

Package ‘OWEA’

October 12, 2022

Type Package

Title Optimal Weight Exchange Algorithm for Optimal Designs for Three Models

Version 0.1.2

Maintainer Shuai Hao <shuaih0303@gmail.com>

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.

License GPL-3

Encoding UTF-8

Suggests knitr, rmarkdown

Imports gtools (>= 3.9.3), MASS, methods, shiny (>= 1.7.2)

RoxygenNote 7.2.1

NeedsCompilation no

Author Shuai Hao [aut, cre],
Min Yang [aut],
Wei Zheng [aut]

Repository CRAN

Date/Publication 2022-09-17 18:56:01 UTC

R topics documented:

design	2
design_app	4
eff	4
effLB	5
infor_design	6
OWEA	6
summary.dropout	7

design	<i>Design Generator for Three Models</i>
--------	--

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 demenstration only.
# crossover dropout model
## D-optimal

example1 <- design('dropout',10,0,3,3,drop=c(0,0,0.5), max_iter = 5)
summary(example1)
eff(example1) # efficiency from rounding
effLB(example1) # obtain lower bound of efficiency

## A-optimal
design('dropout',10,1,3,3,drop=c(0,0,0.5), max_iter = 5)

# 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	<i>Shiny App for design function</i>
------------	--------------------------------------

Description

A function to launch graphical interface to design function.

Usage

```
design_app()
```

Examples

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

eff	<i>Efficiency generic function</i>
-----	------------------------------------

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 `ex` is given, return relative efficiency by $\Phi_{example}/\Phi_{exact_design}$; If `ex` is missing, return relative efficiency by $\Phi_{approx_design}/\Phi_{exact_design}$.

See Also

see examples in [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](#).

infor_design	<i>Generic function for information matrix.</i>
--------------	---

Description

Returns a information matrix for a given design

Usage

```
infor_design(design, t, ...)  
  
## Default S3 method:  
infor_design(design, t)  
  
## S3 method for class 'dropout'  
infor_design(design, t, ...)  
  
## S3 method for class 'interference'  
infor_design(design, t, ...)  
  
## S3 method for class 'proportional'  
infor_design(design, t, ...)
```

Arguments

design	Matrix. A design, each row is a design point with weight or repetition on the last entry.
t	Numeric. Number of levels of treatments.
...	Other control parameter to be passed to methods

Value

An information matrix.

OWEA	<i>OWEA: A package for optimal designs by implementing optimal weight exchange algorithm.</i>
------	---

Description

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

Key functions

[design](#), [design_app](#), [eff](#), [effLB](#), [summary](#)

summary.dropout	<i>Summary method for S3 object</i>
-----------------	-------------------------------------

Description

Return summary info for S3 object return by design function.

Usage

```
## 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](#).

Index

design, [2](#), [5–7](#)
design_app, [4](#), [6](#)

eff, [3](#), [4](#), [6](#)
effLB, [3](#), [5](#), [6](#)

infor_design, [6](#)

OWEA, [6](#)

summary, [3](#), [6](#)
summary.dropout, [7](#)
summary.interference (summary.dropout),
[7](#)
summary.proportional (summary.dropout),
[7](#)