

Package ‘GLHD’

August 9, 2026

Type Package

Title Grouped Latin Hypercube Designs with Controlled Correlations

Version 1.1-1

Description We provide a method of constructing grouped Latin hypercube designs by controlling correlations. Details of the algorithm can be found in Wenlong Li, Jian-Feng Yang and Peter Chien (2026). Grouped Latin hypercube designs with controlled correlations. Technometrics, published online. Important function in this package is ``GLHD_CC".

License LGPL (>= 3)

Imports stats

Encoding UTF-8

RoxygenNote 7.3.2

NeedsCompilation no

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Repository CRAN

Date/Publication 2026-08-09 08:10:19 UTC

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compute_rms

Whole, Within-Group, and Between-Group RMS Correlations

Description

Computes the root mean square (RMS) correlation for a given design matrix, decomposed into three components: the overall (whole) RMS correlation across all variable pairs, the within-group RMS correlation among variables sharing the same group, and the between-group RMS correlation across variables belonging to different groups.

Usage

```
compute_rms(D, groups)
```

Arguments

D	A numeric matrix representing the design, where columns correspond to variables and rows to observations.
groups	A list of integer vectors, each specifying the column indices belonging to one group. Typically created via create_groups .

Value

A named list with three components:

Whole RMS correlation computed over all pairs of variables.

Within RMS correlation computed over pairs within the same group. Returns 0 if every group contains only a single variable.

Between RMS correlation computed over pairs from different groups. Returns 0 if only one group is provided.

Examples

```
library(GLHD)
p <- 15
group_sizes <- c(4, 5, 6)
groups <- create_groups(p, group_sizes)
D <- matrix(rnorm(p * 30), nrow = 30, ncol = p)
compute_rms(D, groups)
```

create_groups	<i>Create Group Index Lists</i>
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Description

Partitions the column indices 1:p into consecutive groups according to group_sizes.

Usage

```
create_groups(p, group_sizes)
```

Arguments

p	Total number of columns; must equal sum(group_sizes).
group_sizes	Integer vector of group sizes (u1, ..., ug).

Value

A list of length length(group_sizes), where the i-th element is an integer vector of column indices for group i.

Examples

```
create_groups(15, c(4, 5, 6))
```

GLHD_CC	<i>Generate a Grouped Latin Hypercube Design with Controlled Correlations</i>
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Description

Constructs a Grouped Latin Hypercube Design GLHD_CC(n, p, (u1, ..., ug)), which is an n x p Latin hypercube design whose p = u1 + ... + ug columns are partitioned into g disjoint groups of sizes u1, ..., ug. The algorithm alternates between between-group and within-group correlation control steps.

Usage

```
GLHD_CC(n, p, group_sizes, seed = 123, n_between = 1, n_within = 9)
```

Arguments

<code>n</code>	A positive integer specifying the number of runs.
<code>p</code>	A positive integer specifying the total number of factors, equal to <code>sum(group_sizes)</code> .
<code>group_sizes</code>	An integer vector (<code>u1</code> , ..., <code>ug</code>) giving the size of each group, with <code>sum(group_sizes) == p</code> .
<code>seed</code>	An integer random seed for reproducibility. Default is 123.
<code>n_between</code>	Number of between-group correlation control iterations. Default is 1.
<code>n_within</code>	Number of within-group correlation control iterations. Default is 9.

Value

An $n \times p$ integer matrix whose columns form a Latin hypercube design with reduced within-group and between-group correlations.

Examples

```
library(GLHD)
n <- 20
p <- 15
group_sizes <- c(4, 5, 6)
D <- GLHD_CC(n, p, group_sizes)
D
```

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