Package 'econetwork'

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Type Package

Title Analyzing Ecological Networks

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Author Stephane Dray, Catherine Matias, Vincent Miele, Marc Ohlmann, Wilfried Thuiller

Maintainer Vincent Miele <vincent.miele@univ-lyon1.fr>

Description A collection of advanced tools, methods and models specifically designed for analyzing different types of ecological networks - especially antagonistic (food webs, host-parasite), mutualistic (plant-pollinator, plant-fungus, etc) and competitive networks, as well as their variability in time and space. Statistical models are developed to describe and understand the mechanisms that determine species interactions, and to decipher the organization of these (multi-layer) ecological networks.

Imports stats, igraph, rdiversity, Matrix.utils

LinkingTo

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econetwork-package *Analyzing Ecological Networks*

Description

A collection of advanced tools, methods and models specifically designed for analyzing different types of ecological networks.

Details

econetwork is designed for analyzing different types of ecological networks - especially antagonistic (food webs, host-parasite), mutualistic (plant-pollinator, plant-fungus, etc.) and competitive networks, as well as their variability in time and space. Statistical models are developed to describe and understand the mechanisms that determine species interactions, and to decipher the organization of these (multi-layer) ecological networks.

Author(s)

Authors: Stephane Dray, Catherine Matias, Vincent Miele, Marc Ohlmann, Wilfried Thuiller Maintainer: Vincent Miele <vincent.miele@univ-lyon1.fr>

References

Marc Ohlmann, Vincent Miele, Stephane Dray, Loic Chalmandrier, Louise O'Connor & Wilfried Thuiller, Diversity indices for ecological networks: a unifying framework using Hill numbers. Ecology Letters (2019) <doi:10.1111/ele.13221>

See Also

igraph bipartite vegan sna statnet enaR

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disPairwise *Computation of the dissimilarity matrix (pairwise beta-diversity) for a set of networks*

Description

Computation of the dissimilarity matrix for a set of networks. Each value of the matrix is the pairwise beta-diversity, computed using Hill numbers. It measures the dissimilarity in terms of groups, links, or probability of links respectively.

Usage

```
disPairwise(gList, groups=NULL, eta=1, type=c('P','L','Pi'))
```

Arguments

gList	A list of graph objects of class igraph.
groups	A named vector of class character indicating the group to which each node belongs to. The length of groups must correspond to the number of different nodes present in gList. The names names(groups) must correspond to the nodes names in gList. If NULL, the groups are the initial nodes.
eta	A positive number that controls the weight given to abundant groups/links. Default value is 1.
type	The type of diversity used to measure dissimilarity. It can be groups diversity ('P'), links diversity ('L') or probability of links diversity ('Pi').

Value

Return a matrix whose elements are the pairwise dissimilarities.

Author(s)

Authors: Stephane Dray, Vincent Miele, Marc Ohlmann, Wilfried Thuiller Maintainer: Wilfried Thuiller <wilfried.thuiller@univ-grenoble-alpes.fr>

References

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Examples

```
# Generating a set of Erdos-Renyi graphs and give name to nodes.
library(igraph)
nbGraph = 10
gList = c()
n = 57 # number of nodes of each graph
C = 0.1  # connectance of each graph
for(i in 1:nbGraph){
  graphLocal = erdos.renyi.game(n, type='gnp', p.or.m =C, directed=TRUE)
  V(graphLocal)$name = as.character(1:57)
  gList = c(gList,list(graphLocal))
}

groups = c(rep("a",23),rep("b",34)) # vector that gives the group of each node
names(groups) = as.character(1:57)

# Dissimilarity matrix based on links beta-diversity
disPairwise(gList, groups, type = 'L')
```

`divPartition` *Partitionning network diversity in alpha, beta and gamma diversity*

Description

This function computes alpha, beta and gamma diversity of a list of networks. It measures either group, links, or probability of links diversity.

Usage

```
divPartition(gList, groups, eta=1, framework=c('RLC','Chao'), type=c('P','L','Pi'))
```

Arguments

`gList`	A `list` of graph objects of class `igraph`.
`groups`	A named vector of class `character` indicating the group to which each node belongs to. The length of `groups` must correspond to the number of different nodes present in `gList`. The names `names(groups)` must correspond to the nodes names in `gList`. If NULL, the groups are the initial nodes.
`eta`	A positive number that controls the weight given to abundant groups/links. Default value is 1.
`framework`	The framework used to partitionate diversity, either Reeve Leinster Cobbold ('RLC') or Chao ('Chao')
`type`	The type of diversity to measure and partitionate. It can be groups diversity ('P'), link diversity ('L') or probability of link diversity ('Pi').

Value

Returns a `list` the following components:

`mAlpha`	The mean value of alpha-diversity accross all networks.
`Alphas`	A vector of `numeric` containing the local alpha-diversities (i.e. the alpha-diversity value for each network).
`Beta`	The value of the overall beta-diversity
`Gamma`	The value of the gamma-diversity

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Examples

```
# Generating a set of Erdos-Renyi graphs and give name to nodes
library(igraph)
nbGraph = 10
gList = c()
n = 57 # number of nodes of each graph
C = 0.1  # connectance of each graph
for(i in 1:nbGraph){
  graphLocal = erdos.renyi.game(n, type='gnp', p.or.m =C, directed=TRUE)
  V(graphLocal)$name = as.character(1:57)
  gList = c(gList,list(graphLocal))
}

groups = c(rep("a",23),rep("b",34)) # vector that gives the group of each node
names(groups) = as.character(1:57)

# Measure of link diversity
divPartition(gList, groups, framework='Chao', type = 'L')
```

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getMetaweb *Get metaweb*

Description

Computation of the binary metaweb from a list of graph

Usage

```
getMetaweb(gList)
```

Arguments

gList	A list of graph objects of class igraph.

Details

This function computes the metaweb from a list of graph. It computes the union (in the sense of graph theory) of the set of graphs.

Value

getMetaweb returns an object of class igraph.

Author(s)

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Examples

```
# Generating a set of Erdos-Renyi graphs
library(igraph)
gList <- c()
for(i in 1:4){
  graphLocal <- erdos.renyi.game(60, type = 'gnp', p.or.m=0.1, directed=TRUE)
  V(graphLocal)$name <- as.character(1:60)
  gList <- c(gList, list(graphLocal))
}
names(gList) <- c("A","B","C","D")

## building the metaweb
graphMetaweb <- getMetaweb(gList)
```

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