Package ‘haarfisz’

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denoise.poisson

Description

Main routine of the package. Estimates the deterministic discretised intensity of a one-dimensional Poisson process using the Haar-Fisz transformation and partial cycle spinning. Requires WaveThresh3.

Usage

denoise.poisson(y, meth.1 = hf.bt, cs.1 = 50, meth.2 = hf.cv, cs.2 = 50, hybrid = TRUE)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>The vector of Poisson counts, its length must be a power of 2.</td>
</tr>
<tr>
<td>meth.1</td>
<td>Unquoted name of an S-Plus routine for denoising Gaussian contaminated vectors. Must take and return a vector of length $2^J$ where $J$ is an integer. The following routines supplied in this package can be used here: hf.u, hf.cv, hf.bt, hf.tiu. The user can define and plug in his or her own routines here.</td>
</tr>
<tr>
<td>cs.1</td>
<td>The number of cycle spins to be performed with meth.1. Must be between 1 and N-1, where N is the length of y.</td>
</tr>
<tr>
<td>meth.2</td>
<td>Of the same type as meth.1.</td>
</tr>
<tr>
<td>cs.2</td>
<td>The number of cycle spins to be performed with meth.2.</td>
</tr>
<tr>
<td>hybrid</td>
<td>If set to TRUE, then the estimates are computed using both meth.1 with cs.1 cycle spins, and meth.2 with cs.2 cycle spins, and the final estimate is taken to be the average of these two. If set to FALSE, only meth.1 with cs.1 cycle spins is used to compute the final estimate.</td>
</tr>
</tbody>
</table>

Value

Returns:

est | The estimate of the intensity which underlies y (a vector of the same length as y). |

Author(s)

Piotr Fryzlewicz
hf.bt

Description
Denoises a Gaussian contaminated vector using a version of the wavelet-based “greedy tree” algorithm by Baraniuk, see the reference in the thesis.

Usage
hf.bt(x, filter.number = 1L, family = “DaubExPhase”, min.level = 3L, noise.level = NULL)

Arguments
- x: The noisy vector, its length must be a power of 2.
- filter.number: The filter number of the analysing wavelet. Can be set to 1, 2, ..., 10 for family == "DaubExPhase", or to 4, 5, ..., 10 for family == "DaubLeAsymm".
- family: The family of wavelet bases from which the wavelet filter.number is chosen. Can be set to "DaubExPhase" or "DaubLeAsymm".
- min.level: The minimum level thresholded.
- noise.level: Standard deviation of the noise, can be set to a positive number or NULL; in the latter case it will be estimated using MAD.

Value
Returns: itemestDenoised version of x.

Author(s)
Piotr Fryzlewicz

hf.cv

Description
Denoises a Gaussian contaminated vector using wavelet thresholding with a threshold chosen by “leave-half-out” cross-validation. Requires WaveThresh3. Also see help to wd, threshold and wr in WaveThresh.

Usage
hf.cv(x, filter.number = 1L, family = "DaubExPhase", min.level = 3L, type = "hard"
Arguments

\texttt{x} \hspace{1cm} The noisy vector, its length must be a power of 2.
\texttt{filter\_number} \hspace{1cm} The filter number of the analysing wavelet. Can be set to 1, 2, ..., 10 for \texttt{family} == "DaubExPhase", or to 4, 5, ..., 10 for \texttt{family} == "DaubLeAsymm".
\texttt{family} \hspace{1cm} The family of wavelet bases from which the wavelet \texttt{filter\_number} is chosen. Can be set to "DaubExPhase" or "DaubLeAsymm".
\texttt{min\_level} \hspace{1cm} The minimum level thresholded.
\texttt{type} \hspace{1cm} Type of thresholding, can be set to "hard" or "soft".

Value

Returns:
\texttt{est} \hspace{1cm} Denoised version of \texttt{x}

Author(s)

Piotr Fryzlewicz

Description

Denoises a Gaussian contaminated vector using translation-invariant hard wavelet thresholding with the universal threshold. Requires WaveThresh3. Also see help to \texttt{wd}, \texttt{threshold}, \texttt{convert} and \texttt{AvBasis} in WaveThresh.

Usage

\texttt{hf.tiu(x, filter\_number = 1, family = "DaubExPhase", min\_level = 3, noise\_level = 1)}

Arguments

\texttt{x} \hspace{1cm} The noisy vector, its length must be a power of 2.
\texttt{filter\_number} \hspace{1cm} The filter number of the analysing wavelet. Can be set to 1, 2, ..., 10 for \texttt{family} == "DaubExPhase", or to 4, 5, ..., 10 for \texttt{family} == "DaubLeAsymm".
\texttt{family} \hspace{1cm} The family of wavelet bases from which the wavelet \texttt{filter\_number} is chosen. Can be set to "DaubExPhase" or "DaubLeAsymm".
\texttt{min\_level} \hspace{1cm} The minimum level thresholded.
\texttt{noise\_level} \hspace{1cm} Standard deviation of the noise, can be set to a positive number or to an estimate (a function of \texttt{x}).
HFU

Value

Returns:

est  Denoised version of x.

Author(s)

Piotr Fryzlewicz

Description

Denoises a Gaussian contaminated vector using wavelet thresholding with the universal threshold. Requires WaveThresh3. Also see help to wd, threshold, and link{wr} in WaveThresh.

Usage

hf.u(x, filter.number = 10, family = "DaubLeAsymm", min.level = 3, type = "hard")

Arguments

x  The noisy vector, its length must be a power of 2.
filter.number  The filter number of the analysing wavelet. Can be set to 1, 2, ..., 10 for family == "DaubExPhase", or to 4, 5, ..., 10 for family == "DaubLeAsymm".
family  The family of wavelet bases from which the wavelet filter.number is chosen. Can be set to "DaubExPhase" or "DaubLeAsymm".
min.level  The minimum level thresholded.
type  Type of thresholding, can be set to hard or soft

Value

Returns:

est  Denoised version of x.

Author(s)

Piotr Fryzlewicz
Description
Performs the Haar-Fisz transform.

Usage
hft(data)

Arguments
data The vector of Poisson counts, its length must be a power of 2

Details
The inverse transform is `hft.inv`

Value
Returns:
hfy The Haar-Fisz transform of codedata (vector of the same length as data).

Author(s)
Piotr Fryzlewicz

See Also
denoise.poisson, hft.inv, hf.bt, hf.cv, hf.u, hf.tiu

Examples
# # Generate Poisson data, half with one intensity, and half with a larger one # v <- c( rpois(64, lambda=1), rpois(64, lambda=10)) # # # Plot it to note that the variation is bigger in the second half # (and the mean, but this is not important for this bit) # # ## Not run: ts.plot(v) # # # Now do the Haar-Fisz transform # # vhf <- hft(v) # # # Now plot this, and see that the variance of the second bit is now comparable
hft.inv

```r
# to the first
#
## Not run: ts.plot(vhft)
```

---

### Description

Performs the inverse Haar-Fisz transform.

### Usage

```r
hft.inv(data)
```

### Arguments

- **data**: Vector of length $2^J$ where $J$ is an integer.

### Value

Returns:

- **ihfx**: The inverse Haar-Fisz transform of $x$ (vector of the same length as `data`).

### Author(s)

Piotr Fryzlewicz

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### Description

One of my functions to resolve issues for a similar function that seems to have been forgotten in `haarfisz`.

### Usage

```r
shift.sequence(v, places, dir="right")
```

### Arguments

- **v**: Vector to shift
- **places**: The number of places to shift
- **dir**: Whether the shift should be right or left
Details

This function takes a sequence input and shifts it to the left or right by the specified number of places.

Value

a shifted output sequence.

Author(s)

Piotr Fryzlewicz

Description

Time series of the number of earthquakes of magnitude $\geq 3.0$ which occurred in Northern California in 1024 weeks, the last week being 29/11 – 05/12/2000.

Usage

data(xquake)

Source

The series was composed using the data obtained from the Northern California Earthquake Data Center.
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