Package 'CWT'

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Type Package

Title Continuous Wavelet Transformation for Spectroscopy

Version 0.2.1

Maintainer J. Antonio Guzmán Q. <antguz06@gmail.com>

Description Fast application of Continuous Wavelet Transformation ('CWT') on time series with special attention to spectroscopy. It is written using data.table and 'C++' language and in some functions it is possible to use parallel processing to speed-up the computation over samples. Currently, only the second derivative of a Gaussian wavelet function is implemented.

License GPL (>= 3)

URL https://github.com/Antguz/CWT

BugReports https://github.com/Antguz/CWT/issues

Depends R (>= 4.0.0)

Imports data.table (>= 1.14.0), Rcpp

Suggests testthat (>= 3.2.0)

LinkingTo Rcpp, RcppArmadillo

ByteCompile true

Config/testthat/edition 3

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RoxygenNote 7.3.1

SystemRequirements GNU make

NeedsCompilation yes

Author J. Antonio Guzmán Q. [cre, aut, cph]
(<https://orcid.org/0000-0002-0721-148X>)

Repository CRAN

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`CWT-package` *Continuous Wavelet Transformation for Spectroscopy*

Description

Fast application of Continuous Wavelet Transformation on time series with special attention to spectroscopy. It is written using 'data.table' and 'C++' language and in some functions it is possible to use parallel processing to speed-up the computation over samples.

Author(s)

Maintainer: J. Antonio Guzmán Q. <antguz06@gmail.com> (ORCID) [copyright holder]

See Also

Useful links:

- https://github.com/Antguz/CWT
- Report bugs at https://github.com/Antguz/CWT/issues

`cwt` *Continuous Wavelet Transform*

Description

Compute a 1D continuous wavelet transformation using 2st order derivative Gaussian wavelet.

Usage

```
cwt(t, scales, variance = 1, summed_wavelet = FALSE, threads = 1L)
```

Arguments

t	A data.table, matrix, or numeric vector where columns or values represent time (i.e., bands) and rows samples (i.e., pixels). Remember the transformation assume that columns or values are evenly spaced though time (i.e., bands at equal to sampling interval).
scales	A positive numeric vector describing the scales to compute. The minimum scale (i.e., scales = 1) is equal to sampling interval between columns.
variance	A positive numerber describing the variance of the Gaussian PDF used to scale. Default variance = 1.
summed_wavelet	If TRUE, it returns the sum of scales. If FALSE, each scale is returned.
threads	An integer specifying the number of threads to use. Experiment to see what works best for your data on your hardware.

Value

If summed_wavelet = TRUE, it returns a data.table where columns are the sum of wavelet scales. If summed_wavelet = FALSE, it returns an array (i.e., time, samples, and scales).

Author(s)

J. Antonio Guzmán Q.

Examples

```
time_series <- sin(seq(0, 20 * pi, length.out = 100))

# Using a numeric vector

cwt(t = time_series,
    scales = c(1, 2, 3, 4, 5),
    summed_wavelet = FALSE)

cwt(t = time_series,
    scales = c(1, 2, 3, 4, 5),
    summed_wavelet = TRUE)

# Using a matrix

times <- 100
frame <- matrix(rep(time_series, times),
                nrow = times,
                byrow = TRUE)

cwt(t = frame,
    scales = c(1, 2, 3, 4, 5),
    summed_wavelet = FALSE)

cwt(t = frame,
    scales = c(1, 2, 3, 4, 5),
    summed_wavelet = TRUE)
```

resampling_FWHM *Full Width Half Maximum Resampling*

Description

It resample spectra data using Full Width Half Maximum (FWHM).

Usage

```
resampling_FWHM(spectra, wavelengths, new_wavelengths, FWHM, threads = 1L)
```

Arguments

spectra	A data.table, data.frame, or matrix where columns represent bands and rows samples (i.e., pixels).
wavelengths	A numeric vector describing the current positioning of the spectral bands within spectra.
new_wavelengths	A numeric vector describing positioning of the new spectral bands to resample.
FWHM	A numeric vector describing the Full Width Half Maximums of the new spectral bands. The length of this vector should be equal than the length of new_wavelengths.
threads	An integer specifying the number of threads to use. Experiment to see what works best for your data on your hardware.

Value

It returns a data.table with the resampled spectra, where columns are the new bands and rows are samples.

Author(s)

J. Antonio Guzmán Q.

Examples

```
mean <- 50
sd1 <- 5
sd2 <- 10
n <- 100

test <- matrix(c(dnorm(1:n, mean = mean, sd = sd1),
                 dnorm(1:n, mean = mean, sd = sd2)),
                 nrow = 2,
                 byrow = TRUE)

current_bands <- 1:n
```

```
new_bands <- seq(10, 90, by = 5)
FHWM <- rep(5, length(new_bands))

resampling_FWHM(spectra = test,
                wavelengths = current_bands,
                new_wavelengths = new_bands,
                FWHM = FHWM)
```

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