Package 'Aoptbdtvc'

January 29, 2024

Title A-Optimal Block Designs for Comparing Test Treatments with Controls

Version 0.0.3

Date 2024-01-25

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Depends R (>= 3.4.0), lpSolve, MASS

Description A collection of functions to construct A-optimal block designs for comparing test treatments with one or more control(s). Mainly A-optimal balanced treatment incomplete block designs, weighted A-optimal balanced treatment incomplete block designs, A-optimal group divisible treatment designs and A-optimal balanced bipartite block designs can be constructed using the package. The designs are constructed using algorithms based on linear integer programming. To the best of our knowledge, these facilities to construct A-optimal block designs for comparing test treatments with one or more controls are not available in the existing R packages. For more details on designs for tests versus control(s) comparisons, please see Hedayat, A. S. and Majumdar, D. (1984) <doi:10.1080/00401706.1984.10487989> A-Optimal Incomplete Block Designs for Control-Test Treatment Comparisons, Technometrics, 26, 363-370 and Mandal, B. N. , Gupta, V. K., Parsad, Rajender. (2017) <doi:10.1080/03610926.2015.1071394> Balanced treatment incomplete block designs through integer programming. Communications in Statistics - Theory and Methods 46(8), 3728-3737.

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NeedsCompilation no

Repository CRAN

Date/Publication 2024-01-29 12:10:03 UTC

R topics documented:

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aoptbbpb *A-optimal balanced bipartite block designs*

Description

This function generates A-optimal balanced bipartite block (BBPB) designs for tests vs controls comparisons with specified parameters

Usage

```
aoptbbpb(v1,v2,b,k,ntrial)
```

Arguments

v1	number of test treatments
v2	number of controls
b	number of blocks
k	block size
ntrial	number of trials, default is 5

Value

It either returns a text message or a design. If a design is found, it returns a list with following components

parameters	parameters of the design
design	generated A-optmal BBPB design
N	incidence matrix of the generated A-optmal BBPB design
NNP	concurrence matrix of the generated design
Aeff	A-efficiency of the design
type	R- type or S- type design

Note

The function is useful to construct A-optimal BBPB designs for v1+v2 <= 30 and up to block size 10. May not be very useful beyond v1+v2 > 30. For k<=3, designs with larger v1+v2 may be obtained.

Author(s)

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References

Jaggi, S., Gupta, V. and Parsad, R. (1996). A-efficient block designs for comparing two disjoint sets of treatments, Communications in Statistics-Theory and Methods 25(5), 967-983.

Mandal, B. N., Parsad, R. and Dash, S. (2017). A-optimal block designs for comparing test treatments with control treatment(s) - an algorithmic approach, upcoming project report, ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India.

Examples

```
##construct an A-optimal BBPB design with 5 test treatments and 3 control treatments in
##12 blocks each of size 5
aoptbbpb(v1=5,v2=3,b=12,k=5)
##construct an A-optimal BBPB design with 6 test treatments and 3 control treatments in
##6 blocks each of size 8
aoptbbpb(v1=6,v2=3,b=6,k=8)
##Design does not exist
#not run
aoptbbpb(3,2,9,3)
aoptbbpb(6,3,9,4)
#Design not found
## Not run: aoptbbpb(3,3,12,4)
```

---

aoptgdtd *A-optimal group divisible treatment designs*

Description

This function generates A-optimal group divisible treatment (GDT) designs for test vs control comparisons with specified parameters

Usage

```
aoptgdtd(m,n,b,k,ntrial)
```

Arguments

m	number of rows such that m*n = number of test treatments
n	number of columns such that m*n = number of test treatments
b	number of blocks
k	block size
ntrial	number of trials, default is 5

Value

It either returns a text message or a design. If a design is found, it returns a list with following components

`parameters`	parameters of the design
`design`	generated A-optmal GDT design
`N`	incidence matrix of the generated A-optmal GDT design
`NNP`	concurrence matrix of the generated design

Note

The function is useful to construct A-optimal GDT designs for number of test treatments <= 30 and up to block size 10. May not be very useful for m*n > 30. For k<=3, designs with larger number of test treatment may be obtained.

Author(s)

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References

Jacroux, M. (1989). The A-optimality of block designs for comparing test treatments with a control, Journal of the American Statistical Association 84(405), 310-317.

Mandal, B. N., Parsad, R. and Dash, S. (2017). A-optimal block designs for comparing test treatments with control treatment(s) - an algorithmic approach, upcoming project report, ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India.

Examples

```
## construct an A-optimal GDT design with 12 (= 4 x 3) test treatments
##in 12 blocks each of size 6
aoptgdtd(m=4,n=3,b=12,k=6)
## construct an A-optimal GDT design with 8 (= 4 x 2) test treatments
##in 8 blocks each of size 4
aoptgdtd(m=4,n=2,b=8,k=4)
##design does not exist
aoptgdtd(4,2,8,2)
##Design not found
## Not run: aoptgdtd(3,3,15,3)
```

wtaoptbtib *Weighted A-optimal balanced treatment incomplete block designs*

Description

This function generates weighted A-optimal balanced treatment incomplete block design for test vs control comparisons with specified parameters

Usage

```
wtaoptbtib(v,b,k,alpha,rho=0,ntrial=5)
```

Arguments

v	number of test treatments
b	number of blocks
k	block size
alpha	Weight for test versus test comparisons. Should be between 0 to 1
rho	rho=0
ntrial	number of trials, default is 5

Value

It either returns a text message or a design. If a design is found, it returns a list with following components

parameters	parameters of the design
design	generated weighted A-optmal BTIB design
N	incidence matrix of the generated weighted A-optmal BTIB design
NNP	concurrence matrix of the generated design

Note

The function is useful to construct weighted A-optimal BTIB designs upto 30 test treatments and up to block size 10. May not be very useful beyond 30 test treatments. For k<=3, designs with larger number of test treatments may be obtained.

Author(s)

Baidya Nath Mandal <mandal.stat@gmail.com>

References

Gupta, V., Ramana, D. and Parsad, R. (1999). Weighted A-efficiency of block designs for making treatment-control and treatment-treatment comparisons, Journal of statistical planning and inference 77(2), 301-319.

Mandal, B. N., Parsad, R. and Dash, S. (2017). A-optimal block designs for comparing test treatments with control treatment(s) - an algorithmic approach, upcoming project report, ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India.

Examples

```
##construct a weighted A-optimal BTIB design with 4 test treatments in 6 blocks each of size 4
##with weights to test vs test treatments comparisons as 0.6
wtaoptbtib(v=4,b=6,k=4,alpha=0.6,rho=0)
##construct an A-optimal BTIB design with 9 test treatments in 12 blocks each of size 4
##with weights to test vs test treatments comparisons as 0
wtaoptbtib(v=9,b=12,k=4,alpha=0,rho=0)
##design not found
## Not run: wtaoptbtib(v=3,b=6,k=5,alpha=0.2,rho=0)
##BTIB design does not exist for these parameters
#Not run
wtaoptbtib(3,4,3,0.2,0)
```

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