Package 'socialh'

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Title Rank and Social Hierarchy for Gregarious Animals

Version 0.1.1

Description Tools developed to facilitate the establishment of the rank and social hierarchy for gregarious animals by the Si method developed by Kondo & Hurnik (1990)<doi:10.1016/0168-1591(90)90125-W>. It is also possible to determine the number of agonistic interactions between two individuals, sociometric and dyadics matrix from dataset obtained through electronic bins. In addition, it is possible plotting the results using a bar plot, box plot, and sociogram.

License GPL-3

Encoding UTF-8

Imports circlize, dplyr, data.table, ggplot2, magrittr, stats, utils

RoxygenNote 7.2.0

Suggests rmarkdown, knitr, testthat (>= 3.0.0)

VignetteBuilder knitr

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LazyLoad true

Depends R (>= 2.10)

LazyData true

NeedsCompilation no

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Repository CRAN

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Contents

`actorSociogram` *Sociogram with actor information*

Description

Function to obtain the circle diagram with actor relationship from an sociomatrix.

Usage

```
actorSociogram(smatrix)
```

Arguments

`smatrix`	sociomatrix

Details

The function actorSociogram is obtained by the sociometric matrix. Return a circular diagram with actor relationship between the animals, where the arrow shows the direction of the relationship and the line thickness indicates the number of encounters (the thicker the line, the greater the number of encounters).

Value

Circular plot with actor information

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
"There is no example"

NULL
```

---

barDom *Barplot from the variables obtained in the dvalue*

Description

Generates a barplot from the variables obtained in the dvalue function (dominance value, social hierarchy and social rank)

Usage

```
barDom(dvalue, variable)
```

Arguments

dvalue	Dominance value
variable	the column with social hierarchy or social rank information.

Details

It is a function that plots the social hierarchy or social rank information of a group in a barplot. The function uses the options provided by ggplot2.

Value

histogram of social dominance

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
"There is no example"
NULL
```

bpDom *Boxplot*

Description

Function to obtain the boxplot of social hierarchy categories from dvalue function.

Usage

```
bpDom(y, x)
```

Arguments

y	the column with animal information.
x	the column with social hierarchy or social rank information.

Details

It is a simple function that plots the social hierarchy or social rank information of a group in a boxplot. The function uses the options provided by ggplot2.

Value

boxplot of social hierarchy or social rank

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
"There is no example"

NULL
```

dmatrix *Sij dyadic relationship matrix*

Description

Function to obtain the Sij dyadic dominance relationship from an sociomatrix.

Usage

```
dmatrix(smatrix)
```

Arguments

smatrix	sociomatrix

Details

The dyadic relationship is obtained by the following expression: Sij = (Xij - Xji) / (|Xij - Xji|), where Sij is the social status of the ith animal relative to the jth animal; Xij is the number of times the animal i won the animal j; Xji is the number of times the animal j won the animal i.

Value

Dyadic matrix

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

Kondo, S., & Hurnik, J. F. (1990). Stabilization of social hierarchy in dairy cows. Applied Animal Behaviour Science, 27(4), 287-297.

Examples

```
x <- matrix(c(0,0,1,0,0,1,0,0,2,0,0,0,0,1,0,0,0,1,0,0,2,
              0,0,0,0,1,1,0,0,0,0,0,1,0,0,1,0,0,1,0,0,0,
              1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0),
              nrow=8,byrow=TRUE,)
colnames(x) <- c(1,2,3,4,5,6,8,9)

rownames(x) <- c(1,2,3,4,5,6,8,9)

dyadic <- dmatrix(x)

print(dyadic)
```

---

dvalue *Dominance value*

Description

Function to obtain the dominance value, social rank and hierarchy from Sij dyadic relationship matrix.

Usage

```
dvalue(dmatrix)
```

Arguments

dmatrix	Sij dyadic relationship matrix

Details

The social categories (rank and hierarchy) are define according to dominance value and is obtained by the following expression: SH =(|Distance between highest(+ X) and lowest(- Y) dominance value| + 1) /(2 or 3), where "SH" is the rank or hierarchy. The rank (high and lower) and social category (dominant, intermediate and subordinate) are determined assigned according to dominance value. The choice for divide the group by rank or social category depends of the study objective. Both rank and social category are estimated by the distance between the highest (+ X) and the lowest (- Y) dominance value, plus 1 (corresponds to the dominance value zero), which determines the number of points in the range.

Value

dominance value, social rank and social hierarchy

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

Coimbra, P. A. D., Machado Filho, L. C. P., & Hötzel, M. J. (2012). Effects of social dominance, water trough location and shade availability on drinking behaviour of cows on pasture. Applied Animal Behaviour Science, 139(3-4), 175-182.

Examples

```
x <- matrix(c(0,-1,1,0,-1,1,0,0,1,0,-1,-1,0,1,0,0,
              -1,1,0,-1,1,-1,0,0,0,1,1,0,-1,0,0,0,
              1,0,-1,1,0,0,1,0,-1,-1,1,0,0,0,0,1,
              0,0,0,0,-1,0,0,0,0,0,0,0,0,-1,0,0),
              nrow=8,byrow=TRUE,)

colnames(x) <- c(1,2,3,4,5,6,8,9)

rownames(x) <- c(1,2,3,4,5,6,8,9)

dominance <- dvalue(x)

print(dominance)
```

feeding_event_data *Feeding event data from Nellore cattle*

Description

A database obtained from feed efficiency test of beef cattle to illustrate the functions of the socialh package.

Usage

```
feeding_event_data
```

Format

A data frame with 90211 rows and 7 variables:

equip_id equipament identification

animal_id animal identification

IN date and time (dd/mm/yyyy and hour:minutes:seconds) when the animal entered at the electronic bin

OUT date and time (dd/mm/yyyy and hour:minutes:seconds) when the animal left the electronic bin

duration (s) duration of the feeding event in seconds

consumption (g) amount of food consumed during the visit to the bin in grams

pen pen identification

Source

https://www.kaggle.com/datasets/juliavalente/data-from-visits-to-the-trough-of-nellore-cattle

Examples

```
data(feeding_event_data)
```

freqActor *Frequency of an animal was actor*

Description

Function to identify frequency that one animal was actor regarding the herd at bins.

Usage

```
freqActor(x)
```

Arguments

x	dataset with replacements information.

Details

freqActor is only applied for dataset with columns ordained and named as follows: actor and reactor.

Value

Frequency of an animal was an actor

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
x <- data.frame(actor = c(6,3,5,4,2,1,3,5,8,6,9,3,2,1,1),
                reactor = c(2,6,3,5,4,2,1,3,5,1,6,4,3,2,5))

freqA <- freqActor(x)

print(freqA)
```

---

freqReactor *Frequency of an animal was reactor*

Description

Function to identify frequency that one animal was reactor regarding the herd at bins.

Usage

```
freqReactor(x)
```

Arguments

x	dataset with replacements information.

Details

freqReactor is only applied for dataset with columns ordained and named as follows: actor and reactor.

Value

Frequency of an animal was an reactor

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
x <- data.frame(actor = c(6,3,5,4,2,1,3,5,8,6,9,3,2,1,1),
                reactor = c(2,6,3,5,4,2,1,3,5,1,6,4,3,2,5))

freqR <- freqReactor(x)

print(freqR)
```

---

improved_index *Improved linearity index*

Description

Function to obtain the linearity index improved by de Vries (1995).

Usage

```
improved_index(dmatrix, smatrix)
```

Arguments

dmatrix	dyatic matrix
smatrix	sociomatrix

Details

The function improved_index is obtained by the following expression: h' = h(6/(n^3-n)*u), where "h'" is the linearity index, "n" is the total of animals, "u" is the unknown or tied relationships.

Value

h' index

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

de Vries, H. (1995). An improved test of linearity in dominance hierarchies containing unknown or tied relationships. Animal Behaviour, 50(5), 1375–1389.

See Also

dmatrix, smatrix

`landau_index` *Landau index*

Description

Function to obtain the linearity index developed by Landau (1951).

Usage

```
landau_index(dmatrix)
```

Arguments

`dmatrix`	dyadic matrix

Details

The function landau_index is obtained by the following expression: h = (12/n^3-n)* sum(Va - ((n-1)/2))^2, where "h" is the linearity index, "n" is the total of animals, "Va" is the total of times that animal "i" dominated other animals.

Value

h index

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

Landau, H. G. (1951). On dominance relations and the structure of animal societies: I. Effect of inherent characteristics. Bulletin of Mathematical Biophysics, 13, 1-19.

See Also

dmatrix

reactorSociogram *Sociogram plot with reactor information*

Description

Function to obtain the circle diagram with reactor relationship from an sociomatrix.

Usage

```
reactorSociogram(smatrix)
```

Arguments

smatrix	sociomatrix

Details

The function reactorCircleDiagram is obtained by the sociometric matrix. Return a circular diagram with reactor relationship between the animals, where the arrow shows the direction of the relationship and the line thickness indicates the number of encounters (the thicker the line, the greater the number of encounters).

Value

Circular plot with reactor information

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
"There is no example"

NULL
```

repByBin *Frequency of replacements by bin*

Description

Function to identify frequency of replacements by bin from electronic bin data.

Usage

```
repByBin(x, sec)
```

Arguments

x	dataset with electronic bins information.
sec	optimal interval (in seconds) between two different animals sequentially visited the same bin (feeder or drinker) to identify a replacement;

Details

repByBin is only applied for dataset with columns named as follows: equip_id (bin identification), animal_id (animal identification), IN (date - dd/mm/yyyy - and time - hh:mm:ss - when the animal entry in the bin), OUT (date - dd/mm/yyyy - and time - hh:mm:ss - when the animal left the bin).

Value

Frequency of replacements by bin

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
x <- data.frame(equip_id = as.numeric("0001"),
                animal_id = c(1,2,6,3,5,4,2,1,3,5,8,1,6,9,4,3,2,1,5,1))

x$IN <-  c("01/08/2017 00:03:42","01/08/2017 00:05:26","01/08/2017 00:07:04","01/08/2017 00:08:15",
       "01/08/2017 00:10:35","01/08/2017 00:15:07","01/08/2017 00:18:13","01/08/2017 00:21:48",
       "01/08/2017 00:23:55","01/08/2017 00:30:14","01/08/2017 00:35:00","01/08/2017 00:38:11",
       "01/08/2017 00:39:05","01/08/2017 00:40:20","01/08/2017 00:42:08","01/08/2017 00:46:00",
       "01/08/2017 00:48:12","01/08/2017 00:49:40","01/08/2017 00:50:57","01/08/2017 00:52:36")

x$OUT <-c("01/08/2017 00:05:24","01/08/2017 00:06:56","01/08/2017 00:08:12","01/08/2017 00:10:32",
      "01/08/2017 00:15:04","01/08/2017 00:18:10","01/08/2017 00:21:41","01/08/2017 00:23:53",
      "01/08/2017 00:30:10","01/08/2017 00:34:56","01/08/2017 00:37:32","01/08/2017 00:39:03",
      "01/08/2017 00:40:10","01/08/2017 00:41:51","01/08/2017 00:45:56","01/08/2017 00:48:10",
      "01/08/2017 00:49:36","01/08/2017 00:50:33","01/08/2017 00:52:32","01/08/2017 00:55:34")

bins <- repByBin(x,10)
```

```
print(bins)
```

`replacement` *Identification of replacements between two animals*

Description

Function to identify replacements between actor and reactor from electronic bins data.

Usage

```
replacement(x, sec)
```

Arguments

`x`	dataset with electronic bins information.
`sec`	optimal interval (in seconds) between two different animals sequentially visited the same bin (feeder or drinker) to identify a replacement;

Details

replacement is only applied for dataset with columns named as follows: equip_id (bin identification), animal_id (animal identification), IN (date - dd/mm/yyyy - and time - hh:mm:ss - when the animal entry in the bin), OUT (date - dd/mm/yyyy - and time - hh:mm:ss - when the animal left the bin).

Value

Replacement between two animals

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
x <- data.frame(equip_id = as.numeric("0001"),
                animal_id = c(1,2,6,3,5,4,2,1,3,5,8,1,6,9,4,3,2,1,5,1))

x$IN <-  c("01/08/2017 00:03:42","01/08/2017 00:05:26","01/08/2017 00:07:04","01/08/2017 00:08:15",
       "01/08/2017 00:10:35","01/08/2017 00:15:07","01/08/2017 00:18:13","01/08/2017 00:21:48",
       "01/08/2017 00:23:55","01/08/2017 00:30:14","01/08/2017 00:35:00","01/08/2017 00:38:11",
       "01/08/2017 00:39:05","01/08/2017 00:40:20","01/08/2017 00:42:08","01/08/2017 00:46:00",
       "01/08/2017 00:48:12","01/08/2017 00:49:40","01/08/2017 00:50:57","01/08/2017 00:52:36")

x$OUT <-c("01/08/2017 00:05:24","01/08/2017 00:06:56","01/08/2017 00:08:12","01/08/2017 00:10:32",
      "01/08/2017 00:15:04","01/08/2017 00:18:10","01/08/2017 00:21:41","01/08/2017 00:23:53",
```

```
      "01/08/2017 00:30:10","01/08/2017 00:34:56","01/08/2017 00:37:32","01/08/2017 00:39:03",
      "01/08/2017 00:40:10","01/08/2017 00:41:51","01/08/2017 00:45:56","01/08/2017 00:48:10",
      "01/08/2017 00:49:36","01/08/2017 00:50:33","01/08/2017 00:52:32","01/08/2017 00:55:34")

replace <- replacement(x,14)

print(replace)
```

`smatrix` *Sociomatrix*

Description

Function to obtain the square matrix contained dyadic frequency of dominance-related behaviors (actor and reactor).

Usage

```
smatrix(x)
```

Arguments

`x`	Replacement or agonistic interaction data table.

Details

The fuction smatrix is only applied for data set with columns named as follows: actor and reactor. The function form a square matrix, in which the number of "n" actors is also the number of "n" reactors.

Value

Sociomatrix

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
x <- data.frame(actor = c(6,3,5,4,2,1,3,5,8,6,9,3,2,1,1),
                reactor = c(2,6,3,5,4,2,1,3,5,1,6,4,3,2,5))

sociomatrix <- smatrix(x)

print(sociomatrix)
```

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