

Package ‘lancor’

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Type Package

Title Statistical Inference via Lancaster Correlation

Version 0.1.2

Description Implementation of the methods described in Holzmann, Klar (2024) [doi:10.48550/arXiv.2303.17872](https://doi.org/10.48550/arXiv.2303.17872). Lancaster correlation is a correlation coefficient which equals the absolute value of the Pearson correlation for the bivariate normal distribution, and is equal to or slightly less than the maximum correlation coefficient for a variety of bivariate distributions. Rank and moment-based estimators and corresponding confidence intervals are implemented, as well as independence tests based on these statistics.

Imports acepack, arrangements, boot, graphics, sn, stats

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Encoding UTF-8

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Suggests testthat (>= 3.0.0)

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ace.test	<i>ACE permutation test of independence</i>
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Description

Performs a permutation test of independence using ace in package acepack. ace stands for alternating conditional expectations.

Usage

```
ace.test(x, y = NULL, nperm = 999)
```

Arguments

x	a numeric vector, or a matrix or data frame with two columns.
y	NULL (default) or a vector with same length as x.
nperm	number of permutations.

Value

A list containing the following components:

ace	the value of the test statistic.
pval	the p-value of the test.

Author(s)

Hajo Holzmann, Bernhard Klar

References

Holzmann, Klar (2024) Lancaster correlation - a new dependence measure linked to maximum correlation. arXiv:2303.17872

See Also

[lcor.test](#)

Examples

```
n <- 200
x <- matrix(rnorm(n*2), n)
nu <- 2
y <- x / sqrt(rchisq(n, nu)/nu) #multivariate t
cor.test(y[,1], y[,2], method = "spearman")
ace.test(y)
```

lcor	<i>Lancaster correlation</i>
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Description

Computes the Lancaster correlation coefficient.

Usage

```
lcor(x, y = NULL, type = c("rank", "linear"))
```

Arguments

x	a numeric vector, or a matrix or data frame with two columns.
y	NULL (default) or a vector with same length as x.
type	a character string indicating which lancaster correlation is to be computed. One of "rank" (default), or "linear": can be abbreviated.

Value

lcor returns the sample Lancaster correlation.

Author(s)

Hajo Holzmann, Bernhard Klar

References

Holzmann, Klar (2024) Lancaster correlation - a new dependence measure linked to maximum correlation. arXiv:2303.17872

See Also

[lcor.comp](#), [lcor.ci](#), [lcor.test](#)

Examples

```
Sigma <- matrix(c(1,0.1,0.1,1), ncol=2)
R <- chol(Sigma)
n <- 1000
x <- matrix(rnorm(n*2), n)
lcor(x, type = "rank")
lcor(x, type = "linear")

x <- matrix(rnorm(n*2), n)
nu <- 2
y <- x / sqrt(rchisq(n, nu)/nu)
cor(y[,1], y[,2], method = "spearman")
lcor(y, type = "rank")
```

lcor.ci	<i>confidence intervals for the Lancaster correlation coefficient</i>
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Description

Computes confidence intervals for the Lancaster correlation coefficient. Lancaster correlation is a bivariate measures of dependence.

Usage

```
lcor.ci(x, y = NULL, conf.level = 0.95, type = c("rank", "linear"), con = TRUE,
        R = 1000, method = c("plugin", "boot", "pretest"))
```

Arguments

x	a numeric vector, or a matrix or data frame with two columns.
y	NULL (default) or a vector with same length as x.
conf.level	confidence level of the interval.
type	a character string indicating which lancaster correlation is to be computed. One of "rank" (default), or "linear": can be abbreviated.
con	logical; if TRUE (default), conservative asymptotic confidence intervals are computed.
R	number of bootstrap replications.
method	a character string indicating how the asymptotic covariance matrix is computed if type ="linear". One of "plugin" (default), "boot" or "symmetric": can be abbreviated.

Value

lcor.ci returns a vector containing the lower and upper limits of the confidence interval.

Author(s)

Hajo Holzmann, Bernhard Klar

References

Holzmann, Klar (2024) Lancaster correlation - a new dependence measure linked to maximum correlation. arXiv:2303.17872

See Also

[lcor](#), [lcor.comp](#), [lcor.test](#)

Examples

```
n <- 1000
x <- matrix(rnorm(n*2), n)
nu <- 2
y <- x / sqrt(rchisq(n, nu)/nu) # multivariate t
lcor(y, type = "rank")
lcor.ci(y, type = "rank")
```

lcor.comp

*Lancaster correlation and its components***Description**

Computes the Lancaster correlation coefficient and its components.

Usage

```
lcor.comp(x, y = NULL, type = c("rank", "linear"), plot = FALSE)
```

Arguments

x	a numeric vector, or a matrix or data frame with two columns.
y	NULL (default) or a vector with same length as x.
type	a character string indicating which lancaster correlation is to be computed. One of "rank" (default), or "linear": can be abbreviated.
plot	logical; if TRUE, scatterplots of the transformed x and y values and of their squares are drawn.

Value

lcor.comp returns a vector containing the two components rho1 and rho2 and the sample Lancaster correlation.

Author(s)

Hajo Holzmann, Bernhard Klar

References

Holzmann, Klar (2024) Lancaster correlation - a new dependence measure linked to maximum correlation. arXiv:2303.17872

See Also

[lcor](#), [lcor.ci](#), [lcor.test](#)

Examples

```

Sigma <- matrix(c(1,0.1,0.1,1), ncol=2)
R <- chol(Sigma)
n <- 1000
x <- matrix(rnorm(n*2), n)
nu <- 8
y <- x / sqrt(rchisq(n, nu)/nu) #multivariate t
cor(y[,1], y[,2])
lcor.comp(y, type = "linear")

x <- matrix(rnorm(n*2), n)
nu <- 2
y <- x / sqrt(rchisq(n, nu)/nu) #multivariate t
cor(y[,1], y[,2], method = "spearman")
lcor.comp(y, type = "rank", plot = TRUE)

```

lcor.test	<i>Lancaster correlation test</i>
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Description

Lancaster correlation test of bivariate independence. Lancaster correlation is a bivariate measures of dependence.

Usage

```

lcor.test(x, y = NULL, type = c("rank", "linear"), nperm = 999,
          method = c("permutation", "asymptotic", "symmetric"))

```

Arguments

x	a numeric vector, or a matrix or data frame with two columns.
y	NULL (default) or a vector with same length as x.
type	a character string indicating which lancaster correlation is to be computed. One of "rank" (default), or "linear": can be abbreviated.
nperm	number of permutations.
method	a character string indicating how the p-value is computed if type="linear". One of "permutation" (default), "asymptotic" or "symmetric": can be abbreviated.

Value

A list containing the following components:

lcor	the value of the test statistic.
pval	the p-value of the test.

Author(s)

Hajo Holzmann, Bernhard Klar

References

Holzmann, Klar (2024) Lancaster correlation - a new dependence measure linked to maximum correlation. arXiv:2303.17872

See Also

[lcor](#), [lcor.comp](#), [lcor.ci](#)

Examples

```
n <- 200
x <- matrix(rnorm(n*2), n)
nu <- 2
y <- x / sqrt(rchisq(n, nu)/nu)
cor.test(y[,1], y[,2], method = "spearman")
lcor.test(y, type = "rank")
```

Sigma.est

Covariance matrix of components of Lancaster correlation coefficient.

Description

Estimate of covariance matrix of the two components of Lancaster correlation. Lancaster correlation is a bivariate measures of dependence.

Usage

```
Sigma.est(xx)
```

Arguments

xx a matrix or data frame with two columns.

Value

Sigma.est returns the estimated covariance matrix.

Author(s)

Hajo Holzmann, Bernhard Klar

References

Holzmann, Klar (2024) Lancaster correlation - a new dependence measure linked to maximum correlation. arXiv:2303.17872

See Also[lcor.ci](#)**Examples**

```
Sigma <- matrix(c(1,0.1,0.1,1), ncol=2)
R <- chol(Sigma)
n <- 1000
x <- matrix(rnorm(n*2), n)
nu <- 8
y <- x / sqrt(rchisq(n, nu)/nu) #multivariate t
Sigma.est(y)
```

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