Package 'netCoin'

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Description Create interactive networked coincidences. It joins the data analysis power of R to study coincidences and the visualization libraries of JavaScript in one package.

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Imports igraph (>= 1.0.1), Matrix (>= 1.2-4), haven (>= 1.1.0)

Suggests knitr, rmarkdown, lavaan

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NeedsCompilation no

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`netCoin-package` *The netCoin package.*

Description

Create interactive networked coincidences. It joins the data analysis power of R to study coincidences and the visualization libraries of JavaScript in one package.

Details

Coincidence analysis detects what events, characters, objects, attributes, or characteristics tend to occur together within certain limits.

These given limits are call scenarios (S) and are considered to be the units of analysis, and as such they have to be placed in the rows of a matrix or data.frame.

In each i scenario, a series of J events X_j, which are to be represented as dichotomous variables X_j in columns, may occur (1) or may not occur (0). Scenarios and events constitute an incidence matrix (**I**).

Incidence matrix

	X_1	X_2	X_3	...	X_J
S_1	0	1	0	...	1
S_2	1	0	1	...	0
...	...	...	...	...	...
S_n	1	1	0	...	1

From this incidences matrix, a coincidence (**C**) matrix can be obtained with the function `coin`. In this matrix the main diagonal represents frequencies of X_j, while the others elements are number of coincidences between two events.

Coincidence matrix

	X_1	X_2	X_3		X_J
X_1	2	1	1	...	1
X_2	1	2	0	...	2
X_3	1	0	1	...	0
...	...	...	...	...	...
X_J	1	2	0	...	2

Once there is a `coin` object, a similarity matrix can be obtained. Similarity matrices available in netCoin are:

- Matching (m), Rogers \& Tanimoto (t) Gower (g) Sneath (s) and Anderberg (and).
- Jaccard (j), dice (d), antiDice (a), Ochiai (o) and Kulczynski (k).
- Hamann (ham), Yule (y), Pearson (p), odds ratio (od) and Rusell (r).

Other measures that can be obtained from `coin` are:

- Relative frequencies (x), conditional frequencies (i) coincidence degree (cc) and probable degree of coincidence (cp).
- Haberman (h) and Z value of Haberman (z)

To obtain similarity and other measures matrices, the function `sim` elaborates a list of them.

Similarity matrix

	X_1	X_2	X_3		X_J
X_1	1.73	-.87	.87	...	-.87
X_2	-.87	1.73	-1.73	...	1.73
X_3	.87	-1.73	1.73	...	-1.73
...	...	...	...	...	...
X_J	-.87	1.73	-1.73	...	1.73

`edgeList` makes a collecion of edges composed by a list of similarity measures whenever a cri-

terium (generally p(Z)<.50) is met.

Edge list

	source	target	Haberman	P(z)
1	X1	X3	0.8660254	0.22509243
2	X2	X4	1.7320508	0.09084506

In order to make a graph, two data frames are needed: a nodes data frames with names and other nodes attributes (see `asNodes`) and an edge data frame (see `edgeList`). For more information go to `netCoin`.

Author

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

References

Escobar, M. (2009): "Redes Semanticas en Textos Periodisticos: Propuestas Tecnicas para su Representacion", en *Empiria*, 17, 13-39.

Escobar, M.(2015): "Studying Coincidences with Network Analysis and Other Multivariate Tools", in *The Stata Journal*, 15(4), 1118-1156.

Escobar, M. Y J. Gomez Isla (2015): "The Expression of Identity through the Image: The Photographic Archives of Miguel de Unamuno and Joaquin Turina", en *Revista Espanola de Investigaciones Sociologicas*, 152, 23-46.

`allNet` *Networked coincidences from incidences data.*

Description

`allNet` produces a network object of coincidences from a data frame or a matrix with dichotomous values.

Usage

```
allNet(incidences, weight = NULL, subsample = FALSE,
       minimum=1, maximum = nrow(incidences), sort = FALSE, decreasing = TRUE,
       frequency = FALSE, percentages = TRUE,
       procedures = "Haberman", criteria = "Z", Bonferroni = FALSE,
       support = -Inf, minL = -Inf, maxL = Inf,
       directed = FALSE, diagonal = FALSE, sortL = NULL, decreasingL = TRUE,
       igraph = FALSE, dir=NULL, ...)
```

Arguments

incidences	an incidence matrix or data frame with only 0/1 variables.
weight	a vector of weights. Optimal for data.framed tables.
subsample	retrict the analysis to scenarios with at least one event.
minimum	minimum frequency to be considered.
maximum	maximum frequency to be considered.
sort	sort the coincidence matrix according to frequency of events.
decreasing	decreasing or increasing sort of the matrix.
frequency	a logical value true if frequencies are to be shown. Default = FALSE.
percentages	a logical value true if percentages are to be shown. Default = TRUE.
procedures	a vector of statistics of similarity. See below.
criteria	statistic to be use for selection criteria.
Bonferroni	Bonferroni criterium of the signification test.
support	minimum value of the frequency of the coincidence to be edged.
minL	minimum value of the statistic to include the edge in the list.
maxL	maximum value of the statistic to include the edge in the list.
directed	includes same edges only once.
diagonal	includes auto-links.
sortL	sort the list according to the values of a statistic. See below.
decreasingL	order in a decreasing way.
igraph	Produces an igraph object instead of a netCoin object if TRUE.
dir	a "character" string representing the directory where the web files will be saved.
...	Any netCoin argument.

Details

Possible measures in procedures are

- Frequencies (f), Relative frequencies (x), Conditional frequencies (i), Coincidence degree (cc), Probable degree (cp),
- Expected (e), Confidence interval (con)
- Matching (m), Rogers & Tanimoto (t), Gower (g), Sneath (s), Anderberg (and),
- Jaccard (j), Dice (d), antiDice (a), Ochiai (o), Kulczynski (k),
- Hamann (ham), Yule (y), Pearson (p), odds ratio (od), Rusell (r),
- Haberman (h), Z value of Haberman (z),
- Hypergeometric p greater value (hyp).
- Convert a matrix into an edge list (shape).

Value

This function creates a netCoin object (or igraph) and, if stated, a folder in the computer with an HTML document named index.html which contains the produced graph. This file can be directly opened with your browser and sent to a web server to work properly.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", sep = "; ")[2:4]
allNet(data) # network object
```

---

asNodes *Nodes data frame.*

Description

Nodes data frame from either an edge list or a coin object.

Usage

```
asNodes(C, frequency=TRUE, percentages=FALSE, language="en")
```

Arguments

C	has to be an edge list or, better, a coin object.
frequency	add frequency of nodes
percentages	add nodes percentages
language	language of colnames (default=en, option=es)

Value

A data frame with nodes' names and their frequency and/or percentages if the input is a coin object

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# From a random incidence matrix I(25X4)
I <- matrix(rbinom(100, 1, .5), nrow = 25, ncol = 4,
     dimnames = list(NULL, c("A", "B", "C", "D")))
C <- coin(I)
asNodes(C)
```

---

barCoin *Networked coincidences.*

Description

barCoin produces a barCoin object.

Usage

```
barCoin(nodes, links, name = "name", label = NULL, text = NULL,
        incidences = "frequency", coincidences = "frequencies", note = NULL,
        cex = 1, language = c("en","es"), dir = NULL, show = TRUE)
```

Arguments

nodes	a data frame with at least two vectors of names and incidences.
links	a data frame with at least three vectors with source and target, including names of nodes and a vector of coincidences.
name	name of the vector with names in the nodes data frame.
label	name of the vector with labels in the nodes data frame.
text	name of the vector with html text in the nodes data frame.
coincidences	name of the vector with coincidences in the links data frame.
incidences	name of the vector with incidences in the nodes data frame.
note	lower title of the graph.
cex	number indicating the amount by which plotting text should be scaled relative to the default. Default = 1.
language	a character vector (es=spanish; en=english).
dir	a "character" string representing the directory where the web files will be saved.
show	a logical value true if the graph is to be shown. Default = TRUE.

Value

Object of class barCoin.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", sep = "; ")[2:4]
C <- coin(data) # coincidence matrix
N <- asNodes(C) # node data frame
E <- edgeList(C,"frequencies") # edge data frame
barCoin(N,E) # barCoin object
```

`cbarCoin` *Networked coincidences.*

Description

`cbarCoin` produces a barCoin object.

Usage

```
cbarCoin(nodes, links, name = "name", label = NULL, text = NULL,
         incidences = "frequency", coincidences = "frequencies",
         expected = "expected", confidence.interval = NULL, note = NULL,
         cex = 1, language = c("en","es"), dir = NULL, show = TRUE)
```

Arguments

`nodes`	a data frame with at least two vectors of names and incidences.
`links`	a data frame with at least three vectors with source and target, including names of nodes and a vector of coincidences.
`name`	name of the vector with names in the nodes data frame.
`label`	name of the vector with labels in the nodes data frame.
`text`	name of the vector with html text in the nodes data frame.
`coincidences`	name of the vector with coincidences in the links data frame.
`incidences`	name of the vector with incidences in the nodes data frame.
`expected`	name of the vector with expected coincidences in the links data frame.
`confidence.interval`	name of the vector with confidence interval in the links data frame.
`note`	lower title of the graph.
`cex`	number indicating the amount by which plotting text should be scaled relative to the default. Default = 1.
`language`	a character vector (es=spanish; en=english).
`dir`	a "character" string representing the directory where the web files will be saved.
`show`	a logical value true if the graph is to be shown. Default = TRUE.

Value

Object of class barCoin.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", sep = "; ")[2:4]
C <- coin(data) # coincidence matrix
N <- asNodes(C) # node data frame
E <- edgeList(C,"frequency","expected") # edge data frame
cbarCoin(N,E) # barCoin object
```

---

coin *Coincidence matrix.*

Description

A coincidence object consists of a list with two elements: 1) the number of scenarios ($n), and 2) a coincidence matrix of events, whose main diagonal figures are the frequency of events and outside this diagonal there are conjoint frequencies of these events ($f)

Usage

```
coin(incidences, minimum = 1, maximum = nrow(incidences),
     sort = FALSE, decreasing = TRUE,
     total=FALSE, subsample=FALSE,
     weight=NULL)
```

Arguments

incidences	an incidence matrix or data frame with only 0/1 variables
minimum	minimum frequency to be considered
maximum	maximum frequency to be considered
sort	sort the coincidence matrix according to frequency of events
decreasing	decreasing or increasing sort of the matrix
total	add one first row and column with total
subsample	retrict the analysis to scenarios with at least one event
weight	a vector of weights. Optimal for data.framed tables

Details

Produce a matrix of coincidences from a matrix of incidences.

Value

An object of coin class

n	Number of scenarios (rows of the incidence matrix)
f	Coincidence matrix

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
## Random incidence matrix: 25 scenarios, 4 events.
I <- matrix(rbinom(100, 1, .5), nrow = 25, ncol = 4,
            dimnames = list(NULL, c("A", "B", "C", "D")))
coin(I, sort = TRUE)

## Hair by Eye by Sex table from M. Friendly (2000)
data(HairEyeColor)
H<-as.data.frame(HairEyeColor)
W<-H$Freq
I<-dichotomize(H,c("Hair","Eye","Sex"),add=FALSE)
coin(I,w=W)
```

---

coocur *Coocurrence matrix.*

Description

A coocurrence object consists of a matrix with the number of ocurrences in its main diagonal and the number of coocurrences outside this diagonal. Besides, this object has two attributes: 1) n is the total of the sum of the ocurrences in each row.2) m is the sum of the maximum number of ocurrences in each row.

Usage

```
coocur(ocurrences, minimum = 1, maximum = Inf,
       sort = FALSE, decreasing = TRUE)
```

Arguments

ocurrences	an ocurrence matrix or data frame
minimum	minimum frequency to be considered
maximum	maximum frequency to be considered
sort	sort the coincidence matrix according to frequency of events
decreasing	decreasing or increasing sort of the matrix

Details

Produce a matrix of coocurrences from a matrix of occurences.

Value

An object of cooc class with a coocurrence matrix. It has two attributes:

n	Total sum of occurences)
m	Sum of maximum occurences in each row of the ocurrence matrix

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
## Tossing two coins five times.
D<-data.frame(Head=c(2,1,1,0,2),Tail=c(0,1,1,2,0))
coocur(D)
```

---

dice *Data: Roll a die (100 times).*

Description

Data frame with events as result.

Usage

```
data("dice")
```

Format

A data frame with 100 observations (scenarios) on the following 11 variables (events):

`dice` : a numeric vector, representing dice results

`1` : a dichotomous vector of the elemental event "1"

`2` : a dichotomous vector of the elemental event "2"

`3` : a dichotomous vector of the elemental event "3"

`4` : a dichotomous vector of the elemental event "4"

`5` : a dichotomous vector of the elemental event "5"

`6` : a dichotomous vector of the elemental event "6"

`odd` : a dichotomous vector of odd events

`even` : a dichotomous vector of even events

`small` : a dichotomous vector of small number events

`large` : a dichotomous vector of large number events

Source

Random extraction via `sample(1:6,100,replace=TRUE)`

References

See `events`.

Examples

```
data(dice)
head(dice,10)
```

`dichotomize` *Dichotomize.*

Description

This converts factor(s) o character(s) column(s) of a data frame into a set of dichotomous columns. Their names will correspond to the labels or text of every category.

Usage

```
dichotomize(data, variables,
            sep = "", min = 1, length = 0, values = NULL,
            sparse = FALSE, add = TRUE, sort = TRUE)
```

Arguments

data	a data frame with a factor or textual column which can be simple (only one value for each scenario) or multiple if components are delinited with a separator.
variables	vector of column names that have to be converted into dichotomous vectors.
sep	vector of characters used to divide columns with multiple events. If this separator is "", every unique cell of every column is converted into a dichotomus data frame's column.
min	convert to dichotomous vectors only label or text that has a frequency less or equal to the value of this parameter. If the value of min is between 0 and 1, its value is interpreted as a percentage
length	maximum number of dichotomous columns generated for every variable
values	vector of labels or texts selected to their conversion to dichotomous columns
sparse	produce a sparse matrix instead of a data.frame
add	add the new columns to the input data.frame
sort	order the new columns by their frequencies

Value

A data frame composed by the original plus the added dichotmous columns.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca, and Luis Martinez Uribe, Fundacion Juan March. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column
frame1 <- data.frame(A = c("Man", "Women", "Man", "Undet."))
dichotomize(frame1, "A", sep = "; ")

# A character column (with separator)
frame2 <- data.frame(A = c("Man; Women", "Women; Women",
                           "Man; Man", "Undet.; Women; Man"))
dichotomize(frame2, "A", sep = "; ")

# A character column and another factor column (same sepatator)
frame3 <- data.frame(A = c("Man; Women", "Women; Women",
                           "Man; Man", "Undet.; Women; Man"),
                     C = factor(c(1:4), labels = c("Paris", "New York",
                           "London; New York", "<NA>")))
dichotomize(frame3, c("A", "C"), sep = "; ")
```

distant *Distance matrix.*

Description

Convert a similarity matrix into a distance matrix.

Usage

```
distant(s, t = FALSE)
```

Arguments

s	a similarity matrix
t	return the same matrix if t=FALSE

Details

For better resultas, use the parameter distance in sim function.

Value

A distance matrix.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# From a random incidence matrix I(25X4)
I <- matrix(rbinom(100, 1, .5), nrow = 25, ncol = 4,
     dimnames = list(NULL, c("A", "B", "C", "D")))
J <- sim(I, "Jaccard")
distant(J, t = TRUE)
#Same results
sim(I, "Jaccard", distance = TRUE)
```

edgeList *Edge list.*

Description

Convert a coincidence/similarity/distance matrix into an edge list form.

Usage

```
edgeList(data, procedures="Haberman", criteria="Z", Bonferroni=FALSE,
         min=-Inf, max=Inf, support=-Inf,
         directed=FALSE, diagonal= FALSE, sort=NULL, decreasing=TRUE)
```

Arguments

data	a coin object, let's say an R list composed by a number of scenarios ($n) and a coincidence matrix with frequencies ($f). In case of change of shape, data should be a matrix.
procedures	a vector of statistics of similarity. See below.
criteria	statistic to be use for selection criteria.
Bonferroni	Bonferroni criterium of the signification test.
min	minimum value of the statistic to include the edge in the list.
max	maximum value of the statistic to include the edge in the list.
support	minimum value of the frequency of the coincidence to be edged
directed	includes same edges only once.
diagonal	includes auto-links
sort	sort the list according to the values of a statistic. See below
decreasing	order in a decreasing way.

Details

Possible measures in procedures are

- Frequencies (f), Relative frequencies (x), Conditional frequencies (i), Coincidence degree (cc), Probable degree (cp),
- Expected (e), Confidence interval (con)
- Matching (m), Rogers & Tanimoto (t), Gower (g), Sneath (s), Anderberg (and),
- Jaccard (j), Dice (d), antiDice (a), Ochiai (o), Kulczynski (k),
- Hamann (ham), Yule (y), Pearson (p), odds ratio (od), Rusell (r),
- Haberman (h), Z value of Haberman (z),
- Hypergeometric p greater value (hyp).
- Convert a matrix into an edge list (shape).

Value

A data frame in which the two first columns are source and target. The rest of the columns are the different statistics explicited in `funcs` parameter.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# From a random incidence matrix I(25X4)
I<-matrix(rbinom(100,1,.5),nrow=25,ncol=4,
dimnames=list(NULL,c("A","B","C","D")))
C<-coin(I)
edgeList(C)
```

`events` *Data: Attributes of the dice events.*

Description

Data frame with the attributes of the events of dice.

Usage

```
data("events")
```

Format

A data frame with 10 observations on the following 4 variables:

`name` : a factor vector with 10 levels

`label` : a factor vector with 10 levels

`frequency` : a numeric vector

`type` : a factor vector with 2 levels

Source

data(dice); coin.dice<-coin(dice); asNodes(coin.dice)

References

See `dice`.

Examples

```
data(events)
events
```

expectedList *Expected list.*

Description

Converts a coin object to a links data frame with coincidences and expected values.

Usage

```
expectedList(data, names = NULL, min = 1, confidence=FALSE)
```

Arguments

data	is a coin object. See coin
names	a character vector.
min	minimum value of the statistic to include the edge in the list.
confidence	add the confidence interval if TRUE.

Value

A links data frame with coincidences and expected values.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", sep = "; ")[2:4]
C <- coin(data) # coincidence matrix
expectedList(C) # edge data frame
```

families *Data: Italian families in the Renaissance.*

Description

Data frame with the characteristics of powerful families of Renaissance Italy.

Usage

```
data("families")
```

Format

A data frame with 16 families (rows) and 6 characteristics.

`name` Family's name

`frequency` number of marriage links

`frequencb` number of business links

`wealth` wealth's index

`priorates` number of priorates on control

`seat` At least priorate

Source

PADGETT, J. F. Y C. K. ANSELL (1993): "Robust Action and the Rise of the Medici, 1400-1434", in American Journal of Sociology, 98, 1259-1319. (http://www.jstor.org/stable/2781822)

Examples

```
data("families")
head(families)
```

finches *Data: Finches'attributes in Galapagos islands.*

Description

Data frame with events as result.

Usage

```
data("finches")
```

Format

A data frame with 13 observations (pinches) and 4 variables (name and characteristics):

`name` : Genus and species of the finche

`frequency` : number of islands where the finche can be found

`type` : Genus of the finche

`species` : name of the file containing the picture of the finche

References

Sanderson, James (2000). Testing Ecological Patterns: A Well-known Algorithm from Computer Science Aids the Evaluation of Species Distributions. American Scientist, 88, pp. 332-339.

Examples

```
data(finches)
head(finches,10)
```

`fromIgraph` *Produce interactive networks from igraph objects.*

Description

`fromIgraph` produce an interactive network from an igraph object.

Usage

```
fromIgraph(G, layout = NULL, language = c("en","es"), dir = NULL)
```

Arguments

`G`	an igraph object.
`layout`	a matrix with two columns.
`language`	a character vector (es=spanish; en=english).
`dir`	a "character" string representing the directory where the graph will be saved.

Value

This function returns a `netCoin` object. If the 'dir' attribute is specified, the function creates a folder in the computer with an HTML document named index.html which contains the produced graph. This file can be directly opened with your browser and sent to a web server to work properly.

Author(s)

David Barrios and Carlos Prieto. Bioinformatics Service of Nucleus, University of Salamanca. See http://bioinfo.usal.es/

Galapagos *Data: Finches' presence in Galapagos Islands.*

Description

Data frame with absence(0) presence(1) of finches in the Galagos Islands.

Usage

```
data("Galapagos")
```

Format

A data frame with 17 localizations (islands) and 13 variables (Genus and species of the finches):

`Geospiza magnirostris`

`Geospiza fortis`

`Geospiza fuliginosa`

`Geospiza difficilis`

`Geospiza scandens`

`Geospiza conirostris`

`Camarhynchus psitticula`

`Camarhynchus pauper`

`Camarhynchus parvulus`

`Platyspiza crassirostris`

`Cactospiza pallida`

`Cactospiza heliobates`

`Certhidea olivacea`

References

Sanderson, James (2000). Testing Ecological Patterns: A Well-known Algorithm from Computer Science Aids the Evaluation of Species Distributions. American Scientist, 88, pp. 332-339.

Examples

```
data(Galapagos)
head(Galapagos,10)
```

incTime *Time incidences.*

Description

Convert a data frame with two numbers (normally a beginning year and end year) into an incidences matrix whose rows are the intermediate numbers, and whose columns are the content of the names column.

Usage

```
incTime(data, name = "name", beginning = "birth", end= "death")
```

Arguments

data	a data frame a name and two numbers.
name	Column with the names (default= "name").
beginning	Column with the beginning number to include (default= "birth").
end	Column with the end number to include (default= "death").

Value

A data frame in which the two first columns are source and target. The rest of the columns are sim.=(1+threshold-real difference) and dist.=(difference between numbers)

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# From sociologists data
data("sociologists")
head(incTime(sociologists))[,1:5]
```

layoutCircle *Produce a circle layout of any number of nodes.*

Description

`layoutCircle` produces a circle layout of any number of nodes.

Usage

```
layoutCircle(N,nodes,deg=0,name=NULL)
```

Arguments

`N`	a data frame of nodes.
`nodes`	a vector specifing nodes.
`deg`	degrees to rotate.
`name`	name of column with node names.

Value

This function returns the input data frame of nodes with the resulting layout applied.

Author(s)

David Barrios

layoutGrid *Produce a layout of any number of nodes.*

Description

`layoutGrid` produces a grid layout of any number of nodes.

Usage

```
layoutGrid(N,string,name=NULL)
```

Arguments

`N`	a data frame of nodes.
`string`	a character vector specifing grouped nodes.
`name`	name of column with node names.

Value

This function returns the input data frame of nodes with the resulting layout applied.

Author(s)

David Barrios

`links` *Data: Links between Italian families in the Renaissance.*

Description

Data frame with the marriage and business links.

Usage

```
data("links")
```

Format

A data frame with 36 links (rows) amongst 16 Italian families in the Renaissance.

`Albizzi`

`Acciaiuoli`

`Barbadori`

`Bischeri`

`Castellani`

`Guadagni`

`Lamberteschi`

`Medici`

`Pazzi`

`Peruzzi`

`Ridolfi`

`Salviati`

`Strozzi`

`Tornabuoni`

`Ginori`

`Pucci`

`link` Type of link: marriage or business

Source

PADGETT, J. F. Y C. K. ANSELL (1993): "Robust Action and the Rise of the Medici, 1400-1434", in American Journal of Sociology, 98, 1259-1319. (http://www.jstor.org/stable/2781822)

Examples

```
data("links")
head(links)
```

`lower` *Similarity/distance matrix display.*

Description

Display the lower part of a matrix with a specified number of decimals.

Usage

```
lower(matrix, decimals = 3)
```

Arguments

`matrix`	a symmetric similarity/distance matrix
`decimals`	number of decimals to be displayed

Value

A data frame of characters.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# From a random incidence matrix I(25X4)
I <- matrix(rbinom(100, 1, .5), nrow = 25, ncol = 4,
     dimnames = list(NULL, c("A", "B", "C", "D")))
lower(sim(I, "Jaccard"), 2)
```

mobileEdges *Mobile Edges.*

Description

Convert a data frame with one number (normally a year) into an edge list form with those whose numbers (years) have a difference lower or equal to a quantity.

Usage

```
mobileEdges(data, name = 1, number = 2, difference=0)
```

Arguments

data	a data frame with a name and a number (year).
name	Column with the names (default= first column).
number	Column with the number (year) to compare (default= second column.
difference	Minimum difference between numbers of every two pair of names to create the edge or link (default=15).

Value

A data frame in which the two first columns are source and target. The rest of the columns are sim.=(1+threshold-real difference) and dist.=(difference between numbers)

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# From a random incidence matrix I(25X4)
data("sociologists")
mobileEdges(sociologists)
```

`multigraphCreate` *Produce interactive multi graphs.*

Description

`multigraphCreate` produce an interactive multi graph.

Usage

```
multigraphCreate(..., parallel = FALSE, language = c("en","es"),
                 dir = "MultiGraph", show = TRUE)
```

Arguments

`...`	coin graphs (netCoin, barCoin, timeCoin) objects or html "directories".
`parallel`	a logical value true to show all graphs simultaneously. Default = FALSE.
`language`	a character vector.
`dir`	a "character" string representing the directory where the graph will be saved.
`show`	a logical value true if the graph is to be shown. Default = TRUE.

Value

The function creates a folder in your computer with an HTML document named index.html which contains the graph. This file can be directly opened with your browser.

Author(s)

David Barrios and Carlos Prieto. Bioinformatics Service of Nucleus, University of Salamanca. See http://bioinfo.usal.es/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", sep = "; ")[2:4]
C <- coin(data) # coincidence matrix
N <- asNodes(C) # node data frame
E <- edgeList(C,c("frequency","expected","haberman")) # edge data frame
bC<- barCoin(N,E) # barCoin object
cC<- cbarCoin(N,E) # barCoin object
nC<- netCoin(N,E) # netCoin object
multigraphCreate("Bar graph" = bC,
                 "Conditional bar graph" = cC,
                 "Net graph"=nC,
                 dir="./example", show = FALSE) # See ./example/index.html file
```

netCoin *Networked coincidences.*

Description

netCoin produces a netCoin object of coincidences. Its input has to be two data.frames: one of attributes of events or nodes, and the other of attributes of the edges or links.

Usage

```
netCoin(nodes, links = NULL, name = NULL, label = NULL, size = NULL,
        color = NULL, shape = NULL, slegend = NULL, ntext = NULL,
        orderA = NULL, orderD = NULL, group = NULL, community = NULL,
        lwidth = NULL, lweight = NULL, lcolor = NULL, ltext = NULL,
        nodeFilter = NULL, linkFilter = NULL, degreeFilter = NULL,
        nodeBipolar = FALSE, linkBipolar = FALSE, defaultColor = "#1f77b4",
        main = NULL, note = NULL, help = NULL, helpOn = FALSE, cex = 1,
        background = NULL, layout = NULL, controls = c(1,2,3),
        mode = c("network","heatmap"), showCoordinates = FALSE,
        showArrows = FALSE, showLegend = TRUE, showAxes = FALSE,
        showLabels = TRUE, axesLabels = NULL, language = c("en","es"),
        image = NULL, imageNames = NULL, dir = NULL, show = TRUE)
```

Arguments

nodes	a data frame with at least one vector of names.
links	a data frame with at least two vectors with source and target, including names of nodes.
name	name of the vector with names in the nodes data frame. By default, if language="en", name is "name", if language="es" is "nombre".
label	name of the vector with labels in the nodes data frame.
group	name of the vector with groups in the nodes data frame.
community	algorithm to make communities: edge_betweenness("ed"), fast_greedy("fa"), label_prop("la"), leiden_eigen("le"), louvain("lo"), optimal("op"), spinglass("sp"), walktrap("wa")
size	name of the vector with size in the nodes data frame.
color	name of the vector with color variable in the nodes data frame.
shape	name of the vector with shape variable in the nodes data frame.
slegend	name of the vector with the variable to represent as a legend in the nodes data frame.
ntext	name of the vector with html text in the nodes data frame.
orderA	name of the vector with node ascending order in the nodes data frame.
orderD	name of the vector with node descending order in the nodes data frame.

lwidth	name of the vector with width variable in the links data frame.
lweight	name of the vector with weight variable in the links data frame.
lcolor	name of the vector with color variable in the links data frame.
ltext	name of the vector with labels in the links data frame.
nodeFilter	condition for filtering nodes.
linkFilter	condition for filtering links.
degreeFilter	numeric vector to filter the resulting network by degree.
nodeBipolar	a logical value that polarizes negative and positive node values in the graphical representation. Default = FALSE.
linkBipolar	a logical value that polarizes negative and positive link values in the graphical representation. Default = FALSE.
defaultColor	a character vector giving a valid html color.
main	upper title of the graph.
note	lower title of the graph.
help	help text of the graph.
helpOn	Should the help be shown at the beginning?
background	background color or image of the graph.
layout	a matrix with two columns or an algorithm to elaborate the coordinates: davidson.harel drl("da"), circle("ci"), fruchterman.reingold("fr"), gem("ge"), grid("gr"), kamada.kawai("ka"), lgl("lg"), mds("md"), random("ra"), reingold.tilfo("re"), star("sta"), sugiyama("sug")
cex	number indicating the amount by which plotting text should be scaled relative to the default. Default = 1.
controls	a numeric vector indicating which controls will be shown. 1 = sidebar, 2 = selection buttons, 3 = tables.
mode	a character vector indicating the graph mode allowed: network, heatmap or both (both by default).
showCoordinates	a logical value true if the coordinates are to be shown in tables. Default = FALSE.
showArrows	a logical value true if the directional arrows are to be shown. Default = FALSE.
showLegend	a logical value true if the legend is to be shown. Default = TRUE.
showAxes	a logical value true if the axes are to be shown. Default = FALSE.
showLabels	a logical value true if the node labels are to be shown. Default = TRUE.
axesLabels	a character vector giving the axes names.
language	a character vector (es=spanish; en=english).
image	name of the vector with image files in the nodes data frame.
imageNames	name of the vector with names for image files in the nodes data frame.
dir	a "character" string representing the directory where the web files will be saved.
show	a logical value true if the graph is to be shown. Default = TRUE.

Value

This function returns a netCoin object. If the 'dir' attribute is specified, the function creates a folder in the computer with an HTML document named index.html which contains the produced graph. This file can be directly opened with your browser and sent to a web server to work properly.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", sep = "; ")[2:4]
C <- coin(data) # coincidence matrix
N <- asNodes(C) # node data frame
E <- edgeList(C) # edge data frame
netCoin(N, E) # netCoin object
```

---

netCorr *Networked coincidences.*

Description

netCorr produces a network object of correlations. Its input has to be at least one set of quantitative variables.

Usage

```
netCorr(variables, weight=NULL,
        minimum=-Inf, maximum=Inf, sort=FALSE, decreasing=TRUE,
        frequency=FALSE, means=TRUE,
        method="pearson", criteria="p", Bonferroni=FALSE,
        minL=0, maxL=Inf,
        sortL=NULL, decreasingL=TRUE,
        igraph=FALSE, ...)
```

Arguments

variables	a data frame with at least two quantitative variables.
weight	a vector of weights. Optimal for data.framed tables
minimum	minimum frequency to be considered
maximum	maximum frequency to be considered
sort	sort the correlation matrix according to the frequency of the events

decreasing	decreasing or increasing sort of the matrix
frequency	a logical value true if frequencies are to be shown. Default=FALSE.
means	a logical value true if means are to be shown. Default=TRUE.
method	a vector of statistics of similarity. Pearson correlation by default. spearman and kendall are also possible
criteria	statistic to be use for selection criteria.
Bonferroni	Bonferroni criterium of the signification test.
minL	minimum value of the statistic to include the edge in the list.
maxL	maximum value of the statistic to include the edge in the list.
sortL	sort the list according to the values of a statistic. See below
decreasingL	order in a decreasing way.
igraph	Produces an igraph object instead of a netCoin object if TRUE
...	Any netCoin argument.

Value

The function creates a netCoin object and eventually a folder in the computer with an HTML document named index.html which contains the produced graph. This file can be directly opened with your browser and sent to a web server to work properly.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
data(iris)
netCorr(iris[,1:4],ltext="value",
 main="Correlations between measurements of Iris Species",
 note="Anderson, Edgar (1935) y Fisher, R. A. (1936)") # network object
```

---

pathCoin *Structural Equation Models Graphs.*

Description

pathCoin produces a netCoin object from a lavaan object, i.e., parameters of structural equation model.

Usage

```
pathCoin(model, estimates=c("b","se","z","pvalue","beta"),
         fitMeasures=c("chisq", "cfi", "rmsea"), ...)
```

Arguments

model	a lavaan object.
estimates	A vector with at least one element amongst "b", "se", "z", "pvalue", "beta".
fitMeasures	Default values: "chisq", "df", "pvalue", "cfi", "rmsea"
...	Any netCoin argument.

Value

The function creates a netCoin object and eventually a folder in the computer with an HTML document named index.html which contains the produced graph. This file can be directly opened with your browser and sent to a web server to work properly.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# Classic Wheaton et al. model
library(lavaan)
lower <- '
11.834
6.947 9.364
6.819 5.091 12.532
4.783 5.028 7.495 9.986
-3.839 -3.889 -3.841 -3.625 9.610
-21.899 -18.831 -21.748 -18.775 35.522 450.288 '
wheaton.cov <- getCov(lower,
               names = c("anomia67", "powerless67","anomia71", "powerless71",
                         "education", "sei"))
wheaton.model <- '
# latent variables
ses =~ education + sei
alien67 =~ anomia67 + powerless67
alien71 =~ anomia71 + powerless71
# regressions
alien71 ~ alien67 + ses
alien67 ~ ses
# correlated residuals
anomia67 ~~ anomia71
powerless67 ~~ powerless71
'
fit <- sem(wheaton.model, sample.cov = wheaton.cov, sample.nobs = 932)

pathCoin(fit)
```

plot *Plot a coin, netCoin, barCoin or timeCoin object.*

Description

Function for plotting of R objects.

Usage

```
plot(x, ...)
```

Arguments

x	A coin object (see coin), netCoin object (see netCoin), barCoin object (see barCoin), timeCoin object (see timeCoin)
...	Additional args

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
## Random incidence matrix: 25 scenarios, 4 events.
I <- matrix(rbinom(100,1,.5),nrow=25,ncol=4,
            dimnames=list(NULL,c("A","B","C","D")))

N <- allNet(I, sort=TRUE,main="Title",note="Comment")
plot(N)
```

print *Print a coin, netCoin, barCoin or timeCoin object.*

Description

Print n and a coincidence lower triangle matrix for coin and cooc objects. Print title, nodes and links heads, and note for netCoin objects.

Usage

```
print(x, ...)
```

Arguments

x	A coin object (see coin), netCoin object (see netCoin), barCoin object (see barCoin), timeCoin object (see timeCoin), cooc object (see coocur)
...	Additional args

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
## Random incidence matrix: 25 scenarios, 4 events.
I <- matrix(rbinom(100,1,.5),nrow=25,ncol=4,
            dimnames=list(NULL,c("A","B","C","D")))

C <- coin(I,sort=TRUE)
C
print(C) #Alternatively

N <- allNet(I, sort=TRUE,main="Title",note="Comment")
N
print(N) #Alternatively
```

---

savePajek *Save a netCoin object as a .net (.paj) file to be read in Pajek, Gephi, ...*

Description

savePajek produces a .net (.paj) file from a netCoin object.

Usage

```
savePajek(net, file="file.net", arcs=NULL, edges=NULL, partitions=NULL, vectors=NULL)
```

Arguments

net	a netCoin object.
file	The name of the file without extension. It will be .net or .paj acoording to data. The default is file.net or file.paj
arcs	Names of netCoin$links to be included and considered as arcs in the Pajek file..
edges	Names of netCoin$links to be included and considered as edges in the Pajek file..
partitions	Names of netCoin$nodes to be included and considered as partitions in the Pajek file.
vectors	Names of netCoin$nodes to be included and considered as vectors in the Pajek file.

Value

The function creates a file with vertices and arcs or edges of a netCoin objetct. Vectors and partitions can be also included. .

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", add=FALSE, sep = "; ")
graph <- allNet(data) # graph from an incidence matrix

savePajek(graph,"graph",edges="Haberman") # save graph.net file
```

---

sim *Similarity matrix.*

Description

It calculates a similarity/distance matrix from either an incidence data frame/matrix or a coin object.

Usage

```
sim(input, procedures="Jaccard", distance=FALSE, minimum=1, maximum=Inf,
    sort=FALSE, decreasing=FALSE)
```

Arguments

input	a binary data frame or a coin object, let's say an R list composed by a number of scenarios ($n) and a coincidence matrix with frequencies ($f).
procedures	a vector of statistics of similarity. See details below.
distance	convert the similarity matrix into a distance matrix
minimum	minimum frequency to obtain a similarity/distance measure.
maximum	maxium frequency to obtain a similarity/distance measure.
sort	sort the list according to the values of a statistic. See details below
decreasing	order in a decreasing way.

Details

Possible measures in procedures are

- Frequencies (f), Relative frequencies (x), Conditional frequencies (i), Coincidence degree (cc), Probable degree (cp),
- Expected (e), Confidence interval (con)
- Matching (m), Rogers & Tanimoto (t), Gower (g), Sneath (s), Anderberg (and),
- Jaccard (j), Dice (d), antiDice (a), Ochiai (o), Kulczynski (k),
- Hamann (ham), Yule (y), Pearson (p), odds ratio (od), Rusell (r),
- Haberman (h), Z value of Haberman (z).
- Hypergeometric p greater value (hyp).

Value

A similarity/distance matrix.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# From a random incidence matrix I(25X4)
I<-matrix(rbinom(100,1,.5),nrow=25,ncol=4,
   dimnames=list(NULL,c("A","B","C","D")))
sim(I)
#Same results
C<-coin(I)
sim(C)
```

`sociologists` *Data: Sociologists born in the 19th century.*

Description

Data frame with names, birth and death year data, birth country and movement.

Usage

```
data("sociologists")
```

Format

A data frame with 33 observations and the following 4 variables (events) to study coincidences in time:

`name` : name and last name of the sociologist

`birth` : birth year

`death` : death year

`birthcountry` : birth country

`movements` : movement or school of thought

Source

Own elaboration from manuals of sociology.

References

See `events`.

Examples

```
data(sociologists)
head(sociologists, 10)
tail(sociologists, 10)
```

`summary` *Summary of a coin or netCoin object.*

Description

Produce result summaries of coin or netCoin objects.

Usage

```
summary(object, ...)
```

Arguments

`object`	A coin object (see `coin`), netCoin object (see `netCoin`), barCoin object (see `barCoin`), timeCoin object (see `timeCoin`)
`...`	Additional args

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
## Random incidence matrix: 25 scenarios, 4 events.
I <- matrix(rbinom(100,1,.5),nrow=25,ncol=4,
            dimnames=list(NULL,c("A","B","C","D")))

N <- allNet(I, sort=TRUE,main="Title",note="Comment")
summary(N)
```

---

surCoin *Networked coincidences from a data frame.*

Description

surCoin produces a network object of coincidences from a data frame converting variables into dichotomies.

Usage

```
surCoin(data,variables=names(data), commonlabel=NULL,
        dichotomies=NULL, valueDicho=1, metric=NULL, exogenous=NULL,
        weight=NULL, subsample=FALSE,
        minimum=1, maximum=nrow(data), sort=FALSE, decreasing=TRUE,
        frequency=FALSE, percentages=TRUE,
        procedures="Haberman", criteria="Z", Bonferroni=FALSE,
        support=-Inf, minL=-Inf, maxL=Inf,
        directed=FALSE, diagonal=FALSE, sortL=NULL, decreasingL=TRUE,
        igraph=FALSE, dir=NULL, ...)
```

Arguments

data	a data frame
variables	a vector of variables included in the previous data frame
commonlabel	a vector of variables whose names are to be included in nodes labels
dichotomies	a vector of dichotomous variables to appear as just one categorie
valueDicho	value to be selected for dichotomous variables. Default is 1
metric	a vector of metrics
exogenous	a vector of variables whose relations amongst them are of no interest. None by default
weight	a vector of weights. Optimal for data.framed tables
subsample	retrict the analysis to scenarios with at least one event
minimum	minimum frequency to be considered
maximum	maximum frequency to be considered
sort	sort the coincidence matrix according to frequency of events

decreasing	decreasing or increasing sort of the matrix
frequency	a logical value true if frequencies are to be shown. Default=FALSE.
percentages	a logical value true if percentages are to be shown. Default=TRUE.
procedures	a vector of statistics of similarity. See below.
criteria	statistic to be use for selection criteria.
Bonferroni	Bonferroni criterium of the signification test.
support	minimum value of the frequency of the coincidence to be edged
minL	minimum value of the statistic to include the edge in the list.
maxL	maximum value of the statistic to include the edge in the list.
directed	includes same edges only once.
diagonal	includes auto-links
sortL	sort the list according to the values of a statistic. See below
decreasingL	order in a decreasing way.
igraph	Produces an igraph object instead of a netCoin object if TRUE.
dir	a "character" string representing the directory where the web files will be saved.
...	Any netCoin argument.

Details

Possible measures in procedures are

- Frequencies (f), Relative frequencies (x), Conditional frequencies (i), Coincidence degree (cc), Probable degree (cp),
- Expected (e), Confidence interval (con)
- Matching (m), Rogers & Tanimoto (t), Gower (g), Sneath (s), Anderberg (and),
- Jaccard (j), Dice (d), antiDice (a), Ochiai (o), Kulczynski (k),
- Hamann (ham), Yule (y), Pearson (p), odds ratio (od), Rusell (r),
- Haberman (h), Z value of Haberman (z),
- Hypergeometric p greater value (hyp).
- Convert a matrix into an edge list (shape).

Value

This function creates a netCoin object (or igraph) and, if stated, a folder in the computer with an HTML document named index.html which contains the produced graph. This file can be directly opened with your browser and sent to a web server to work properly.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A data frame with two variables Gender and Opinion
frame<-data.frame(Gender=c(rep("Man",3),rep("Woman",3)),
                  Opinion=c("Yes","Yes","No","No","No","Yes"))
surCoin(frame,commonlabel="") # network object
```

`timeCoin` *Networked coincidences.*

Description

`timeCoin` produces a timeCoin object.

Usage

```
timeCoin(nodes, name = "name", start = "start", end = "end",
         group = NULL, text = NULL, main = NULL, note = NULL, cex = 1,
         language = c("en","es"), dir = NULL, show = TRUE)
```

Arguments

`nodes`	a data frame with at least two vectors of names and incidences.
`name`	name of the vector with names in the nodes data frame.
`start`	name of the vector with starts in the nodes data frame.
`end`	name of the vector with ends in the nodes data frame.
`group`	name of the vector with groups in the nodes data frame.
`text`	name of the vector with html text in the nodes data frame.
`main`	upper title of the graph.
`note`	lower title of the graph.
`cex`	number indicating the amount by which plotting text should be scaled relative to the default. Default = 1.
`language`	a character vector (es=spanish; en=english).
`dir`	a "character" string representing the directory where the web files will be saved.
`show`	a logical value true if the graph is to be shown. Default = TRUE.

Value

Object of class `timeCoin`.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# Database of 19th century sociologists
data(sociologists)
timeCoin(sociologists,"name","birth","death","birthcountry",
         dir = "./timeline", show = FALSE) # See ./timeline/index.html file
```

---

toIgraph *igraph object.*

Description

igraph object from a netCoin object.

Usage

```
toIgraph(net)
```

Arguments

net	is a netCoin object. See netCoin

Value

An igraph object.

Author(s)

Modesto Escobar, Department of Sociology and Communication, University of Salamanca. See http://casus.usal.es/blog/modesto-escobar/

Examples

```
# A character column (with separator)
frame <- data.frame(A = c("Man; Women", "Women; Women",
                          "Man; Man", "Undet.; Women; Man"))
data <- dichotomize(frame, "A", sep="; ")[2:4]
C <- coin(data) # coincidence matrix
N <- asNodes(C) # node data frame
E <- edgeList(C) # edge data frame
net <- netCoin(N, E) # netCoin object
toIgraph(net) # conversion into a igraph object
```

Index