

Package ‘mrfse’

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Title Markov Random Field Structure Estimator

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Description A Markov random field structure estimator that uses a penalized maximum conditional likelihood method similar to the Bayesian Information Criterion (Fron-dana, 2016) <doi:10.11606/T.45.2018.tde-02022018-151123>.

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con.mrfse	<i>Conservative approach for mrfse</i>
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Description

Conservative construction of the estimated Markov random field graph.

Usage

```
con.mrfse(a_size, sample, c, max_neigh = NULL)
```

Arguments

a_size	Size of the alphabet.
sample	A integer-valued matrix. Each value must belong range 0 and a_size -1. Matrix has dimension n x V, where n is number of samples and V is number of nodes.
c	The penalization constant. Must be positive.
max_neigh	The maximum length of a candidate Markovian neighborhood. Must be non-negative and less than ncol(sample). If NULL then max_neigh will be set as ncol(sample) -1.

Value

A adjacency matrix of the estimated Markov random field graph.

Author(s)

Rodrigo Carvalho

References

FRONDANA, Iara Moreira. *Model selection for discrete Markov random fields on graphs*. São Paulo : Instituto de Matemática e Estatística, University of São Paulo, 2016. Doctoral Thesis in Estatística. <doi:10.11606/T.45.2018.tde-02022018-151123> http://www.teses.usp.br/teses/disponiveis/45/45133/tde-02022018-151123/publico/tese_Iara_Frondana.pdf

Examples

```
library(mrfse)
a = c(0, 1)
s = matrix(sample(a, size=1000, replace=TRUE), ncol=5)
con.mrfse(length(a), s, 1.0)
```

cv.mrfse

Cross-validation for mrfse

Description

K-fold Cross-validation to estimate a penalization constant.

Usage

```
cv.mrfse(a_size, sample, can, k = 10, max_neigh = NULL)
```

Arguments

a_size	Size of the alphabet.
sample	A integer-valued matrix. Each value must belong range 0 and a_size -1. Matrix has dimension n x V, where n is number of samples and V is number of nodes.
can	Candidates values for penalization constant.
k	Size of fold.
max_neigh	The maximum length of a candidate Markovian neighborhood. Must be non-negative and less than ncol(sample). If NULL then max_neigh will be set as ncol(sample) -1.

Value

Return the best fitted for k-fold-cv in can.

Author(s)

Rodrigo Carvalho

References

FRONDANA, Iara Moreira. *Model selection for discrete Markov random fields on graphs*. São Paulo : Instituto de Matemática e Estatística, University of São Paulo, 2016. Doctoral Thesis in Estatística. <doi:10.11606/T.45.2018.tde-02022018-151123> http://www.teses.usp.br/teses/disponiveis/45/45133/tde-02022018-151123/publico/tese_Iara_Frondana.pdf

Examples

```
library(mrfse)
a_size = c(0, 1)
can = seq(0.1, 1.0, 0.1)
s = matrix(sample(a_size, size=1000, replace=TRUE), ncol=5)
cv.mrfse(length(a_size), s, can, 5)
```

mrfse

A Markov random field structure estimator

Description

A penalized likelihood BIC-based to estimate Markovian neighborhoods.

Usage

```
mrfse(a_size, sample, c, max_neigh=NULL)
```

Arguments

a_size	Size of the alphabet.
sample	A integer-valued matrix. Each value must belong range 0 and a_size -1. Matrix has dimension n x V, where n is number of samples and V is number of nodes.
c	The penalization constant. Must be positive.
max_neigh	The maximum length of a candidate Markovian neighborhood. Must be non-negative and less than ncol(sample). If NULL then max_neigh will be set as ncol(sample) -1.

Value

A list filled with estimated Markov neighborhood for each graph vertex

Author(s)

Rodrigo Carvalho

References

FRONDANA, Iara Moreira. *Model selection for discrete Markov random fields on graphs*. São Paulo : Instituto de Matemática e Estatística, University of São Paulo, 2016. Doctoral Thesis in Estatística. <doi:10.11606/T.45.2018.tde-02022018-151123> http://www.teses.usp.br/teses/disponiveis/45/45133/tde-02022018-151123/publico/tese_Iara_Frondana.pdf

Examples

```
library(mrfse)
a_size = c(0, 1)
s = matrix(sample(a_size, size=1000, replace=TRUE), ncol=5)
mrfse(length(a_size), s, 1.0)
```

ncon.mrfse

Non-conservative approach for mrfse

Description

Non-conservative construction of the estimated Markov random field graph.

Usage

```
ncon.mrfse(a_size, sample, c, max_neigh = NULL)
```

Arguments

a_size	Size of the alphabet.
sample	A integer-valued matrix. Each value must belong range 0 and a_size -1. Matrix has dimension n x V, where n is number of samples and V is number of nodes.
c	The penalization constant. Must be positive.
max_neigh	The maximum length of a candidate Markovian neighborhood. Must be non-negative and less than ncol(sample). If NULL then max_neigh will be set as ncol(sample) -1.

Value

A adjacency matrix of the estimated Markov random field graph.

Author(s)

Rodrigo Carvalho

References

FRONDANA, Iara Moreira. *Model selection for discrete Markov random fields on graphs*. São Paulo : Instituto de Matemática e Estatística, University of São Paulo, 2016. Doctoral Thesis in Estatística. <doi:10.11606/T.45.2018.tde-02022018-151123> http://www.teses.usp.br/teses/disponiveis/45/45133/tde-02022018-151123/publico/tese_Iara_Frondana.pdf

Examples

```
library(mrfse)
a_size = c(0, 1)
s = matrix(sample(a_size, size=1000, replace=TRUE), ncol=5)
ncon.mrfse(length(a_size), s, 1.0)
```

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