Package 'ADMMsigma'

February 24, 2018

Type Package

Title Penalized Precision Matrix Estimation via ADMM

Version 1.0

Date 2018-02-23

Description This R package produces penalized precision matrix estimates via the alternating direction method of multipliers (ADMM) algorithm

License MIT + file LICENSE

ByteCompile TRUE

NeedsCompilation yes

Encoding UTF-8

LazyData true

RoxygenNote 6.0.1

Imports Rcpp (>= 0.12.10),
        RcppArmadillo

LinkingTo Rcpp,
        RcppArmadillo,
        RcppParallel

Suggests testthat

SystemRequirements GNU make

R topics documented:

1

ADMMsigma   *ADMM penalized precision matrix estimation (using ADMM_sigmac)*

Description

Penalized Gaussian likelihood precision matrix estimation using the ADMM algorithm.

Usage

```
ADMMsigma(X = NULL, S = NULL, lam = 10^seq(-5, 5, 0.5), alpha = 1,
  rho = 2, mu = 10, tau1 = 2, tau2 = 2, crit = "ADMM", tol1 = 1e-04,
  tol2 = 1e-04, maxit = 1000, ind = NULL, K = 3, quiet = TRUE)
```

Arguments

lam	tuning parameter for penalty. Defaults to 10^seq(-5, 5, 0.5)
alpha	elasticnet mixing parameter [0, 1]: 0 = ridge, 1 = lasso/bridge
rho	initial step size for ADMM
mu	factor for primal and residual norms
tau1	adjustment for rho
tau2	adjustment for rho
crit	criterion for convergence c('ADMM', 'grad', 'lik'). Option crit != 'ADMM' will use tol1 as tolerance. Default is 'ADMM'
tol1	absolute tolerance. Defaults to 1e-4
tol2	relative tolerance. Defaults to 1e-4
maxit	maximum number of iterations
ind	vector of a permutation of 1,..,n for CV
K	specify the number of folds for cross validation
quiet	specify whether the function returns progress of CV or not

Value

iterations, lam, omega, and gradient

Examples

```
ADMM_sigma(X, lam = 0.1, rho = 10)
```

ADMMsigmac   *ADMM penalized precision matrix estimation (c++)*

Description

Penalized Gaussian likelihood precision matrix estimation using the ADMM algorithm.

Usage

```
ADMMsigmac(S, lam, alpha = 1, rho = 2, mu = 10, tau1 = 2, tau2 = 2,
  crit = "ADMM", tol1 = 1e-04, tol2 = 1e-04, maxit = 1000L)
```

Arguments

S	option to specify sample covariance matrix (denominator n)
lam	tuning parameter for penalty
alpha	elasticnet mixing parameter [0, 1]: 0 = ridge, 1 = lasso/bridge
rho	initial step size for ADMM
mu	factor for primal and residual norms
tau1	adjustment for rho
tau2	adjustment for rho
crit	criterion for convergence c("ADMM", "grad", "lik"). Option crit != "ADMM" will use tol1 as tolerance. Defaults to "ADMM"
tol1	absolute tolerance. Defaults to 1e-4
tol2	relative tolerance. Defaults to 1e-4
maxit	maximum number of iterations
X	data matrix

Value

iterations, lam, omega

Examples

```
ADMM_sigmac(X, lam = 0.1)
```

CV_ADMMsigma   *CV ADMM penalized precision matrix estimation*

Description

Cross validation function for ADMM_sigma.

Usage

```
CV_ADMMsigma(X, lam, alpha = 1, rho = 2, mu = 10, tau1 = 2, tau2 = 2,
  crit = "ADMM", tol1 = 1e-04, tol2 = 1e-04, maxit = 1000, ind = NULL,
  K = 3, quiet = TRUE)
```

Arguments

X	matrix or data frame. This is the n x p column matrix where the rows are a realization of n independent copies of a p-variate random vector
lam	tuning parameter for penalty. Defaults to 10^seq(-5, 5, 0.5)
alpha	elasticnet mixing parameter [0, 1]: 0 = ridge, 1 = lasso/bridge
rho	initial step size for ADMM
mu	factor for primal and residual norms
tau1	adjustment for rho
tau2	adjustment for rho
crit	criterion for convergence c('ADMM', 'grad', 'lik'). Option crit != 'ADMM' will use tol1 as tolerance. Defaults to 'ADMM'
tol1	absolute tolerance. Defaults to 1e-4
tol2	relative tolerance. Defaults to 1e-4
maxit	maximum number of iterations
ind	vector of a permutation of 1,..,n for CV
K	specify the number of folds for cross validation
quiet	specify whether the function returns progress of CV or not

Value

iterations, lam, S, Omega, and cv.errors

Examples

```
CV_ADMMsigma(X, lam = seq(0.1, 3, 0.1))
```

CV_sigma_ridge   *CV Ridge-penalized precision matrix estimation*

Description

Cross validation function for sigma_ridge.

Usage

```
CV_sigma_ridge(X, lam, ind = NULL, K = 5, quiet = TRUE)
```

Arguments

X	matrix or data frame. This is the n x p column matrix where the rows are a realization of n independent copies of a p-variate random vector
lam	tuning parameters for ridge regularization term.
ind	vector of a permutation of 1,..,n
K	specify the number of folds for cross validation
quiet	specify whether the function returns progress or not

Value

omega hat matrix, best lambda, CV error, vector of lambdas

Examples

```
CV_sigma_ridge(X, lam = seq(0.1, 3, 0.1))
```

sigma_ridge   *Ridge-penalized precision matrix estimation*

Description

Ridge-penalized Gaussian likelihood precision matrix estimation.

Usage

```
sigma_ridge(S, lam)
```

Arguments

S	sample covariance matrix (denominator n)
lam	tuning parameter for penalty

Value

matrix of omega hat

Examples

```
n = nrow(X)
sigma_ridge(S = (n-1)/n*cov(X), lam = 0.1)
```

Index