

Package ‘CARS’

January 20, 2019

Title Covariate Assisted Ranking and Screening for Large-Scale
Two-Sample Inference

Version 0.2.2

Description It implements the CARS procedure, which is a two-sample multiple testing procedure that utilizes an additional auxiliary variable to capture the sparsity information, hence improving power. The CARS procedure is shown to be asymptotically valid and optimal for FDR control. For more information, please see the website <<http://www-bcf.usc.edu/~wenguans/Papers/CARS.html>> and the accompanying paper.

Depends R (>= 3.2.2)

Imports np, stats

Encoding UTF-8

LazyData true

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RoxygenNote 6.1.0

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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CARS

The CARS procedure for controlling the false discovery rate

Description

This function runs the CARS procedure, constructing the auxiliary variables, computing the test statistics, choosing the cutoff and selecting the locations.

Usage

```
CARS(X, Y, alpha, tau = 0.9, variance, option = c("sparse", "regular"))
```

Arguments

X	the first matrix or data frame of observation
Y	the second matrix or date frame of observation
alpha	targeted FDR (false discovery rate) level
tau	the threshold for choosing interesting locations for density estimation, default is 0.5
variance	for X and Y, default is NULL. If provided, in the form of a m*2 matrix, the columns are representing x and y's variance for each location
option	sparse case for FDR control or regular for FDR control. Sparse case has more stability when it comes to controlling FDR, power is slightly compromised

Value

A list containing the following components:

de	decision for each location (0 or 1)
cars	estimated CARS statistics
th	threshold for CARS procedure

Examples

```
X <- matrix(rnorm(1000), ncol=5, nrow=200);  
Y <- matrix(rep(c(0, 3), c(800, 200))+rnorm(1000), ncol=5, nrow=200);  
CARS(X, Y, 0.05, tau=0.9, option='regular');
```

epsest.func	<i>Estimation of the non-null proportion</i>
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Description

Estimates the proportion of non-nulls.

Usage

```
epsest.func(x, u, sigma)
```

Arguments

x	the corresponding vector to be estimated
u	the mean of the null distribution
sigma	the standard deviation of the null distribution

Value

a value indicating the estimated non-null proportion

Examples

```
X <- rep(c(0,2),c(800,200))+rnorm(1000);  
epsest.func(X,0,1);
```

lin.itp	<i>Linear interpolation</i>
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Description

Interpolates desired vector given density estimation.

Usage

```
lin.itp(x, X, Y)
```

Arguments

x	the coordinates of points where the density needs to be interpolated
X	the coordinates of the estimated densities
Y	the values of the estimated densities

Value

the interpolated densities

Examples

```
X <- seq(-10,10,length.out=20);  
Y <- dnorm(X);  
x <- seq(-10,10,length.out=100);  
lin.itp(x,X,Y)
```

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