Package: lacunarity (via r-universe)

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Type Package

Title Standard and Generalized Lacunarity for Binary Time Series

Version 0.1.0

Depends R (>= 3.0.1)

Description Estimates lacunarity and generalized lacunarity for unidimensional binary time series. The lacunarity index summarizes the similarity of parts from different regions of a series at a given scale by averaging the behavior of variable size structures of zeros and ones. The generalized lacunarity concept provides an enhanced measure of the organization of the gaps over all measured scales and over the different arrangements of smaller and larger gaps in the series.

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Encoding UTF-8

RoxygenNote 7.3.3

Imports zoo, plyr, stats

URL https://github.com/Ikarobarreto/lacunarity

BugReports https://github.com/Ikarobarreto/lacunarity/issues

Suggests rmarkdown, knitr, testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

NeedsCompilation no

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Repository https://cran.r-universe.dev

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RemoteUrl https://github.com/cran/lacunarity

RemoteRef HEAD

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`genlac` *Generalized lacunarity of a binary series*

Description

Computes the generalized (multifractal-like) lacunarity $\Lambda_q(s)$ of a binary time series and the spectrum of scaling exponents $\gamma(q)$.

Usage

```
genlac(x)
```

Arguments

`x` a binary vector of 0's and 1's.

Details

The ordinary lacunarity is extended to an arbitrary moment order q by

$$\Lambda_q(s) = \left[\frac{Z(2q,s)}{Z(q,s)^2}\right]^{1/q},$$

where $Z(q,s)$ is the q-th moment of the gliding-box mass distribution at scale s. Large positive q emphasises dense boxes and negative q emphasises sparse boxes, so the curve $q \mapsto \gamma(q)$, with $\gamma(q)$ the slope of $\log_{10} \Lambda_q(s)$ on $\log_{10} s$, describes how gaps of different magnitudes scale. Orders q range over $\{-10, \ldots, 10\} \setminus \{0\}$.

Value

A list with components:

`s` the dyadic box scales $s = 2^i$.

`q` the moment orders.

`yq` the generalized scaling exponents $\gamma(q)$.

`Dqs` the matrix of generalized lacunarities $\Lambda_q(s)$ (rows index `q`, columns index `s`).

References

Vernon-Carter, J., Lobato-Calleros, C., Escarela-Perez, R., Rodriguez, E. and Alvarez-Ramirez, J. (2009). A suggested generalization for the lacunarity index. *Physica A*, 388(20), 4305-4314.

Allain, C. and Cloitre, M. (1991). Characterizing the lacunarity of random and deterministic fractal sets. *Physical Review A*, 44(6), 3552-3558.

See Also

lac for the ordinary lacunarity index.

Examples

```
x <- rbinom(1000, 1, 0.85)
genlac(x)
```

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lac *Lacunarity index of a binary series*

Description

Computes the gliding-box lacunarity index $\Lambda(s)$ of a binary time series across dyadic scales, together with its scaling exponent.

Usage

```
lac(x)
```

Arguments

x	a binary vector of 0's and 1's.

Details

A box of size s is slid one observation at a time along the series and its mass m (the number of ones it covers) is recorded. Writing $Z(q, s)$ for the q-th moment of the resulting box-mass distribution, the lacunarity index is

$$\Lambda(s) = \frac{Z(2, s)}{Z(1, s)^2} = 1 + \frac{\mathrm{Var}(m)}{\mathrm{mean}(m)^2},$$

so that $\Lambda(s) \geq 1$, with equality only for a translationally homogeneous pattern. Larger values indicate gappier, more heterogeneous textures. The scaling exponent y is the slope of $\log_2 \Lambda(s)$ regressed on $\log_2 s$. Scales are dyadic, $s = 2^i$, and capped by the longest run of ones.

Value

A list with components:

y the lacunarity scaling exponent γ.

Ds the lacunarity $\Lambda(s)$ at each scale.

s the dyadic box scales $s = 2^i$.

References

Allain, C. and Cloitre, M. (1991). Characterizing the lacunarity of random and deterministic fractal sets. *Physical Review A*, 44(6), 3552-3558.

Plotnick, R. E., Gardner, R. H., Hargrove, W. W., Prestegaard, K. and Perlmutter, M. (1996). Lacunarity analysis: a general technique for the analysis of spatial patterns. *Physical Review E*, 53(5), 5461-5468.

See Also

`genlac` for the generalized lacunarity spectrum.

Examples

```
x <- rbinom(1000, 1, 0.85)
lac(x)
```

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