Package 'fixedTimeEvents'

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Type Package

Title The Distribution of Distances Between Discrete Events in Fixed Time

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Description Distribution functions and test for over-representation of short distances in the Liland distribution. Simulation functions are included for comparison.

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URL https://github.com/khliland/fixedTimeEvents/

BugReports https://github.com/khliland/fixedTimeEvents/issues/

Imports stats

Suggests knitr, rmarkdown

VignetteBuilder knitr

RoxygenNote 7.1.1

NeedsCompilation no

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R topics documented:

`dLiland` *The distribution of distances between discrete events in fixed time/space (the Liland distribution)*

Description

Density, distribution function, quantile function and random generation for the Liland distribution with `R` trials and `r` successes.

Usage

```
dLiland(x, R, r, warn = FALSE)
pLiland(q, R, r, lower.tail = TRUE, warn = FALSE)
qLiland(p, R, r)
rLiland(n, R, r)
```

Arguments

`x, q`	vector of quantiles.
`p`	vector of probabilities.
`n`	number of observations.
`R`	number of trials.
`r`	number of successes.
`warn`	logical indicating if a warning should be issued if approximation is used.
`lower.tail`	logical indicating if the lower tail of the distribution should be summed.

Details

The Liland distribution has probability mass

$$f(X = x; R, r) = \frac{\binom{R-x}{r-1}}{\binom{R}{r}}$$

where x is the distance between consecutive successes, R is the number of trials and r is the number of successes.

Value

`dLiland` gives the probability mass, `pLiland` gives the distribution function, `qLiland` gives the quantile function, and `rLiland` generates random Liland values.

Author(s)

Kristian Hovde Liland

References

Liland, KH & Snipen, L, FixedTimeEvents: An R package for the distribution of distances between discrete events in fixed time, SoftwareX 5 (2016).

See Also

Liland, Liland.test, simLiland

Examples

```
dLiland(19, R = 1949, r = 162)
pLiland(19, R = 1949, r = 162)
qLiland(0.5, R = 1949, r = 162)
plot( pLiland(1:100, R = 1949, r = 162) )

## QQ-plot of Liland distribution and random Liland values
R <- 2000
r <- 120
n <- 1000
samp <- rLiland(n,R,r)
theo <- qLiland(ppoints(n),R,r)
qqplot(theo,samp,
       xlab='F(x;2000,120)', ylab='Sample (1000)', axes=FALSE)
axis(1,at=c(0,40,80,120))
axis(2,at=c(0,40,80,120))
box()
qqline(samp, distribution = function(p)qLiland(p,R=2000,r=120), col='gray',lty=2)
```

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facL *Approximated logarithm of factorials*

Description

Stirling's 2nd order approximation of the logarithm of a factorial.

Usage

```
facL(n)
```

Arguments

n	vector of integers for which to compute the logarithmic factorial.

Value

The logarithm of the factorial.

Author(s)

Kristian Hovde Liland

References

Liland, KH & Snipen, L, FixedTimeEvents: An R package for the distribution of distances between discrete events in fixed time, SoftwareX 5 (2016).

See Also

dLiland, Liland, Liland.test, simLiland

Examples

```
# Some values of the logarithm of factorials.
facL( c(2,10,100,1000) )
log( factorial( c(2,10,100,1000) ) )

# Fraction of two factorials
exp( facL(200)-facL(180) )
factorial(200)/factorial(180)
```

Liland *Properties of the Liland distribution*

Description

Calculates the mean and variance of the Liland distribution according to the number of trials and successes.

Usage

```
Liland(R, r)
```

Arguments

R	number of trials.
r	number of successes.

Value

Returns a named vector containing the mean and variance of the Liland distribution.

Author(s)

Kristian Hovde Liland

References

Liland, KH & Snipen, L, FixedTimeEvents: An R package for the distribution of distances between discrete events in fixed time, SoftwareX, in press.

See Also

dLiland, Liland.test, simLiland

Examples

```
Liland(R = 1949, r = 162)
```

Liland.test *A test for over represented short distances in the Liland distribution.*

Description

A binomial test is performed using probabilites from the Liland distribution to check if the number of distances shorter to or equal to xlim are significantly higher than the expected value. Critical value and power are supplied as separate functions.

Usage

```
Liland.test(y, xlim, R, r)
## S3 method for class 'Ltest'
print(x, ...)
## S3 method for class 'Ltest'
summary(object, ...)
Liland.crit(xlim, R, r, alpha = 0.05)
Liland.pow(xlim, R, r, y = 1:(r-1), alpha = 0.05)
```

Arguments

y	The number of observed short distances.
xlim	The maximum distance that is seen as short.
R	The number of trials.
r	The number of successes.
alpha	Significance level.
x	The object to printed.
object	The object to be summarized.
...	Additional arguments for print and summary (not used).

Value

Liland.test returns a named vector of P-values with class Ltest. The other methods only print.

References

Liland, KH & Snipen, L, FixedTimeEvents: An R package for the distribution of distances between discrete events in fixed time, SoftwareX 5 (2016).

See Also

dLiland, Liland, simLiland

Examples

```
Lt <- Liland.test(12,1,1949,162)
print(Lt)
summary(Lt)

# Critical value
Liland.crit(1, 1949, 162)

# Power
plot(Liland.pow(1,1949,161, alpha = 0.05), type = 'l', xlab = '#(x<2)', ylab = 'power')
```

NA2NaN *Translation of values from NA (not available) to NaN (not a number)*

Description

Exchanges all occurrences of NA in a vector with NaN. A warning is issued when NAs or NaNs are found.

Usage

```
NA2NaN(k)
```

Arguments

k	numerical vector possibly containig NAs.

Value

Returns a vector where possible NAs have been changed to NaNs.

Author(s)

Kristian Hovde Liland

See Also

dLiland, Liland, Liland.test, simLiland

Examples

```
NA2NaN( c(0, 1, NA, NaN))
NA2NaN( c(0, 1, 2, NaN))
NA2NaN( c(0, 1, NA, 100))
NA2NaN( c(0, 1, 2, 100))
```

`rrLiland` *Random Bernoulli trials for Liland distributed mean numbers.*

Description

r successes are drawn from R trials. This is repeated n times to produce a random vector of mean Liland distributed numbers.

Usage

```
rrLiland(n, R, r)
```

Arguments

`n`	number of repeated samples.
`R`	number of Bernoulli trials.
`r`	number of successes per sample.

Value

Vector of mean distance between successful events.

Author(s)

Kristian Hovde Liland

References

Liland, KH & Snipen, L, FixedTimeEvents: An R package for the distribution of distances between discrete events in fixed time, SoftwareX 5 (2016).

See Also

`dLiland`, `Liland`, `Liland.test`, `simLiland`

Examples

```
mdist <- rrLiland(1000, 25, 7)
plot(density(mdist))
```

simLiland *Simulations for the Liland distribution.*

Description

Three different simulations are provided for the Liland distribution. These include sampling repeatedly from a given Liland distribution, sampling from the Bernoulli distribution and summarizing, and sampling random mean Liland numbers.

Usage

```
simLiland(S, R, r)
simLiland2(S, R, r)
simLilandMu(S, R, r)
```

Arguments

S	number of samples.
R	number of trials or denominator of Bernoulli probability.
r	number of successes or numerator of Bernoulli probablity.

Value

simLiland returns a vector of simulated Liland probabilities. simLiland2 returns a list of sampled counts (res), summary of counts (counts) and order of counts (ms). simLilandMu returns a vector of simulated mean Liland numbers.

Author(s)

Kristian Hovde Liland

References

Liland, KH & Snipen, L, FixedTimeEvents: An R package for the distribution of distances between discrete events in fixed time, SoftwareX 5 (2016).

See Also

dLiland, Liland, Liland.test

Examples

```
simLiland(1000,20,10)
sl <- simLiland2(1000,20,10)
sl$counts[sl$ms]/1000
plot(density(simLilandMu(1000,20,10)))
```

validate.Rr *Validation of Liland distribution parameters.*

Description

Checks if parameters conform to R >= 2, r >= 2 and r <= R.

Usage

```
validate.Rr(R, r)
```

Arguments

R	number of Bernoulli trials.
r	number of successes.

Value

No return, only testing.

Author(s)

Kristian Hovde Liland

References

Liland, KH & Snipen, L, FixedTimeEvents: An R package for the distribution of distances between discrete events in fixed time, SoftwareX 5 (2016).

See Also

dLiland

Examples

```
validate.Rr(20,10)
## Not run:
# r>R results in an error.
  validate.Rr(20,30)

## End(Not run)
```

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