Package 'convo'

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Type Package

Title Fast Computation of Running Sample Statistics

Version 0.1.0

Description Provides methods for fast computation of running (aka rolling) sample statistics. These include running sample mean of a single numeric sequence, running sample variance of a single numeric sequence, running sample covariance of two numeric sequences. Implementation of the methods uses convolution via Fast Fourier Transform. The complexity of the convolution can be reduced from O(n^2) to O(n log n) with fast Fourier transform compared to conventional computation.

License GPL-3

Imports stats

Encoding UTF-8

LazyData true

RoxygenNote 6.0.1

Suggests knitr,
rmarkdown,
testthat,
covr

VignetteBuilder knitr

R topics documented:

RunningCor *Fast Running Correlation Computation*

Description

Computes running correlation between two sequences in a fixed width window, whose length corresponds to the length of the shorter sequence. Uses convolution via Fast Fourier Transform.

Usage

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

Arguments

x	numeric sequence
y	numeric sequence, of equal or shorter length than x sequence
circular	logical; whether running correlation is computed assuming circular nature of x sequence (see Details)

Details

Computes running correlation between two sequences in a fixed width window. The length of a window is equal to the shorter of the two sequences (y), and window "runs" over the length of longer sequence (x).

Parameter circular determines whether x sequence is assumed to have a circular nature. Assume l_x is the length of sequence x, l_y is the length of shorter sequence y.

If circular equals TRUE then

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

If circular equals FALSE then

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

Value

numeric sequence

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 two sequences in a fixed width window, whose length corresponds to the length of the shorter sequence. Uses convolution via Fast Fourier Transform.

Usage

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

Arguments

x	numeric sequence
y	numeric sequence, of equal or shorter length than x sequence
circular	logical; whether running variance is computed assuming circular nature of x sequence (see Details)

Details

Computes running covariance between two sequences in a fixed width window. The length of a window is equal to the shorter of the two sequences (y), and window "runs" over the length of longer sequence (x).

Parameter circular determines whether x sequence is assumed to have a circular nature. Assume l_x is the length of sequence x, l_y is the length of shorter sequence y.

If circular equals TRUE then

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

If circular equals FALSE then

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

Value

numeric sequence

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 two sequences in a fixed width window, whose length corresponds to the length of the shorter sequence. Uses convolution via Fast Fourier Transform.

Usage

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

Arguments

x	numeric sequence
y	numeric sequence, of equal or shorter length than x sequence
circular	logical; whether running L2 norm is computed assuming circular nature of x sequence (see Details)

Details

Computes running L2 norm between two sequences in a fixed width window. The length of a window is equal to the shorter of the two sequences (y), and window "runs" over the length of longer sequence (x).

Parameter circular determines whether x sequence is assumed to have a circular nature. Assume l_x is the length of sequence x, l_y is the length of shorter sequence y.

If circular equals TRUE then

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

If circular equals FALSE then

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

Value

numeric sequence

Examples

```
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")
```

RunningMean *Fast Running Mean Computation*

Description

Computes running sample mean of a sequence in a fixed width window. Uses convolution via Fast Fourier Transform.

Usage

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

Arguments

x	numeric sequence
W	numeric; width of x sequence window
circular	logical; whether running sample mean is computed assuming circular nature of x sequence (see Details)

Details

Parameter `circular` determines whether `x` sequence is assumed to have a circular nature. Assume l_x is the length of sequence `x`, `W` is a fixed length of `x` sequence window.

If `circular` equals `TRUE` then

- output sequence length equals l_x,
- first element of the output sequence corresponds to sample mean of `x[1:W]`,
- last element of the output sequence corresponds to sample mean of `c(x[l_x], x[1:(W - 1)])`.

If `circular` equals `FALSE` then

- output sequence length equals $l_x - W + 1$,
- first element of the output sequence corresponds to sample mean of `x[1:W]`,
- last element of the output sequence corresponds to sample mean of `x[(l_x - W + 1):l_x]`.

Value

numeric sequence

Examples

```
x <- rnorm(1000)
RunningMean(x, 100)
length(RunningMean(x, 100, circular = FALSE))
length(RunningMean(x, 100, circular = TRUE))
```

RunningSd *Fast Running Standard Deviation Computation*

Description

Computes running sample standard deviation of a sequence in a fixed width window. Uses convolution via Fast Fourier Transform.

Usage

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

Arguments

x	numeric sequence
W	numeric; width of x sequence window
circular	logical; whether running sample standard deviation is computed assuming circular nature of x sequence (see Details)

Details

Parameter `circular` determines whether `x` sequence is assumed to have a circular nature. Assume l_x is the length of sequence `x`, `W` is a fixed length of `x` sequence window.

If `circular` equals `TRUE` then

- output sequence length equals l_x,
- first element of the output sequence corresponds to sample standard deviation of `x[1:W]`,
- last element of the output sequence corresponds to sample standard deviation of `c(x[l_x], x[1:(W - 1)])`.

If `circular` equals `FALSE` then

- output sequence length equals $l_x - W + 1$,
- first element of the output sequence corresponds to sample standard deviation of `x[1:W]`,
- last element of the output sequence corresponds to sample standard deviation of `x[(l_x - W + 1):l_x]`.

Value

numeric sequence

Examples

```
x <- rnorm(1000)
RunningSd(x, 100)
length(RunningSd(x, 100, circular = FALSE))
length(RunningSd(x, 100, circular = TRUE))
```

RunningVar *Fast Running Variance Computation*

Description

Computes running sample variance of a sequence in a fixed width window. Uses convolution via Fast Fourier Transform.

Usage

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

Arguments

x	numeric sequence
W	numeric; width of x sequence window
circular	logical; whether running sample variance is computed assuming circular nature of x sequence (see Details)

Details

Parameter `circular` determines whether `x` sequence is assumed to have a circular nature. Assume l_x is the length of sequence `x`, `W` is a fixed length of `x` sequence window.

If `circular` equals `TRUE` then

- output sequence length equals l_x,
- first element of the output sequence corresponds to sample variance of `x[1:W]`,
- last element of the output sequence corresponds to sample variance of `c(x[l_x], x[1:(W - 1)])`.

If `circular` equals `FALSE` then

- output sequence length equals $l_x - W + 1$,
- first element of the output sequence corresponds to sample variance of `x[1:W]`,
- last element of the output sequence corresponds to sample variance of `x[(l_x - W + 1):l_x]`.

Value

numeric sequence

Examples

```
x <- rnorm(1000)
RunningVar(x, 100)
length(RunningVar(x, 100, circular = FALSE))
length(RunningVar(x, 100, circular = TRUE))
```

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