Package ‘GGRidge’

October 12, 2022

Type Package

Title Graphical Group Ridge

Version 0.1.0

Author Saeed Aldahmani and Taoufik Zoubeidi

Maintainer Saeed Aldahmani <`saldahmani@uaeu.ac.ae`>

Description The Graphical Group Ridge 'GGRidge' package package classifies ridge regression predictors in disjoint groups of conditionally correlated variables and derives different penalties (shrinkage parameters) for these groups of predictors. It combines the ridge regression method with the graphical model for high-dimensional data (i.e. the number of predictors exceeds the number of cases) or ill-conditioned data (e.g. in the presence of multicollinearity among predictors). The package reduces the mean square errors and the extent of overshrinking of predictors as compared to the ridge method.

License GPL-2

Imports gRbase, CVglasso, MASS, graph

RoxygenNote 6.0.1

NeedsCompilation no

Repository CRAN

Date/Publication 2021-03-02 10:10:06 UTC

R topics documented:

GGRidge-package 2
GGRidge 3
SampleEyeData 5

Index **6**

`GGRidge-package` *GGRidge: Graphical Group Ridge*

Description

The Graphical Group Ridge 'GGRidge' classifies ridge regression predictors in disjoint groups of conditionally correlated variables and derives different penalties (shrinkage parameters) for these groups of predictors. It combines the ridge regression method with the graphical model for high-dimensional data (i.e. the number of predictors exceeds the number of cases) or ill-conditioned data (e.g. in the presence of multicollinearity among predictors). The package reduces the mean square errors and the extent of over-shrinking of predictors as compared to the ridge method.

Details

Package:	GGRidge
Type:	Package
Version:	1.0
Date:	2021-1-28
License:	GPL-2

Author(s)

Saeed Aldahmani and Taoufik Zoubeidi

Maintainer: Saeed Aldahmani <saldahmani@uaeu.ac.ae>

References

Claus Dethlefsen and Soren Hojsgaard (2005): A Common Platform for Graphical Models in R: The gRbase Package, *Journal of Statistical Software*, `https://www.jstatsoft.org/v14/i17/`, 14(17).

Gabor Csardi and Tamas Nepusz (2006): The igraph software package for complex network research, *Inter Journal*, `https://igraph.org`.

Saeed Aldahmani and Taoufik Zoubeidi (2020): Graphical group ridge, *Journal of Statistical Computation and Simulation*.

Matt Galloway (2018):CVglasso: Lasso Penalized Precision Matrix Estimation, `https://CRAN.R-project.org/package=CVglasso`.

Scheetz, T.E., Kim, K.Y.A., Swiderski, R.E., Philp, A.R., Braun, T.A., Knudtson, K.L., Dorrance, A.M., DiBona, G.F., Huang, J., Casavant, T.L. and Sheffield, V.C. (2006). Regulation of gene expression in the mammalian eye and its relevance to eye disease. *Proceedings of the National Academy of Sciences*.

`GGRidge` *GGRidge: Graphical group ridge*

Description

The function has two main tasks. The first task is to find the graph structure (using GraphicalLasso) which is used to identify the conditionally correlated groups of predictors and then search for the optimal values of the tuning parameters to estimate the GGRidge regression coeffcients. For given data, an estimated regression coeffcients, mean squared error (MSE) and the shrinkage parameters for the estimated groups of predictors are returned.

Usage

```
GGRidge(data, kg=5, sq=c(0.01,5,0.01), k=5, PE=50)
```

Arguments

`data`	A matrix of dimension `n x v)` where `v=(p+1)` consisting of the values of the predictors and the response variable (last variable).
`kg`	Number of splits in k-fold cross-validation to find the graph structure. Default value is kg=5.
`sq`	The starting (maximal) end values and number: increment of the sequence of the tuning parameters for the generated penalty term. Defaults are 0.01, 5 & 0.01 respectively.
`k`	Number of splits in k-fold cross-validation to find the ridge penalty parameter. Default value is k=5.
`PE`	The number of iterations used in computing the prediction mean square error for each group of predictors. The default is PE=50.

Value

A list of three values:

`Coefficients`	The vector of estimated regression parameters.
`MSE`	Mean square error for the parameters.
`lambda.opt`	Optimal values of the penalty.

Author(s)

Saeed Aldahmani and Taoufik Zoubeidi

References

Claus Dethlefsen and Soren Hojsgaard (2005): A Common Platform for Graphical Models in R: The gRbase Package, *Journal of Statistical Software*, https://www.jstatsoft.org/v14/i17/, 14(17).

Gabor Csardi and Tamas Nepusz (2006): The igraph software package for complex network research, *Inter Journal*, https://igraph.org.

Saeed Aldahmani and Taoufik Zoubeidi (2020): Graphical group ridge, *Journal of Statistical Computation and Simulation*.

Matt Galloway (2018):CVglasso: Lasso Penalized Precision Matrix Estimation, https://CRAN.R-project.org/package=CVglasso.

Scheetz, T.E., Kim, K.Y.A., Swiderski, R.E., Philp, A.R., Braun, T.A., Knudtson, K.L., Dorrance, A.M., DiBona, G.F., Huang, J., Casavant, T.L. and Sheffield, V.C. (2006). Regulation of gene expression in the mammalian eye and its relevance to eye disease. *Proceedings of the National Academy of Sciences*.

Examples

```
###################################

# Example

###################################
library(gRbase)
library("CVglasso")
library("MASS")
#load the data
data(SampleEyeData)
x <- scale(SampleEyeData[,-51], center = TRUE, scale = TRUE)
y <- scale(SampleEyeData[,51], center = TRUE)

Data<-as.matrix(cbind(x,y))



# Call GGRidge(.) .

results <- GGRidge(data=Data,kg=3,sq=c(0.1,.5,0.1),k=3,PE=30)


# The returned objects are

results$Coefficients
results$MSE
results$lambda.opt
```

`SampleEyeData` *SampleEyeData*

Description

The package utilizes a sample of 50 genes from the genes expressions dataset used in Scheetz et al. [2006]. The sampled data set consists of 50 predictors and 40 observations with a continuous response (TRIM32 gene).

Usage

```
data("SampleEyeData")
```

Format

A data frame with 40 observations on 51 variables including the response.

Index

∗ **package**
    `GGRidge`, 3
    `GGRidge-package`, 2

`GGRidge`, 3
`GGRidge-package`, 2

`SampleEyeData`, 5