Package ‘Difdtl’

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Type Package

Title Difference of Two Precision Matrices Estimation

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Depends MASS

Description Difference of two precision matrices is estimated by the d-trace loss with lasso penalty, given two sample classes.

NeedsCompilation yes

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`Difdtl-package` *Difference of Two Precision Matrices Estimation*

Description

Difference of two precision matrices is estimated by the d-trace loss with lasso penalty, given two sample classes.

Details

Package:	Dpmdtl
Type:	Package
Version:	1.0
Date:	2016-04-26
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Author(s)

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References

Huili Yuan, Ruibin Xi and Minghua Deng(2015). Differential Network Analysis via the Lasso Penalized D-Trace Loss. http://arxiv.org/abs/1511.09188

Examples

```
##generate samples
library(MASS)
set.seed(1);
Sigma1 = genp(50,0.2,0.5)
set.seed(1);
Sigma2 = Sigma1+genp1(50,100,0.5)
tdelta = Sigma2-Sigma1
SigmaX<-solve(Sigma1)
SigmaY<-solve(Sigma2)
n<-200
p<-50
X1<-mvrnorm(n,rep(0,p),SigmaX)
Y1<-mvrnorm(n,rep(0,p),SigmaY)
##use of Dpmdtl
dpmdtl<- Dpmdtl(X1,Y1,nlambda=10,tuning="bic")
```

Dpmdtl *Return the result of difference of two precision matrices estimation by d-trace loss with lasso penalty.*

Description

Calculate the result of difference of two precision matrices estimation by d-trace loss with lasso penalty, given two sample classes.

Usage

```
Dpmdtl(X1, X0, lambda = NULL, nlambda = 10, lambda.min.ratio = NULL,
rho = NULL, shrink = NULL, prec = 0.001, correlation = FALSE,
tuning = c("none", "aic", "bic", "nbic"))
```

Arguments

X1	A nXp matrix.
X0	A nXp matrix.
lambda	The tuning parameter of lasso penalty.
nlambda	The number of tuning parameter of lasso penalty for selection.
lambda.min.ratio	
rho	The parameter in augmented Lagrange method. The rho here equals the 2*rho in the reference paper.
shrink	
prec	
correlation	
tuning	The method used in the lambda selection.

Value

Dpmdtl	The result of estimation by d-trace loss with lasso penalty.
lambda	The lambda used in the lasso penalty
nlambda	The number of lambda used in the lasso penalty
opt	Number of best lambda chosen by different matrix norms.

Author(s)

Huili Yuan

References

Huili Yuan, Ruibin Xi and Minghua Deng(2015). Differential Network Analysis via the Lasso Penalized D-Trace Loss. http://arxiv.org/abs/1511.09188

Examples

```
##generate samples
library(MASS)
set.seed(1);
Sigma1 = genp(50,0.2,0.5)
set.seed(1);
Sigma2 = Sigma1+genp1(50,100,0.5)
tdelta = Sigma2-Sigma1
SigmaX<-solve(Sigma1)
SigmaY<-solve(Sigma2)
n<-200
p<-50
X1<-mvrnorm(n,rep(0,p),SigmaX)
Y1<-mvrnorm(n,rep(0,p),SigmaY)
##use of Dpmdtl
dpmdtl<- Dpmdtl(X1,Y1,nlambda=10,tuning="bic")
```

---

dpmdtl.ic *Return the best lambda number selected by AIC.*

Description

Return the best lambda number selected by AIC by different norms, given sample covariance matrices of two sample classes, estimation by different lambdas and the total number of samples.

Usage

```
dpmdtl.ic(S1, S0, ret, n, penalty)
```

Arguments

S1	A pXp matrix. The sample covariance matrix of one sample class.
S0	A pXp matrix. The sample covariance matrix of one sample class.
ret	A list consist of pXp matrices.
n	The total number of samples.
penalty	The magnitude of penalty.

Value

A vector of best lambda number chosen by different matrix norms.

References

Zhao,S., Cai,T.& Li,H.(2014) Direct estimation of differential networks. Biometrika 101, 253-268.

Examples

```
##generate samples
library(MASS)
set.seed(1);
Sigma1 = genp(50,0.2,0.5)
set.seed(1);
Sigma2 = Sigma1+genp1(50,100,0.5)
tdelta = Sigma2-Sigma1
S1<-solve(Sigma1)
S0<-solve(Sigma2)
n<-200
p<-50
X1<-mvrnorm(n,rep(0,p),S1)
Y1<-mvrnorm(n,rep(0,p),S0)
dpmdtl<- Dpmdtl(X1,Y1,nlambda=10,tuning="none")
ret<-dpmdtl$Dpmdtl
##use of dpmdtl.ic
aic=dpmdtl.ic(S1,S0,ret,2*n,2)
```

---

genp *Generate one precision matrix.*

Description

Generate one precision matrix with certain sparse degree.

Usage

```
genp(p, sparsity, sigma)
```

Arguments

p	The dim of the matrix.
sparsity	The sparse degree.
sigma	The parameter used to describe the magnitude of the non-zero element.

Value

A symetric positive definite pXp matrix.

Examples

```
set.seed(1)
sparsematrix<-genp(50,0.05,0.5)
```

genp1 *Generate difference of two precision matrices.*

Description

Generate difference of two precision matrices with certain number of non-zero elements.

Usage

```
genp1(p, n, sigma)
```

Arguments

p	The dim of the matrix.
n	The non-zero element in the matrix.
sigma	The parameter used to describe the magnitude of the non-zero element.

Value

A symmetric pXp matrix.

Examples

```
set.seed(1)
diffmatrix<-genp1(50,100,0.5)
```

L1_dts *The algorithm used to calculate the difference of two precision matrices estimation.*

Description

Calculate the difference of two precision matrices estimation, given the sample covariance matrices of two sample classes.

Usage

```
L1_dts(SigmaX, SigmaY, rho, lambda)
```

Arguments

SigmaX	A pXp matrix.
SigmaY	A pXp matrix.
rho	The parameter used in augmented Lagrange method.
lambda	The tuning parameter of lasso penalty.

Value

A symmetric pXp matrix.

Author(s)

Huili Yuan

References

Huili Yuan, Ruibin Xi and Minghua Deng(2015). Differential Network Analysis via the Lasso Penalized D-Trace Loss. http://arxiv.org/abs/1511.09188

Examples

```
##generate samples
library(MASS)
set.seed(1);
Sigma1 = genp(50,0.2,0.5)
set.seed(1);
Sigma2 = Sigma1+genp1(50,100,0.5)
tdelta = Sigma2-Sigma1
SigmaX<-solve(Sigma1)
SigmaY<-solve(Sigma2)
n<-200
p<-50
X1<-mvrnorm(n,rep(0,p),SigmaX)
Y1<-mvrnorm(n,rep(0,p),SigmaY)
##use of L1_dts
dtsmatrix<-L1_dts(SigmaX, SigmaY,1,0.5)
```

`loss` *Calculate the loss function value for the estimation.*

Description

Calculate the loss function value for the estimation, given the estimation of two precision matrices and the sample covariance matrices of two sample classes.

Usage

```
loss(D, S1, S0)
```

Arguments

D	The difference of two precision matrics estimation.
S1	The sample covariance matrix for one sample class.
S0	The sample covariance matrix for one sample class.

Value

A vector of loss function value by different matrix norms.

Author(s)

Huili Yuan

References

Huili Yuan, Ruibin Xi and Minghua Deng(2015). Differential Network Analysis via the Lasso Penalized D-Trace Loss. http://arxiv.org/abs/1511.09188

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