Package 'CIDnetworks'

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Type Package

Title Generative models for complex networks with conditionally independent dyadic structure

Version 0.6.0

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Description Generative models for complex networks with conditionally independent dyadic structure. Now supports directed arcs!

License GPL (> 3)

Depends R (>= 3.0.0)

Imports mvtnorm, msm, methods, Rcpp (>= 0.11.0), igraph, numDeriv,pbivnorm

LinkingTo Rcpp

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R topics documented:

CIDnetworks-package *Model Complex Networks With Multiple Components*

Description

The CIDnetworks package allows a user to construct hierarchical models of complex networks using one of many different modes for latent structure.

Details

Package:	CIDnetworks
Type:	Package
Version:	0.6.0
Date:	2014-06-18
License:	GPLv3

Author(s)

Beau Dabbs, Brian Junker, Mauricio Sadinle, Tracy Sweet, A.C. Thomas Maintainer: A.C. Thomas <act@acthomas.ca>

Examples

```
data(dolphins)
model.plain <- CID.Gibbs (input=dolphins, burnin=10, draws=10)
```

CIDnetworks-classes *Classes of CIDnetwork subcomponents*

Description

Each of the reference classes used as components in the CIDnetworks methodology.

Usage

```
BETA(...)
COV (...)
HBM (...)
LSM (...)
```

```
LVM (...)
MMSBM (...)
SBM (...)
SR (...)
```

Arguments

...	Arguments passed to the respective classes.

Details

Each of these functions can serve as a subcomponent in the main CIDnetwork class object. Information on the nodes, edge list, and so forth will be passed automatically by any routine creating a CID object. Options are generally provided by default. Arguments for each class:

BETA: required: (nothing). Parameters: intercept.sr.

COV: required: covariates (matrix). Parameters: Corresponding coefficient vector coef.cov.

HBM: required: n.groups (single value). Parameters: block.value, membership (for nodes to blocks), tree.parent (for blocks).

LSM: required: dimension (single value). Parameters: latent.space.pos.

LVM: required: dimension (single value). Parameters: latent.space.pos.

MMSBM: required: n.groups (single value). Parameters: b.vector, membership.edge, membership.node.

SBM: required: n.groups (single value). Parameters: b.vector, membership.

SR: required: (nothing). Parameters: intercept.sr.

Value

Each expression yields a Reference Class object for the respective submodel. If generate=TRUE, it will produce an outcome value for that class depending on its specific properties.

Author(s)

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`CIDnetworks-data` *CIDnetworks: Included Data Sets*

Description

Data sets included with the CIDnetworks package.

Usage

```
Lazega
c.elegans
dolphins
prison
```

Format

Lazega: A list including six sociomatrices (three directed, three symmetrized) and one attributes matrix for the nodes.

c.elegans: An symmetric valued "sociomatrix" for the number of connections between neurons.

dolphins: A symmetric sociomatrix.

prison: (Thanks to UCINET) In the 1950s John Gagnon collected sociometric choice data from 67 prison inmates. All were asked, "What fellows on the tier are you closest friends with?" Each was free to choose as few or as many "friends" as he desired.

Author(s)

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References

Emmanuel Lazega. The Collegial Phenomenon: The Social Mechanisms of Cooperation Among Peers in a Corporate Law Partnership, Oxford University Press (2001).

D. J. Watts and S. H. Strogatz, Nature 393, 440-442 (1998).

J. G. White, E. Southgate, J. N. Thompson, and S. Brenner, Phil. Trans. R. Soc. London 314, 1-340 (1986).

D. Lusseau, K. Schneider, O. J. Boisseau, P. Haase, E. Slooten, and S. M. Dawson, Behavioral Ecology and Sociobiology 54, 396-405 (2003).

MacRae J. (1960). Direct factor analysis of sociometric data. Sociometry, 23, 360-371.

`CIDnetworks-gibbs` *CIDnetworks: Bayesian Inference*

Description

Usage of CID Gibbs Samplers.

Usage

```
 CID.Gibbs (input,
            outcome,

            components = list(),
            class.outcome = NULL,
            fill.in.missing.edges = missing(outcome),
            new.chain = FALSE,

            draws = 100,
            burnin = -1,
            thin = 10,
            ...)

 ## S3 method for class 'CID.Gibbs'
print(x, ...)
 ## S3 method for class 'CID.Gibbs'
summary(object, ...)
 ## S3 method for class 'CID.Gibbs'
plot(x, ...)
 ## S3 method for class 'summary.CID.Gibbs'
print(x, ...)

 likelihood.plot(x, ...)
 intercept.plot(x, trace = FALSE, ...)
 COV.plot(x, ...)
 LSM.plot(x, ...)
 SBM.plot(x, ...)
 MMSBM.plot(x, ...)
 SR.plot(x, ...)

 network.plot (x, fitted.values=FALSE, ...)
 sociogram.plot (x, component.color=0, vertexcolor, ...)

 n.nodes(object)
 edge.list(object)
 is.net.directed(object)
 net.density(object)
 outcome(object)
 node.names(object)
 inDegree(object)
 outDegree(object)
 socio(object)
 value.mat(CID.Gibbs.object, prob = TRUE)
 switcheroo(CID.Gibbs.object)
```

Arguments

input	An object containing information about the edges in a network. Must be one of the following classes: Matrix, CIDnetwork, or CID.Gibbs. If input is a square matrix, it is assumed to be a sociomatrix. Otherwise a matrix with 2 columns and a number of rows equal to the number of edges is required. Providing a CIDnetwork will use the associated edge.list. Providing a CID.Gibbs object will continue the MCMC chain from the last draw.
outcome	If an edgelist is provided as input and outcome is missing, the edges provided are assumed to be the ones in a binary sociomatrix. Otherwise, an outcome value must be specified for each edge in the edgelist, and any edges not provided are assumed to have no data.
CID.Gibbs.object	If desired, an existing CID.Gibbs output object can be loaded instead of a new network specification.
components	A list of sub-components, including (COV, HBM, LSM, LVM, MMSBM, SBM, SR).
class.outcome	One of "ordinal" (default, values from 0 to higher integers), "binary" (ordinal in 0 and 1) or "gaussian" (unbounded continuous values). Class is auto-detected if NULL remains in place.
fill.in.missing.edges	If TRUE, the edge list will be augmented with zeroes for all unspecified but possible edges. By default, if an outcome is specified, these edges will not be added.
new.chain	If a CID.Gibbs object is provided, the default value of FALSE will return both the old and new MCMC chain combined. A value of TRUE will drop the old chain completely.
draws	Number of draws to return.
burnin	Number of draws to burnin. A negative value will automatically determine burnin amount.
thin	Amount of draws to thin the chain by.
...	Further arguments to be passed to the Gibbs sampler routine or the plot routine. See details for more.
x, object	An object outputted from CID.Gibbs.
fitted.values	If TRUE, plots the fitted tie strength under the Gibbs sampler. If FALSE, plots the network outcomes as entered.
component.color	If non-zero, colors the nodes in the sociogram according to the output of the Gibbs sampler.
vertexcolor	User-passed vertex colors for sociogram.plot .
trace	If selected, displays the Gibbs sampler trace plot for the intercept rather than a point and interval.
prob	In value.mat, converts the linear predictor value to the probability of a binary edge.

Details

This is the main routine for running a Gibbs sampler on any of the CID models. See the vignettes for more information.

Value

CID.Gibbs outputs a list containing a CID object, the results of the Gibbs sampler, and the Deviance Information Criterion estimate for the Gibbs.

Author(s)

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CIDnetworks-helpers *Functions to aid in the use and construction of CIDnetworks objects*

Description

Functions to aid in the use and construction of CIDnetworks objects

Usage

```
l.diag (nn)
u.diag (nn)
ordinal.maker (vec, cuts=quantile(vec, c(0.25, 0.5, 0.75)))

unwrap.CID.Gibbs (gibbs.out)
mat.cov.to.edge.list.cov (Xmat)
```

Arguments

nn	The number of rows in the square matrix for which we wish to extract the lower or upper diagonal matrix.
vec	The elements to be divided into ordinal categories.
cuts	The cut points at which to divide vec into ordinal categories. Default values separate vec into quartiles.
gibbs.out	The list object of draws from the Gibbs sampler. This re-sorts the object into a matrix form for easier consumption.
Xmat	A three-dimensional array of covariates, with n.nodes rows and columns. Each slice is a different covariate.

Details

These functions are included for the convenience of users of CIDnetworks. l.diag and u.diag provide the indices of a matrix to extract the lower and upper diagonal elements. ordinal.maker will turn any numeric vector into a series of ordinal integers for easy use in a CIDnetworks outcome. Xmat converts a sociomatrix-style array of covariates into one that can easily be used by the COV() component.

Author(s)

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`CIDnetworks-master` *Forward Simulation and Declaration of CID Network Models*

Description

Usage of the CID main class.

Usage

```
CID (...)
CID.generate (...)
```

Arguments

...	Arguments passed to the master class.

Details

Generating a complex network according to the CID modelling framework is easy and straightforward. See vignettes for more information.

Value

A CIDnetwork object.

Author(s)

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