Package 'ExtendedLaplace'

May 27, 2025

Title The Extended Laplace Distribution

Version 0.1.6

Description Provides computational tools for working with the Extended Laplace distribution, including the probability density function, cumulative distribution function, quantile function, random variate generation based on convolution with Uniform noise and the quantile-quantile plot. Useful for modeling contaminated Laplace data and other applications in robust statistics. See Saah and Kozubowski (2025) <doi:10.1016/j.cam.2025.116588>.

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Encoding UTF-8

RoxygenNote 7.3.2

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

VignetteBuilder knitr

URL https://doi.org/10.1016/j.cam.2025.116588

BugReports https://github.com/saahdavid/ExtendedLaplace/issues

Imports stats, VGAM

NeedsCompilation no

Author David Saah [aut, cre] (ORCID: <https://orcid.org/0009-0006-8049-3627>), Tomasz Kozubowski [aut]

Maintainer David Saah <saahdavidkofi@gmail.com>

Repository CRAN

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Contents

dEL *Density function of the Extended Laplace Distribution*

Description

Density function of the Extended Laplace Distribution

Usage

```
dEL(y, mu, sigma, delta)
```

Arguments

y	Vector of values where the density is to be evaluated
mu	Location parameter
sigma	Scale parameter (must be > 0)
delta	Uniform noise parameter (must be > 0)

Value

Vector of density values

References

Saah, D. K., & Kozubowski, T. J. (2025). A new class of extended Laplace distributions with applications to modeling contaminated Laplace data. Journal of Computational and Applied Mathematics. doi:10.1016/j.cam.2025.116588

pEL *Cumulative Distribution Function of the Extended Laplace Distribution*

Description

Cumulative Distribution Function of the Extended Laplace Distribution

Usage

```
pEL(y, mu, sigma, delta)
```

Arguments

y	Vector of values where the density is to be evaluated
mu	Location parameter
sigma	Scale parameter (must be > 0)
delta	Uniform noise parameter (must be > 0)

Value

Vector of distribution values

References

Saah, D. K., & Kozubowski, T. J. (2025). A new class of extended Laplace distributions with applications to modeling contaminated Laplace data. Journal of Computational and Applied Mathematics. doi:10.1016/j.cam.2025.116588

`qEL` *Inverse Cumulative Distribution Function or Quantile Function of the Extended Laplace Distribution*

Description

Inverse Cumulative Distribution Function or Quantile Function of the Extended Laplace Distribution

Usage

```
qEL(u, mu, sigma, delta)
```

Arguments

`u`	A numeric vector of probabilities.
`mu`	Location parameter
`sigma`	Scale parameter (must be > 0)
`delta`	Uniform noise parameter (must be > 0)

Value

Vector of quantiles values

References

Saah, D. K., & Kozubowski, T. J. (2025). A new class of extended Laplace distributions with applications to modeling contaminated Laplace data. Journal of Computational and Applied Mathematics. doi:10.1016/j.cam.2025.116588

qqplotEL *Quantile-Quantile Plot for the Extended Laplace Distribution*

Description

Quantile-Quantile Plot for the Extended Laplace Distribution

Usage

```
qqplotEL(sample_data, mu, sigma, delta)
```

Arguments

sample_data	A numeric vector of sample data
mu	Location parameter
sigma	Scale parameter (must be > 0)
delta	Uniform noise parameter (must be > 0)

Value

A Q-Q plot comparing sample data to the theoretical Extended Laplace distribution

Examples

```
sample <- rEL(1000, mu = 0, sigma = 1, delta = 1)
qqplotEL(sample, mu = 0, sigma = 1, delta = 1)
```

rEL *Random Sample Generation of the Extended Laplace Distribution*

Description

Generates random samples from the Extended Laplace distribution using the convolution representation: $Y = X + U$, where $X \sim \text{Laplace}(\mu, \sigma)$ and $U \sim \text{Uniform}(-\delta, \delta)$.

Usage

```
rEL(n, mu, sigma, delta)
```

Arguments

n	Integer. Sample size.
mu	Numeric. Location parameter.
sigma	Numeric. Scale parameter (must be > 0).
delta	Numeric. Uniform noise parameter (must be > 0).

Value

A numeric vector of random samples from the Extended Laplace distribution.

References

Saah, D. K., & Kozubowski, T. J. (2025). A new class of extended Laplace distributions with applications to modeling contaminated Laplace data. *Journal of Computational and Applied Mathematics*. doi:10.1016/j.cam.2025.116588

Examples

```
rEL(10, mu = 0, sigma = 1, delta = 0.5)
```

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