Package 'PLindleyROC'

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Type Package

Title Receiver Operating Characteristic Based on Power Lindley Distribution

Version 0.1.1

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Description Receiver Operating Characteristic (ROC) analysis is performed assuming samples are from the Power Lindley distribution. Specificity, sensitivity, area under the curve and ROC curve are provided.

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URL https://github.com/ErtanSU/PLindleyROC, https://ertansu.github.io/PLindleyROC/

BugReports https://github.com/ErtanSU/PLindleyROC/issues

Suggests knitr,
rmarkdown,
testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

RoxygenNote 7.2.3

R topics documented:

PLindleyROC *Receiver Operating Characteristic based on Power Lindley Distribution*

Description

ROC curve analysis is performed assuming samples are from the Power Lindley distribution. Specificity, sensitivity, area under the curve and ROC curve are provided.

Usage

```
dPLD(x, alpha, beta)

pPLD(x, alpha, beta)

qPLD(p, alpha, beta)

rPLD(n, alpha, beta)

r.pl_auc(
  x,
  y,
  init_param = c(alpha1 = 1, beta1 = 1, alpha2 = 1, beta2 = 1),
  true_param = c(alpha1 = 1, beta1 = 1, alpha2 = 1, beta2 = 1),
  method = c("MLE", "ADE", "CvM", "LSE", "WLSE", "TRUE")
)

r.pl_index(
  x,
  y,
  init_param = c(alpha1 = 1, beta1 = 1, alpha2 = 1, beta2 = 1),
  init_index = 1,
  true_param = c(alpha1 = 1, beta1 = 1, alpha2 = 1, beta2 = 1),
  method = c("MLE", "ADE", "CvM", "LSE", "WLSE", "TRUE")
)

r.pl_graph(
  x,
  y,
  init_param = c(alpha1 = 1, beta1 = 1, alpha2 = 1, beta2 = 1),
  true_param = c(alpha1 = 1, beta1 = 1, alpha2 = 1, beta2 = 1),
  empirical = TRUE,
  method = c("MLE", "ADE", "CvM", "LSE", "WLSE", "TRUE")
)
```

Arguments

x, y	vector of quantiles.
alpha	shape parameter.
beta	scale parameter.

p	vector of probabilities.
n	number of observations. If length(n) > 1, the length is taken to be the number required.
init_param	initial paremeter values for the estimation method.
true_param	true parameter values.
method	estimation method.
init_index	initial index value for the optimization calculation.
empirical	empirical must be TRUE or FALSE.
alpha1	shape parameter of distribution of first sample.
beta1	scale parameter of distribution of first sample.
alpha2	shape parameter of distribution of second sample.
beta2	scale parameter of distribution of second sample.

Details

The probability density function (PDF) and cumulative distribution function (CDF) are as follows:

$$f(x;\boldsymbol{\theta}) = \frac{\alpha\beta^2}{\beta+1}(1+x^\alpha)x^{\alpha-1}\exp(-\beta x^\alpha)$$
$$= zg_1(t) + (1-z)g_2(t),$$

$$F(x;\boldsymbol{\theta}) = P(X \le x) = 1 - (1+zx^\alpha)\exp(-\beta x^\alpha),$$

and quantile function is given by

$$Q(u;\boldsymbol{\theta}) = F^{-1}(u;\boldsymbol{\theta}) = \left\{-\frac{W\left((1+\beta)(-1+u)\exp(-(1+\beta))\right)+1+\beta}{\beta}\right\}^{\frac{1}{\alpha}},$$

where

$$z = \frac{\beta}{\beta+1},$$
$$g_1(x) = \alpha\beta x^{\alpha-1}\exp(-\beta x^\alpha),$$
$$g_2(x) = \alpha\beta^2 x^{2\alpha-1}\exp(-\beta x^\alpha),$$

$\boldsymbol{\theta} = (\alpha, \beta)$, $0 < u < 1$, $\alpha > 0$ is a shape parameter, $\beta > 0$ is a scale parameter and W(•) is Lambert W function.

Value

dPLD gives the probability density function of Power Lindley Distribution.

pPLD gives the cumulative density function of Power Lindley Distribution.

qPLD gives the quantile function of Power Lindley Distribution.

rPLD gives random numbers from Power Lindley Distribution.

r.pl_auc gives the Area Under the Curve (AUC) when the data conforms to the Power Lindley Distribution.

r.pl_index gives index values when the data conforms to the Power Lindley Distribution.

r.pl_graph gives the ROC curve when the data conforms to the Power Lindley Distribution.

References

Akgenç, E., and Kuş, C., 2023, *ROC Curve Analysis for the Measurements Distributed Power-Lindley Distribution*, 2nd International E-Conference On Mathematical And Statistical Sciences: A Selçuk Meeting (ICOMSS-2023), Konya, 25.

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Pundir, S. and Amala, R., 2014, *Evaluation of area under the constant shape bi-weibull roc curve*, Journal of Modern Applied Statistical Methods, 13(1),1-20.

Youden, W. J., 1950, *Index for rating diagnostic tests*, Cancer, 3(1), 32-35.

Examples

```
dPLD(c(1,2,3,4,5,200),alpha=3,beta=2)
pPLD(c(.5,1,2,3,4),alpha=3,beta=2)
qPLD(c(.9971,0.5,0.3),alpha=3,beta=2)
rPLD(10,alpha=3,beta=2)
r.pl_auc(x=c(1,2,2,3,1),y=c(1,3,2,4,2,3),
true_param=c(alpha1=1,beta1=1,alpha2=1,beta2=1),method=c("TRUE"))
r.pl_index(x=c(1,2,2,3,1),y=c(1,3,2,4,2,3),init_param=c(1,1,1,1),
init_index=1,method=c("MLE"))
x=c(1,2,2,3,1)
y=c(1,3,2,4,2,3)
r.pl_graph(x,y,init_param=c(1,1,1,1),
empirical=TRUE,method=c("MLE"))
```

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