Package 'GSparO'

February 20, 2017

Title Group Sparse Optimization

Version 1.0

Description
Approaches a group sparse solution of an underdetermined linear system. It implements the proximal gradient algorithm to solve a lower regularization model of group sparse learning. For details, please refer to the paper ``Y. Hu, C. Li, K. Meng, J. Qin and X. Yang. Group sparse optimization via l_{p,q} regularization. Journal of Machine Learning Research, to appear, 2017''.

Depends R (>= 3.3.1)

License GPL (>= 2)

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LazyData true

Imports stats,ThreeWay,ggplot2

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NeedsCompilation no

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R topics documented:

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demon   *The example for GSparO*

Description

demon is a function that implements GSparO for an example of least squares regression with A and b being Gaussian ensembles. A figure plotting the true signal and estimation by GSparO is illustrated in Plots, and the errors of least squares regression and obtained solution are printed. Two packages ThreeWay and ggplot2 should be installed for implementing demon.

Usage

```
demon()
```

Details

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Examples

```
demon()
```

GSparO   *Group sparse optimization*

Description

Group sparse optimization (GSparO) for least squares regression by using the proximal gradient algorithm to solve the L_2,1/2 regularization model.

Usage

```
GSparO(A, b, Initial, group, MaxIter, sparsity)
```

Arguments

A	decoding matrix (matrix of predictors)
b	noised signal (response)
Initial	an initial point of iteration, recommend to set as a column vector of zeros
group	group information, a column vector consisting of the length of each group
MaxIter	the maximum number of iterations (a stopping criterion), recommend to set as 200
sparsity	a guess of the group sparsity level (the number of nonzero groups)

Details

GSparO is group sparse optimization for least squares regression described in [Hu et al(2017)], in which the proximal gradient algorithm is implemented to solve the L_2,1/2 regularization model. GSparO is an iterative algorithm consisting of a gradient step for the least squares regression and a proximal steps for the L_2,1/2 penalty, which is analytically formulated in this function. Also, GSparO can solve sparse variable selection problem in absence of group structure. In particular, setting group in GSparO be a vector of ones, GSparO is reduced to the iterative half thresholding algorithm introduced in [Xu et al (2012)]. Copyright by Dr. Yaohua Hu, College of Mathematics and Statistics, Shenzhen University. Email: mayhhu@szu.edu.cn

Author(s)

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References

Y. Hu, C. Li, K. Meng, J. Qin, and X. Yang (2017). Group sparse optimization via L_p,q regularization. Journal of Machine Learning Research, to appear.

Z. Xu, X. Chang, F. Xu, and H. Zhang (2012). L_1/2 regularization: A thresholding representation theory and a fast solver. IEEE Transactions on Neural Networks and Learning Systems.

Examples

```
m <- 256
n <- 1024
sparsity <- 6
gLen <- 16
MaxIter <- 200
gNo <- 1024/gLen
group <- gLen*matrix(1,gNo,1)
A <- matrix(rnorm(m*n,0,1),m,n)
library(ThreeWay)
A <- orth(t(A))
A <- t(A)
gNo1 <- 1:gNo
ActInd <- sample(gNo1,gNo)
Bs <- matrix(0,n,1)
c <- matrix(rnorm(n,0,1),n,1)
for (i in 1:sparsity){
 Bs[((ActInd[i]-1)*gLen+1):(ActInd[i]*gLen)] <- matrix(1,gLen,1)}
c <- Bs*c
sigma <- 1e-3
b <- A%*%c + sigma*matrix(runif(m,min=0,max=1),m,1)
Initial <- matrix(0,n,1)
GSparO(A,b,Initial,group,MaxIter,sparsity)
```

Index