

Package ‘netClust’

May 9, 2026

Type Package

Title Model-Based Clustering of Network Data

Version 1.0.2

Maintainer Shuchismita Sarkar <ssarkar@bgsu.edu>

Description Clustering unilayer and multilayer network data by means of finite mixtures is the main utility of netClust.

License GPL (>= 2)

Depends R (>= 2.10)

Imports Rcpp (>= 1.0.2)

LinkingTo Rcpp, RcppArmadillo

RoxygenNote 7.3.2

Encoding UTF-8

NeedsCompilation yes

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netClust-package *Model-Based Clustering of Network Data*

Description

Clustering unilayer and multilayer network data by means of finite mixtures is the main utility of netClust.

Details

The DESCRIPTION file:

```
Package:      netClust
Type:         Package
Title:        Model-Based Clustering of Network Data
Version:      1.0.2
Authors@R:   c(person(given = "Shuchismita", family = "Sarkar", role = c("aut", "cre"), email = "ssarkar@bgsu.edu"), pers
Maintainer:   Shuchismita Sarkar <ssarkar@bgsu.edu>
Description:  Clustering unilayer and multilayer network data by means of finite mixtures is the main utility of netClust.
License:      GPL (>= 2)
Depends:     R (>= 2.10)
Imports:     Rcpp (>= 1.0.2)
LinkingTo:   Rcpp, RcppArmadillo
RoxygenNote: 7.3.2
Encoding:    UTF-8
Author:      Shuchismita Sarkar [aut, cre], Volodymyr Melnykov [aut]
Archs:       x64
```

Index of help topics:

```
netClust-package      Model-Based Clustering of Network Data
netData               Dataset: netData
netDataID             Dataset: netDataID
netEM_multilayer      Returns the EM object for multilayer network
netEM_unilayer        Returns the EM object for unilayer network
rcpparma_hello_world Set of functions in example RcppArmadillo
package
```

Provides model-based clustering for weighted networks. Core functions: netEM_unilayer() and netEM_multilayer().

Author(s)

NA

Maintainer: Shuchismita Sarkar <ssarkar@bgsu.edu>

References

Melnykov, V., Sarkar, S. and Melnykov, Y., 2021. On finite mixture modeling and model-based clustering of directed weighted multilayer networks. *Pattern Recognition*, 112, p.107641.

Examples

```

data(netData) ## Read network data
data(netDataID) ## Read original ID for network data

n <- dim(netData)[1] ## number of nodes of the network
p <- dim(netData)[4] ## number of layers of the network
K <- 2                ## number of clusters
y <- netData

eps=0.0001
RndStrtUni= 5
RndStrtMult= 10
SmEMUni= 3
SmEMMult= 5
ItrSmEM=5
burn = 10*n
ItrMCMC= 100*n
sSigma = 1
sPsi = 1
a=0

#####
### Run unilayer network EM seperately for each layer ###
#####

for (MatC in 1:p){

  x <- array(0, dim = c(n,n,2))
  for (i in 1:n){
    for (j in 1:n){
      x[i,j,] <- y[i,j,,MatC]
    }
  }

  E <- netEM_unilayer(x, K, eps, RndStrtUni, SmEMUni, ItrSmEM, burn, ItrMCMC, sSigma,a)
  cat("Unilayer network", "Original ID", netDataID, "\n")
  cat("Unilayer network", "Feature", MatC, "Assigned ID", E$id, "\n")

}

#####
### Run multilayer network EM ###
#####

E <- netEM_multilayer(y,K,p, eps, RndStrtMult, SmEMMult, ItrSmEM, burn, ItrMCMC, sSigma, sPsi, n, a)

```

```
cat("Multilayer network", "Original ID", netDataID, "\n")
cat("Multilayer network", "Assigned ID", E$id, "\n")
```

netData

Dataset: netData

Description

Network data with 20 nodes and 2 layers

Usage

```
data("netData")
```

Format

The format is: num [1:20, 1:20, 1:2, 1:2] 0 0 0 0 0 0 0 0 0 ...

Details

Dataset demonstrating multilayer network

Source

Sarkar, S. (2020)

References

Sarkar, S. (2019) On the use of transformations for modeling multidimensional heterogeneous data, The University of Alabama Libraries Digital Collections

Examples

```
data(netData)
## maybe str(netData) ; plot(netData) ...
```

`netDataID`*Dataset: netDataID*

Description

ID for netData dataset

Usage

```
data("netDataID")
```

Format

A data frame with 30 observations on the following 1 variable.

netDataID a numeric vector

Details

ID for the dataset demonstrating multilayer network

Source

Sarkar, S. (2020)

References

Sarkar, S. (2019) On the use of transformations for modeling multidimensional heterogeneous data, The University of Alabama Libraries Digital Collections

Examples

```
data(netDataID)
## maybe str(netDataID) ; plot(netDataID) ...
```

`netEM_multilayer`*Returns the EM object for multilayer network*

Description

Returns the EM object for multilayer network

Usage

```
netEM_multilayer(  
  y,  
  K,  
  p,  
  eps,  
  num_rand_start,  
  num_run_smallEM,  
  max_itr_smallEM,  
  burn,  
  MCMC_itr,  
  sigma_mult,  
  psi_mult,  
  n,  
  alpha  
)
```

Arguments

y	multiple network
K	number of clusters
p	number of layers
eps	epsilon for convergence
num_rand_start	number of random starts
num_run_smallEM	number of runs for small EM
max_itr_smallEM	maximum number of runs for small EM
burn	number of runs for burn for Metropolis Hastings
MCMC_itr	number of runs for Metropolis Hastings iterations
sigma_mult	scaling multiplier for Sigma matrix
psi_mult	scaling multiplier for Psi matrix
n	number of nodes of the network
alpha	seed provided by the user

Value

EM object

netEM_unilayer *Returns the EM object for unilayer network*

Description

Returns the EM object for unilayer network

Usage

```
netEM_unilayer(  
  x,  
  K,  
  eps,  
  num_rand_start,  
  num_run_smallEM,  
  max_itr_smallEM,  
  burn,  
  MCMC_itr,  
  sigma_mult,  
  alpha  
)
```

Arguments

x	multiple network
K	number of clusters
eps	epsilon for convergence
num_rand_start	number of random starts
num_run_smallEM	number of runs for small EM
max_itr_smallEM	maximum number of runs for small EM
burn	number of runs for burn for Metropolis Hastings
MCMC_itr	number of runs for Metropolis Hastings iterations
sigma_mult	scaling multiplier for Sigma matrix
alpha	seed provided by the user

Value

EM object

RcppArmadillo-Functions

Set of functions in example RcppArmadillo package

Description

These four functions are created when `RcppArmadillo.package.skeleton()` is invoked to create a skeleton packages.

Usage

```
rcpparma_hello_world()  
rcpparma_outerproduct(x)  
rcpparma_innerproduct(x)  
rcpparma_bothproducts(x)
```

Arguments

`x` a numeric vector

Details

These are example functions which should be largely self-explanatory. Their main benefit is to demonstrate how to write a function using the Armadillo C++ classes, and to have to such a function accessible from R.

Value

`rcpparma_hello_world()` does not return a value, but displays a message to the console.
`rcpparma_outerproduct()` returns a numeric matrix computed as the outer (vector) product of `x`.
`rcpparma_innerproduct()` returns a double computer as the inner (vector) product of `x`.
`rcpparma_bothproducts()` returns a list with both the outer and inner products.

Author(s)

Dirk Eddelbuettel

References

See the documentation for Armadillo, and RcppArmadillo, for more details.

Examples

```
x <- sqrt(1:4)  
rcpparma_innerproduct(x)  
rcpparma_outerproduct(x)
```

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