

Package ‘runstats’

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Type Package

Title Fast Computation of Running Statistics for Time Series

Version 1.1.0

Description Provides methods for fast computation of running sample statistics for time series. These include: (1) mean, (2) standard deviation, and (3) variance over a fixed-length window of time-series, (4) correlation, (5) covariance, and (6) Euclidean distance (L2 norm) between short-time pattern and time-series. Implemented methods utilize Convolution Theorem to compute convolutions via Fast Fourier Transform (FFT).

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Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

URL <https://github.com/martakarass/runstats>

BugReports <https://github.com/martakarass/runstats/issues>

Imports fftwtools

Suggests covr, testthat, ggplot2, knitr, rmarkdown, sessioninfo, rbenchmark, cowplot, spelling

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Language en-US

NeedsCompilation no

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RunningCor	<i>Fast Running Correlation Computation</i>
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Description

Computes running correlation between time-series x and short-time pattern y .

Usage

`RunningCor(x, y, circular = FALSE)`

Arguments

<code>x</code>	A numeric vector.
<code>y</code>	A numeric vector, of equal or shorter length than x .
<code>circular</code>	logical; whether running correlation is computed assuming circular nature of x time-series (see Details).

Details

Computes running correlation between time-series x and short-time pattern y . The length of output vector equals the length of x . Parameter `circular` determines whether x time-series is assumed to have a circular nature. Assume l_x is the length of time-series x , l_y is the length of short-time pattern y .

If `circular` equals `TRUE` then

- first element of the output vector corresponds to sample correlation between $x[1:l_y]$ and y ,
- last element of the output vector corresponds to sample correlation between $c(x[l_x], x[1:(l_y - 1)])$ and y .

If `circular` equals `FALSE` then

- first element of the output vector corresponds to sample correlation between $x[1:l_y]$ and y ,
- the $l_x - W + 1$ -th element of the output vector corresponds to sample correlation between $x[(l_x - l_y + 1):l_x]$,
- last $W-1$ elements of the output vector are filled with NA.

See `runstats.demo(func.name = "RunningCor")` for a detailed presentation.

Value

A numeric vector.

Examples

```
x <- sin(seq(0, 1, length.out = 1000) * 2 * pi * 6)
y <- x[1:100]
out1 <- RunningCor(x, y, circular = TRUE)
out2 <- RunningCor(x, y, circular = FALSE)
plot(out1, type = "l"); points(out2, col = "red")
```

RunningCov

*Fast Running Covariance Computation***Description**

Computes running covariance between time-series x and short-time pattern y .

Usage

```
RunningCov(x, y, circular = FALSE)
```

Arguments

x	A numeric vector.
y	A numeric vector, of equal or shorter length than x .
<code>circular</code>	Logical; whether running variance is computed assuming circular nature of x time-series (see Details).

Details

Computes running covariance between time-series x and short-time pattern y .

The length of output vector equals the length of x . Parameter `circular` determines whether x time-series is assumed to have a circular nature. Assume l_x is the length of time-series x , l_y is the length of short-time pattern y .

If `circular` equals `TRUE` then

- first element of the output vector corresponds to sample covariance between $x[1:l_y]$ and y ,
- last element of the output vector corresponds to sample covariance between $c(x[l_x], x[1:(l_y - 1)])$ and y .

If `circular` equals `FALSE` then

- first element of the output vector corresponds to sample covariance between $x[1:l_y]$ and y ,
- the $l_x - W + 1$ -th last element of the output vector corresponds to sample covariance between $x[(l_x - l_y + 1):l_x]$,
- last $W-1$ elements of the output vector are filled with NA.

See `runstats.demo(func.name = "RunningCov")` for a detailed presentation.

Value

A numeric vector.

Examples

```
x <- sin(seq(0, 1, length.out = 1000) * 2 * pi * 6)
y <- x[1:100]
out1 <- RunningCov(x, y, circular = TRUE)
out2 <- RunningCov(x, y, circular = FALSE)
plot(out1, type = "l"); points(out2, col = "red")
```

RunningL2Norm

Fast Running L2 Norm Computation

Description

Computes running L2 norm between between time-series x and short-time pattern y .

Usage

```
RunningL2Norm(x, y, circular = FALSE)
```

Arguments

x	A numeric vector.
y	A numeric vector, of equal or shorter length than x .
<code>circular</code>	logical; whether running L2 norm is computed assuming circular nature of x time-series (see Details).

Details

Computes running L2 norm between between time-series x and short-time pattern y . The length of output vector equals the length of x . Parameter `circular` determines whether x time-series is assumed to have a circular nature. Assume l_x is the length of time-series x , l_y is the length of short-time pattern y .

If `circular` equals `TRUE` then

- first element of the output vector corresponds to sample L2 norm between $x[1:l_y]$ and y ,
- last element of the output vector corresponds to sample L2 norm between $c(x[l_x], x[1:(l_y - 1)])$ and y .

If `circular` equals `FALSE` then

- first element of the output vector corresponds to sample L2 norm between $x[1:l_y]$ and y ,
- the $l_x - W + 1$ -th element of the output vector corresponds to sample L2 norm between $x[(l_x - l_y + 1):l_x]$,
- last $W - 1$ elements of the output vector are filled with NA.

See `runstats.demo(func.name = "RunningL2Norm")` for a detailed presentation.

Value

A numeric vector.

Examples

```
## Ex.1.
x <- sin(seq(0, 1, length.out = 1000) * 2 * pi * 6)
y1 <- x[1:100] + rnorm(100)
y2 <- rnorm(100)
out1 <- RunningL2Norm(x, y1)
out2 <- RunningL2Norm(x, y2)
plot(out1, type = "l"); points(out2, col = "blue")
## Ex.2.
x <- sin(seq(0, 1, length.out = 1000) * 2 * pi * 6)
y <- x[1:100] + rnorm(100)
out1 <- RunningL2Norm(x, y, circular = TRUE)
out2 <- RunningL2Norm(x, y, circular = FALSE)
plot(out1, type = "l"); points(out2, col = "red")
```

RunningMean

Fast Running Mean Computation

Description

Computes running sample mean of a time-series x in a fixed length window.

Usage

```
RunningMean(x, W, circular = FALSE)
```

Arguments

x	A numeric vector.
W	A numeric scalar; length of x window over which sample mean is computed.
<code>circular</code>	Logical; whether running sample mean is computed assuming circular nature of x time-series (see Details).

Details

The length of output vector equals the length of x vector. Parameter `circular` determines whether x time-series is assumed to have a circular nature. Assume l_x is the length of time-series x , W is a fixed length of x time-series window.

If `circular` equals `TRUE` then

- first element of the output time-series corresponds to sample mean of $x[1:W]$,
- last element of the output time-series corresponds to sample mean of $c(x[l_x], x[1:(W-1)])$.

If `circular` equals `FALSE` then

- first element of the output time-series corresponds to sample mean of $x[1:W]$,
- $l_x - W + 1$ -th element of the output time-series corresponds to sample mean of $x[(l_x - W + 1):l_x]$,
- last $W-1$ elements of the output time-series are filled with NA.

See `runstats.demo(func.name = "RunningMean")` for a detailed presentation.

Value

A numeric vector.

Examples

```
x <- rnorm(10)
RunningMean(x, 3, circular = FALSE)
RunningMean(x, 3, circular = TRUE)
```

RunningSd

Fast Running Standard Deviation Computation

Description

Computes running sample standard deviation of a time-series x in a fixed length window.

Usage

```
RunningSd(x, W, circular = FALSE)
```

Arguments

<code>x</code>	A numeric vector.
<code>W</code>	A numeric scalar; length of x window over which sample variance is computed.
<code>circular</code>	Logical; whether running sample standard deviation is computed assuming circular nature of x time-series (see Details).

Details

The length of output vector equals the length of x vector. Parameter `circular` determines whether x time-series is assumed to have a circular nature. Assume l_x is the length of time-series x , W is a fixed length of x time-series window.

If `circular` equals `TRUE` then

- first element of the output time-series corresponds to sample standard deviation of $x[1:W]$,
- last element of the output time-series corresponds to sample standard deviation of $c(x[1_x], x[1:(W-1)])$.

If circular equals FALSE then

- first element of the output time-series corresponds to sample standard deviation of $x[1:W]$,
- the $l_x - W + 1$ -th element of the output time-series corresponds to sample standard deviation of $x[(l_x - W + 1):l_x]$,
- last $W-1$ elements of the output time-series are filled with NA.

See `runstats.demo(func.name = "RunningSd")` for a detailed presentation.

Value

A numeric vector.

Examples

```
x <- rnorm(10)
RunningSd(x, 3, circular = FALSE)
RunningSd(x, 3, circular = FALSE)
```

RunningVar

Fast Running Variance Computation

Description

Computes running sample variance of a time-series x in a fixed length window.

Usage

```
RunningVar(x, W, circular = FALSE)
```

Arguments

x	A numeric vector.
W	A numeric scalar; length of x window over which sample variance is computed.
circular	Logical; whether running sample variance is computed assuming circular nature of x time-series (see Details).

Details

The length of output vector equals the length of x vector. Parameter `circular` determines whether x time-series is assumed to have a circular nature. Assume l_x is the length of time-series x , W is a fixed length of x time-series window.

If circular equals TRUE then

- first element of the output time-series corresponds to sample variance of $x[1:W]$,
- last element of the output time-series corresponds to sample variance of $c(x[l_x], x[1:(W - 1)])$.

If circular equals FALSE then

- first element of the output time-series corresponds to sample variance of $x[1:W]$,
- the $l_x - W + 1$ -th element of the output time-series corresponds to sample variance of $x[(l_x - W + 1):l_x]$,
- last $W-1$ elements of the output time-series are filled with NA.

See `runstats.demo(func.name = "RunningVar")` for a detailed presentation.

Value

A numeric vector.

Examples

```
x <- rnorm(10)
RunningVar(x, W = 3, circular = FALSE)
RunningVar(x, W = 3, circular = TRUE)
```

runstats.demo

Demo visualization of package functions

Description

Generates demo visualization of output of methods for computing running statistics.

Usage

```
runstats.demo(func.name = "RunningCov")
```

Arguments

<code>func.name</code>	Character value; one of the following: <ul style="list-style-type: none"> • "RunningMean", • "RunningSd", • "RunningVar", • "RunningCov", • "RunningCor", • "RunningL2Norm".
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Value

NULL

Examples

```
## Not run:
runstats.demo(func.name = "RunningMean")
runstats.demo(func.name = "RunningSd")
runstats.demo(func.name = "RunningVar")
runstats.demo(func.name = "RunningCov")
runstats.demo(func.name = "RunningCor")
runstats.demo(func.name = "RunningL2Norm")

## End(Not run)
```

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