Package 'MEclustnet'

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Title Fit the Mixture of Experts Latent Position Cluster Model to Network Data

Version 1.2.2

Description
Functions to facilitate model-based clustering of nodes in a network in a mixture of experts setting, which incorporates covariate information on the nodes in the modelling process. Isobel Claire Gormley and Thomas Brendan Murphy (2010) <doi:10.1016/j.stamet.2010.01.002>.

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Contents

`calclambda` *Title Compute mixing proportions*

Description

Function to compute the each observation's mixing proportions which are modeled as a logistic function of their covariates.

Usage

```
calclambda(tau, x.mix)
```

Arguments

`tau`	A matrix of logistic regression coefficients, with G rows and number of columns equal to the number of covariates in the mixing proportions model plus 1, for the intercept.
`x.mix`	A matrix of covariates in the mixing proportions model (including dummy variables for any factor covariates), with a column of 1's appended at the front.

Value

An n x G matrix of mixing proportions.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

`MEclustnet`

calcloglikelihood *Calculate the log likelihood function of the data.*

Description

This function calculates the log likelihood function of the data.

Usage

```
calcloglikelihood(pis, y)
```

Arguments

pis	Vector of link probabilities.
y	Vector version of the adjacency matrix, with the diagonal removed.

Value

The value of the log likelihood function.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

calcm *Totals the number of observations in each cluster.*

Description

Update the count of the number of observations in each cluster.

Usage

```
calcm(m, G, K)
```

Arguments

m	Vector of length G containing the number of nodes in each cluster.
G	The number of clusters in the model being fitted.
K	Vector of length n detailing the number of the cluster to which each node belongs.

Value

Vector of length G containing the number of nodes in each cluster.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

`calcpis` *Calculate link probabilities.*

Description

Function calculates link probabilities between nodes.

Usage

```
calcpis(beta, x.link, delta, n.tilde)
```

Arguments

`beta`	Vector of regression coefficients in the link probabilities.
`x.link`	Matrix, with $n^2 - n$ rows and the same number of columns as covariates (including the intercept), giving the differences in covariates for all pairs of nodes.
`delta`	Vector of Euclidean distances between locations in the latent space of all pairs of nodes.
`n.tilde`	Length of the vector version of the adjacency matrix, with the diagonal removed i.e. $n^2 - n$.

Value

A vector of length $n^2 - n$ providing the link probabilities between all pairs of nodes.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

`formatting.covars` *Reformat matrix of covariates.*

Description

This function reformats the matrix of input covariates into the required format for the link probabilities and for the mixing proportions.

Usage

```
formatting.covars(covars, link.vars, mix.vars, n)
```

Arguments

`covars`	The n x p data frame of node specific covariates passed in to the overall `MEclustnet` function. The first column should be a column of 1's and categorical variables should be factors.
`link.vars`	A vector detailing the column numbers of the matrix covars that should be included in the link probabilities model.
`mix.vars`	A vector detailing the column numbers of the matrix covars that should be included in the mixing proportions probabilities model.
`n`	The number of nodes in the network.

Details

For the link regression model, the difference in the link.vars covariates, for all pairs of nodes is calculated. For the mixing proportions model, the required representation of the mix.vars required is formed, where for categorical/factor variables a dummy value representation is used.

Value

A list with

x.link A matrix with n^2 rows and length(link.vars) columns, detailing the differences in covariates for all pairs of nodes.

x.mix A matrix with n rows and number of columns equal to the number of variables detailed in mix.vars, where dummy variable representations will be used for categorical.factor covariates.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

`MEclustnet`

Examples

```
data(us.twitter.covariates)
link.vars = c(1)
mix.vars = c(1,5,7,8)
res = formatting.covars(us.twitter.covariates, link.vars, mix.vars, nrow(us.twitter.covariates))
dim(res$x.link)
dim(res$x.mix)
```

---

invariant *Account for invariance of configurations.*

Description

This function accounts for the fact that configurations in the latent space are invariant to rotations, reflections and translations.

Usage

```
invariant(z, zMAP)
```

Arguments

z	An n x d matrix of latent locations in the d dimensional space for each of n nodes.
zMAP	The *maximum a posteriori* configuration of latent locations used as the template to which all sampled configurations are mapped.

Details

Procrustean rotations, reflections and translations (note: NOT dilations) are employed to best match z to zMAP.

Value

The transformed version of the input configuration z that best matches zMAP.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

labelswitch *Label switching correction.*

Description

This function corrects for the issue of label switching when fitting mixture models in a Bayesian setting.

Usage

```
labelswitch(mu, sigma2, lambda, tau, K, G, d, perms, muMAP, iter, uphill,
  burnin, thin, s, x.mix)
```

Arguments

mu	A G x d matrix of mean latent locations.
sigma2	A vector of length G containing the covariance of the latent locations within each cluster.
lambda	An n x G matrix of mixing proportions.
tau	A matrix of logistic regression coefficients, with G rows and number of columns equal to the number of covariates in the mixing proportions model plus 1, for the intercept.
K	Vector of length n detailing the number of the cluster to which each node belongs.
G	The number of clusters in the model being fitted.
d	The dimension of the latent space.
perms	A G! x G matrix of all possible permutations of 1:G (output by permutations(G), say).
muMAP	A G x d matrix of *maximum a posteriori* latent location means, obtained at the end of the uphill only section of the MCMC chain. Used as the template to correct for label switching.
iter	Iteration number.
uphill	Number of iterations for which uphill only steps in the MCMC chain should be run.
burnin	Number of iterations of the MCMC chain which should not be included in *a posteriori* summaries.
thin	Thinning frequency of the MCMC chain to ensure independent samples.
s	Number of columns in the reformatted covariates matrix for the mixing proportions model, output by formatting.covars.
x.mix	The reformatted covariates matrix for the mixing proportions model, output by formatting.covars.

Details

The muMAP matrix is used as the reference to which each new estimate the cluster means is matched to correct for any label switching which may have occurred during sampling. A sum of squares function is employed as the loss function.

Value

A list containing:list(mu, sigma2, lambda, tau, K)

mu The label-corrected matrix of cluster means.

sigma2 The label-corrected vector of cluster covariances.

lambda The label-corrected matrix of mixing proportions.

tau The label-corrected matrix of logistic regression coefficients for the mixing proportions model.

K The label-corrected vector of length n detailing the number of the cluster to which each node belongs.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

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lawyers.adjacency.advice

Adjacency matrix detailing the presence or absence of advice links between the 'Lazega Lawyers'.

Description

Data on whether or not 71 lawyers in a northeastern American law firm asked each other for advice.

Usage

```
lawyers.adjacency.advice
```

Format

A 71 x 71 binary matrix, with 0 down the diagonal.

Source

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

`lawyers.adjacency.coworkers`

Adjacency matrix detailing the presence or absence of coworker links between the 'Lazega Lawyers'.

Description

Data on whether or not 71 lawyers in a northeastern American law firm work with each other.

Usage

```
lawyers.adjacency.coworkers
```

Format

A 71 x 71 binary matrix, with 0 down the diagonal.

Source

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

`lawyers.adjacency.friends`

Adjacency matrix detailing the presence or absence of friendship links between the 'Lazega Lawyers'.

Description

Data on whether or not 71 lawyers in a northeastern American law firm are friends outside of work.

Usage

```
lawyers.adjacency.friends
```

Format

A 71 x 71 binary matrix, with 0 down the diagonal.

Source

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

lawyers.covariates *A matrix of covariates of the 'Lazega Lawyers'.*

Description

Covariates on each of 71 lawyers in a northeastern American law firm. Note the first column is a column of 1's.

Usage

```
lawyers.covariates
```

Format

A data frame with 71 observations on the following 8 variables.

`Intercept` a column of 1s should always be the first column.

`Seniority` a factor with levels 1 = partner, 2 = associate.

`Gender` a factor with 1 = male, 2 = female.

`Office` a factor with levels 1 = Boston, 2 = Hartford and 3 = Providence

`Years` a numeric vector detailing years with the firm.

`Age` a numeric vector detailing the age of each lawyer.

`Practice` a factor with levels 1 = litigation and 2 = corporate.

`School` a factor with levels 1 = Harvard or Yale, 2 = University of Connecticut and 3 = Other.

Source

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

MEclustnet *MEclustnet: A package for model-based clustering of nodes in a network, accounting for covariates.*

Description

The main function of interest is MEclustnet which will fit a mixture of experts latent position cluster model to a binary network.

MEclustnet will fit a mixture of experts latent position cluster model to a binary network.

Usage

```
MEclustnet(Y, covars, link.vars = c(1:ncol(covars)),
  mix.vars = c(1:ncol(covars)), G = 2, d = 2, itermax = 10000,
  uphill = 100, burnin = 1000, thin = 10, rho.input = 1,
  verbose = TRUE, ...)
```

Arguments

`Y`	An n x n binary matrix of links between n nodes, with 0 on the diagonal and 1 indicating a link.
`covars`	An n x p data frame of node specific covariates. Categorical variables should be factors. First column should be a column of 1s, and should always be passed in.
`link.vars`	A vector of the column numbers of the data frame `covars` to be included in link probability model. If none are to be included, this argument should be 1.
`mix.vars`	A vector of the column numbers of the data frame `covars` to be included in mixing proportions model. If none are to be included, argument should be 1.
`G`	The number of clusters in the model to be fitted.
`d`	The dimension of the latent space.
`itermax`	Maximum number of iterations in the MCMC chain.
`uphill`	Number of iterations for which uphill only steps in the MCMC chain should be run to find *maximum a posteriori* estimates.
`burnin`	Number of burnin iterations in the MCMC chain.
`thin`	The degree of thinning to be applied to the MCMC chain.
`rho.input`	Scaling factor to achieve desirable acceptance rates in Metropolis-Hastings steps.
`verbose`	Print progress updates to screen? Recommended as the models are slow to run.
`...`	Additional arguments.

Details

This function fits the mixture of experts latent position cluster model to a binary network via a Metropolis-within-Gibbs sampler. Covariates can influence either the link probabilities between nodes and/or the cluster memberships of nodes.

Value

An object of class `MEclustnet`, which is a list containing:

zstore An n x d x store.dim array of sampled latent location matrices, where store.dim is the number of post burnin thinned iterations.

betastore A store.dim x p matrix of sampled beta vectors, the logistic regression parameters of the link probabilities model.

Kstore A store.dim x n matrix of sampled cluster membership vectors.

mustore A G x d x store.dim array of sampled cluster mean latent location matrices.

sigma2store A store.dim x G matrix of sampled cluster variances.

lambdastore An n x G x store.dim array of sampled mixing proportion matrices.

taustore A G x s x store.dim array of sampled tau vectors, the logistic regression parameters of the mixing proportions model, where s is the length of tau.

LLstore A vector of length store.dim storing the loglikelihood from each stored iteration.

G The number of clusters fitted

d The dimension of the latent space

countbeta Count of accepted beta values

counttau Count of accepted tau values

MEclustnet functions

MEclustnet

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

Examples

```
#################################################################
# An example from the Gormley and Murphy (2010) paper, using the Lazega lawyers friendship network.
#################################################################
# Number of iterations etc. are set to low values for illustrative purposes.
# Longer run times are likely to be required to achieve sufficient mixing.

library(latentnet)
data(lawyers.adjacency.friends)
data(lawyers.covariates)

link.vars = c(1)
mix.vars = c(1,4,5)

fit = MEclustnet(lawyers.adjacency.friends, lawyers.covariates,
link.vars, mix.vars, G=2, d=2, itermax = 500, burnin = 50, uphill = 1, thin=10)

# Plot the trace plot of the mean of dimension 1 for each cluster.
matplot(t(fit$mustore[,1,]), type="l", xlab="Iteration", ylab="Parameter")

# Compute posterior summaries
summ = summaryMEclustnet(fit, lawyers.adjacency.friends)
plot(summ$zmean, col=summ$Kmode, xlab="Dimension 1", ylab="Dimension 2", pch=summ$Kmode,
     main = "Posterior mean latent location for each node.")

# Plot the resulting latent space, with uncertainties
plotMEclustnet(fit, lawyers.adjacency.friends, link.vars, mix.vars)
```

```
#####################################################################
# An example analysing a 2016 Twitter network of US politicians.
#####################################################################
# Number of iterations etc. are set to low values for illustrative purposes.
# Longer run times are likely to be required to achieve sufficient mixing.

library(latentnet)
data(us.twitter.adjacency)
data(us.twitter.covariates)

link.vars = c(1)
mix.vars = c(1,5,7,8)

fit = MEclustnet(us.twitter.adjacency, us.twitter.covariates,
link.vars, mix.vars, G=4, d=2, itermax = 500, burnin = 50, uphill = 1, thin=10)

# Plot the trace plot of the mean of dimension 1 for each cluster.
matplot(t(fit$mustore[,1,]), type="l", xlab="Iteration", ylab="Parameter")

# Compute posterior summaries
summ = summaryMEclustnet(fit, us.twitter.adjacency)

plot(summ$zmean, col=summ$Kmode, xlab="Dimension 1", ylab="Dimension 2", pch=summ$Kmode,
     main = "Posterior mean latent location for each node.")

# Plot the resulting latent space, with uncertainties
plotMEclustnet(fit, us.twitter.adjacency, link.vars, mix.vars)

# Examine which politicians are in which clusters...
clusters = list()
for(g in 1:fit$G)
{
  clusters[[g]] = us.twitter.covariates[summ$Kmode==g,c("name", "party")]
}
clusters
```

`plotMEclustnet` *Plot latent position network.*

Description

Function to plot the resulting fitted network, using first two dimensions only.

Usage

```
plotMEclustnet(fit, Y, link.vars, mix.vars)
```

Arguments

fit	An object storing the output of the function MEclustnet.
Y	The n x n binary adjacency matrix, with 0 down the diagonal, that was passed to MEclustnet.
link.vars	A vector of the column numbers of the data frame covars to be included in link probability model. If none are to be included, this argument should be 1.
mix.vars	A vector of the column numbers of the data frame covars to be included in mixing proportions model. If none are to be included, argument should be 1.

Details

This function will plot the posterior mean latent location for each node in the network. The colour of each node reflects the posterior modal cluster membership, and the ellipses are 50% posterior sets illustrating the uncertainty in the latent locations. The grey lines illustrate the observed links between the nodes.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

Examples

```
#####################################################################
# An example analysing a 2016 Twitter network of US politicians.
#####################################################################
# Number of iterations etc. are set to low values for illustrative purposes.
# Longer run times are likely to be required to achieve sufficient mixing.

library(latentnet)
data(us.twitter.adjacency)
data(us.twitter.covariates)

link.vars = c(1)
mix.vars = c(1,5,7,8)

fit = MEclustnet(us.twitter.adjacency, us.twitter.covariates,
          link.vars, mix.vars, G=4, d=2, itermax = 500, burnin = 50, uphill = 1, thin=10)

# Plot the trace plot of the mean of dimension 1 for each cluster.
matplot(t(fit$mustore[,1,]), type="l", xlab="Iteration", ylab="Parameter")

# Compute posterior summaries
summ = summaryMEclustnet(fit, us.twitter.adjacency)

plot(summ$zmean, col=summ$Kmode, xlab="Dimension 1", ylab="Dimension 2", pch=summ$Kmode,
```

```
     main = "Posterior mean latent location for each node.")

# Plot the resulting latent space, with uncertainties
plotMEclustnet(fit, us.twitter.adjacency, link.vars, mix.vars)

# Examine which politicians are in which clusters...
clusters = list()
for(g in 1:fit$G)
{
  clusters[[g]] = us.twitter.covariates[summ$Kmode==g,c("name", "party")]
}
clusters
```

`summaryMEclustnet` *Summary of MEclustnet object.*

Description

Summary of the output of the function MEclustnet which fits a mixture of experts latent position cluster model.

Usage

```
summaryMEclustnet(fit, Y)
```

Arguments

`fit`	An object storing the output of the function `MEclustnet`.
`Y`	The n x n binary adjacency matrix, with 0 down the diagonal, that was passed to `MEclustnet`.

Value

A list with:

AICM The value of the AICM criterion for the fitted model.

BICM The value of the BICM criterion for the fitted model.

BICMCMC The value of the BICMCMC criterion for the fitted model.

betamean The posterior mean vector of the regression coefficients for the link probabilities model.

betasd The standard deviation of the posterior distribution of beta.

taumean A matrix with G rows, detailing the posterior mean of the regression coefficients for the mixing proportions model.

tausd The standard deviation of the posterior distribution of tau.

mumean A G x d matrix containing the posterior mean of the latent locations' mean.

meansd The standard deviation of the posterior distribution of mu.

sigma2mean A vector of length G containing the posterior mean of the latent locations' covariance.

sigma2sd The standard deviation of the posterior distribution of the latent locations' covariance.

Kmode A vector of length n detailing the posterior modal cluster membership for each node.

zmean An n x d matrix containing the posterior mean latent location for each node.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

Examples

```
#####################################################################
# An example analysing a 2016 Twitter network of US politicians.
#####################################################################
# Number of iterations etc. are set to low values for illustrative purposes.
# Longer run times are likely to be required to achieve sufficient mixing.

library(latentnet)
data(us.twitter.adjacency)
data(us.twitter.covariates)

link.vars = c(1)
mix.vars = c(1,5,7,8)

fit = MEclustnet(us.twitter.adjacency, us.twitter.covariates,
 link.vars, mix.vars, G=4, d=2, itermax = 500, burnin = 50, uphill = 1, thin=10)

# Plot the trace plot of the mean of dimension 1 for each cluster.
matplot(t(fit$mustore[,1,]), type="l", xlab="Iteration", ylab="Parameter")

# Compute posterior summaries
summ = summaryMEclustnet(fit, us.twitter.adjacency)

plot(summ$zmean, col=summ$Kmode, xlab="Dimension 1", ylab="Dimension 2", pch=summ$Kmode,
     main = "Posterior mean latent location for each node.")

# Plot the resulting latent space, with uncertainties
plotMEclustnet(fit, us.twitter.adjacency, link.vars, mix.vars)

# Examine which politicians are in which clusters...
clusters = list()
for(g in 1:fit$G)
{
  clusters[[g]] = us.twitter.covariates[summ$Kmode==g,c("name", "party")]
}
```

clusters

---

updatebeta *Update the logistic regression parameters in the link probabilities model.*

Description

The Metropolis-Hastings update step for the logistic regression parameters in the link probabilities model, using a surrogate proposal distribution.

Usage

```
updatebeta(beta, p, x.link, delta, y, epsilon, psi, psi.inv, pis,
  countbeta, rho, n.tilde)
```

Arguments

beta	Vector of regression coefficients in the link probabilities.
p	Length of beta.
x.link	Matrix, with $n^2 - n$ rows and the same number of columns as covariates (including the intercept), giving the differences in covariates for all pairs of nodes.
delta	Vector of Euclidean distances between locations in the latent space of all pairs of nodes.
y	Vector version of the adjacency matrix, with the diagonal removed.
epsilon	Mean of the multivariate normal prior on beta.
psi	Covariance of the multivariate normal prior on beta.
psi.inv	Inverse covariance of the multivariate normal prior on beta.
pis	Vector of length $n^2 - n$ providing the link probabilities between all pairs of nodes.
countbeta	Counter for number of steps for which the proposed beta value was accepted.
rho	Scaling factor to be used to adjust the acceptance rate.
n.tilde	Length of the vector version of the adjacency matrix, with the diagonal removed i.e. $n^2 - n$.

Details

See appendix of the paper detailed below for details.

Value

A list:

beta The returned version of the beta parameter vector.

countbeta The count of the number of acceptances of beta to that point in the MCMC chain.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

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updateK *Update the cluster membership vector.*

Description

A Gibbs update step for K, the cluster membership vector.

Usage

```
updateK(G, K, z, mu, sigma2, Id, lambda)
```

Arguments

G	The number of clusters being fitted.
K	The cluster membership vector.
z	The n x d matrix of latent locations.
mu	The G x d matrix of cluster means.
sigma2	The G vector of cluster covariances.
Id	An identity matrix of dimension d.
lambda	The n x G matrix of mixing proportions.

Value

The cluster membership vector.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

updatemu *Update the mean of each cluster.*

Description

A Gibbs step to update the mean of each cluster.

Usage

```
updatemu(G, z, K, m, sigma2, omega2, Id, mu, d)
```

Arguments

G	The number of clusters being fitted.
z	The n x d matrix of latent locations.
K	The cluster membership vector.
m	Vector of length G containing the number of nodes in each cluster.
sigma2	The covariance of each cluster.
omega2	Covariance of the multivariate normal prior distribution on the means. Note this is a scalar value, as the prior covariance is diagonal.
Id	A d x d identity matrix.
mu	The G x d matrix of cluster means.
d	The dimension of the latent space.

Value

The G x d matrix of cluster means.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

`updatesigma2` *Update variances in each cluster.*

Description

A Gibbs step to update variances in each cluster.

Usage

```
updatesigma2(G, alpha, m, d, sigma02, z, K, mu, sigma2)
```

Arguments

`G`	The number of clusters being fitted.
`alpha`	Degrees of freedom of the scaled inverse Chi squared prior distribution on the cluster variances.
`m`	Vector of length G containing the number of nodes in each cluster.
`d`	Dimension of the latent space.
`sigma02`	Scaled factor of the scaled inverse Chi squared prior distribution on the cluster variances.
`z`	The n x d matrix of latent locations.
`K`	The cluster membership vector.
`mu`	The G x d matrix of cluster means.
`sigma2`	The G vector of cluster variances.

Value

The G vector of cluster variances.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

`MEclustnet`

updatetau *Update the logistic regression parameters in the mixing proportions model.*

Description

The Metropolis-Hastings update step for the logistic regression parameters in the mixing proportions model, using a surrogate proposal distribution.

Usage

```
updatetau(G, x.mix, lambda, Sigmag, Sigmag.inv, K, gammag, tau, counttau,
  rho)
```

Arguments

G	The number of clusters being fitted.
x.mix	A matrix of covariates in the mixing proportions model (including dummy variables for any factor covariates), with a column of 1's appended at the front.
lambda	An n x G matrix of mixing proportions.
Sigmag	Covariance matrix of the multivariate normal prior for tau.
Sigmag.inv	The inverse of Sigmag.
K	The cluster membership vector.
gammag	Mean vector of the multivariate normal prior for tau.
tau	A matrix of logistic regression coefficients, with G rows and number of columns equal to the number of covariates in the mixing proportions model plus 1, for the intercept.
counttau	Counter for number of steps for which the proposed tau value was accepted.
rho	Scaling factor to be used to adjust the acceptance rate.

Value

A list:

tau The returned version of the tau parameter vector.

lambda The returned version of the lambda matrix.

counttau The count of the number of acceptances of tau to that point in the MCMC chain.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

updatez *Update step for the latent locations.*

Description

A Metropolis-Hastings update step for the latent locations.

Usage

```
updatez(n, z, x.link, delta, beta, y, mu, K, sigma2, Id, pis, iter, uphill,
  countz, delete, d, n.tilde)
```

Arguments

n	The number of nodes.
z	The n x d matrix of latent locations.
x.link	Matrix, with $n^2 - n$ rows and the same number of columns as covariates (including the intercept), giving the differences in covariates for all pairs of nodes.
delta	Vector of Euclidean distances between locations in the latent space of all pairs of nodes.
beta	Vector of regression coefficients in the link probabilities.
y	Vector version of the adjacency matrix, with the diagonal removed.
mu	The G x d matrix of cluster means.
K	The cluster membership vector
sigma2	The covariance of each cluster.
Id	A d dimensional identity matrix.
pis	A vector of length $n^2 - n$ providing the link probabilities between all pairs of nodes.
iter	Iteration number.
uphill	Number of iterations for which uphill only steps in the MCMC chain should be run.
countz	Counter for number of steps for which the proposed z value was accepted.
delete	Index of the terms to be deleted in order to delete the diagonal terms from the vector version of the adjacency matrix.
d	The dimension of the latent space.
n.tilde	Length of the vector version of the adjacency matrix, with the diagonal removed i.e. $n^2 - n$.

Value

A list:

z The returned matrix of latent locations.

delta Vector of Euclidean distances between locations in the latent space of all pairs of nodes.

pis A vector of length $n^2 - n$ providing the link probabilities between all pairs of nodes.

countz Counter for z acceptance rate.

References

Isobel Claire Gormley and Thomas Brendan Murphy. (2010) A Mixture of Experts Latent Position Cluster Model for Social Network Data. Statistical Methodology, 7 (3), pp.385-405.

See Also

MEclustnet

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us.twitter.adjacency *Directed adjacency matrix detailing the presence or absence of Twitter friend/follower links between US politicians.*

Description

Network data on whether or not 69 US politicians are friends/followers on Twitter.

Usage

```
us.twitter.adjacency
```

Format

A 69 x 69 binary matrix, with 0 down the diagonal.

Source

With thanks to Dr. Derek Greene. School of Computer Science, University College Dublin.

`us.twitter.covariates` *A matrix of covariates of the US politicians.*

Description

Covariates on each of 69 US politicians. Note the first column is a column of 1's.

Usage

```
us.twitter.covariates
```

Format

A data frame with 69 observations on the following 8 variables.

'1' a column of 1s should always be the first column.

`twitter_id` Twitter number.

`twitter_name` Twitter name.

`name` Actual name.

`party` a factor with levels `Democrat` `Republican`

`location` a factor with levels detailing location.

`role` a factor with levels `Candidate`, `Representative` and `Senator`

`gender` a factor with levels `Female` and `Male`

Source

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

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