Package ‘geppe’

June 24, 2024

Type Package

Title Generalised Exponential Poisson and Poisson Exponential Distributions

Version 1.0

Date 2024-06-23

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Depends R (>= 4.0)

Imports Rfast2, stats

Description

Maximum likelihood estimation, random values generation, density computation and other functions for the exponential-Poisson generalised exponential-Poisson and Poisson-exponential distributions. References include: Rodrigues G. C., Louzada F. and Ramos P. L. (2018). ``Poisson-exponential distribution: different methods of estimation''. Journal of Applied Statistics, 45(1): 128--144. <doi:10.1080/02664763.2016.1268571>. Louzada F., Ramos, P. L. and Ferreira, H. P. (2020). ``Exponential-Poisson distribution: estimation and applications to rainfall and aircraft data with zero occurrence''. Communications in Statistics--Simulation and Computation, 49(4): 1024--1043. <doi:10.1080/03610918.2018.1491988>. Barreto-Souza W. and Cribari-Neto F. (2009). ``A generalization of the exponential-Poisson distribution''. Statistics and Probability Letters, 79(24): 2493--2500. <doi:10.1016/j.spl.2009.09.003>.

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NeedsCompilation no

Repository CRAN

Date/Publication 2024-06-24 16:00:02 UTC

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geppe-package *Generalised Exponential Poisson and Poisson Exponential Distributions*

Description

The package offers sime functions (including MLE) for the exponential-Poisson (EP), the generalised EP (GEP) and the Poisson-exponential (PE) distributions.

Details

Package:	geppe
Type:	Package
Version:	1.0
Date:	2024-06-23
License:	GPL-2

Maintainers

Michail Tsagris <mtsagris@uoc.gr>.

Author(s)

Michail Tsagris <mtsagris@uoc.gr> and Sofia Piperaki <sofiapip23@gmail.com>.

References

Barreto-Souza W. and Cribari-Neto F. (2009). A generalization of the exponential-Poisson distribution. Statistics and Probability Letters, 79(24): 2493–2500.

Louzada F., Ramos P. L. and Ferreira H. P. (2020). Exponential-Poisson distribution: estimation and applications to rainfall and aircraft data with zero occurrence. Communications in Statistics-Simulation and Computation, 49(4): 1024–1043.

Rodrigues G. C., Louzada F. and Ramos P. L. (2018). Poisson-exponential distribution: different methods of estimation. Journal of Applied Statistics, 45(1): 128–144.

Density computation of the GEP, EP and PE distributions
Density computation of the GEP, EP and PE distributions

Description

Density computation of the GEP, EP and PE distributions.

Usage

```
depois(x, beta, lambda, logged = FALSE)
dgep(x, beta, alpha, lambda, logged = FALSE)
dpe(x, theta, lambda, logged = FALSE)
```

Arguments

x	A numerical vector with non-negative values.
beta	A strictly positive number, the scale parameter (β).
alpha	A stritly positive number, the α parameter of the GEP distribution. If $a = 1$, then one ends up with the EP distribution.
theta	A strictly positive number, the shape parameter (θ).
lambda	A strictly positive number, the shape parameter (λ).
logged	Should the logarithm of the density values be computed? The default value is FALSE.

Details

The density values of the GEP, EP and PE distributions are computed. The density function of the EP is given by $f(x) = \frac{\lambda \beta e^{-\lambda - \beta x + \lambda e^{-\beta x}}}{1 - e^{-\lambda}}$.

The density function of the GEP is given by $f(x) = \frac{\alpha \lambda \beta}{(1 - e^{-\lambda})^{\alpha}} \left(1 - e^{-\lambda + \lambda e^{-\beta x}}\right)^{\alpha - 1} e^{-\lambda - \beta x + \lambda e^{-\beta x}}$.

The density function of the PE is given by $f(x) = \frac{\theta \lambda e^{-\lambda x - \theta e^{\lambda x}}}{1 - e^{-\theta}}$.

Value

A vector with the (logged) density values.

Author(s)

Sofia Piperaki.

R implementation and documentation: Sofia Piperaki <`sofiapip23@gmail.com`> and Michail Tsagris <`mtsagris@uoc.gr`>.

References

Barreto-Souza W. and Cribari-Neto F. (2009). A generalization of the exponential-Poisson distribution. Statistics and Probability Letters, 79(24): 2493–2500.

Louzada F., Ramos P. L. and Ferreira H. P. (2020). Exponential-Poisson distribution: estimation and applications to rainfall and aircraft data with zero occurrence. Communications in Statistics-Simulation and Computation, 49(4): 1024–1043.

Rodrigues G. C., Louzada F. and Ramos P. L. (2018). Poisson-exponential distribution: different methods of estimation. Journal of Applied Statistics, 45(1): 128–144.

See Also

rgep, pgep

Examples

```
x <- rgep(100, 1, 2, 3)
y <- dgep(x, 1, 2, 3, logged = TRUE)
sum(y)
```

Distribution function of the GEP, EP and PE distributions

Distribution function of the GEP, EP and PE distributions

Description

Distribution function of the GEP, EP and PE distributions.

Usage

```
pepois(x, beta, lambda)
pgep(x, beta, alpha, lambda)
ppe(x, theta, lambda)
```

Arguments

x	A numerical vector with non-negative values.
beta	A strictly positive number, the scale parameter (β).
alpha	A stritly positive number, the α parameter of the GEP distribution. If $a = 1$, then one ends up with the EP distribution.
theta	A strictly positive number, the shape parameter (θ).
lambda	A strictly positive number, the shape parameter (λ).

Details

The cumulative distribution values of the GEP, EP and PE distributions are computed. The probability function of the EP is given by $f(x) = \frac{e^{\lambda e^{-\beta x}}}{1 - e^{\lambda}}$.

The probability function of the GEP is given by $f(x) = \left(\frac{1 - e^{-\lambda + \lambda e^{-\beta x}}}{1 - e^{-\lambda}} \right)^{\alpha]}$.

The probability function of the PE is given by $f(x) = \frac{1 - e^{\theta - \theta e^{-\lambda x}}}{1 - e^{-\theta}}$.

Value

A vector with the cumulative distribution density values.

Author(s)

Sofia Piperaki.

R implementation and documentation: Sofia Piperaki `<sofiapip23@gmail.com>` and Michail Tsagris `<mtsagris@uoc.gr>`.

References

Barreto-Souza W. and Cribari-Neto F. (2009). A generalization of the exponential-Poisson distribution. Statistics and Probability Letters, 79(24): 2493–2500.

Louzada F., Ramos P. L. and Ferreira H. P. (2020). Exponential-Poisson distribution: estimation and applications to rainfall and aircraft data with zero occurrence. Communications in Statistics-Simulation and Computation, 49(4): 1024–1043.

Rodrigues G. C., Louzada F. and Ramos P. L. (2018). Poisson-exponential distribution: different methods of estimation. Journal of Applied Statistics, 45(1): 128–144.

See Also

`dgep`, `qgep`

Examples

```
x <- rgep(100, 1, 2, 3)
y <- pgep(x, 1, 2, 3)
```

`Maximum likelihood estimation of the GEP, EP and PE distributions`
Maximum likelihood estimation of the GEP, EP and PE distributions

Description

Maximum likelihood estimation of the GEP, EP and PE distributions.

Usage

```
epois.mle(x)
gep.mle(x)
pe.mle(x)
```

Arguments

`x`	A numerical vector with non negative values.

Details

Maximum likelihood estimation of the EP, GEP and PE distributions is performed.

Value

A list including:

`param`	A vector with the estimated values of α, β, θ, λ, depending on the distribution used.
`loglik`	The log-likelihood value of the distribution.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <`mtsagris@uoc.gr`>.

References

Barreto-Souza W. and Cribari-Neto F. (2009). A generalization of the exponential-Poisson distribution. Statistics and Probability Letters, 79(24): 2493–2500.

Louzada F., Ramos P. L. and Ferreira H. P. (2020). Exponential-Poisson distribution: estimation and applications to rainfall and aircraft data with zero occurrence. Communications in Statistics-Simulation and Computation, 49(4): 1024–1043.

Rodrigues G. C., Louzada F. and Ramos P. L. (2018). Poisson-exponential distribution: different methods of estimation. Journal of Applied Statistics, 45(1): 128–144.

See Also

`rgep`

Examples

```
x <- repois( 1000, 1, 3)
epois.mle(x)
```

`Quantile function of the GEP, EP and PE distributions`
Quantile function of the GEP, EP and PE distributions

Description

Quantile function of the GEP, EP and PE distributions.

Usage

```
qepois(p, beta, lambda)
qgep(p, beta, alpha, lambda)
qpe(p, theta, lambda)
```

Arguments

`p`	A numerical vector with probability values.
`beta`	A strictly positive number, the scale parameter (β).
`alpha`	A stritly positive number, the α parameter of the GEP distribution. If $a = 1$, then one ends up with the EP distribution.
`theta`	A strictly positive number, the shape parameter (θ).
`lambda`	A strictly positive number, the shape parameter (λ).

Details

The quantiles of the GEP, EP and PE distributions are computed.

The quantile function of the EP is given by $x_q = -\frac{\log\left[\lambda^{-1}\log\left(q\left(1-e^{\lambda}\right)+e^{\lambda}\right)\right]}{\beta}$.

The quantile function of the GEP is given by $x_q = -\frac{\log\left[1+\lambda^{-1}\log\left(1-q^{1/\alpha}\left(1-e^{-\lambda}\right)\right)\right]}{\beta}$.

The quantile function of the PE is given by $x_q = \frac{\log\left(\theta\right)-\log\left[-\log\left(q-e^{\theta}\left(q-1\right)\right)\right]}{\lambda}$.

Value

A vector with the quantile values.

Author(s)

Sofia Piperaki.

R implementation and documentation: Sofia Piperaki `<sofiapip23@gmail.com>` and Michail Tsagris `<mtsagris@uoc.gr>`.

References

Barreto-Souza W. and Cribari-Neto F. (2009). A generalization of the exponential-Poisson distribution. Statistics and Probability Letters, 79(24): 2493–2500.

Louzada F., Ramos P. L. and Ferreira H. P. (2020). Exponential-Poisson distribution: estimation and applications to rainfall and aircraft data with zero occurrence. Communications in Statistics-Simulation and Computation, 49(4): 1024–1043.

Rodrigues G. C., Louzada F. and Ramos P. L. (2018). Poisson-exponential distribution: different methods of estimation. Journal of Applied Statistics, 45(1): 128–144.

See Also

`rgep`, `pgep`

Examples

```
y <- qgep(seq(0.1, 0.9, by = 0.1), 1, 2, 3)
```

`Random values generation from the GEP, EP and PE distributions`

Random values generation from the GEP, EP and PE distributions

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Description

Random values generation from the GEP, EP and PE distributions.

Usage

```
repois(n, beta, lambda)
rgep(n, beta, alpha, lambda)
rpe(n, theta, lambda)
```

Arguments

`n`	The sample size.
`beta`	A strictly positive number, the scale parameter (β).
`alpha`	A stritly positive number, the α parameter of the GEP distribution. If $a = 1$, then one ends up with the EP distribution.
`theta`	A strictly positive number, the shape parameter (θ).
`lambda`	A strictly positive number, the shape parameter (λ).

Details

In order to generate values from these distributions the inverse rejection sampling is used.

Value

A vector with generated values from the GEP, EP or the PE distribution.

Author(s)

Sofia Piperaki.

R implementation and documentation: Sofia Piperaki `<sofiapip23@gmail.com>` and Michail Tsagris `<mtsagris@uoc.gr>`.

References

Barreto-Souza W. and Cribari-Neto F. (2009). A generalization of the exponential-Poisson distribution. Statistics and Probability Letters, 79(24): 2493–2500.

Louzada F., Ramos P. L. and Ferreira H. P. (2020). Exponential-Poisson distribution: estimation and applications to rainfall and aircraft data with zero occurrence. Communications in Statistics-Simulation and Computation, 49(4): 1024–1043.

Rodrigues G. C., Louzada F. and Ramos P. L. (2018). Poisson-exponential distribution: different methods of estimation. Journal of Applied Statistics, 45(1): 128–144.

See Also

`dgep`

Examples

```
x <- rgep(100, 1, 2, 3)
```

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