

Package ‘SujathaDist’

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Type Package

Title Statistical Methods for the Sujatha Distribution

Version 1.0.0

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Description Provides computational tools for the Sujatha distribution, including probability density, cumulative distribution, quantile function, random number generation, parameter estimation by maximum likelihood, goodness-of-fit procedures, and associated statistical methods for lifetime data analysis. The implemented methods are based on the Sujatha distribution proposed by Shanker (2016) <[doi:10.59170/stattrans-2016-023](https://doi.org/10.59170/stattrans-2016-023)>.

License GPL-3

Encoding UTF-8

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Depends R (>= 4.1.0)

Imports stats, graphics

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

VignetteBuilder knitr

URL <https://github.com/hosenur72/SujathaDist>

BugReports <https://github.com/hosenur72/SujathaDist/issues>

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AIC.fitsujatha	<i>Akaike Information Criterion</i>
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Description

Akaike Information Criterion

Usage

```
## S3 method for class 'fitsujatha'  
AIC(object, ...)
```

Arguments

- object An object of class "fitsujatha".
- ... Additional arguments passed to or from other methods.

Value

AIC value.

BIC.fitsujatha	<i>Bayesian Information Criterion</i>
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Description

Returns the Bayesian Information Criterion (BIC).

Usage

```
## S3 method for class 'fitsujatha'
BIC(object, ...)
```

Arguments

object	An object of class "fitsujatha".
...	Additional arguments passed to or from other methods.

Value

A numeric value giving the BIC.

coef.fitsujatha	<i>Coefficients of a fitted Sujatha distribution</i>
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Description

Coefficients of a fitted Sujatha distribution

Usage

```
## S3 method for class 'fitsujatha'
coef(object, ...)
```

Arguments

object	An object of class "fitsujatha".
...	Additional arguments passed to or from other methods.

Value

Estimated parameter(s).

confint.fitsujatha	<i>Confidence Intervals</i>
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Description

Computes Wald confidence intervals.

Usage

```
## S3 method for class 'fitsujatha'  
confint(object, parm = NULL, level = 0.95, ...)
```

Arguments

object	An object of class "fitsujatha".
parm	Ignored.
level	Confidence level.
...	Additional arguments passed to or from other methods.

Value

Confidence interval matrix.

deviance.fitsujatha	<i>Deviance</i>
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Description

Deviance

Usage

```
## S3 method for class 'fitsujatha'  
deviance(object, ...)
```

Arguments

object	An object of class "fitsujatha".
...	Additional arguments passed to or from other methods.

Value

Model deviance.

`dsujatha`*Density Function of the Sujatha Distribution*

Description

Computes the probability density function (PDF) of the Sujatha distribution.

Usage

```
dsujatha(x, theta)
```

Arguments

<code>x</code>	A numeric vector of observations.
<code>theta</code>	A positive parameter.

Value

A numeric vector of density values.

Examples

```
dsujatha(1, theta = 2)
dsujatha(c(0.5, 1, 2), theta = 3)
```

`fitsujatha`*Maximum Likelihood Estimation for the Sujatha Distribution*

Description

Fits the Sujatha distribution using Maximum Likelihood Estimation (MLE).

Usage

```
fitsujatha(x, start = 1, method = "L-BFGS-B")
```

Arguments

<code>x</code>	A numeric vector of observations.
<code>start</code>	Initial value of theta.
<code>method</code>	Optimization method (default = "L-BFGS-B").

Value

An object of class "fitsujatha" containing

- Estimate
- Standard error
- Variance-covariance matrix
- Hessian matrix
- Log-likelihood
- AIC
- AICc
- BIC
- CAIC
- HQIC
- Deviance
- Convergence status
- Number of iterations
- Original data

Examples

```
set.seed(123)
x <- rsujatha(100, theta = 2)
fit <- fitsujatha(x)
fit
```

gofsujatha

Goodness-of-Fit Measures for the Sujatha Distribution

Description

Computes several goodness-of-fit statistics for a fitted Sujatha distribution.

Usage

```
gofsujatha(object)
```

Arguments

object An object of class "fitsujatha".

Value

A list containing

- Log-likelihood
- AIC
- AICc
- BIC
- CAIC
- HQIC
- KS statistic
- KS p-value
- Anderson-Darling statistic
- AD p-value
- Cramer-von Mises statistic
- CVM p-value
- Watson statistic
- Watson p-value

logLik.fitsujatha	<i>Log-likelihood</i>
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Description

Log-likelihood

Usage

```
## S3 method for class 'fitsujatha'  
logLik(object, ...)
```

Arguments

object	An object of class "fitsujatha".
...	Additional arguments passed to or from other methods.

Value

Object of class "logLik".

plot.fitsujatha	<i>Diagnostic Plots for Sujatha Distribution</i>
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Description

Produces diagnostic plots for an object of class "fitsujatha".

Usage

```
## S3 method for class 'fitsujatha'
plot(x, which = 1, ...)
```

Arguments

x	An object of class "fitsujatha".
which	Integer specifying the plot to draw.
...	Additional arguments passed to or from other methods.

Value

A diagnostic plot.

print.fitsujatha	<i>Print a fitted Sujatha distribution</i>
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Description

Print a fitted Sujatha distribution

Usage

```
## S3 method for class 'fitsujatha'
print(x, ...)
```

Arguments

x	An object of class "fitsujatha".
...	Additional arguments passed to or from other methods.

Value

Prints the fitted model summary.

psujatha

Cumulative Distribution Function of the Sujatha Distribution

Description

Computes the cumulative distribution function (CDF).

Usage

```
psujatha(q, theta)
```

Arguments

q	Numeric vector of quantiles.
theta	Positive parameter.

Value

A numeric vector of cumulative probabilities.

Examples

```
psujatha(1, theta = 2)
```

qsujatha

Quantile Function of the Sujatha Distribution

Description

Computes quantiles of the Sujatha distribution by numerically inverting the cumulative distribution function.

Usage

```
qsujatha(p, theta, lower.tail = TRUE, log.p = FALSE)
```

Arguments

p	Numeric vector of probabilities.
theta	Positive parameter.
lower.tail	Logical; if TRUE (default), probabilities are $P(X \leq x)$.
log.p	Logical; if TRUE, probabilities are given as $\log(p)$.

Value

A numeric vector of quantiles.

Examples

```
qsujatha(0.5, theta = 2)
```

rsujatha

Random Generation from the Sujatha Distribution

Description

Generates random observations from the Sujatha distribution using one of three methods: #' @details Three random generation methods are available:

- "mixture": Exact gamma-mixture method (default).
- "inverse": Inverse transform method.
- "rejection": Acceptance-rejection method using an exponential proposal.

Usage

```
rsujatha(
  n,
  theta,
  method = c("mixture", "inverse", "rejection"),
  lambda = NULL,
  M = NULL
)
```

Arguments

n	Number of observations.
theta	Positive parameter of the Sujatha distribution.
method	Generation method. One of "mixture", "inverse", or "rejection".
lambda	Rate parameter of the exponential proposal. Used only for the rejection method.
M	Rejection constant. If NULL, it is computed automatically.

Value

A numeric vector of random observations.

Examples

```
set.seed(123)

## Gamma-mixture method (default)
x1 <- rsujatha(10, theta = 2)

## Inverse transform
x2 <- rsujatha(10, theta = 2, method = "inverse")

## Acceptance-Rejection
x3 <- rsujatha(10,
               theta = 2,
               method = "rejection",
               lambda = 1)
```

vcov.fitsujatha	<i>Variance-Covariance Matrix</i>
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Description

Variance-Covariance Matrix

Usage

```
## S3 method for class 'fitsujatha'
vcov(object, ...)
```

Arguments

object	An object of class "fitsujatha".
...	Additional arguments passed to or from other methods.

Value

Variance-covariance matrix.

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