

# Package ‘TLIC’

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**Type** Package

**Title** The LIC for T Distribution Regression Analysis

**Version** 0.4

**Date** 2025-2-12

**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](https://doi.org/10.1080/02664763.2022.2053949)>.

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**Encoding** UTF-8

**RoxygenNote** 7.3.2

**Imports** stats, LaplacesDemon, fBasics

**NeedsCompilation** no

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beta\_AD

*Calculate the estimators of beta on the A-opt and D-opt***Description**

Calculate 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)
```

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beta\_cor

*Calculate the estimator of beta on the COR*

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### Description

Calculate 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.
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### 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](https://doi.org/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)
```

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LICnew	<i>Calculate the LIC estimator based on A-optimal and D-optimal criterion</i>
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### 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 $n \times p$
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.
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### 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](https://doi.org/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)
```

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terr	<i>terr function is used to generate a dataset where the error term follows a T-distribution</i>
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### 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)
```

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TLIC	<i>TLIC function based on LIC with T-distributed errors</i>
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### 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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