

Package ‘iid.test’

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Title iid-test

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Depends clim.pact, R (>= 2.1.1)

Description Testing whether data is independent and identically distributed

License GPL (>= 2)

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```
daily.station.records
```

```
daily.station.records
```

Description

Test for whether daily station data are independent and identically distributed (iid).

Reference:

Benestad, R.E., 2003: How often can we expect a record-event? *Climate Research*. 23, 3-13 (pdf)

Benestad, R.E., 2004: Record values, nonstationarity tests and extreme value distributions, *Global and Planetary Change*, vol 44, p. 11-26

The papers are available in the pdf format from http://regclim.met.no/results_iii_artref.html.

Note: Gaps of missing values will bias the results towards low number of record-events. Likewise, large number of dry days (zero precipitation) will also bias the series since if it only rains 1 out of 100 days, then no new record can be set for days without rain. One solution is to apply the test to the maximum monthly/seasonal rainfall or to exclude the record with many dry days.

Usage

```
daily.station.records(obs, element="precip", subsample=5, tolerance=2, remove.zeroes=FALSE)
```

Arguments

| | |
|-----------------------------------|--|
| <code>obs</code> | A <code>daily.station.record</code> (The <code>clim.pact</code> -package). |
| <code>element</code> | Decides which element is analysed ("t2m" or "precip"). |
| <code>subsample</code> | Subsampling to reduce the effects of dependencies. |
| <code>tolerance</code> | How many days with missing value is tolerable before the results are significantly biased. |
| <code>remove.zeroes</code> | Remove records with many dry days (rare and occasional precipitation events tend to lead to undercount). |
| <code>reverse.plot.reverse</code> | see <code>iid.test</code> |

Value

list: 'record.density' and 'record.density.rev' for the reverse analysis.

Author(s)

R.E. Benestad

Examples

```
data(obs)
daily.station.records(obs, subsample=30)
```

```
iid.test          iid test
```

Description

Test for whether a variable is independent and identically distributed (iid). Used in `daily.station.records`.

Reference:

Benestad, R.E., 2003: How often can we expect a record-event? *Climate Research*. 23, 3-13 (pdf)

Benestad, R.E., 2004: Record values, nonstationarity tests and extreme value distributions, *Global and Planetary Change*, vol 44, p. 11-26

The papers are available in the pdf format from http://regclim.met.no/results_iii_artref.html.

Note, gaps of missing data (NA) can bias the results and produce an under-count. The sign of non-iid behaviour is when the 'forward' analysis indicated higher number of record-events than the confidence region and the backward analysis gives lower than the confidence region.

Version 0.7: Added a test checking for dependencies based on an expected number from a binomial distribution and given the probability $p_1(n) = 1/n$. This test is applied to the parallel series for one respective time (realisation), and is then repeated for all observation times. The check uses `qbinom` to compute a theoretical 95% confidence interval, and a number outside this range is marked with red in the 'ball diagram' (first plot). `pbinom` is used to estimate the p-value for the

Usage

```
iid.test(Y, plot=TRUE, Monte.Carlo=TRUE, N.test=200, reverse.plot.reverse=TRUE)
```

Arguments

| | |
|-----------------------------------|---|
| <code>Y</code> | A data matrix or a vector. |
| <code>plot</code> | Flag: plot the diagnostics. |
| <code>Monte.Carlo</code> | Flag: for estimating confidence limits. |
| <code>N.test</code> | Number of Monte-Carlo runs. |
| <code>reverse.plot.reverse</code> | TRUE: plots reverse from right to left, else left to right. |

Value

list: 'record.density' and 'record.density.rev' for the reverse analysis. The variables `CI.95`, `p.val`, and `i.cluster` (and their reverse equivalents '.rev') return the estimated 95% conf. int, p-value, and the location of the clusters (binomial).

Author(s)

R.E. Benestad

Examples

```
dat <- rnorm(100*30)
dim(dat) <- c(100,30)
iid.test(dat)
```

n.records

n.records

Description

Number of record-events.

Reference:

Benestad, R.E., 2003: How often can we expect a record-event? *Climate Research*. 23, 3-13 (pdf)

Benestad, R.E., 2004: Record values, nonstationarity tests and extreme value distributions, *Global and Planetary Change*, vol 44, p. 11-26

The papers are available in the pdf format from http://regclim.met.no/results_iii_artref.html.

Usage

```
n.records(y)
```

Arguments

y A vector.

Value

list: N= number of records, t=vector of time index corresponding to when a new record is set, events= a vector with TRUE where there is a record-event. The same fields with a suffix '.rev' represent the same analysis but for a reversed chronological order.

Author(s)

R.E. Benestad

Examples

```
y <- rnorm(100)
n.records(y)
```

 obs

Daily temperature and precipitation from Oslo

Description

Daily temperature and precipitation from Oslo. Stored as a 'daily.station.record' (clim.pact).

Usage

```
data(obs)
```

Format

The data is a 'daily.station.record' object (see [station.obj](#)).

Examples

```
data(obs)
```

 test.iid.test

test.iid.test

Description

Testing routine for the iid-test..

Reference:

Benestad, R.E., 2003: How often can we expect a record-event? Climate Research. 23, 3-13 (pdf)

Benestad, R.E., 2004: Record values, nonstationarity tests and extreme value distributions, Global and Planetary Change, vol 44, p. 11-26

The papers are available in the pdf format from http://regclim.met.no/results_iii_artref.html.

Usage

```
test.iid.test(distr="rnorm",d=c(70, 50),plot=TRUE,Monte.Carlo=TRUE)
```

Arguments

| | |
|-------------|--|
| distr | What type of random numbers to be used, .eg normally distributed.. |
| d | Dimension of the test matrix. |
| plot | For plotting the diagnostics. |
| Monte.Carlo | Flag for running Monte-Carlo simulations to estimate 95 |

Value

list: 'record.density' and 'record.density.rev' for the reverse analysis.

Author(s)

R.E. Benestad

Examples

```
test.iid.test()
```

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