Package ‘IsingFit’

July 2, 2014

Type Package

Title Fitting Ising models using the eLasso method

Version 0.2.0

Date 2014-17-04

Depends R (>= 3.0.0)

Imports qgraph, Matrix, glmnet

Suggests IsingSampler

Author Claudia van Borkulo, Sacha Epskamp, with contributions from Alexander Robitzsch

Maintainer Claudia van Borkulo <cvborkulo@gmail.com>

Description This network estimation procedure eLasso, which is based on the Ising model, combines l1-regularized logistic regression with model selection based on the Extended Bayesian Information Criterion (EBIC). EBIC is a fit measure that identifies relevant relationships between variables. The resulting network consists of variables as nodes and relevant relationships as edges. Can deal with binary data.

License GPL-2

NeedsCompilation no

Repository CRAN

Date/Publication 2014-04-23 12:28:40

R topics documented:

IsingFit-package *Network estimation using the eLasso method*

Description

This network estimation procedure eLasso, which is based on the Ising model, combines l1-regularized logistic regression with model selection based on the Extended Bayesian Information Criterion (EBIC). EBIC is a fit measure that identifies relevant relationships between variables. The resulting network consists of variables as nodes and relevant relationships as edges. Can deal with binary data.

Details

Package:	IsingFit
Type:	Package
Version:	0.2.0
Date:	2014-04-17
License:	What license is it under?

Author(s)

Claudia D. van Borkulo, Sacha Epskamp, with contributions from Alexander Robitzsch

Maintainer: Claudia D. van Borkulo <cvborkulo@gmail.com>

References

Chen, J., & Chen, Z. (2008). Extended bayesian information criteria for model selection with large model spaces. Biometrika, 95(3), 759-771.

Foygel, R., & Drton, M. (2011). Bayesian model choice and information criteria in sparse generalized linear models. arXiv preprint arXiv:1112.5635.

Ravikumar, P., Wainwright, M. J., & Lafferty, J. D. (2010). High-dimensional Ising model selection using l1-regularized logistic regression. The Annals of Statistics, 38, 1287 - 1319.

Van Borkulo, C. D., Borsboom, D., Epskamp, S., Blanken, T. F., Boschloo, L., Schoevers, R. A., & Waldorp, L. J. (manuscript submitted for publication). A new method for constructing networks from binary data.

`Ising-methods` *Methods for IsingFit objects*

Description

Print method prints the IsingFit output , plot method plots the estimated network (with the `qgraph` package), and summary method returns density of the network, the value of gamma used, the rule used, and the time the analysis took.

Usage

```
## S3 method for class 'IsingFit'
print(x, ...)
## S3 method for class 'IsingFit'
summary(object, ...)
## S3 method for class 'IsingFit'
plot(x, ...)
```

Arguments

`x`	output of `IsingFit`
`object`	output of `IsingFit`
`...`	Arguments sent to qgraph. Only used in plot method.

Author(s)

Claudia van Borkulo

`IsingFit` *Network estimation using the eLasso method*

Description

This network estimation procedure eLasso, which is based on the Ising model, combines l1-regularized logistic regression with model selection based on the Extended Bayesian Information Criterion (EBIC). EBIC is a fit measure that identifies relevant relationships between variables. The resulting network consists of variables as nodes and relevant relationships as edges. Can deal with binary data.

Usage

```
IsingFit(x, family='binomial', AND = TRUE, gamma = 0.25,
plot = TRUE, progressbar = TRUE, ...)
```

Arguments

`x`	Input matrix. The dimension of the matrix is nobs x nvars; each row is a vector of observations of the variables. Must be cross-sectional data.
`family`	The default is 'binomial', treating the data as binary. Currently, this procedure is only supported for binary data.
`AND`	Logical. Can be TRUE of FALSE to indicate whether the AND-rule or the OR-rule should be used to define the edges in the network. Defaults to TRUE.
`gamma`	A value of hyperparameter gamma in the extended BIC. Can be anything between 0 and 1. Defaults to .25.
`plot`	Logical. Should the resulting network be plotted?
`progressbar`	Logical. Should the pbar be plotted in order to see the progress of the estimation procedure?
`...`	Arguments sent to `qgraph`.

Value

IsingFit returns (invisibly) a 'IsingFit' object that contains the following items:

`weiadj`	The weighted adjacency matrix.
`thresholds`	Thresholds of the variables.
`q`	The object that is returned by qgraph (class 'qgraph').
`gamma`	The value of hyperparameter gamma.
`AND`	A logical indicating whether the AND-rule is used or not. If not, the OR-rule is used.
`time`	The time it took to estimate the network.

Note

See also my website: http://cvborkulo.com

Author(s)

Claudia D. van Borkulo, Sacha Epskamp, with contributions from Alexander Robitzsch

Maintainer: Claudia D. van Borkulo <cvborkulo@gmail.com>

References

Chen, J., & Chen, Z. (2008). Extended bayesian information criteria for model selection with large model spaces. Biometrika, 95(3), 759-771.

Foygel, R., & Drton, M. (2011). Bayesian model choice and information criteria in sparse generalized linear models. arXiv preprint arXiv:1112.5635.

Ravikumar, P., Wainwright, M. J., & Lafferty, J. D. (2010). High-dimensional Ising model selection using l1-regularized logistic regression. The Annals of Statistics, 38, 1287 - 1319.

Van Borkulo, C. D., Borsboom, D., Epskamp, S., Blanken, T. F., Boschloo, L., Schoevers, R. A., & Waldorp, L. J. (manuscript submitted for publication). A new method for constructing networks from binary data.

Examples

```
library("IsingSampler")

### Simulate dataset ###
# Input:
N <- 6 # Number of nodes
nSample <- 1000 # Number of samples

# Ising parameters:
Graph <- matrix(sample(0:1,N^2,TRUE,prob = c(0.8, 0.2)),N,N) * runif(N^2,0.5,2)
Graph <- pmax(Graph,t(Graph))
diag(Graph) <- 0
Thresh <- -rowSums(Graph) / 2

# Simulate:
Data <- IsingSampler(nSample, Graph, Thresh)

### Fit using IsingFit ###
Res <- IsingFit(Data, family='binomial', plot=FALSE)

# Plot results:
library("qgraph")
layout(t(1:2))
qgraph(Res$weiadj,fade = FALSE)
title("Estimated network")
qgraph(Graph,fade = FALSE)
title("Original network")
```

Index