

Package ‘mlsbm’

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Title Efficient Estimation of Bayesian SBMs & MLSBMs

Version 0.99.2

Description Fit Bayesian stochastic block models (SBMs) and multi-level stochastic block models (MLSBMs) using efficient Gibbs sampling implemented in 'Rcpp'. The models assume symmetric, non-reflexive graphs (no self-loops) with unweighted, binary edges. Data are input as a symmetric binary adjacency matrix (SBMs), or list of such matrices (MLSBMs).

License GPL (>= 2)

Encoding UTF-8

LazyData true

RoxygenNote 7.1.1

LinkingTo Rcpp, RcppArmadillo

Imports Rcpp

Depends R (>= 2.10)

NeedsCompilation yes

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AL	<i>Simulated 3-layer network data</i>
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Description

A data set containing 3 layers of undirected, symmetric adjacency matrices simulated from an SBM with 3 true clusters

Usage

AL

Format

A list of length 3

col_summarize	<i>The col_summarize function</i>
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Description

Function to quickly return credible intervals

Usage

```
col_summarize(MAT, dig = 2, level = 0.95)
```

Arguments

MAT	A matrix
dig	Number of digits to round estimates and CrIs to
level	Confidence level

Value

A character vector of posterior estimates and intervals

Examples

```
M <- matrix(rnorm(1000), ncol = 4)
col_summarize(M)
```

`fit_mlsbm`*R/Rcpp function for fitting multilevel stochastic block model*

Description

This function allows you to fit multilevel stochastic block models.

Usage

```
fit_mlsbm(  
  A,  
  K,  
  a0 = 0.5,  
  b10 = 0.5,  
  b20 = 0.5,  
  n_iter = 1000,  
  burn = 100,  
  verbose = TRUE  
)
```

Arguments

A	An adjacency list of length L, the number of levels. Each level contains an n x n symmetric adjacency matrix.
K	The number of clusters specified a priori.
a0	Dirichlet prior parameter for cluster sizes for clusters 1,...,K.
b10	Beta distribution prior parameter for community connectivity.
b20	Beta distribution prior parameter for community connectivity.
n_iter	The number of total MCMC iterations to run.
burn	The number of burn-in MCMC iterations to discard. The number of saved iterations will be n_iter - burn.
verbose	Whether to print a progress bar to track MCMC progress. Defaults to true.

Value

A list of MCMC samples, including the MAP estimate of cluster indicators (z)

Examples

```
data(AL)  
# increase n_iter in practice  
fit <- fit_mlsbm(AL,3,n_iter = 100)
```

`fit_sbm`*R/Rcpp function for fitting single level stochastic block model*

Description

This function allows you to fit single level stochastic block models.

Usage

```
fit_sbm(  
  A,  
  K,  
  a0 = 0.5,  
  b10 = 0.5,  
  b20 = 0.5,  
  n_iter = 1000,  
  burn = 100,  
  verbose = TRUE  
)
```

Arguments

<code>A</code>	An $n \times n$ symmetric adjacency matrix.
<code>K</code>	The number of clusters specified a priori.
<code>a0</code>	Dirichlet prior parameter for cluster sizes for clusters 1,...,K.
<code>b10</code>	Beta distribution prior parameter for community connectivity.
<code>b20</code>	Beta distribution prior parameter for community connectivity.
<code>n_iter</code>	The number of total MCMC iterations to run.
<code>burn</code>	The number of burn-in MCMC iterations to discard. The number of saved iterations will be <code>n_iter - burn</code> .
<code>verbose</code>	Whether to print a progress bar to track MCMC progress. Defaults to true.

Value

A list of MCMC samples, including the MAP estimate of cluster indicators (z)

Examples

```
data(AL)  
fit <- fit_sbm(AL[[1]],3)
```

mean_CRI	<i>The mean_CRI function</i>
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Description

Simple function to return the mean (95% CrI) for a vector

Usage

```
mean_CRI(y, dig = 2)
```

Arguments

y	A numeric vector
dig	The number of digits to round to

Value

A string of mean and 95% quantile interval rounded to 'dig'

Examples

```
mean_CRI(rnorm(1000))
```

mlsbm	<i>mypackage: A package for fitting single and multilevel SBMs.</i>
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Description

This package fits Bayesian stochastic block models (SBMs)

mlsbm functions

The mlsbm functions ...

sample_mlsbm	<i>R/Rcpp function for sampling from a multilevel stochastic block model</i>
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Description

This function allows you to sample a multilevel stochastic block model.

Usage

```
sample_mlsbm(z, P, L)
```

Arguments

z	An n x 1 vector of community labels for each node
P	A K x K symmetric matrix of community connectivity probabilities
L	The number of levels to sample

Value

A list of adjacency matrices – one for each level of the MLSBM

Examples

```
n = 100
K = 3
L = 2
pi = rep(1/K,K)
z = sample(1:K, size = n, replace = TRUE, prob = pi)
p_in = 0.50
p_out = 0.05
P = matrix(p_out, nrow = K, ncol = K)
diag(P) = p_in
AL = sample_mlsbm(z,P,L)
```

sample_sbm	<i>R/Rcpp function for sampling from a single level stochastic block model</i>
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Description

This function allows you to sample a single level stochastic block model.

Usage

```
sample_sbm(z, P)
```

Arguments

- `z` An $n \times 1$ vector of community labels for each node
- `P` A $K \times K$ symmetric matrix of community connectivity probabilities

Value

An adjacency matrix

Examples

```
n = 100
K = 3
pi = rep(1/K,K)
z = sample(1:K, size = n, replace = TRUE, prob = pi)
p_in = 0.50
p_out = 0.05
P = matrix(p_out, nrow = K, ncol = K)
diag(P) = p_in
A = sample_sbm(z,P)
```

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