Package ‘symmetry’

January 3, 2019

Title What the Package Does (one line, title case)

Version 0.0.0.9000

Description What the package does (one paragraph).

Depends R (>= 3.1.0)

License What license is it under?

Encoding UTF-8

LazyData true

Imports Rcpp, RcppArmadillo

LinkingTo Rcpp, RcppArmadillo

RoxygenNote 6.0.1

SystemRequirements C++11

Suggests knitr,
rmarkdown

VignetteBuilder knitr

R topics documented:

BHI *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
BHI(X, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
mu	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\frac{1}{n\binom{n}{2}}\sum_{\mathcal{I}_2}\sum_{i_3=1}^{n}\left(\frac{1}{2}I\{|X_{i_1}-\mu|<|X_{i_3}-\mu|\}+\frac{1}{2}I\{|X_{i_2}-\mu|<|X_{i_3}-\mu|\}-I\{|X_{(2),X_{i_1},X_{i_2}}-\mu|<|X_{i_3}-\mu|\}\right)$$

Examples

```
set.seed(1)
X <- rnorm(50)
BHI(X)
X <- rnorm(50, 1)
BHI(X, 1)
```

BHK *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
BHK(X, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
mu	the estimate of the location parameter
k	the value of parameter 'k' used in the formula

Examples

```
set.seed(1)
X <- rnorm(50)
BHK(X, 2)
X <- rnorm(50, 1)
BHK(X, 2, 1)
```

HG *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
HG(X, k, t, H = TRUE)
```

Arguments

X	the sample for which to calculate the statistic
k	the value of parameter 'k' used in the formula
t	the value with which to compare in indicator
H	whether to calculate H or G

Value

The value of the statistics given by the formula:

$$H = \frac{1}{\binom{n}{2k+1}} \sum_{\mathcal{I}_{2k+1}} I\{-X_{(k+1),X_{i_1},\dots,X_{i_{2k+1}}} < t\}$$

$$G = \frac{1}{\binom{n}{2k+1}} \sum_{\mathcal{I}_{2k+1}} I\{X_{(k+1),X_{i_1},\dots,X_{i_{2k+1}}} < t\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
HG(X, 2)
```

I1 *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I1(X, k, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
k	the value of parameter 'k' used in the formula
mu	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\frac{1}{n\binom{n}{2k}}\sum_{\mathcal{I}_{2k}}\sum_{i_{2k+1}=1}^{n} I\{|X_{(k),X_{i_1},\ldots,X_{i_{2k}}}-\mu|<|X_{i_{2k+1}}-\mu|\}-I\{|X_{(k+1),X_{i_1},\ldots,X_{i_{2k}}}-\mu|<|X_{i_{2k+1}}-\mu|\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I1(X, 2)
X <- rnorm(50, 1)
I1(X, 2, 1)
```

I2 *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2(X)
```

Arguments

`X`	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{n^4} \sum_{i,j,a,b=1}^{n} I\{|X_i - X_j| < X_a + X_b\} - I\{|X_i + X_j| < X_a + X_b\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2(X)
```

`I2A` *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2A(X)
```

Arguments

`X`	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{n^4} \sum_{i,j,a,b=1}^{n} I\{|X_i - X_j| < |X_a + X_b|\} - I\{|X_i + X_j| < |X_a + X_b|\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2A(X)
```

I2HU — *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2HU(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{n^2\binom{n}{2}}\sum_{1\leq i<j\leq n}\sum_{a,b=1}^{n} I\{|X_i - X_j| < X_a + X_b\} - I\{|X_i + X_j| < X_a + X_b\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2HU(X)
```

I2HUA — *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2HUA(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{n^2\binom{n}{2}}\sum_{1\leq i<j\leq n}\sum_{a,b=1}^{n} I\{|X_i - X_j| < |X_a + X_b|\} - I\{|X_i + X_j| < |X_a + X_b|\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2HUA(X)
```

I2U *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2U(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{\binom{n}{4}} \sum_{1 \leq i < j < a < b \leq n} I\{|X_i - X_j| < X_a + X_b\} - I\{|X_i + X_j| < X_a + X_b\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2U(X)
```

I2UA *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2UA(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{\binom{n}{4}} \sum_{1\le i<j<a<b\le n} I\{|X_i - X_j| < |X_a + X_b|\} - I\{|X_i + X_j| < |X_a + X_b|\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2UA(X)
```

I2UAS *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2UAS(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{\binom{n}{4}} \sum_{1\le i<j<a<b\le n} I\{|X_i - X_j| < |X_a + X_b|\} - I\{|X_i + X_j| < |X_a + X_b|\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2UAS(X)
```

I2US *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
I2US(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\frac{1}{\binom{n}{4}} \sum_{1 \le i < j < a < b \le n} I\{|X_i - X_j| < X_a + X_b\} - I\{|X_i + X_j| < X_a + X_b\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
I2US(X)
```

K1 *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
K1(X, k, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
k	the value of parameter 'k' used in the formula
mu	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\sup_{t>0} \left| \frac{1}{\binom{n}{2k}} \sum_{\mathcal{I}_{2k}} I\{|X_{(k),X_{i_1},\dots,X_{i_{2k}}} - \mu| < t\} - I\{|X_{(k+1),X_{i_1},\dots,X_{i_{2k}}} - \mu| < t\} \right|$$

Examples

```
set.seed(1)
X <- rnorm(50)
K1(X, 2)
X <- rnorm(50, 1)
K1(X, 2, 1)
```

K2 *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
K2(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\sup_{t>0} \frac{1}{n^2} \left| \sum_{i,j=1}^{n} I\{|X_i - X_j| < t\} - I\{|X_i + X_j| < t\} \right|$$

Examples

```
set.seed(1)
X <- rnorm(50)
K2(X)
```

K2U *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
K2U(X)
```

Arguments

X	the sample for which to calculate the statistic

Value

The value of the test statistic given by the formula:

$$\sup_{t>0} \frac{1}{\binom{n}{2}} \left| \sum_{1 \le i < j \le n} I\{|X_i - X_j| < t\} - I\{|X_i + X_j| < t\} \right|$$

Examples

```
set.seed(1)
X <- rnorm(50)
K2U(X)
```

KS *Calculate Kolmogorov Smirnov test statistic (see 'Value' for formula)*

Description

Calculate Kolmogorov Smirnov test statistic (see 'Value' for formula)

Usage

```
KS(X, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
mu	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\sup_{t} |F_n(t + \mu) - (1 - F_n(\mu - t))|$$

Examples

```
set.seed(1)
X <- rnorm(50)
KS(X)
```

L1 *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
L1(X, a)
```

Arguments

X	the sample for which to calculate the statistic
a	the tuning parameter for the Laplace transform

Value

The value of the test statistic given by the formula:

$$\frac{1}{n^4}\sum_{i,j,k,l=1}^{n}\frac{1}{a+|X_i-X_j|+|X_k-X_l|}-\frac{1}{a+|X_i-X_j|+|X_k+X_l|}-\frac{1}{a+|X_i+X_j|+|X_k-X_l|}+\frac{1}{a+|X_i+X_j|$$

Examples

```
set.seed(1)
X <- rnorm(50)
L1(X)
```

NAI *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
NAI(X, k, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
k	the value of parameter 'k' used in the formula
mu	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\frac{1}{n\binom{n}{k}}\sum_{\mathcal{I}_k}\sum_{i_{k+1}=1}^{n} I\{|X_{(1),X_{i_1},\ldots,X_{i_k}}-\mu|<|X_{i_{k+1}}-\mu|\}-I\{|X_{(k),X_{i_1},\ldots,X_{i_k}}-\mu|<|X_{i_{k+1}}-\mu|\}$$

Examples

```
set.seed(1)
X <- rnorm(50)
NAI(X, 2)
X <- rnorm(50, 1)
NAI(X, 2, 1)
```

NAK *Calculate _ test statistic (see 'Value' for formula)*

Description

Calculate _ test statistic (see 'Value' for formula)

Usage

```
NAK(X, k, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
k	the value of parameter 'k' used in the formula
mu	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\sup_{t>0}\left|\frac{1}{\binom{n}{k}}\sum_{\mathcal{I}_k} I\{|X_{(1),X_{i_1},\ldots,X_{i_k}}-\mu|<t\}-I\{|X_{(k),X_{i_1},\ldots,X_{i_k}}-\mu|<t\}\right|$$

Examples

```
set.seed(1)
X <- rnorm(50)
NAK(X, 2)
X <- rnorm(50, 1)
NAK(X, 2, 1)
```

parTvalues *Simulate the distribution of a test statistic in parallel*

Description

This is just a parallel version of the Tvalues function, all arguments apply for this function. See Tvalues.

Usage

```
parTvalues(N, n, dist = list(), TS = list(), freecores = 0,
  clust = NULL)
```

Arguments

N	the number of simulations to do
n	the sample size for each simulation
dist	a list which specifies the null distribution (see details)
TS	a list which specifies the test statistic to use (see details)
freecores	how many cores to leave unused (0 for maximum use of cpu)
clust	a cluster to use for parallel

Value

A vector of size N, each element being the value of the statistic TS on simulated samples of size n.

Examples

```
parTvalues(1000, 50, list(name='norm'), list(name='I1', k=2))
parTvalues(1000, 50, list(name='unif', min=-1, max=1), list(name='I2'))
parTvalues(1000, 50, list(name='logis', loc=0.5), list(name='K1', k=2))
parTvalues(1000, 50, list(name='exp'), list(name='K2'))
```

rsl *Azzalini skew logistic distribution*

Description

Generates random numbers from the skew logistic distribution

Usage

```
rsl(n = 1, xi = 0, omega = 1, alpha = 0, dp = NULL)
```

Arguments

`n`	sample size.
`xi`	vector of location parameters.
`omega`	vector of (positive) scale parameters.
`alpha`	vector of slant parameters.
`dp`	a vector of length 3 whose elements represent the parameters described above. If `dp` is specified, the individual parameters cannot be set.

Value

Vector of random numbers from Azzalini skew logistic distribution.

`SGN` *Calculate Signed test statistic (see 'Value' for formula)*

Description

Calculate Signed test statistic (see 'Value' for formula)

Usage

```
SGN(X, mu = 0)
```

Arguments

`X`	the sample for which to calculate the statistic
`mu`	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\frac{1}{n}\sum_{i=1}^{n} I\{X_i - \mu > 0\} - \frac{1}{2}$$

Examples

```
set.seed(1)
X <- rnorm(50)
SGN(X)
```

`symmetry` *symmetry: A package which implements tests for symmetry*

Description

symmetry: A package which implements tests for symmetry

`test_power` *Calculate the power of a test*

Description

This function calculates the power of a test given the null and alternative T values and the significance level.

Usage

```
test_power(t0, t1, alpha = 0.05, two_sided = FALSE)
```

Arguments

`t0`	the vector of null T values
`t1`	the vector of alternative T values
`alpha`	the significance level
`two_sided`	indicator whether to use two sided critical region

`Tvalues` *Simulate the distribution of a test statistic*

Description

Simulates the distribution of the specified test statistic under the given null distribution.

Usage

```
Tvalues(N, n, dist = list(), TS = list())
```

Arguments

`N`	the number of simulations to do
`n`	the sample size for each simulation
`dist`	a list which specifies the null distribution (see details)
`TS`	a list which specifies the test statistic to use (see details)

Details

The dist argument is a list which must contain a field called "name" which determines which distribution to use (e.g. "norm", "unif", "exp", etc.) and, if needed, the parameters for the distribution. The name must be such that the function "r"+name exists ("rnorm", "runif", "rexp", etc). Further parameters are passed to that function.

The TS argument is a list which must contain a field called "name" which specifies which test statistic function to use for each sample. The name can be "I1", "K1", "I2", "K2" for statistics implemented by us, or any other statistic for which an R function exists (e.g. "mean", "var", etc.).

Value

A vector of size N, each element being the value of the statistic TS on simulated samples of size n.

Examples

```
Tvalues(1000, 50, list(name='norm'), list(name='I1', k=2))
Tvalues(1000, 50, list(name='unif', min=-1, max=1), list(name='I2'))
Tvalues(1000, 50, list(name='logis', loc=0.5, sca=1), list(name='K1', k=2))
Tvalues(1000, 50, list(name='exp'), list(name='K2'))
```

WCX *Calculate Wilcoxon test statistic (see 'Value' for formula)*

Description

Calculate Wilcoxon test statistic (see 'Value' for formula)

Usage

```
WCX(X, mu = 0)
```

Arguments

X	the sample for which to calculate the statistic
mu	the estimate of the location parameter

Value

The value of the test statistic given by the formula:

$$\frac{1}{\binom{n}{2}} \sum_{1 \le i < j \le n} I\{X_i + X_j - 2\mu > 0\} - \frac{1}{2}$$

Examples

```
set.seed(1)
X <- rnorm(50)
WCX(X)
```

Index