Package 'PLindleyROC'

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Type Package

Title Receiver Operating Characteristic Based on Power Lindley Distribution

Version 0.1.2

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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

Encoding UTF-8

RoxygenNote 7.3.2

Language en-US

VignetteBuilder knitr

Imports stats, graphics

Suggests tibble, vctrs, knitr, rmarkdown, testthat (>= 3.0.0)

NeedsCompilation no

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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", "AD", "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", "AD", "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", "AD", "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. The default value for the method is "MLE".
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:

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

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

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.

Additionally, the estimation methods Anderson-Darling "AD", Cramér-von Mises "CvM", least squares "LS" and weighted least squares "WLS" as well as the "TRUE" option for the true value, are available. Please note that the default value for the method parameter is maximum likelihood "ML" estimation.

The cut-off point values corresponding to Youden's J index (J), the criterion closest to (0, 1) (ER), the concordance probability method (CZ), and the newly proposed Ertan-Coskun index (EC) are provided.

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

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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.

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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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