

# Package: TLCAR (via r-universe)

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**Type** Package

**Title** Computation of Topp-Leone Cauchy Rayleigh (TLCAR )  
distribution's properties

**Version** 0.1.0

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**Description** Provides a comprehensive suite of statistical tools for  
analyzing, simulating, and computing properties of the  
Topp-Leone Cauchy Rayleigh (TLCAR) distribution, a versatile  
distribution amalgamating features of the Topp-Leone, Cauchy,  
and Rayleigh distributions, ideal for modeling intricate,  
heterogeneous data across scientific domains. See Atchadé,  
M.N., Bogninou, M.J., and Djibril, A.M. (2023)  
<[doi:10.1007/s44199-023-00066-4](https://doi.org/10.1007/s44199-023-00066-4)> and Atchadé, M.N., Bogninou,  
M.J., and Djibril, A.M. (2024) <[doi:10.1007/s44199-023-00069-1](https://doi.org/10.1007/s44199-023-00069-1)>  
for further insights.

**Depends** R (>= 3.6.0),stats,dplyr,ggplot2

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

**Language** fr

**License** GPL-2

**NeedsCompilation** no

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.2.3

**VignetteBuilder** knitr

**Config/testthat/edition** 3

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**Repository** <https://judepower1.r-universe.dev>

**RemoteUrl** <https://github.com/cran/TLCAR>

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ConductorFailureTimes *Dataset: ConductorFailureTimes*

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### Description

This dataset contains failure times measured in hours from an accelerated life test with 59 conductors.

### Usage

```
data(ConductorFailureTimes)
```

### Format

A numeric vector of failure times.

### Details

This dataset contains failure times (measured in hours) obtained from an accelerated life test involving 59 conductors. The data are presented as a numeric vector.

### References

- Nasiri, B., et al. (2010). "Bayesian analysis of the accelerated life model with Type-II censoring." *Journal of Statistical Planning and Inference*, 140(6), 1565-1572.
- Schafft, H. A., et al. (1987). "Reproducibility of the accelerated test for electric cable insulation." *IEEE Transactions on Electrical Insulation*, 22(5), 739-746.

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cTLCAR

*Cumulative Distribution Function (CDF) for the TLCAR Distribution*


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**Description**

Calculate the cumulative distribution at a given value using the TLCAR distribution.

**Usage**

```
cTLCAR(x, alpha, a, b, theta, m)
```

**Arguments**

x	Value at which to calculate the CDF.
alpha	Parameter representing the distribution of the Topp-Leone component.
a	Parameter representing the scale (a) of the Cauchy component.
b	Parameter representing the position (b) of the Cauchy component.
theta	Parameter representing the scale of the Rayleigh component.
m	Additional parameter.

**Details**

The cumulative distribution function (CDF) for the TLCAR distribution is defined as follows:

$$F(x) = \left[ 1 - \left( \frac{1}{2} - \frac{1}{\pi} \arctan \frac{x \left( 1 - e^{-\frac{x^2}{2\theta^2}} + m \right) - b}{a} \right)^2 \right]^\alpha$$

**Value**

Cumulative distribution at the given value.

**Examples**

```
cTLCAR(x = 1, alpha = 1, a = 1, b = 0, theta = 2, m = 0.5)
```

dTLCAR

*Probability Density Function (PDF) for the TLCAR Distribution***Description**

Calculate the probability density at a given value using the TLCAR distribution.

**Usage**

dTLCAR(x, alpha, a, b, theta, m)

**Arguments**

x	Value at which to calculate the PDF.
alpha	Parameter representing the distribution of the Topp-Leone component.
a	Parameter representing the scale (a) of the Cauchy component.
b	Parameter representing the position (b) of the Cauchy component.
theta	Parameter representing the scale of the Rayleigh component.
m	Additional parameter.

**Details**

The probability density function (PDF) for the TLCAR distribution is defined as follows:

$$f(x) = \frac{2\alpha}{\pi a} \left[ \frac{1 + \left(\frac{x^2}{\theta^2} - 1\right) e^{-\frac{x^2}{2\theta^2}} + m}{\left(1 + \left(\frac{x \left(1 - e^{-\frac{x^2}{2\theta^2}} + m\right) - b}{a}\right)\right)^2} \right] \left[ \frac{1}{2} - \frac{1}{\pi} \arctan \frac{x \left(1 - e^{-\frac{x^2}{2\theta^2}} + m\right) - b}{a} \right] \left[ 1 - \left( \frac{1}{2} - \frac{1}{\pi} \arctan \frac{x \left(1 - e^{-\frac{x^2}{2\theta^2}} + m\right) - b}{a} \right) \right]$$

**Value**

Probability density at the given value.

**Examples**

dTLCAR(x = 1, alpha = 1, a = 1, b = 0, theta = 2, m = 0.5)

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fTLCAR	<i>Estimate parameters for the TLCAR distribution using maximum likelihood.</i>
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**Description**

This function estimates the parameters of the TLCAR distribution while respecting the constraints on the parameters.

**Usage**

```
fTLCAR(data)
```

**Arguments**

data            Numeric vector of data values.

**Value**

Numeric vector of estimated parameters.

**Examples**

```
data(ConductorFailureTimes)
estimated_params <- fTLCAR(ConductorFailureTimes)
```

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plotTLCAR	<i>Graphical Plot of the TLCAR Distribution</i>
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**Description**

Generate a graphical plot of the probability density function (PDF) or cumulative distribution function (CDF) for the TLCAR distribution.

**Usage**

```
plotTLCAR(x, alpha, a, b, theta, m, type = "pdf")
```

**Arguments**

x                The range of values to plot the distribution.  
alpha            Parameter representing the distribution of the Topp-Leone component.  
a                Parameter representing the scale (a) of the Cauchy component.  
b                Parameter representing the position (b) of the Cauchy component.  
theta            Parameter representing the scale of the Rayleigh component.  
m                Additional parameter.  
type             The type of plot to generate: "pdf" for PDF plot, "cdf" for CDF plot.

**Value**

A graphical plot of the TLCAR distribution.

**Examples**

```
ploTLCAR(x = seq(0, 10, by = 0.1), alpha = 0.5, a = 1, b = 0, theta = 2, m = 1, type = "pdf")
```

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qTLCAR

*Quantile function for TLCAR distribution*


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**Description**

Calculate the quantile value for a given probability using the TLCAR distribution.

**Usage**

```
qTLCAR(p, alpha, a, b, theta, m)
```

**Arguments**

p	Probability value (between 0 and 1).
alpha	Parameter representing the distribution of the Topp-Leone component.
a	Parameter representing the scale (a) of the Cauchy component.
b	Parameter representing the position (b) of the Cauchy component.
theta	Parameter representing the scale of the Rayleigh component.
m	Additional parameter.

**Value**

Numeric value representing the quantile.

**Examples**

```
qTLCAR(p = 0.5, alpha = 1, a = 1, b = 0, theta = 3, m = 1)
```

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rTLCAR	<i>Generate a random sample from the TLCAR distribution</i>
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**Description**

Generate a random sample from the TLCAR distribution using the quantile function.

**Usage**

```
rTLCAR(n, alpha, a, b, theta, m)
```

**Arguments**

n	Number of observations in the sample.
alpha	Parameter representing the distribution of the Topp-Leone component.
a	Parameter representing the scale (a) of the Cauchy component.
b	Parameter representing the position (b) of the Cauchy component.
theta	Parameter representing the scale of the Rayleigh component.
m	Additional parameter.

**Value**

Random sample from the TLCAR distribution.

**Examples**

```
# Generate a random sample with 100 observations using estimated parameters  
sample <- rTLCAR(n = 100, alpha = 1, a = 1, b = 0, theta = 3, m = 1)
```

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sTLCAR	<i>Estimate parameters with constraints and plot histogram with estimated density</i>
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**Description**

This function estimates the parameters of the TLCAR distribution while respecting the constraints on the parameters. It plots the histogram of the data along with the estimated density curve.

**Usage**

```
sTLCAR(data)
```

**Arguments**

data            Numeric vector of data values.

**Value**

Numeric vector of estimated parameters.

**Examples**

```
data(ConductorFailureTimes)
sTLCAR(ConductorFailureTimes)
```

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temp_var	<i>Temporary Variable Calculation</i>
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**Description**

This function calculates a temporary variable used in the TLCAR distribution density function.

**Usage**

```
temp_var(x, theta, a, b, m)
```

**Arguments**

x            Numeric vector of values at which to calculate the temporary variable.  
theta        Parameter representing the scale of the Rayleigh component.  
a            Parameter representing the scale (a) of the Cauchy component.  
b            Parameter representing the position (b) of the Cauchy component.  
m            Additional parameter.

**Value**

Numeric vector of calculated temporary variable values



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Tree_diameters	<i>Dataset: Tree_diameters</i>
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**Description**

This dataset contains tree diameter measurements (in cm) for Teak trees in the Agrimey sector in Benin.

**Usage**

```
data(Tree_diameters)
```

**Format**

A numeric vector of tree diameter measurements (in cm).

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