

Package ‘IrishDirectorates’

October 12, 2022

Type Package

Title A Dynamic Bipartite Latent Space Model to Analyse Irish Companies' Boards from 2003 to 2013

Version 1.4

Date 2019-8-20

Description Provides the dataset and an implementation of the method illustrated in Friel, N., Rastelli, R., Wyse, J. and Raftery, A.E. (2016) <[DOI:10.1073/pnas.1606295113](https://doi.org/10.1073/pnas.1606295113)>.

License GPL-3

Imports Rcpp (>= 0.12.19)

LinkingTo Rcpp, RcppArmadillo

Depends R (>= 3.5.0)

NeedsCompilation yes

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Repository CRAN

Date/Publication 2019-08-29 07:30:10 UTC

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IrishDirectorates-package

A Dynamic Bipartite Latent Space Model to Analyse Irish Companies' Boards from 2003 to 2013

Description

Provides the dataset and an implementation of the method illustrated in Friel, N., Rastelli, R., Wyse, J. and Raftery, A.E. (2016) <DOI:10.1073/pnas.1606295113>.

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References

Friel, N., Rastelli, R., Wyse, J. and Raftery, A.E. (2016) <DOI:10.1073/pnas.1606295113>

dblpm_mcmc

dblpm_mcmc

Description

Runs the Metropolis-within-Gibbs sampler on the given Dynamic Bipartite Latent Position Model (dblpm network).

Usage

```
dblpm_mcmc(network, niter, burnin, thin, x_var, w_var, gamma_var, beta_var, verbose = T)
```

Arguments

network	A list identifying a dblpm network.
niter	Number of iterations after thinning and burnin.
burnin	Number of iterations to be discarded before starting the count for niter. The burnin iterations are not thinned.
thin	After burnin, keep one sampled observation every thin and discard the rest.
x_var	Proposal variance for the positions of sender nodes.
w_var	Proposal variance for the positions of receiver nodes.
gamma_var	Proposal variance for the intercept gamma.
beta_var	Proposal variance for the intercept beta.
verbose	true or false indicating whether a lengthy output should be printed out.

Value

computing_time Number of seconds required for the sampling process.
 samples Sampled values for each of the model parameters.
 tail dblpm network sampled in the last iteration.

Examples

```

data(IrishDirectoratesFit)
IrishDirectoratesFit <- dblpm_mcmc(network = IrishDirectoratesFit$tail,
  niter = 3, burnin = 6, thin = 3,
  x_var = 4.75, w_var = 0.25, gamma_var = 1.825, beta_var = 0.2175,
  verbose = TRUE)
# to replicate the results of the paper: niter = 10000, burnin = 500000, thin = 50

```

dblpm_posterior	<i>dblpm_posterior</i>
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Description

Evaluates the posterior value for a given Dynamic Bipartite Latent Position Model (dblpm network).

Usage

```
dblpm_posterior(network)
```

Arguments

network A list identifying a dblpm network.

Value

computing_time Number of seconds required for the evaluation.
 likelihood_value Likelihood value for the given network.
 posterior_value Posterior value for the given network.

Examples

```

data(IrishDirectoratesFit)
res <- dblpm_posterior(network = IrishDirectoratesFit$tail)

```

IrishDirectoratesData *Board Composition For Companies Quoted On The Irish Stock Exchange From 2003 To 2013*

Description

Board composition for companies quoted on Irish Stock Exchange from 2003 to 2013. Board compositions are only observed at the end of each year.

Usage

```
data("IrishDirectoratesData")
```

Format

IrishDirectoratesData is a list containing:

`edgelist` the edgelist for a bipartite dynamic network. Each row of this dataframe corresponds to an undirected edge in the network. For each row, the first entry identifies the time frame where the edge occurs, the second entry represents the director, whereas the third identifies the company. The presence of an edge at a certain time frame between a director and a company means that the director was part of the company's board at the end of the corresponding year.

`years` lookup table for the time frame labels.

`directors_names` lookup table for directors' names.

`companies_names` lookup table for companies' names.

Details

The adjacency cube can be constructed from the edgelist. Please see example for sample code.

Source

Irish Stock Exchange (<http://www.ise.ie/>).

References

Friel, N., Rastelli, R., Wyse, J. and Raftery, A.E. (2016) <DOI:10.1073/pnas.1606295113>.

Examples

```
data(IrishDirectoratesData)
attach(IrishDirectoratesData)

N <- length(directors_names)
M <- length(companies_names)
tframes <- length(years)

# construct the binary adjacency cube
```

```

adj <- array(0,c(N,M,tframes))
for (l in 1:nrow(edgelist)) adj[edgelist[l,2],edgelist[l,3],edgelist[l,1]] = 1
dimnames(adj) = list(directors_names, companies_names, years)

# calculate the degrees of directors and boards
out_degrees <- apply(adj,c(1,3),sum)
in_degrees <- apply(adj,c(2,3),sum)

# create a binary matrix with ones corresponding to interlocked directors
interlocked_directors <- ifelse(out_degrees > 1, 1, 0)

# create a binary matrix with ones corresponding to interlocking companies
interlocking_companies <- matrix(0,M,tframes)
for (t in 1:tframes) for (i in 1:N) for (j in 1:M) if (adj[i,j,t] == 1) {
  if (interlocked_directors[i,t] > 0) interlocking_companies[j,t] = 1
}

# extract labels of interlocking companies
selected_companies <- which(rowSums(interlocking_companies) > 0)

# extract labels of remaining active directors
new_out_degrees <- apply(adj[,selected_companies,], c(1,3), sum)
selected_directors <- which(rowSums(new_out_degrees) > 0)

# create the new adjacency cube for the reduced data, as shown in the referenced paper
adj_reduced <- adj[selected_directors, selected_companies, ]

```

IrishDirectoratesFit *Fitted Dynamic Bipartite Latent Position Model.*

Description

Fitted Dynamic Bipartite Latent Position Model (dblpm) that serves as initialisation for the Metropolis-within-Gibbs algorithm

Usage

```
data("IrishDirectoratesFit")
```

Format

The list `IrishDirectoratesFit` has one element called `tail` which contains the values for each of the model parameters.

References

Friel, N., Rastelli, R., Wyse, J. and Raftery, A.E. (2016) <DOI:10.1073/pnas.1606295113>.

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