Package 'belg'

December 15, 2022

Title Boltzmann Entropy of a Landscape Gradient

Version 1.5.3

Description Calculates the Boltzmann entropy of a landscape gradient. This package uses the analytical method created by Gao, P., Zhang, H. and Li, Z., 2018 (<doi:10.1111/tgis.12315>) and by Gao, P. and Li, Z., 2019 (<doi:10.1007/s10980-019-00854-3>). It also extend the original ideas by allowing calculations on data with missing values.

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Encoding UTF-8

ByteCompile true

RoxygenNote 7.2.2

Depends R (>= 3.3.0)

LinkingTo Rcpp, RcppArmadillo

Imports Rcpp

Suggests testthat, sp, raster, covr, knitr, rmarkdown, ggplot2, rasterVis, stars, terra

URL https://r-spatialecology.github.io/belg/

BugReports https://github.com/r-spatialecology/belg/issues

VignetteBuilder knitr

NeedsCompilation yes

Author Jakub Nowosad [aut, cre] (<https://orcid.org/0000-0002-1057-3721>), Space Informatics Lab [cph]

Maintainer Jakub Nowosad <nowosad.jakub@gmail.com>

Repository CRAN

Date/Publication 2022-12-15 15:30:03 UTC

R topics documented:

get_boltzmann *Boltzmann entropy of a landscape gradient*

Description

Calculates the Boltzmann entropy of a landscape gradient

Usage

```
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## Default S3 method:
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'matrix'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'array'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'RasterLayer'
get_boltzmann(
  x,
```

```
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'RasterStack'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'RasterBrick'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = FALSE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'stars'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'SpatRaster'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)
```

Arguments

x	SpatRaster, stars, RasterLayer, RasterStack, RasterBrick, matrix, or array.
method	A method used. Either "hierarchy" for the hierarchy-based method (Gao et al., 2017) or "aggregation" (default) for the aggregation-based method (Gao et al., 2019).

na_adjust	Should the output value be adjusted to the proportion of not missing cells? Either TRUE (default) or FALSE
base	A logarithm base ("log", "log2" or "log10").
relative	Should a relative or absolute entropy be calculated? TRUE or FALSE (default).

Details

The method for computing the Boltzmann entropy of a landscape gradient works on integer values that are either positive or equals to zero. This function automatically rounds values to the nearest integer value (rounding halfway cases away from zero) and negative values are shifted to positive values.

Value

a numeric vector

References

Gao, Peichao, Hong Zhang, and Zhilin Li. "A hierarchy-based solution to calculate the configurational entropy of landscape gradients." Landscape Ecology 32.6 (2017): 1133-1146.

Gao, Peichao, Hong Zhang, and Zhilin Li. "An efficient analytical method for computing the Boltzmann entropy of a landscape gradient." Transactions in GIS (2018).

Gao, Peichao and Zhilin Li. "Aggregation-based method for computing absolute Boltzmann entropy of landscape gradient with full thermodynamic consistency" Landscape Ecology (2019)

Examples

```
new_c = c(56, 86, 98, 50, 45, 56, 96, 25,
          15, 55, 85, 69, 12, 52, 25, 56,
          32, 25, 68, 98, 58, 66, 56, 58)


lg = matrix(new_c, nrow = 3, ncol = 8, byrow = TRUE)
get_boltzmann(lg, relative = FALSE, method = "hierarchy", base = "log10")
get_boltzmann(lg, relative = TRUE, method = "hierarchy", base = "log2")
get_boltzmann(lg, relative = TRUE, method = "hierarchy", base = "log")
```

Index