Package: GTRT (via r-universe)

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Type Package

Title Graph Theoretic Randomness Tests

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Description A collection of functions for testing randomness (or mutual independence) in linear and circular data as proposed in Gehlot and Laha (2025a) <doi:10.48550/arXiv.2506.21157> and Gehlot and Laha (2025b) <doi:10.48550/arXiv.2506.23522>, respectively.

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Encoding UTF-8

RoxygenNote 7.3.2

Imports stats, circular

Suggests knitr, rmarkdown, timeSeriesDataSets

VignetteBuilder knitr

NeedsCompilation no

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Contents

`cdf.rcag` *Theoretical CDF for RCAG for a given number of vertices.*

Description

Computes the theoretical CDF for an RCAG with for a given number of vertices.

Usage

```
cdf.rcag(m)
```

Arguments

`m`	Number of observations.

Value

A vector representing the theoretical CDF of an RCAG with m/2 vertices.

Examples

```
cdf.rcag(1000)
```

`cdf.rig` *Theoretical CDF of RIG for a given number of vertices.*

Description

Computes the theoretical CDF for RIG with for a given number of vertices.

Usage

```
cdf.rig(m)
```

Arguments

m	Number of observations.

Value

A vector representing the theoretical CDF of RIG with m/2 vertices.

Examples

```
cdf.rig(1000)
```

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deg.rcag *Degree Calculation for Random Circular Graph*

Description

Computes the degree of each vertex in a Random Circular Graph based on input arcs.

Usage

```
deg.rcag(theta)
```

Arguments

theta	A numeric vector of length m=2*nv.

Value

A vector of degrees for each vertex of RCAG obtained using theta.

Examples

```
x <- arima.sim(model = list(ar=0.9), 1000) ## AR(1) model
theta <- ((2*atan(x))%%(2*pi))*(180/pi) ##LAR(1) model
deg.rcag(theta)
```

deg.rig *Degree Calculation for Random Interval Graph*

Description

Computes the degree of each vertex in a Random Interval Graph based on the input intervals.

Usage

```
deg.rig(x)
```

Arguments

x	A numeric vector of length m=2*nv.

Value

A vector of degrees for each vertex of RIG obtained using x.

Examples

```
x <- arima.sim(model = list(ar=0.7), 1000) ## AR(1) model
deg.rig(x)
```

hellinger.dist *Hellinger Distance Between Distributions*

Description

Calculates the Hellinger distance between two probability distributions.

Usage

```
hellinger.dist(p, q)
```

Arguments

p	A probability vector.
q	Another probability vector of same length as p.

Value

Hellinger distance between p and q.

nip.rcag *Proportion of Non-Intersecting Arc Pairs in an RCAG.*

Description

Computes the proportion of non-intersecting pairs of arcs in the RCAG obtained using data.

Usage

```
nip.rcag(s, t, e1, e2)
```

Arguments

s	Start points of arcs.
t	End points of arcs.
e1	Vector of indices for the first interval in each pair.
e2	Vector of indices for the second interval in each pair.

Value

Mean proportion of non-intersecting pairs.

Examples

```
s <- circular::rcircularuniform(10)
t <- circular::rcircularuniform(10)
e1 <- c(2,10,6,1,5)
e2 <- c(4,3,8,7,9)
nip.rcag(s,t,e1,e2)
```

nip.rig *Proportion of Non-Intersecting Interval Pairs in an RIG*

Description

Computes the proportion of non-intersecting pairs of interval in the RIG obtained using data.

Usage

```
nip.rig(s, t, e1, e2)
```

Arguments

s	Start points of intervals.
t	End points of intervals.
e1	Vector of indices for the first interval in each pair.
e2	Vector of indices for the second interval in each pair.

Value

Mean proportion of non-intersecting pairs.

Examples

```
s <- runif(10,0,1)
t <- runif(10,0,1)
e1 <- c(2,10,6,1,5)
e2 <- c(4,3,8,7,9)
nip.rig(s,t,e1,e2)
```

---

rcagdd.test *RCAG-DD Test*

Description

Performs the RCAG-DD RIG-DD test of randomness for circular data.

Usage

```
rcagdd.test(theta)
```

Arguments

theta	A numeric vector representing endpoints of arcs.

Value

Vector of test statistics of RCAG-DD Test.

Examples

```
x <- arima.sim(model = list(ar=c(0.6,0.3)), 1000) ## AR(2) model
theta <- ((2*atan(x))%%(2*pi))*(180/pi) ##LAR(2) model
rcagdd.test(theta)
```

rcagep.test *RCAG-EP Test*

Description

Performs the RCAG-EP test of randomness for circular data.

Usage

```
rcagep.test(theta, alpha)
```

Arguments

theta	A numeric vector.
alpha	The level of significance

Value

Probability of non-intersection of edges, cutoff for RCAG-EP test and adjusted p-values for the RCAG-EP test.

Examples

```
x <- arima.sim(model = list(ar=0.9), 1000) ## AR(1) model
theta <- ((2*atan(x))%%(2*pi))*(180/pi) ##LAR(1) model
rcagep.test(theta,0.05)
```

rigdd.test *RIG-DD Test*

Description

Performs the RIG-DD test of randomness.

Usage

```
rigdd.test(x)
```

Arguments

x	A numeric vector corresponding to interval of an RIG.

Value

Vector of test statistics of RIG-DD Test.

Examples

```
x <- arima.sim(model = list(ar=c(0.7,0.2)), 1000) ## AR(2) model
rigdd.test(x)
```

`rigep.test` *RIG-EP Test*

Description

Performs the RIG-EP test of randomness.

Usage

```
rigep.test(x, alpha)
```

Arguments

`x`	A numeric vector
`alpha`	The level of significance

Value

Probability of non-intersection of edges, cutoff for RIG-EP test and adjusted p-values for the RIG-EP test.

Examples

```
x <- arima.sim(model = list(ar=0.9), 1000) ## AR(1) model
rigep.test(x,0.05)
```

`thrsd.rcagdd` *Threshold for RCAG-DD Test of randomness for circular data*

Description

Calculates a threshold for RCAG-DD test using simulated data.

Usage

```
thrsd.rcagdd(m, n_iter, alpha)
```

Arguments

`m`	Number of observations.
`n_iter`	Number of simulations.
`alpha`	Level of significance.

Value

Threshold value for RCAG-DD test. thrsd.rcagdd(500,1000,0.05)

`thrsd.rigdd` *Threshold for RIG-DD Test of randomness*

Description

Calculates a threshold for RIG-DD test using simulated data.

Usage

```
thrsd.rigdd(m, n_iter, alpha)
```

Arguments

`m`	Number of observations.
`n_iter`	Number of simulation iterations.
`alpha`	Level of significance.

Value

Threshold value for RIG-DD test.

Examples

```
thrsd.rigdd(250,1000,0.05)
```

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