests all pairwise comparisons or comparisons with control for general block designs with empirical likelihood. Two single step asymptotic k-FWER (generalized family-wise error rate) controlling procedures are available: asymptotic Monte Carlo (AMC) and nonparametric bootstrap (NB).

Usage

```
el_pairwise(
  formula,
  data,
  control = NULL,
  k = 1L,
  alpha = 0.05,
  method = c("AMC", "NB"),
  B,
  nthreads = 1L,
  maxit = 10000L,
  abstol = 1e-08,
  verbose = FALSE
)
```

Arguments

formula	An object of class formula (or one that can be coerced to that class) for a symbolic description of the model to be fitted. It must specify the variables for response, treatment, and block as response ~ treatment | block. Note that the use of vertical bar (|) separating treatment and block.
data	A data frame, list or environment (or object coercible by as.data.frame() to a data frame) containing the variables in formula.
control	An optional single character that specifies the treatment for comparisons with control.
k	A single integer for k in k-FWER. Defaults to 1.
alpha	A single numeric for the overall significance level. Defaults to 0.05.
method	A single character for the procedure to be used; either AMC or NB is supported. Defaults to AMC.
B	A single integer for the number of Monte Carlo samples for the AMC (number of bootstrap replicates for the NB).
nthreads	A single integer for the number of threads for parallel computation via 'OpenMP' (if available). Defaults to 1.

maxit	A single integer for the maximum number of iterations for constrained minimization of empirical likelihood. Defaults to 10000.
abstol	A single numeric for the the absolute convergence tolerance for optimization. Defaults to 1e-08.
verbose	A single logical. If TRUE, a message on the convergence status is printed. Defaults to FALSE.

Value

A list containing the model fit and optimization results.

References

Kim E, MacEachern SN, Peruggia M (2023). "Empirical likelihood for the analysis of experimental designs." *Journal of Nonparametric Statistics*, **35**(4), 709–732. doi:10.1080/10485252.2023.2206919.

Examples

```
# All pairwise comparisons
data("clothianidin")
el_pairwise(clo ~ trt | blk, data = clothianidin, B = 1000)

# Comparisons with control
el_pairwise(clo ~ trt | blk,
  control = "Naked", data = clothianidin, B = 1000
)
```

---

el_test *Hypothesis testing with empirical likelihood*

Description

Tests single hypothesis for general block designs with empirical likelihood.

Usage

```
el_test(
  formula,
  data,
  lhs,
  rhs = NULL,
  maxit = 10000,
  abstol = 1e-08,
  verbose = FALSE
)
```

Arguments

formula	An object of class formula (or one that can be coerced to that class) for a symbolic description of the model to be fitted. It must specify the variables for response, treatment, and block as response ~ treatment | block. Note that the use of vertical bar (|) separating treatment and block.
data	A data frame containing the variables in formula.
lhs	A numeric matrix specifying the left-hand side of a hypothesis in terms of parameters.
rhs	An optional numeric vector specifying the right-hand side the hypothesis. If not specified, it is set to the zero vector. Defaults to NULL.
maxit	A single integer for the maximum number of iterations for optimization. Defaults to 10000.
abstol	A single numeric for the absolute convergence tolerance for optimization. Defaults to 1e-08.
verbose	A single logical. If TRUE, a message on the convergence status is printed. Defaults to FALSE.

Value

A list containing the model fit and optimization results.

References

Kim E, MacEachern SN, Peruggia M (2023). "Empirical likelihood for the analysis of experimental designs." *Journal of Nonparametric Statistics*, **35**(4), 709–732. doi:10.1080/10485252.2023.2206919.

Examples

```
# Test for equal means
data("clothianidin")
el_test(clo ~ trt | blk, clothianidin,
  lhs = matrix(c(
    1, -1, 0, 0,
    0, 1, -1, 0,
    0, 0, 1, -1
  ), byrow = TRUE, nrow = 3L)
)
```

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