

# Package ‘belg’

May 1, 2022

**Title** Boltzmann Entropy of a Landscape Gradient

**Version** 1.5.2

**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](https://doi.org/10.1111/tgis.12315)>) and by Gao, P. and Li, Z., 2019 (<[doi:10.1007/s10980-019-00854-3](https://doi.org/10.1007/s10980-019-00854-3)>). It also extend the original ideas by allowing calculations on data with missing values.

**License** MIT + file LICENSE

**Encoding** UTF-8

**ByteCompile** true

**RoxygenNote** 7.1.2

**Depends** R (>= 3.3.0)

**LinkingTo** Rcpp, RcppArmadillo

**Imports** Rcpp

**Suggests** testthat, sp, raster, rgdal, 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](mailto:nowosad.jakub@gmail.com)>

**Repository** CRAN

**Date/Publication** 2022-05-01 14:30:10 UTC

## R topics documented:

get\_boltzmann . . . . . 2

**Index** . . . . . 5

---

get_boltzmann	<i>Boltzmann entropy of a landscape gradient</i>
---------------	--

---

**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).

<code>na_adjust</code>	Should the output value be adjusted to the proportion of not missing cells? Either TRUE (default) or FALSE
<code>base</code>	A logarithm base ("log", "log2" or "log10").
<code>relative</code>	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

`get_boltzmann`, [2](#)