

# Package: LIStest (via r-universe)

September 14, 2024

**Type** Package

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

**Version** 2.1

**Date** 2014-03-12

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

**Maintainer** J. E. Garcia <jg@ime.unicamp.br>

**Depends** R (>= 2.10)

**Description** Tests for independence between  $X$  and  $Y$  computed from a paired sample  $(x_1, y_1), \dots, (x_n, y_n)$  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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LIStest-package	<i>Tests of independence based on the Longest Increasing Subsequence</i>
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**Description**

Tests for independence between X and Y computed from a paired sample  $(x_1, y_1), \dots, (x_n, y_n)$  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**

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

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JLMn	<i>JLMn statistic, to test independence</i>
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**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**

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

**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
I<-(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*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
```

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JLn

*JLn statistic, to test independence*

---

**Description**

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

**Usage**

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), <http://dx.doi.org/10.1016/j.jmva.2014.02.010>

**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
I <- (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*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*

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**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**

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

**Examples**

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

lis.test

*Test for independence between paired samples***Description**

Test for independence between X and Y computed from a paired sample  $(x_1, y_1), \dots, (x_n, y_n)$  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.

**Usage**

```
lis.test(x, y, alternative = c("two.sided", "less", "greater"),
method = c("JLMn", "Ln", "JLn"))
```

**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", "JLn", or "JLMn"(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), <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 <- 0.90
Z1 <- rnorm(N)
Z2 <- rnorm(N)
X2 <- X1 <- Z1
I <- (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*ro))
X1[I2] <- Z1[I2]
X2[I2] <- (Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
plot(X1,X2)
# calculate the p.value using the default settings (method="JLMn"
# 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 = "Ln")
#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**

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

**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
I<-(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*ro))
X1[I2]<-Z1[I2]
X2[I2]<-(Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
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**

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

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TJLN

*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**

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

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TLN

*Simulated values for the Ln statistic*

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**Description**

Simulated values for the Ln statistic under the hypothesis of independence

**Format**

The format is: List of 200 tables

**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), <http://dx.doi.org/10.1016/j.jmva.2014.02.010>

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