Package ‘scio’

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Title Sparse Column-wise Inverse Operator
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Description Sparse Column-wise Inverse Operator for estimating the inverse covariance matrix. Note that this is a preliminary version accompanying the arXiv paper (arXiv:1203.3896) in 2012. This version contains only the minimal set of functions for estimation and cross validation.
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scio Sparse Column-wise Inverse Operator

Description

Estimates a sparse inverse covariance matrix using Sparse Column-wise Inverse Operator

Usage

scio(S, lambda, thr=1e-4, maxit=1e4, pen.diag=F, sym=T)
Arguments

S  
Input covariance matrix of size p by p (symmetric).

lambda  
(Non-negative) regularization parameter for the lasso penalty. Can be a scalar or a matrix of size p by p.

thr  
Threshold for convergence. Iterations stop when the maximum change in two successive updates is less than thr. Default value is 1e-4.

maxit  
Maximum number of iterations for each column computation. Default 10,000.

pen диаг  
Whether the diagonal should be penalized. Default False.

sym  
Whether the return values should be symmetrized. Default True.

Details

This is a fast, nonparametric approach to estimate sparse inverse covariance matrices, with possibly really large dimensions. Details of this procedure are described in the reference.

Value

A list with components:

w  
Estimated inverse covariance matrix

References


Examples

```r
set.seed(100)
x<-matrix(rnorm(50*20),ncol=4)
s<- var(x)
a<-scio(s, lambda=.01)
```

scio.cv  
Sparse Column-wise Inverse Operator

Description

Cross validated estimates of a sparse inverse covariance matrix using Sparse Column-wise Inverse Operator

Usage

```r
scio.cv(X, lambda.max=1, alpha=0.95, cv.maxit=1e2, ...)
```
Arguments

- **x**: Input data of dimension samples \( n \) x variables \( p \).
- **lambda.max**: Maximum lambda to start with in CV, which is decreased by multiplying **alpha** in each iteration.
- **alpha**: Scaling factor to decrease lambda by multiplication.
- **cv.maxit**: Maximum number of CV iterations. Default 1e2.
- **scio**: Other option parameters in **scio**.

Details

This is a fast, nonparametric approach to estimate sparse inverse covariance matrices, with possibly really large dimensions. Details of this procedure are described in the reference. This function does a simple cross validation based on likelihood.

Value

A list with components:

- **w**: Estimated inverse covariance matrix
- **lambda.cv**: CV selected lambda

References


Examples

```r
set.seed(100)
x <- matrix(rnorm(50*20), ncol=4)
a <- scio cv(x)
```

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**scio.refit**

*Refitted Sparse Column-wise Inverse Operator*

Description

Refitted SCIO Estimators using Penalized Likelihood

Usage

```r
scio.refit(S, Omega, thr=1e-4, ...)
```
Arguments

S  Input covariance matrix of size p by p (symmetric).
Omega  Estimated inverse covariance matrices. Can be a matrix of size p by p from scio or a collection of matrices from sciopath.
thr  Tolerance. Small entries in magnitude (<thr) in Omega are treated as zeros when refitting the precision matrix with the same support as the scio or sciopath outputs. Default 1e-4.

Details

This implements the refitting procedure discussed in Cai, Liu, and Luo (2011). The current version uses the QUIC solver for the penalized likelihood criterion. More solvers will be added.

Value

A list with one component:

w  Estimated inverse covariance matrix when a single Omega matrix is supplied, or an array of matrices when a 3 dimensional array of Omega is supplied.

References


Examples

```r
set.seed(100)
x <- matrix(rnorm(50*20), ncol=4)
s <- var(x)
a <- scio(s, lambda=.01)

require(QUIR)
b <- scio.refit(s, a$w)
```

Description

Estimates a sparse inverse covariance matrix using a Sparse Column-wise Inverse Operator, path-following a grid of values for the regularization parameter.
sciopath

Usage

sciopath(S, lambdalist=NULL, thr = 1e-4, maxit = 1e4, pen.diag=F, sym=T)

Arguments

S          Input covariance matrix of size p by p (symmetric).
lambdalist Vector of non-negative regularization parameters for the lasso penalty. The path is computed from the largest to the smallest value of this vector. If not given, 10 values are generated.
thr        Threshold for convergence. Iterations stop when the maximum change in two successive updates is less than thr. Default 1e-4.
maxit      Maximum number of iterations for each column computation. Default 10,000.
pen.diag   Whether the diagonal should be penalized. Default False.
sym        Whether the return values should be symmetrized. Default True.

Details

This is a fast, nonparametric approach to estimate sparse inverse covariance matrices, with possibly really large dimensions. Details of this procedure are described in the reference.

Value

A list with components:

wlist      Estimated covariance matrices, an array of dimension (nrow(s),ncol(n), length(lambdalist))
lambdalist Regularization parameters used

References


Examples

set.seed(100)
x <- matrix(rnorm(50*20),ncol=4)
s <- var(x)
a <- sciopath(s)
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