Package: fixedTimeEvents (via r-universe)

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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

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`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)
```

---

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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