

Package ‘SCCDdesign’

September 3, 2026

Title Construction of Screening Designs for Mixed Level Continuous and Categorical Factors

Version 0.1.0

Description Provides functions for constructing screening designs for experiments involving three-level continuous and two-level categorical factors. The package implements three methods proposed by Jones, B., Lekivetz, R., Majumdar, D. and Nachtsheim, C. (2025) [<doi:10.1080/00401706.2024.2362149>](https://doi.org/10.1080/00401706.2024.2362149) for generating efficient screening designs for even run sizes. It also includes functions for constructing conference matrices using Paley Type I and Type II constructions, as well as construction of pseudo conference matrices by coordinate exchange algorithm given by Jones, B. and Nachtsheim, C. J. (2011) [<doi:10.1080/00224065.2011.11917841>](https://doi.org/10.1080/00224065.2011.11917841) which are used in the development of these screening designs.

License GPL-3

Encoding UTF-8

RoxygenNote 8.0.0

Imports pracma, AlgDesign

NeedsCompilation no

Author Vyshna I C [aut, cre],
Cini Varghese [aut, ctb],
Safeela Nasrin [aut],
Boyina Devi Priyanka [aut, ctb],
Mohd Harun [aut, ctb],
Anindita Datta [aut, ctb]

Maintainer Vyshna I C <vyshnaic@gmail.com>

Repository CRAN

Date/Publication 2026-09-03 12:20:22 UTC

Contents

conferenceMatrix	2
----------------------------	---

dOptimalTwoLevel	3
hadamardMatrix	3
pseudoConference	4
SCCD	5
Index	6

conferenceMatrix	<i>Constructs a conference matrix of a specified order using a direct construction for order 2 and Paley-based constructions for supported odd prime or prime-power values of $q = n - 1$.</i>
------------------	---

Description

Constructs a conference matrix of a specified order using a direct construction for order 2 and Paley-based constructions for supported odd prime or prime-power values of $q = n - 1$.

Usage

conferenceMatrix(n)

Arguments

n A single finite integer specifying the order of the conference matrix. The value must be at least 2.

Details

For $n = 2$, the conference matrix is constructed directly. For larger orders, the function sets $q = n - 1$ and determines whether q is a supported odd prime or odd prime power. Depending on the value of q modulo 4, the corresponding Paley construction is used. An error is returned when the supplied order does not satisfy the requirements of the implemented construction.

Value

A numeric $n \times n$ conference matrix.

Examples

conferenceMatrix(6)

dOptimalTwoLevel	<i>Constructs a D-optimal two-level design with m runs and $m - 1$ factors. The factor levels are coded as -1 and +1.</i>
------------------	---

Description

Constructs a D-optimal two-level design with m runs and $m - 1$ factors. The factor levels are coded as -1 and +1.

Usage

```
dOptimalTwoLevel(m)
```

Arguments

m	A positive integer specifying the number of runs. The minimum value is 3.
-----	---

Details

The candidate set is generated using all possible combinations of -1 and +1 for the factors. The D-optimal design is selected using `AlgDesign::optFederov()`.

Value

A numeric matrix containing the D-optimal two-level design.

Examples

```
dOptimalTwoLevel(4)
dOptimalTwoLevel(8)
```

hadamardMatrix	<i>Constructs a Hadamard matrix of order n using <code>pracma::hadamard()</code>.</i>
----------------	--

Description

Constructs a Hadamard matrix of order n using `pracma::hadamard()`.

Usage

```
hadamardMatrix(n)
```

Arguments

n	A positive integer specifying the order of the matrix.
-----	--

Details

A Hadamard matrix contains only +1 and -1, and its rows are mutually orthogonal. The supported orders are of the forms 2^e , $12(2^e)$, and $20(2^e)$.

Value

A Hadamard matrix of order n.

Examples

```
hadamardMatrix(4)
hadamardMatrix(8)
hadamardMatrix(12)
```

pseudoConference	<i>Constructs a pseudo-conference matrix of order n using a determinant-based search procedure.</i>
------------------	---

Description

Constructs a pseudo-conference matrix of order n using a determinant-based search procedure.

Usage

```
pseudoConference(n, starts = 1000, max.iter = 100)
```

Arguments

n	A positive integer specifying the order of the matrix.
starts	Number of random starting matrices used in the search. Default is 1000.
max.iter	Maximum number of iterations for each starting matrix. Default is 100.

Details

The matrix has zero diagonal elements and off-diagonal elements equal to -1 or +1. The search selects a matrix by maximizing the determinant criterion.

Value

A list containing the pseudo-conference matrix and the corresponding log-determinant value.

Examples

```
result <- pseudoConference(6, starts = 10, max.iter = 10)
result$Matrix
result$LogDet
```

SCCD	<i>Constructs an SCCD for a specified number of runs ($n=2m$). The construction method is selected automatically according to the number of runs.</i>
------	--

Description

Constructs an SCCD for a specified number of runs ($n=2m$). The construction method is selected automatically according to the number of runs.

Usage

SCCD(n)

Arguments

n A positive even integer specifying the number of runs.

Details

Method I is used when n is divisible by 8. Method II is used when n is divisible by 4 but not by 8. Method III is used when n is even but not divisible by 4.

Value

A numeric SCCD matrix containing m continuous and $m-1$ categorical factors.

Examples

SCCD(16)

Index

conferenceMatrix, [2](#)

dOptimalTwoLevel, [3](#)

hadamardMatrix, [3](#)

pseudoConference, [4](#)

SCCD, [5](#)