Package 'newIMVC'

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Type Package

Title A Robust Integrated Mean Variance Correlation

Version 0.1.0

Description Measure the dependence structure between two random variables with a new correlation coefficient and extend it to hypothesis test, feature screening and false discovery rate control.

License GPL-3

Encoding UTF-8

Imports splines, quantreg, expm, CompQuadForm, GGMridge, limma, stats

RoxygenNote 7.2.3

Suggests knitr, mvtnorm, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

NeedsCompilation no

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Contents

IMVC *Integrated Mean Variance Correlation*

Description

This function is used to calculate the integrated mean variance correlation between two vectors

Usage

```
IMVC(y, x, K, NN = 3, type)
```

Arguments

y	is a numeric vector
x	is a numeric vector
K	is the number of quantile levels
NN	is the number of B spline basis, default is 3
type	is an indicator for measuring linear or nonlinear correlation, "linear" represents linear correlation and "nonlinear" represents linear or nonlinear correlation using B splines

Value

The value of the corresponding sample statistic

Examples

```
n=200
x=rnorm(n)
y=x^2+rt(n,2)

IMVC(y,x,K=10,type="nonlinear")
```

IMVCFDR *Integrated Mean Variance Correlation Based FDR Control*

Description

This function is used for FDR control with integrated mean variance correlation

Usage

```
IMVCFDR(y, x, K, NN = 3, numboot, timeboot, true_signal, null_method, alpha)
```

Arguments

y	is the response vector
x	is the covariate matrix
K	is the number of quantile levels
NN	is the number of B spline basis, default is 3
numboot	is the size of bootstrap samples
timeboot	is the number of bootstrap times for computing standard deviation of the IMVC
true_signal	is the true active set
null_method	is the estimation method for proportion of true null hypotheses. Choices are "lfdr", "mean", "hist" or "convest"
alpha	is the nominal FDR level

Value

A list of FDP, power and selected variables

Examples

```
require("mvtnorm")
n=200
p=20
pho1=0.5
mean_x=rep(0,p)
sigma_x=matrix(NA,nrow = p,ncol = p)
for (i in 1:p) {
 for (j in 1:p) {
   sigma_x[i,j]=pho1^(abs(i-j))
 }
}
x=rmvnorm(n, mean = mean_x, sigma = sigma_x,method = "chol")
x1=x[,1]
x2=x[,2]
x3=x[,3]
y=2*x1+2*x2+2*x3+rnorm(n)

IMVCFDR(y,x,K=5,numboot=100,timeboot=20,true_signal=c(1,2,3),null_method="hist",alpha=0.2)
```

IMVCS *Integrated Mean Variance Correlation Based Screening*

Description

This function is used to select important features using integrated mean variance correlation

Usage

```
IMVCS(y, x, K, d, NN = 3, type)
```

Arguments

y	is the response vector
x	is the covariate matrix
K	is the number of quantile levels
d	is the size of selected variables
NN	is the number of B spline basis, default is 3
type	is an indicator for measuring linear or nonlinear correlation, "linear" represents linear correlation and "nonlinear" represents linear or nonlinear correlation using B splines

Value

The labels of first d largest active set of all predictors

Examples

```
require("mvtnorm")
n=200
p=500
pho1=0.8
mean_x=rep(0,p)
sigma_x=matrix(NA,nrow = p,ncol = p)
for (i in 1:p) {
 for (j in 1:p) {
   sigma_x[i,j]=pho1^(abs(i-j))
 }
}
x=rmvnorm(n, mean = mean_x, sigma = sigma_x,method = "chol")
x1=x[,1]
x2=x[,2]
x3=x[,12]
x4=x[,22]
y=2*x1+0.5*x2+3*x3*ifelse(x3<0,1,0)+2*x4+rnorm(n)

IMVCS(y,x,K=5,d=round(n/log(n)),type="nonlinear")
```

IMVCT *Integrated Mean Variance Correlation Based Hypothesis Test*

Description

This function is used to test significance of linear or nonlinear correlation using integrated mean variance correlation

Usage

```
IMVCT(x, y, K, num_per, NN = 3, type)
```

Arguments

x	is the univariate covariate vector
y	is the response vector
K	is the number of quantile levels
num_per	is the number of permutation times
NN	is the number of B spline basis, default is 3
type	is an indicator for measuring linear or nonlinear correlation, "linear" represents linear correlation and "nonlinear" represents linear or nonlinear correlation using B splines

Value

The p-value of the corresponding hypothesis test

Examples

```
# linear model
n=100
x=rnorm(n)
y=2*x+rt(n,2)

IMVCT(x,y,K=5,type = "linear")
# nonlinear model
n=100
x=rnorm(n)
y=2*cos(x)+rt(n,2)

IMVCT(x,y,K=5,type = "nonlinear",num_per = 100)
```

Index