# Package ‘LIStest’

**Type**  Package

**Title**  Tests of independence based on the Longest Increasing Subsequence

**Version**  2.1

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**Depends**  R (>= 2.10)

**Description**  Tests for independence between X and Y computed from a paired sample \((x_1,y_1), \ldots (x_n,y_n)\) of \((X,Y)\), using one of the following statistics (a) the Longest Increasing Subsequence \(L_n\), (b) \(JL_n\), a Jackknife version of \(L_n\) or (c) \(JLM_n\), a Jackknife version of the longest monotonic subsequence. This family of tests can be applied under the assumption of continuity of \(X\) and \(Y\).

**License**  GPL-2

**LazyLoad**  yes

**LazyData**  yes

**NeedsCompilation**  no

**Repository**  CRAN

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Tests of independence based on the Longest Increasing Subsequence

Description

Tests for independence between X and Y computed from a paired sample \((x_1,y_1), \ldots, (x_n,y_n)\) of \((X,Y)\), using one of the following statistics (a) the Longest Increasing Subsequence (Ln), (b) JLn, a Jackknife version of Ln or (c) JLMn, a Jackknife version of the longest monotonic subsequence. This family of tests can be applied under the assumption of continuity of X and Y.

Details

Package: LIStest
Type: Package
Version: 2.1
Date: 2014-03-12
License: GPL-2

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez
Maintainer: J. E. Garcia <jg@ime.unicamp.br>

References


JLMn

JLMn statistic, to test independence

Description

It compute the JLMn-statistic, from a bivariate sample of continuous random variables X and Y.

Usage

JLMn(x, y)

Arguments

x, y numeric vectors of data values. x and y must have the same length.
Details
See subsection 3.3-Main reference. For sample sizes less than 20, the correction introduced in subsection 3.2 from main reference, with $c = 0.4$ was avoided.

Value
The value of the JLMn-statistic.

Author(s)
J. E. Garcia, V. A. Gonzalez-Lopez

References

Examples
# mixture of two bivariate normal, one with correlation 0.9 and # the other with correlation -0.9
#
N <- 100
ro <- 0.90
Z1 <- rnorm(N)
Z2 <- rnorm(N)
X2 <- X1 <- Z1
I1 <- (1:floor(N*0.5))
I2 <- (floor(N*0.5)+1):N
X1[I1] <- Z1[I1]
X2[I1] <- (-Z1[I1]*ro+Z2[I1]*sqrt(1-ro*ro))
X1[I2] <- Z1[I2]
X2[I2] <- (-Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
plot(X1, X2)

# calculate the statistic
a <- JLMn(X1, X2)
a

JLn
JLn statistic, to test independence

Description
It compute the JLn-statistic, from a bivariate sample of continuous random variables $X$ and $Y$. 
Usage

\texttt{JLn(x, y)}

Arguments

\(x, y\) numeric vectors of data values. \(x\) and \(y\) must have the same length.

Details

See subsection 3.2.-Main reference. For sample sizes less than 20, the correction introduced in subsection 3.2 from main reference, with \(c = 0.4\) was avoided.

Value

The value of the JLn-statistic.

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), \url{http://dx.doi.org/10.1016/j.jmva.2014.02.010}

Examples

```r
## mixture of two bivariate normal, one with correlation 0.9 and
## the other with correlation -0.9
#
N <- 100
ro < - 0.90
Z1 <- rnorm(N)
Z2 <- rnorm(N)
X2 <- X1 <- Z1
I1 <- (1:floor(N*0.5))
I2 <- ((floor(N*0.5)+1):N)
X1[I1] <- Z1[I1]
X2[I1] <- (Z1[I1]*ro+Z2[I1]*sqrt(1-ro*ro))
X1[I2] <- Z1[I2]
X2[I2] <- (Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
plot(X1, X2)

# calculate the statistic
a <- JLn(X1, X2)
a
```
lis

Longest increasing subsequence for a univariate sample

Description

It compute the size of the longest increasing subsequence from a sample of a (continuous) random variable.

Usage

lis(x)

Arguments

x numeric vector of data values.

Details

See example 2.1-Main reference.

Value

Integer, the size of the longest increasing subsequence.

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez

References


Examples

#see Example 2.1 (reference)
a<-lis(c(3,6,1,7,4,2,5,8))
a
Description

Test for independence between X and Y computed from a paired sample \((x_1, y_1), \ldots, (x_n, y_n)\) of \((X, Y)\), using one of the following statistics (a) the Longest Increasing Subsequence \((L_n)\), (b) \(JL_n\), a Jackknife version of \(L_n\) or (c) \(JL_Mn\), a Jackknife version of the longest monotonic subsequence. This family of tests can be applied under the assumption of continuity of \(X\) and \(Y\).

Usage

```r
lis.test(x, y, alternative = c("two.sided", "less", "greater"),
         method = c("JL_Mn", "Ln", "JL_n"))
```

Arguments

- **x, y** numeric vectors of data values. \(x\) and \(y\) must have the same length.
- **alternative** indicates the alternative hypothesis and must be one of "two.sided" (default), "greater" or "less".
- **method** a character string indicating which statistics is to be used for the test. One of "Ln", "JL_n", or "JL_Mn" (default).

Details

For sample sizes less than 20, the correction introduced in subsection 3.2 from main reference, with \(c = 0.4\) was avoided.

Value

- **sample.estimate** the value of the statistic.
- **p.value** the p-value for the test.
- **alternative** a character string describing the alternative hypothesis.
- **method** a character string indicating what type of Lis-test was performed.

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), \texttt{http://dx.doi.org/10.1016/j.jmva.2014.02.010}
Examples

# Example 1
# mixture of two bivariate normal, one with correlation 0.9
# and the other with correlation -0.9

N <- 100
ro <- 0.9
Z1 <- rnorm(N)
Z2 <- rnorm(N)
X2 <- X1 <- Z1
I1 <- (1:floor(N*0.5))
I2 <- ((floor(N*0.5)+1):N)
X1[I1] <- Z1[I1]
Y2[I1] <- (Z1[I1]*ro+Z2[I1]*sqrt(1-ro^ro))
X1[I2] <- Z1[I2]
Y2[I2] <- (Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro^ro))
plot(X1, X2)
# calculate the p.value using the default settings (method="JLm"
# and alternative="two.sided")
lis.test(X1, X2)
# calculate the p.value using method="JLn" and
# alternative="two.sided"
#lis.test(X1, X2, method="JLn")

# Example 2: see subsection 4.3.2-Application 2 from main reference.
# (It requires the package VGAM)
# #require(VGAM)
#/plot(coalminers$BW, coalminers$nbW)
#/lis.test(coalminers$BW, coalminers$nbW, 
#/alternative = "greater", method = "JLn")
#lis.test(coalminers$BW, coalminers$nbW, 
#/alternative = "greater", method = "JLn")
#

Ln

Ln (Longest Increasing Subsequence) statistic, to test independence

Description

It compute the Ln-statistic, from a bivariate sample of continuous random variables X and Y.

Usage

Ln(x, y)

Arguments

x, y numeric vectors of data values. x and y must have the same length.
**Details**

See Section 2.-Main reference.

**Value**

The value of the Ln-statistic.

**Author(s)**

J. E. Garcia and V. A. Gonzalez-Lopez

**References**


**Examples**

```r
## mixture of two bivariate normal, one with correlation 
## 0.9 and the other with correlation -0.9

#
N <- 100
ro <- 0.90
Z1 <- rnorm(N)
Z2 <- rnorm(N)
X2 <- X1 <- Z1
I2 <- (1:floor(N*0.5))
I2 <- ((floor(N*0.5)+1):N)
X1[I] <- Z1[I]
X2[I] <- (Z1[I]*ro+Z2[I]*sqrt(1-ro^2))
X1[I2] <- Z1[I2]
X2[I2] <- (Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro^2))
plot(X1, X2)

# calculate the statistic
a <- Ln(X1, X2)
a
```

---

| TJLMN | Simulated values for the JLMn statistic |

**Description**

Simulated values for the JLMn statistic under the hypothesis of independence

**Format**

The format is: List of 200 tables
References


Simulated values for the JLn statistic

Description
Simulated values for the JLn statistic under the hypothesis of independence.

Format
The format is: List of 200 tables

References


Simulated values for the Ln statistic

Description
Simulated values for the Ln statistic under the hypothesis of independence.

Format
The format is: List of 200 tables

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