

Package ‘pass’

February 20, 2015

Type Package

Title Prediction and Stability Selection of Tuning Parameters

Version 1.0

Date 2012-12-21

Author Yixin Fang, Wei Sun, Junhui Wang

Maintainer Yixin Fang <yixin.fang@nyumc.org>

Description To implement two methods, Kappa and PASS, for selecting tuning parameters in regularized procedures such as LASSO, SCAD, adaptive LASSO, aiming for variable selection in regularized regression

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LazyLoad yes

Depends R (>= 2.10.0), MASS, lars, ncvreg

Repository CRAN

Date/Publication 2013-01-12 15:01:38

NeedsCompilation no

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agree.twosets *Agreement of Two Subsets*

Description

To calculate Cohen's Kappa coefficients of two subsets

Usage

```
agree.twosets(aset1, aset2, p.tot)
```

Arguments

aset1	The first subsets
aset2	The second subsets
p.tot	The total number of variables

Value

ratio	The Kappa coefficient of the input two subsets
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References

Cohen (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement* 20: 37-46.

cv.twosets *Two-fold Cross-Validation*

Description

To calculate two-fold cross-validation based on a random splitting

Usage

```
cv.twosets(data1, beta1.hat, data2, beta2.hat)
```

Arguments

data1	The first subsample
beta1.hat	The sparse solution obtained from the first subsample
data2	The second subsample
beta2.hat	The sparse solution obtained from the second subsample

Value

cv.value	The two-fold cross-validation value.
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Description

To perform two methods, Kappa and PASS, for selecting tuning parameters in regularized procedures such as LASSO, SCAD, and adaptive LASSO

Usage

```
pass(data, base = "LASSO", lambda.grid=NULL, num.grid=20, num.split = 20, alpha = 0.1)

## S3 method for class 'pass'
print(x, ...)
## S3 method for class 'pass'
plot(x, ...)
```

Arguments

<code>data</code>	It is an n by $(p+1)$ matrix, where the first p columns form the design matrix and the last column is response vector.
<code>base</code>	It is the base procedure used for variable selection. Three choices of base are "LASSO", "SCAD", and "aLASSO".
<code>lambda.grid</code>	It is a vector consisting of the values of tuning parameter λ to be evaluated. If <code>lambda.grid=NULL</code> , a grid of λ 's will be decided automatically, with specified number of λ 's to be considered.
<code>num.grid</code>	It is the number of λ 's to be considered, where a grid of λ 's is decided manually or automatically. The default value is 20.
<code>num.split</code>	It is the number of random half-half splittings. The default value is 20.
<code>alpha</code>	It is the threshold only used for the Kappa selection method. It is not a tuning parameter. The default value is 0.1.
<code>x</code>	This is the output object of class "pass" to be used in <code>print.pass</code> and <code>plot.pass</code> .
<code>...</code>	Not used.

Details

Because the data matrix will be centered so that the column means are zero, there is no need an intercept column in the data matrix. Function `print.lass(x)` prints the two estimated optimal values of tuning parameter λ and function `plot.lass(x)` plots the two tuning parameter selection processes, where x is the output of function `pass`.

Value

<code>pass.values</code>	The values evaluated over <code>lambda.grid</code> using the PASS criterion. A curve based on these values can be drawn using function <code>plot.pass</code> . The maximum point is selected as the estimated optimal value for the tuning parameter <code>lamda</code> .
<code>kappa.values</code>	The values evaluated over <code>lambda.grid</code> using the Kappa criterion. A curve based on these values can be drawn using function <code>plot.pass</code> . The maximum point (adjusted for the threshold <code>alpha</code>) is selected as the estimated optimal value for the tuning parameter <code>lamda</code> .
<code>lambda.pass</code>	The estimated optimal value for the tuning parameter <code>lambda</code> using the PASS criterion
<code>lambda.kappa</code>	The estimated optimal value for the tuning parameter <code>lambda</code> using the Kappa criterion (adjusted for the threshold <code>alpha</code>)
<code>beta.pass</code>	The estimated coefficients using selected <code>lambda</code> by the PASS criterion
<code>beta.kappa</code>	The estimated coefficients using selected <code>lambda</code> by the Kappa criterion (adjusted for the threshold <code>alpha</code>)
<code>subset.pass</code>	The selected submodel by the PASS criterion
<code>subset.kappa</code>	The selected submodel by the Kappa criterion (adjusted for the threshold <code>alpha</code>)

Author(s)

Yixin Fang, Wei Sun, Junhui Wang

References

- (1) Sun, Wang, and Fang (2012+) Consistent selection of tuning parameters via variable selection stability. Revision Submitted. Available at arXiv.
- (2) Fang, Wang, and Sun (2012+) A PASS for tuning parameter selection in regularized regression. Submitted. Available at arXiv.

Examples

```
library(MASS)
library(lars)
library(ncvreg)

beta=c(3,1.5,0,0,2,0,0,0)
p=8
n=100
sigma=1
rho=0.5

set.seed(100)
x=matrix(0, n, p)
x[,1]<-rnorm(n, 0, 1)
for (i in 2:p) x[,i]<-rho*x[,i-1]+sqrt(1-rho^2)*rnorm(n, 0, 1)
y=x%*%beta+sigma*rnorm(n, 0, 1)
data<-cbind(x,y)
```

```
lambda.grid=10^seq(-2,2,length=20)
results<-pass(data=data, base="LASSO", lambda.grid=lambda.grid, num.grid=20, num.split=20)
print(results)
plot(results)
```

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