Package ‘dcov’

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centering

Centering method This method implements the double centering and U-centering during computing distance covariance.

Description

Centering method This method implements the double centering and U-centering during computing distance covariance.

Usage

centering(D, type = c("V", "U"))
centering_from_data(x, type = c("V", "U"))

Arguments

D : the pairwise distance matrix

Type : "V" or "U". "V" for double centering. "U" for U-centering.

x : the matrix of x

Examples

x = matrix(rnorm(200),100,2)
D = as.matrix(dist(x))
A = centering(D, 'U')
A = centering_from_data(x)

dcor.test

Permutation test of distance correlation and partial distance correlation

Description

Simple independence test based on data permutation using distance correlation and partial distance correlation.

Usage

dcor.test(x, y, R = 500, type = c("V", "U"))
pdcor.test(x, y, z, R = 500, type = c("U", "V"))
**Arguments**

x the data of x
y the data of y
R the number of replicates
type "U" or "V"
z the data of controlling variables. Given z, pdcor between x and y is calculated.

**Examples**

```r
n = 200
z = rnorm(n)
x = rnorm(n)*z
y = rnorm(n)*z
res1 = dcor.ttest(x, y, R=500)
res2 = pdcor.ttest(x, y, z, R=500)
```

**dcor.ttest**

*Distance correlation T-test* It uses the result of U-statistic distance correlation to test independence for high dimensional data

**Description**

Distance correlation T-test It uses the result of U-statistic distance correlation to test independence for high dimensional data

**Usage**

dcor.ttest(x, y)

**Arguments**

x data of x
y data of y

**Examples**

```r
n = 200
x = rnorm(n)
y = rnorm(n)
res = dcor.ttest(x, y)
```
### Description

This method implements the method to compute the value of distance covariance proposed by Székely et al. (2007) and Székely and Rizzo (2013) by Armadillo library. For distance covariance between two one dimensional variables, the fast algorithm proposed by Huo and Székely (2016) is used.

### Usage

```r
dcov(x, y, type = c("V", "U"))
dcor(x, y, type = c("V", "U"))
```

### Arguments

- `x`: the matrix of x
- `y`: the matrix of y
- `type`: "V" or "U", for V- or U-statistics of distance covariance or correlation. The default value is "V".

### Note

Note that the result of `dcov(x,y,"V")` and `dcor(x,y,"V")` is same with the result of `energy::dcov(x,y)^2` and `energy::dcor(x,y)^2`. The result of `dcov(x,y,"U")` and `dcor(x,y,"U")` is same with the result of `energy::dcovU(x,y)` and `energy::bcdcor(x,y)`.

### References


### See Also

dcov2d
Examples

\[ \text{x = matrix(rnorm(200), 100, 2)} \]
\[ \text{y = matrix(rnorm(200), 100, 2)} \]
\[ \text{dcov(x, y)} \]
\[ \text{dcor(x, y)} \]

\hline
\text{dcov2d} & \text{Fast distance covariance for two bivariate variables} \\
\hline

Description

This method implements the fast algorithm proposed by Huo and Székely. The result of dcov2d and dcor2d is same with the result of energy::dcov2d and energy::dcor2d.

Usage

\[ \text{dcov2d(x, y, type = c("V", "U")]} \]
\[ \text{dcor2d(x, y, type = c("V", "U")]} \]

Arguments

\[ \text{x} \quad \text{the vector of x} \]
\[ \text{y} \quad \text{the vector of y} \]
\[ \text{type} \quad \text{"V" or "U", for V- or U-statistics of distance covariance or correlation. The default value is "V".} \]

References


Examples

\[ \text{x = rnorm(200)} \]
\[ \text{y = rnorm(200)} \]
\[ \text{dcov2d(x, y)} \]
\[ \text{dcor2d(x, y)} \]
### mdcov

**Marginal distance covariance** This function implements the method of calculating distance covariance between y and each column in x.

**Description**

Marginal distance covariance This function implements the method of calculating distance covariance between y and each column in x.

**Usage**

```r
mdcov(y, x, type = c("V", "U"))
mdcor(y, x, type = c("V", "U"))
```

**Arguments**

- **y**
  - the matrix of y
- **x**
  - the matrix of x, distance covariance is calculated for each variable in x with y.
- **type**
  - "V" or "U", for V- or U-statistics of distance covariance or correlation. The default value is "V".

**Examples**

```r
n = 200; p = 10
y = matrix(rnorm(n*2),n,2)
x = matrix(rnorm(n*p),n,p)
res1 = mdcov(y,x)
res2 = numeric(p)
for(j in 1:p){res2[j] = dcov::dcov(y,x[,j])}
# res1 is same with res2
res1 - res2
res3 = mdcor(y,x)
res4 = numeric(p)
for(j in 1:p){res4[j] = dcov::dcor(y,x[,j])}
# res3 is same with res4
res3 - res4
```

### pcov

**Projection covariance between two random vectors** This function implements the projection correlation in Zhu et al.(2017).

**Description**

Projection covariance between two random vectors This function implements the projection correlation in Zhu et al.(2017).
Usage

pcov(x, y)

Arguments

x the matrix of x
y the matrix of y

References


Examples

x = matrix(rnorm(200), 100, 2)
y = matrix(rnorm(200), 100, 2)
pcov(x, y)

Description

This method implements the method to compute the value of partial distance covariance proposed by Székely and Rizzo, 2014.

Usage

pdcov(x, y, z, type = c("U", "V"))

Arguments

x the matrix of x
y the matrix of y
z the matrix of z. Given the value of z, pdcov or pdcor between x and y is calculated.
type "V" or "U", for V- or U-statistics of partial distance covariance or correlation. The default value is "U".

References

Examples
   z = matrix(rnorm(400),200,2)
   x = matrix(rnorm(400),200,2)*z
   y = matrix(rnorm(400),200,2)*z
   pdcov(x,y,z)
   pdcor(x,y,z)
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