

Package ‘rrandvec’

March 30, 2023

Title Generate Random Vectors Whose Components Sum Up to One

Description A single method implementing multiple approaches to generate pseudo-random vectors whose components sum up to one (see, e.g., Maziero (2015) <[doi:10.1007/s13538-015-0337-8](https://doi.org/10.1007/s13538-015-0337-8)>). The components of such vectors can for example be used for weighting objectives when reducing multi-objective optimisation problems to a single-objective problem in the so-called weighted sum scalarisation approach.

Version 1.0.0

Depends R (>= 3.1.0)

Imports Rcpp, checkmate

Suggests covr, testthat, scatterplot3d

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URL <https://jakobbossek.github.io/rrandvec/>,
<https://github.com/jakobbossek/rrandvec>

BugReports <https://github.com/jakobbossek/rrandvec/issues>

Encoding UTF-8

ByteCompile true

RoxygenNote 7.2.3

LinkingTo Rcpp

NeedsCompilation yes

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rrandvec *Generate random vectors that sum up to one.*

Description

Generate an $n \times d$ matrix. Each row vector is a probability vector (p_1, \dots, p_d) with $\sum_{i=1}^d p_i = 1$. The function offers several methods to generate the rows in a way that the components are unbiased which means that they are required to have similar / the same probability distributions.

[1] Maziero, J. Generating Pseudo-Random Discrete Probability Distributions. Brazilian Journal of Physics 45, 377–382 (2015). <https://doi.org/10.1007/s13538-015-0337-8>

[2] Grimme, C. Picking a Uniformly Random Point from an Arbitrary Simplex. Technical Report. <https://doi.org/10.13140/RG.2.1.3807.6968>

Usage

```
rrandvec(n, d, method = "normalization", shuffle = FALSE, as.df = FALSE)
```

Arguments

n	[integer(1)] Number of vectors to generate.
d	[integer(1)] Number of components of each vector (at least 2).
method	[character(1)] One of “norm” (normalization method), “trigonometric”, “simplex” (sample from a unit simplex), “exponential” or “iterative”. Default is simplex.
shuffle	[logical(1)] Should the values of each vector be permutated randomly? Background: methods “iterative” and “trigonometric” introduce unwanted bias (see description). This issue can be alleviated by random shuffling. Default is FALSE.
as.df	[logical(1)] Should the return value be a data frame with column names X1 to Xd? Default is FALSE.

Value

matrix(n, d) ($n \times d$) matrix even if $n = 1$.

Examples

```
R = rrandvec(1000, 2)
R = rrandvec(1000, 5, method = "iterative")
R = rrandvec(1000, 3, method = "trigonometric", shuffle = TRUE, as.df = TRUE)

if (require("scatterplot3d")) {
  scatterplot3d::scatterplot3d(R, angle = 120, cex.symbols = 0.5, pch = 3, color = "blue")
}
```

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