R documentation

of all in 'man'

December 9, 2019

R topics documented:

`DesignEval` *Evaluate design in terms of criteria*

Description

This function takes matrix X and crit to output the criterion value.

Usage

```
DesignEval(x,crit)
```

Arguments

`x`	an integer matrix object. Representing the design to be evaluated.
`crit`	a character R object. Type of criterion to use: "CD2" – Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" – Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimum Coherence ; "A2" – Mean Squared Correlation.

Value

criterion value.

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
x = matrix(c(1,1,1,2,2,2,3,3,3),nrow=3,byrow=TRUE)
crit="MD2"
value = DesignEval(x,crit)
```

DesignPairPlot *Draw pair plot for design of experiments*

Description

This function takes a design D and a boolean value Diag to draw pair plot.

Usage

```
DesignPairPlot(D,Diag)
```

Arguments

D	a matrix object. Design of Experiment.
Diag	a boolean R object.

Value

A pair plot

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
##e.g.1
n=12 #(must be multiples of q)
s=3
q=4
crit = "MD2"#(Mixture L2 criteria)
D = DesignQuery(n=n,s=s,q=q,crit="MD2")
DesignPairPlot(D)

##e.g.2
n=12 #(must be multiples of q)
s=3
q=3
```

```
crit = "MD2"#(Mixture L2 criteria)
D = DesignQuery(n=n,s=s,q=q,crit="MD2")
DesignPairPlot(D,Diag=TRUE)
```

`DesignQuery` *Evaluate design in terms of criteria*

Description

This function takes size of desired design,criterion crit. If the required design exists in database, then return the design, else return NULL.

Usage

```
DesignQuery(n,s,q,crit,ShowCrit)
```

Arguments

`n`	an integer R object. Run of Experiment
`s`	an integer R object. Factor of Experiment.
`q`	an integer R object. Level of Experiment.
`crit`	a character R object. Type of criterion to use: "CD2" – Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" – Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimum Coherence ; "A2" – Mean Squared Correlation.
`ShowCrit`	If TRUE, print CD2,MD2,maximin value of required design. Default: TRUE

Value

Desired design

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
n = 9
s = 3
q = 3
crit="MD2"
D = DesignQuery(n,s,q,crit)
D
```

GenAUD *Generating sequential Uniform Design of Experiments (Augmenting Runs)*

Description

This function takes n,s,q; a unchanged initial design and other arguments to output a list (described below).

Usage

```
GenAUD(xp,n,s,q,initX,crit,maxiter,hits_ratio,levelpermt,rand_seed,vis)
```

Arguments

xp	an integer matrix R object. Representing the previous existing design matrix.
n	an integer R object. Run of Experiment (including the previous design xp).
s	an integer R object. Factor of Experiment.
q	an integer R object. Level of Experiment.
init	a string vector R object. Initialization method for the run-augmented design: "rand" –Randomly generate initial design (default); "input". –User specified.
initX	a user-defined integer matrix R object. This is the user-defined initial augmentation matrix, and will be used when init="input".
crit	a character R object. Type of criterion to use: "CD2" – Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" – Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimum Coherence ; "A2" – Mean Squared Correlation.
maxiter	a positive integer R object. Maximum iteration number in outer while loop of SOAT algorithm.
hits_ratio	a float R object. Default value is 0.1, which is the ratio to accept changes of design in inner for loop.
levelpermt	a boolean R object. It controls whether to use level permutation.
rand_seed	a integer R object. It controls the random seed used for optimization.
vis	a boolean variable. If true, plot the trace of criterion values.

Value

A list that contains Initial design matrix(initial_design),optimal design matrix(final_design), initial criterion value(initial_criterion), final criterion value(final_criterion) and criterion list(criterion_history) in update process.

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
#Example.
#Set a fixed initial matrix:
n=12 #(must be multiples of q)
s=3
q=4
mat0 = matrix(c(1,1,1,2,2,2,3,3,3),ncol=3,byrow=TRUE)# nb. of columns=s
crit = "MD2" #(Mixture L2 criteria)
res = GenAUD(xp=mat0,n,s,q,crit=crit,maxiter=100,vis=TRUE)
```

GenAUD_COL *Generating sequential Uniform Design of Experiments (Augmenting Factors)*

Description

This function takes n,s,q; a unchanged initial design and other arguments to output a list (described below).

Usage

```
GenAUD_COL(xp,n,s,q,init,initX,crit,maxiter,hits_ratio,levelpermt,rand_seed,vis)
```

Arguments

xp	an integer matrix R object, representing the previous existing design matrix.
n	an integer R object. Run of Experiment
s	an integer R object. Factor of Experiment (including the number of factors in previous design xp).
q	an integer R object. Level of Experiment.
init	a string vector R object. Initialization method for the factor-augmented design: "rand" –Randomly generate initial design (default); "input". –User specified.
initX	a user-defined integer matrix R object. This is the user-defined initial augmentation matrix, and will be used when init="input".
crit	a character R object. Type of criterion to use: "CD2" –Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" –Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimize Coherence ; "A2" – Minimize Average Chi-Square.
maxiter	a positive integer R object. Maximum iteration number in outer while loop of SOAT algorithm.

hits_ratio	a float R object. Default value is 0.1, which is the ratio to accept changes of design in inner for loop.
levelpermt	a boolean R object. It controls whether to use level permutation.
rand_seed	a integer R object. It controls the random seed used for optimization.
vis	a boolean variable. If true, plot the trace of criterion values.

Value

A list that contains Initial design matrix(initial_design),optimal design matrix(final_design), initial criterion value(initial_criterion), final criterion value(final_criterion) and criterion list(criterion_history) in update process.

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
#Example.
#Set a fixed initial matrix:
n=6 #(must be multiples of q)
s=4
q=3
mat0 = matrix(c(1,2,2,1,1,3,3,1,2,3,3,2),ncol=2,byrow=TRUE)
crit = "MD2" #(Mixture L2 criteria)
res = GenAUD_COL(xp=mat0,n,s,q,crit=crit,maxiter=100,vis=TRUE)
```

GenAUD_COL_MS *Generating sequential Uniform Design of Experiments (Augmenting Factors) using diffrent initial designs*

Description

This function takes n,s,q and other arguments to output a list(described below).

Usage

```
GenAUD_COL_MS(xp, n, s, q, crit, maxiter, nshoot, rand_seed, vis=FALSE)
```

Arguments

xp	an integer matrix R object. Representing the previous existing design matrix.
n	an integer R object.
s	an integer R object. Factor of Experiment (including the number of factors in previous design xp).
q	an integer R object. Level of Experiment.

crit	a character R object. Type of criterion to use: "CD2" – Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" – Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimum Coherence ; "A2" – Mean Squared Correlation.
maxiter	a positive integer R object. Maximum iteration number in outer while loop of SATA algorithm in each shoot.
nshoot	Total counts to try different initial designs.
rand_seed	a integer R object. It controls the random seed used for optimization.
vis	a boolean R object. If true, plot the criterion value sequence for all shoots.

Value

Best design over all shoots.

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
D1 = DesignQuery(n=18, s=3, q=3, crit="MD2")
D2 = GenAUD_COL_MS(xp=D1, n=18, s=5, q=3, crit="MD2",
               maxiter=100, nshoot=5)
```

GenAUD_MS *Generating sequential Uniform Design of Experiments (Augmenting Runs) using diffrent initial designs*

Description

This function takes n,s,q and other arguments to output a list(described below).

Usage

```
GenAUD_MS(xp, n, s, q, crit, maxiter, nshoot, rand_seed, vis=FALSE)
```

Arguments

xp	an integer matrix R object. Representing the previous existing design matrix.
n	an integer R object. Run of Experiment (including the previous design xp).
s	an integer R object. Factor of Experiment.
q	an integer R object. Level of Experiment.

crit	a character R object. Type of criterion to use: "CD2" – Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" – Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimum Coherence ; "A2" – Mean Squared Correlation.
maxiter	a positive integer R object. Maximum iteration number in outer while loop of SATA algorithm in each shoot.
nshoot	Total counts to try different initial designs.
rand_seed	a integer R object. It controls the random seed used for optimization.
vis	a boolean R object. If true, plot the criterion value sequence for all shoots.

Value

Best design over all shoots.

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
D1 = DesignQuery(n=18, s=7, q=3, crit="MD2")
D2 = GenAUD_MS(xp=D1, n=21, s=7, q=3, crit="MD2",
               maxiter=100, nshoot=5)
```

GenUD *Generating Uniform Design of Experiments*

Description

This function takes n,s,q and other arguments to output a list(described below).

Usage

```
GenUD(n,s,q,init,initX,crit,maxiter,hits_ratio,levelpermt,rand_seed,vis)
```

Arguments

n	an integer R object. Run of Experiment.
s	an integer R object. Factor of Experiment.
q	an integer R object. Level of Experiment.
init	a string vector R object. Initialization method for the design: "rand" –Randomly generate initial design (default); "input". –User specified.
initX	a user-defined integer matrix R object. This is the user-defined initial design matrix, and will be used when init="input".

crit	a character R object. Type of criterion to use: "CD2" – Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" – Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimum Coherence ; "A2" – Mean Squared Correlation.
maxiter	a positive integer R object. Maximum iteration number in outer while loop of SATA algorithm.
levelpermt	a boolean R object. It controls whether to use level permutation.
rand_seed	a integer R object. It controls the random seed used for optimization.
hits_ratio	a float R object. Default value is 0.1, which is the ratio to accept changes of design in inner for loop.
vis	a boolean R object. If true, plot the criterion value sequence.

Value

A list that contains Initial design matrix(initial_design),optimal design matrix(final_design), initial criterion value(initial_criterion), final criterion value(final_criterion) and criterion list(criterion_history) in update process.

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
##Example 1
n=12 #(must be multiples of q)
s=3
q=4
crit = "CD2"#(Centered L2 criteria)
res = GenUD(n,s,q,crit=crit,maxiter=100)

##Example 2
n=10 #(must be multiples of q)
s=3
q=5
init = "rand"
crit = "MD2" #(Mixture L2 criteria)
vis=TRUE
res=GenUD(n,s,q,init=init,crit=crit,maxiter=100,vis=vis)

##Example 3
#If init="input", algorithm will search for better a better design with same size as in
init = "input"
n=6
s=2
q=3
initX = matrix(c(1,1,2,2,3,3,3,3,1,1,2,2),ncol=2)
res = GenUD(n,s,q,init=init,initX=initX,maxiter=100)
```

GenUD_MS *Generating Uniform Design of Experiments using diffrent initial designs*

Description

This function takes n,s,q,crit and nshoot to return a design. nshoot number of random initial designs are used in each shoot. The design returned is the best design over all shoots.

Usage

```
GenUD_MS(n, s, q, crit, maxiter, nshoot, rand_seed, vis)
```

Arguments

n	an integer R object. Run of Experiment
s	an integer R object. Factor of Experiment.
q	an integer R object. Level of Experiment.
crit	a character R object. Type of criterion to use: "CD2" – Centered L2 Discrepancy (default) ; "WD2" – Wrap-around L2 Discrepancy ; "MD2" – Mixture L2 Discrepancy ; "maximin" – Maximin Discrepancy ; "MC" – Minimum Coherence ; "A2" – Mean Squared Correlation.
maxiter	a positive integer R object. Maximum iteration number in outer while loop of SATA algorithm in each shoot.
nshoot	Total counts to try different initial designs.
rand_seed	a integer R object. It controls the random seed used for optimization.
vis	a boolean R object. If true, plot the criterion value sequence for all shoots.

Value

Best design over all shoots.

Author(s)

Aijun Zhang, Zebin Yang, Haoyu Li, Shijie Quan

Examples

```
D = GenUD_MS(36, 4, 6, crit="CD2",
             maxiter=50, nshoot=6,
             vis=TRUE)
```

Index