Package ‘OWEA’

Type Package

Title Optimal Weight Exchange Algorithm for Optimal Designs for Three Models

Version 0.1.1

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Description An implementation of optimal weight exchange algorithm Yang(2013) <doi:10.1080/01621459.2013.806268> for three models. They are Crossover model with subject dropout, crossover model with proportional first order residual effects and interference model. You can use it to find either A-opt or D-opt approximate designs. Exact designs can be automatically rounded from approximate designs and relative efficiency is provided as well.

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Encoding UTF-8

LazyData true

Suggests knitr, rmarkdown

Imports gtools (>= 3.8.1), MASS, shiny (>= 1.1.0)

RoxygenNote 6.1.0

NeedsCompilation no

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Design Generator for Three Models

Description

Construct optimal approximate designs as well as efficient exact designs for crossover model with subject dropout, crossover model with proportional residual effect, and interference model.

Usage

design(model = c("dropout", "proportional", "interference"), n, opt, t, p, ..., max_iter = 40)

Arguments

- **model**: an model indicator, must be one of 'dropout', 'proportional', or 'interference'.
- **n**: Positive Integer, total number of observations needed.
- **opt**: Integer. optimal criterion indicator, opt = 0 means D-opt, opt = 1 means A-opt
- **t**: Positive interger,number or levels of treatment, the default coding is integer from 1 to t
- **p**: Numeric, number of periods for crossover model or number of blocks for interference model
- **...**: other necessary control parameters required by specific model For crossover with dropout, drop, a numeric vector of dropout mechanism For crossover proportional, lambda, value of proportion coefficient in proportional model and sigma, assumed covariance matrix. For interference model, sigma, assumed covariance matrix.
- **max_iter**: a positive integer. Controls maximum iteration time of exchange. Default is 40.

Value

A S3 object of one of classes 'dropout', 'proportional' or 'interference'.

- **model**: the model name
- **n**: total number of observations of exact design
- **opt**: optimal criterion
- **t**: number of levels of treatments
- **p**: number of periods or plots in a block
- **...**: other inputs
- **initial_design**: a randomly chosen design as a starting point for newton’s method
- **exact_design**: an exact design rounded from approximate design
- **approx_design**: optimal approximate design
verify_equivalence
result of general equivalence theorem, the last entry is the value of directional
derivative
time computing time for approximate design

See Also
eff, effLB, summary

Examples

# NOTE: max_iter is usually set to 40.
# Here max_iter = 5 is for demonstration only.
# crossover dropout model
## D-optimal
design(example1)

## a-optimal
design(example1)

## A-optimal
design(example1)

# proportional model
## D-optimal
design('proportional',10,0,3,3, sigma = diag(1,3), tau = matrix(sqrt(1+3),
    nrow=3, ncol=1), lambda = 0.2, max_iter = 5)

## A-optimal
design('proportional',10,1,3,3, sigma = diag(1,3), tau = matrix(sqrt(1+3),
    nrow=3, ncol=1), lambda = 0.2, max_iter = 5)

## interference model
## D-optimal
design('interference',10,0,3,3, sigma = diag(1,3), max_iter = 5)

## A-optimal
design('interference',10,1,3,3, sigma = diag(1,3), max_iter = 5)

**design_app**

Shiny App for design function

**Description**

A function to launch graphical interface to design function.
Usage

design_app()

Examples

## Not run:
design_app() # launching the app.
## End(Not run)

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\textbf{eff} \hfill \textit{Efficiency generic function}

Description

A generic function that returns the efficiency for either exact designs to approximate designs or exact design to a given design.

Usage

eff(exact_design, ex = NULL)

## Default S3 method:
eff(exact_design, ex = NULL)

## S3 method for class 'dropout'
eff(exact_design, ex = NULL)

## S3 method for class 'proportional'
eff(exact_design, ex = NULL)

## S3 method for class 'interference'
eff(exact_design, ex = NULL)

Arguments

- **exact_design**: A S3 object returned by design function.
- **ex**: Matrix. Design to be compared to. Default is NULL.

Value

Numeric. Relative Efficiency.

If \textit{ex} is given return relative efficiency by

\[ \Phi_{\text{example}} / \Phi_{\text{exact\_design}} \]

If \textit{ex} is missing return relative efficiency by

\[ \Phi_{\text{approx\_design}} / \Phi_{\text{exact\_design}} \]
**effLB**  

*Lower Bound Efficiency for Crossover-Dropout Model*

**Description**

The function take S3 object of class 'dropout' as input and return its lower bound of efficiency of exact design.

**Usage**

`efflb(exact_design)`

**Arguments**

- `exact_design`: A object of class returned by design function.

**Value**

A list of relevant numerics.

- `optimal`: Optimal Criterion
- `lower_bound`: Lower Bound of the exact design
- `optimal.value`: The value of objective function at optimal approximate design

**See Also**

- see examples in `design`

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**infor_design**  

*Generic function for information matrix.*

**Description**

Returns a information matrix for a given design
Usage

\texttt{infor\_design(design, t, \ldots)}

## Default S3 method:
infor\_design(design, t)

## S3 method for class 'dropout'
infor\_design(design, t, \ldots)

## S3 method for class 'interference'
infor\_design(design, t, \ldots)

## S3 method for class 'proportional'
infor\_design(design, t, \ldots)

Arguments

design \hspace{1cm} \text{Matrix. A design, each row is a design point with weight or repetition on the last entry.}
t \hspace{1cm} \text{Numeric. Number of levels of treatments.}
\ldots \hspace{1cm} \text{Other control parameter to be passed to methods}

Value

An information matrix.

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**OWEA**

*OWEA: A package for optimal designs by implementing optimal weight exchange algorithm.*

Description

The OWEA package provides realizations for three models: crossover with subject dropout, crossover with proportional first order residual, and interference model.

Key functions

\texttt{design, design\_app, eff, effLB, summary}
**Summary**

*dropout*

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**Summary method for S3 object**

**Description**

Return summary info for S3 object return by `design` function.

**Usage**

```r
## S3 method for class 'dropout'
summary(object, ...)

## S3 method for class 'proportional'
summary(object, ...)

## S3 method for class 'interference'
summary(object, ...)
```

**Arguments**

- `object` A S3 object of class 'dropout', 'proportional', or 'interference'.
- `...` other control parameters, but usually not necessary.

**Value**

A list of key info.

- `exact_design` exact design and its repetitions
- `approximate_design` approximate design and its weights
- `computing_time` computing time for approximate design

**See Also**

see examples in `design`.
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