Package 'manet'

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Title Multiple Allocation Model for Actor-Event Networks

Version 2.0

Description Mixture model with overlapping clusters for binary actor-event data. Parameters are estimated in a Bayesian framework. Model and inference are described in Ranciati, Vinciotti, Wit (2017) Modelling actor-event network data via a mixture model under overlapping clusters. Submitted.

Depends R (>= 3.3), MCMCpack, combinat, igraph, mclust

License GPL-2

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NeedsCompilation no

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Repository CRAN

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concerts   *Concerts synthetic network*

Description

Synthetic data matrix of dimension n x d, recording attendances of n=500 people to d=14 concerts from 14 different artists. There are three clusters in the data, each one corresponding to a community of fans of a specific musical genre. Overlaps of these fandoms point towards attendances dictated by artists playing music from sub-genres - such as electropop.

Usage

```
concerts
```

Format

A data frame with 500 rows and 14 variables

Details

- 14 concerts attendended: "Blondie", "Fleetwood Mac", "Paramore", "Queen", "St.Vincent", "The Queen", "Pet Shop Boys", "M83", "Daft Punk", "Goldfrapp", "Chvrches", "LaRoux", "Robyn", "BANKS"

- 500 attendees

Examples

```
#DATA GENERATION
z_ext <-function(x,nfac){
 nq <- length(x)
 zx <- hcube(rep(nq,nfac))
 zx <- zx[,dim(zx)[2]:1]
 z2 <- matrix(x[zx],dim(zx)[1],dim(zx)[2])
 return(z2)
 }
K=3 # main clusters: Rock (cluster h=5), Pop (cluster h=3), Electronic (cluster h=2)
K_star=2^K
n=500 #attendees
set.seed(777)
u=z_ext(0:1,K)
alpha_star=rep(0,K_star)
alpha_star=c(0.05,0.10,0.35,0.15,0.25,0.00,0.10,0.00)
index=rep(0,n)
for(i in 1:n)
 index[i]=sample(1:K_star,1,prob=alpha_star)
d=14 #concerts/artists
y<-matrix(0,n,d)
colnames(y)=c("Blondie", "Fleetwood Mac", "Paramore","Queen","St.Vincent", "The Queen",
"Pet Shop Boys","M83","Daft Punk", "Goldfrapp", "Chvrches", "LaRoux", "Robyn","BANKS")
```

```
pi.greco=matrix(0,K,d)
rownames(pi.greco)=c("Rock","Pop","Electronic")
colnames(pi.greco)=colnames(y)
pi.greco[1,]=c(0.80,0.80,0.80,0.70,0.90,0.80,0.10,0.10,0.05,0.05,0.10,0.05,0.05,0.10)
pi.greco[2,]=c(0.10,0.10,0.90,0.80,0.90,0.80,0.05,0.10,0.05,0.70,0.70,0.05,0.80,0.05)
pi.greco[3,]=c(0.05,0.05,0.05,0.10,0.05,0.05,0.80,0.90,0.90,0.80,0.70,0.80,0.90,0.90)
for (i in 1:n)
for(j in 1:d)
 y[i,j]<-rbinom(1,1,prob=ifelse(sum(u[index[i],])==0,0.00000001,min(pi.greco[,j]^u[index[i],])))
#y is the 500x14 matrix of data

#RUNNING MANET
## Not run:
data(concerts)
start=Sys.time()
crt<-manet(concerts,K=3,maxT=5000)
finish=Sys.time()
finish-start
#Time difference of 11.58112 mins
plot(crt)
summary(crt)
alloc<-summary(crt)$actor.allocations[,2]
adjustedRandIndex(index,alloc)
#0.8420733
classError(alloc,index)$errorRate
#0.07

## End(Not run)
```

---

deepsouth   *Deep South Network*

Description

This is a data set of 18 women observed over a nine-month period. During that period, various subsets of these women met in a series of 14 informal social events. The data recored which women met for which events.

Usage

```
deepsouth
```

Format

A data frame with 18 rows and 14 variables

Source

Davies et al (1941) Deep South: A sociological anthropological study of caste and class. University of Chicago Press.

---

manet   *Multiple allocation clustering of actor-event networks*

Description

This function infers K multiple allocation cluster for actor-event network data.

Usage

```
manet(y, K = 2, maxT = 5000, seed = 1, link = "min", verbose = FALSE)
```

Arguments

y	A n x d actor-event adjacency matrix, whereby y_ij is 1 if actor i attended event j – 0 otherwise.
K	Number of multiple clusters. Default is set to 2.
maxT	Number of MCMC iterations. Default is set to 5000.
seed	Random seed. Default is 1.
link	Method to combine the parameters of the parent clusters into the parameter for the heir cluster. Default is "min". The alternative is "max".
verbose	Set to TRUE if you want to see the steps of the MCMC iterations. Defaults is FALSE.

Value

A manet object consisting of a list with five outputs:

- p.allocation.chain A maxT x n x 2^K array with the posterior probabilities of allocation to the heir clusters.

- p.event.chain A maxT x K x d array with the cluster - posterior probabilities of attendance to events.

- p.community.chain A maxT x 2^K matrix with the heir cluster proportions.

- parent.heir.cluster A 2^K x K matrix, which indicates the relationship between parent and heir clusters.

- adj The original adjacency matrix.

- proc.time The computational time.

Examples

```
data(deepsouth)
ds<-manet(deepsouth,K=2,maxT=100)
plot(ds)
summary(ds)
```

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mixtbern   *Single allocation clustering in networks*

Description

This function infers K single allocation cluster for actor-event network data.

Usage

```
mixtbern(y, K = 4, maxT = 5000, seed = 1, verbose = FALSE)
```

Arguments

y	A n x d actor-event adjacency matrix, whereby y_ij is 1 if actor i attended event j – 0 otherwise.
K	Number of single clusters. Default is set to 4.
maxT	Number of MCMC iterations. Default is set to 5000.
seed	Random seed. Default is 1.
verbose	Set to TRUE if you want to see the steps of the MCMC iterations. Defaults is FALSE.

Value

A manet object consisting of a list with five outputs:

- p.allocation.chain A maxT x n x K array with the posterior probabilities of allocation to the heir clusters.

- p.event.chain A maxT x K x d array with the cluster - posterior probabilities of attendance to events.

- p.community.chain A maxT x K matrix with the heir cluster proportions.

- adj The original adjacency matrix.

- proc.time The computational time.

Examples

```
data(deepsouth)
ds<-mixtbern(deepsouth,K=2,maxT=100)
plot(ds)
summary(ds)
```

| noordin | *Noordin Top terrorist network* |

Description

The Noordin Top Terrorist Network Data were drawn primarily from "Terrorism in Indonesia: Noordin's Networks," a publication of the International Crisis Group, and include relational data on 79 individuals discussed in that publication. The dataset includes information on these individuals' affiliations with terrorist/insurgent organizations, educational institutions, businesses, and religious institutions.

Usage

```
noordin
```

Format

A data frame with 79 rows and 45 variables

Details

- 45 events attendended: eight organizations, five operations (bombings), eleven training events, two financial meetings, seven logistic meetings, twelve general meetings

- 79 terrorists, as documented in Everton (2012) but including also the five "lone wolves" (last five rows)

Source

Everton (2012) Disrupting dark networks 34. Cambridge University Press.

| plot.manet | *Plotting the output from the multiple allocation clustering.* |

Description

This function plots the output of the manet function.

Usage

```
## S3 method for class 'manet'
plot(x, seed = 1, layout = layout_nicely, ...)
```

Arguments

x	A manet object.
seed	Random seed. Default is 1.
layout	Layout of the network from the igraph package. Default is layout_nicely.
...	Additional inputs to the igraph function.

Value

An actor-event network with events as round circles and actors as squared circles with the different colours corresponding to the identified communities.

Examples

```
data(deepsouth)
ds<-manet(deepsouth,K=2,maxT=100)
plot(ds)
```

---

print.manet	*Printing the output from the multiple allocation clustering*

Description

This function prints the output of the manet function

Usage

```
## S3 method for class 'manet'
print(x, digits = 3, ...)
```

Arguments

x	A manet object.
digits	Number of digits. Default is 3.
...	Additional arguments to the print function.

Examples

```
data(deepsouth)
ds<-manet(deepsouth,K=2,maxT=100)
print(ds)
```

summary.manet	*Summarising the output from the multiple allocation clustering*

Description

This function summarises the output of the manet function

Usage

```
## S3 method for class 'manet'
summary(object, digits = 3, ...)
```

Arguments

object	A manet object.
digits	Number of digits. Default is 3.
...	Additional arguments to the summary function.

Examples

```
data(deepsouth)
ds<-manet(deepsouth,K=2,maxT=100)
summary(ds)
```

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