Package 'RAT'

July 21, 2025

Title Research Assessment Tools

Version 0.3.1

Date 2022-08-23

Description Includes algorithms to assess research productivity and patterns, such as the h-index and i-index. Cardoso et al. (2022) Cardoso, P., Fukushima, C.S. & Mammola, S. (2022) Quantifying the internationalization and representativeness in research. Trends in Ecology and Evolution, 37: 725-728.

Depends R (>= 3.5.0)

Imports ggplot2, graphics, mapproj, stats, stringr, utils

Encoding UTF-8

License GPL-3

LazyData true

RoxygenNote 7.2.1

NeedsCompilation no

Author Pedro Cardoso [aut, cre],
Stefano Mammola [aut]

Maintainer Pedro Cardoso <pedro.cardoso@helsinki.fi>

Repository CRAN

Date/Publication 2022-08-24 07:00:23 UTC

Contents

biblio *biblio file for testing.*

Description

A dataset from Web of Science, exported as tab delimited text, full record.

Usage

```
data(biblio)
```

Format

A data.frame with bibliographical data.

h.index *H-index.*

Description

Calculates the h-index.

Usage

```
h.index(biblio, fulldata = FALSE)
```

Arguments

biblio	A data.frame exported from Web of Science as tab delimited text, full record.
fulldata	if TRUE returns publication and citation counts.

Details

The h-index is a measure of scientific output calculated as the h number of papers with more than h citations (Hirsch, 2005).

Value

The h-index value. If fulldata = TRUE a list with full data.

References

Hirsch, J.E. (2005). An index to quantify an individual's scientific research output. PNAS, 102: 16569–16572. doi:10.1073/pnas.0507655102.

Examples

```
data(biblio)
h.index(biblio)
h.index(biblio, TRUE)
```

`i.index` *I-index.*

Description

Calculates the i-index (internationalization).

Usage

```
i.index(
  biblio,
  r = FALSE,
  h = FALSE,
  homeCountry = NULL,
  logbase = 2,
  fulldata = FALSE
)
```

Arguments

`biblio`	A data.frame exported from Web of Science as tab delimited text, full record OR a vector with country frequencies where names are the country names.
`r`	if TRUE the i-index is multiplied by the r-index, i.e., weighted according to the expected distribution of GDP values of collaborating countries.
`h`	if TRUE the i-index is divided by the h-index to create a measure independent of the latter. In such case 'biblio' must come from WoS.
`homeCountry`	A character string specifying the country of origin of the researcher to calculate the r-index if r = TRUE. Look at map$country for the complete list. If NULL, the country with most hits in Web of Science is used.
`logbase`	The log base for building the octaves of the r-index if r = TRUE.
`fulldata`	if TRUE returns publication and citation counts.

Details

The i-index (internationalization) is a measure of scientific collaborations across countries. Calculated as the i number of co-author countries in more than i papers (Cardoso et al. 2022). The weighted version of the index multiplies its raw value by the square rooted difference between observed and expected distribution of GDP per capita of countries constituting the index (function RAT::represent). The standardized distribution divides the i-index (weighted or not) by the h-index as these two are usually correlated.

Value

The i-index value. If fulldata = TRUE a list with full data.

References

Cardoso, P., Fukushima, C.S. & Mammola, S. (2022) Quantifying the internationalization and representativeness in research. Trends in Ecology and Evolution, 37: 725-728.

Examples

```
data(biblio)
i.index(biblio)
i.index(biblio, r = TRUE, fulldata = TRUE)
i.index(biblio, r = TRUE, h = TRUE, logbase = 10, fulldata = TRUE)

biblio = c(5, 3, 2, 1)
names(biblio) = c("Finland", "Portugal", "Brazil", "Italy")
i.index(biblio)
```

---

i.map *Map of international collaboration.*

Description

Generates a network of international collaboration.

Usage

```
i.map(
  biblio,
  homeCountry = NULL,
  ext = c(-180, 180, -55, 90),
  sea.col = "white",
  country.col = "grey",
  country.border.col = "black",
  country.border.tick = 0.3,
  line.curvature = 0.1,
  line.size = 0.8,
  line.alpha = 0.4,
  line.color = "black",
  country.point.color = "white",
  country.point.line = "black",
  country.point.alpha = 0.8,
  country.size.proportional = FALSE,
  country.point.size = 1,
  homeCountry.point.color = "darkgrey",
  homeCountry.point.line = "black",
```

```
  homeCountry.point.alpha = 0.8,
  homeCountry.point.size = 5
)
```

Arguments

biblio	A data.frame exported from Web of Science as tab delimited text, full record OR a vector with country frequencies where names are the country names.
homeCountry	A character string specifying the country of origin of the researcher. Look at map$country for the complete list. If NULL, the country with most hits in Web of Science is used.
ext	extent of the bounding box of the map in decimal degrees (minX, maxX, minY, maxY).
sea.col	A character indicating the color of the sea.
country.col	A character indicating the color of the countries in the world.
country.border.col	A character indicating the color of the border among countries.
country.border.tick	An integer value defining the size of the border line among countries.
line.curvature	An integer value defining the curvature of the line connecting the home country with the countries of collaborators.
line.size	An integer value defining the size of the line connecting the home country with the countries of collaborators.
line.alpha	An integer value defining the transparency of the line connecting the home country with the countries of collaborators.
line.color	A character indicating the color of the line connecting the home country with the countries of collaborators.
country.point.color	A character indicating the color of the vertex representing each country.
country.point.line	A character indicating the color of line of the vertex representing each country.
country.point.alpha	An integer value defining the transparency of the vertex representing each country.
country.size.proportional	Logical. If TRUE, the size of each country is proportional to the number of collaborations.
country.point.size	An integer value defining the size of vertex representing each country. Ignored if country.size.proportional = TRUE.
homeCountry.point.color	A character indicating the color of the vertex representing the home country.
homeCountry.point.line	A character indicating the color of the line of the vertex representing the home country.

homeCountry.point.alpha
: An integer value defining the transparency of the vertex representing the home country.

homeCountry.point.size
: An integer value defining the size of vertex representing the home country.

Details

The network connects the researcher with all their collaborators.

Value

A map with the network of collaborations.

Examples

```
data(biblio)
i.map(biblio, country.size.proportional = TRUE)

biblio = c(5, 3, 2, 1)
names(biblio) = c("Finland", "Portugal", "Brazil", "Italy")
i.map(biblio)
```

---

map *Matrix matching country names, coordinates and GDP.*

Description

A dataset that links author countries with the map using the coordinates and with GDP per capita.
Current GDP values are for 2020 (World Bank data: https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD)

Usage

```
data(map)
```

Format

A data.frame with countries and corresponding coordinates.

r.index *R-index.*

Description

Calculates the r-index (representativeness).

Usage

```
r.index(biblio, homeCountry = NULL, logbase = 2, plot = FALSE)
```

Arguments

biblio	A data.frame exported from Web of Science as tab delimited text, full record OR a vector with country frequencies where names are the country names.
homeCountry	A character string specifying the country of origin of the researcher. Look at map$country for the complete list. If NULL, the country with most hits in Web of Science is used.
logbase	The log base for building the octaves.
plot	plots the expected and observed distribution of collaborations according to GDP.

Details

The r-index (representativeness) is a measure of the overlap between observed and expected distributions of GDP per capita of collaborating countries (Cardoso et al. 2022). The abundance distribution of log(GDP per capita) of countries in the collaborators list is calculated (using octaves). This is compared with the global distribution of GDPs by using the overlap of both lists.

Value

The r-index value.

References

Cardoso, P., Fukushima, C.S. & Mammola, S. (2022) Quantifying the internationalization and representativeness in research. Trends in Ecology and Evolution, 37: 725-728.

Examples

```
data(biblio)
r.index(biblio)
r.index(biblio, plot = TRUE)

biblio = c(5, 3, 2, 1)
names(biblio) = c("Finland", "Portugal", "Brazil", "Italy")
r.index(biblio, plot = TRUE)
```

Index