Package 'TLIC'

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Type Package

Title The LIC for T Distribution Regression Analysis

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Description This comprehensive toolkit for T-distributed regression is designated as ``TLIC'' (The LIC for T Distribution Regression Analysis) analysis. It is predicated on the assumption that the error term adheres to a T-distribution. The philosophy of the package is described in Guo G. (2020) <doi:10.1080/02664763.2022.2053949>.

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Encoding UTF-8

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Imports stats, LaplacesDemon, fBasics

NeedsCompilation no

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beta_AD *Caculate the estimators of beta on the A-opt and D-opt*

Description

Caculate the estimators of beta on the A-opt and D-opt

Usage

```
beta_AD(K = K, nk = nk, alpha = alpha, X = X, y = y)
```

Arguments

K	is the number of subsets
nk	is the length of subsets
alpha	is the significance level
X	is the observation matrix
y	is the response vector

Value

A list containing:

betaA	The estimator of beta on the A-opt.
betaD	The estimator of beta on the D-opt.

References

Guo, G., Song, H. & Zhu, L. The COR criterion for optimal subset selection in distributed estimation. *Statistics and Computing*, 34, 163 (2024). doi:10.1007/s1122202410471z

Examples

```
p=6;n=1000;K=2;nk=200;alpha=0.05;sigma=1
e=rnorm(n,0,sigma); beta=c(sort(c(runif(p,0,1))));
data=c(rnorm(n*p,5,10));X=matrix(data, ncol=p);
y=X%*%beta+e;
beta_AD(K=K,nk=nk,alpha=alpha,X=X,y=y)
```

beta_cor *Caculate the estimator of beta on the COR*

Description

Caculate the estimator of beta on the COR

Usage

```
beta_cor(K = K, nk = nk, alpha = alpha, X = X, y = y)
```

Arguments

K	is the number of subsets
nk	is the length of subsets
alpha	is the significance level
X	is the observation matrix
y	is the response vector

Value

A list containing:

betaC	The estimator of beta on the COR.

References

Guo, G., Song, H. & Zhu, L. The COR criterion for optimal subset selection in distributed estimation. *Statistics and Computing*, 34, 163 (2024). doi:10.1007/s1122202410471z

Examples

```
p=6;n=1000;K=2;nk=200;alpha=0.05;sigma=1
e=rnorm(n,0,sigma); beta=c(sort(c(runif(p,0,1))));
data=c(rnorm(n*p,5,10));X=matrix(data, ncol=p);
y=X%*%beta+e;
beta_cor(K=K,nk=nk,alpha=alpha,X=X,y=y)
```

`LICnew` *Calculate the LIC estimator based on A-optimal and D-optimal criterion*

Description

Calculate the LIC estimator based on A-optimal and D-optimal criterion

Usage

```
LICnew(X, Y, alpha, K, nk)
```

Arguments

`X`	A matrix of observations (design matrix) with size n x p
`Y`	A vector of responses with length n
`alpha`	The significance level for confidence intervals
`K`	The number of subsets to consider
`nk`	The size of each subset

Value

A list containing:

`E5`	The LIC estimator based on A-optimal and D-optimal criterion.

References

Guo, G., Song, H. & Zhu, L. The COR criterion for optimal subset selection in distributed estimation. *Statistics and Computing*, 34, 163 (2024). doi:10.1007/s1122202410471z

Examples

```
p = 6; n = 1000; K = 2; nk = 200; alpha = 0.05; sigma = 1
e = rnorm(n, 0, sigma); beta = c(sort(c(runif(p, 0, 1))));
data = c(rnorm(n * p, 5, 10)); X = matrix(data, ncol = p);
Y = X %*% beta + e;
LICnew(X = X, Y = Y, alpha = alpha, K = K, nk = nk)
```

terr — *terr function is used to generate a dataset where the error term follows a T-distribution*

Description

This terr function generates a dataset with a specified number of observations and predictors, along with a response vector that has an error term following a T-distribution.

Usage

```
terr(n, nr, p, dist_type, ...)
```

Arguments

n	is the number of observations
nr	is the number of observations with a different error T distribution
p	is the dimension of the observation
dist_type	is the type where the error term obeys a T-distribution
...	is additional arguments for the T-distribution function

Value

X,Y,e

Examples

```
set.seed(12)
data <- terr(n = 1200, nr = 200, p = 5, dist_type = "student_t")
str(data)
```

TLIC — *TLIC function based on LIC with T-distributed errors*

Description

The TLIC function builds on the LIC function by introducing the assumption that the error term follows a T-distribution, thereby enhancing the length and information optimisation criterion.

Usage

```
TLIC(X, Y, alpha = 0.05, K = 10, nk = NULL, dist_type = "student_t")
```

Arguments

X	is a design matrix
Y	is a random response vector of observed values
alpha	is the significance level
K	is the number of subsets
nk	is the sample size of subsets
dist_type	is the type where the error term obeys a T-distribution

Value

MUopt, Bopt, MAEMUopt, MSEMUopt, opt, Yopt

Examples

```
set.seed(12)
n <- 1200
nr <- 200
p <- 5
data <- terr(n, nr, p, dist_type = "student_t")
TLIC(data$X, data$Y, alpha = 0.05, K = 10, nk = n / 10, dist_type = "student_t")
```

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