Package 'wrg'

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Title WeibullR Gamma

Description Developing gamma distribution support for package WeibullR.

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URL <http://www.openreliability.org/weibull-r-weibull-analysis-on-r/>

LazyLoad yes

Imports Rcpp (>= 0.11.1)

Depends WeibullR

LinkingTo Rcpp, RcppArmadillo

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NeedsCompilation yes

Repository CRAN

Archs i386, x64

R topics documented:

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gstart   *Generate approximate gamma distribution parameters.*

Description

This function generates parameters suitable for starting a likelihood optimization.

Usage

```
gstart(x)
```

Arguments

x   A dataframe such as generated by mleframe with column names 'left', 'right'
                and optionally 'qty'. Exact failure data (occurrences) have same time entered
                in both 'left' and 'right' columns. Suspension data has last known life[time]
                entered in 'left' column and -1 entered in 'right' column. The left(early) interval
                bound for left-censored data must be entered as zero. (NA is not accepted).

Details

This function performs a correlation of the gamma shape parameter based on the weibull shape
parameter fitted to the data. The beta (rate) parameter is then determined utilizing the mean of
failure data. The correlation is significantly affected by the occurence of right-censored, suspension,
data. This correlation currently considers these suspensions to be evenly occurring within the data.
Strong alteration is known to exist in the presence of late suspensions, which has not yet been
modeled.

Value

Returns a vector of alpha (shape) and beta (rate) parameters for the gamma distribution.

References

William Q. Meeker and Luis A. Escobar, (1998) "Statistical Methods for Reliability Data", Wiley-
Interscience, New York

Robert B. Abernethy, (2008) "The New Weibull Handbook, Fifth Edition"

Marie Laure Delignette-Muller, Christophe Dutang (2015). "fitdistrplus: An R Package for Fitting
Distributions". Journal of Statistical Software, 64(4), 1-34. URL http://www.jstatsoft.org/v64/i04/.

Examples

```
failures<-c(90,96,30,49,82)
suspensions<-c(100,45,10)
gstart(mleframe(failures,suspensions))
```

LLgamma *Log Likelihood for gamma fitted data, failures and suspensions only*

Description

Determination of log-likelihood values for the basic distributions covered by R should be ubiquitous, but an implementation is provided here to enable likelihood ratio testing particularly for comparison of 3-parameter optimized models with their 2-parameter counterpart.

Usage

```
LLgamma(x, s=NULL, alpha_g, beta_g)
```

Arguments

x   A vector of failure data.

s   An optional vector of suspension data.

alpha_g   The shape parameter from a gamma fit.

beta_g   The rate parameter from a gamma fit.

Details

Function LLgamma can only handle datasets with failure and suspension data. For data including intervals wblrLikelihood_g can be used. This function is somewhat unique among likelihood functions in that it will scan the suspension data for removal of negative values. Such negative values are likely to be entered as data is provided for a 3-parameter fit by explicitly providing the original data with vector subtraction by the optimized t0. The primary intention for likelihood determination is to permit likelihood ratio testing for comparison of 3-parameter optimized models with their 2-parameter counterpart.

Value

Returns a log-likelihood value.

References

Marie Laure Delignette-Muller, Christophe Dutang (2015). "fitdistrplus: An R Package for Fitting Distributions". Journal of Statistical Software, 64(4), 1-34. URL http://www.jstatsoft.org/v64/i04/.

Examples

```
failures<-c(90,96,30,49,82)
suspensions<-c(100,45,10)
LL<-LLgamma(failures, suspensions, 5.2 , 0.064)
```

| mle_gamma | *Maximum likelihood regression on the gamma distribution* |

Description

Maximum likelihood regression on the gamma distribution.

Usage

```
mle_gamma(x, par,  control=NULL)
```

Arguments

x	A dataframe such as generated by mleframe with column names 'left', 'right' and optionally 'qty'. Exact failure data (occurrences) have same time entered in both 'left' and 'right' columns. Suspension data has last known life[time] entered in 'left' column and -1 entered in 'right' column. The left(early) interval bound for left-censored data must be entered as zero. (NA is not accepted).
par	A vector holding the approximation of the gamma shape and rate parameters. This approximation is expected to be derived from function gstart.
control	An optional list suitable for passing to the optim function.

Details

The negative log-likelihood is minimized by the Nelder-Meade, simplex, algorithm. This algorithm requires a reasonable starting point for the estimate. The mle_gamma function makes a call to optim in the R base rather than custom code for the simplex algorithm as used by mlefit in WeibullR. The control argument has been provided to give debug developers a means of altering and examining the progress of the optimization.

Value

Returns a named vector with parameters of the distribution fit and goodness of fit in terms of log likelihood.

References

William Q. Meeker and Luis A. Escobar, (1998) "Statistical Methods for Reliability Data", Wiley-Interscience, New York

Marie Laure Delignette-Muller, Christophe Dutang (2015). "fitdistrplus: An R Package for Fitting Distributions". Journal of Statistical Software, 64(4), 1-34. URL http://www.jstatsoft.org/v64/i04/.

Examples

```
failures<-c(90,96,30,49,82)
suspensions<-c(100,45,10)
mle_data<-mleframe(failures, suspensions)
gamma_fit<-mle_gamma(mle_data, gstart(mle_data))
```

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wblrLoglike	*Log likelihood for Weibull, Lognormal and Gamma fitted data including intervals*

Description

This function generates the Log likelihood for Wiebull, lognormal and gamma distributions from life(-time) data containing fixed time occurrences, and suspensions (progressive right-censored data), discoveries (left-censored data), and interval censored data. This function will overwrite existing wblrLoglike in WeibullR.

Usage

```
wblrLoglike(par, x, dist="weibull", sign=1, tz=0 )
```

Arguments

par	A vector of parameters taken in the same order as the underlying R distribution. That is, for weibull the order of parameters is (shape, scale). For lognormal (meanlog, sdlog). (Unsuitable parameters cannot be pre-tested, but may cause the function to fail with NaN, or inf values.)
x	A dataframe such as generated by mleframe with column names 'left', 'right' and optionally 'qty'. Exact failure data (occurrences) have same time entered in both 'left' and 'right' columns. Suspension data has last known life[time] entered in 'left' column and -1 entered in 'right' column. The left(early) interval bound for left-censored data must be entered as zero. (NA is not accepted).
dist	A string defining a distribution to be fit. Implemented distributions are "weibull" (default), "lognormal" and "gamma". (Only 2-parameter models are accepted.)
sign	An integer of 1 or -1 assigning a multiplier for the returned value. A value of -1 results in a minimization function suitable for use as an argument to optim.
tz	A scalar vector with the translation parameter, t0, to be applied to data.

Value

Returns a scalar vector holding the value of log-likelihood. Unsuitable parameters may cause generation of NaN.

References

William Q. Meeker and Luis A. Escobar, (1998) "Statistical Methods for Reliability Data", Wiley-Interscience, New York

Robert B. Abernethy, (2008) "The New Weibull Handbook, Fifth Edition"

Marie Laure Delignette-Muller, Christophe Dutang (2015). "fitdistrplus: An R Package for Fitting Distributions". Journal of Statistical Software, 64(4), 1-34. URL http://www.jstatsoft.org/v64/i04/.

Examples

```
failures<-c(90,96,30,49,82)
suspensions<-c(100,45,10)
weibull_loglike<-wblrLoglike(c( 2.26, 4900), mleframe(failures,suspensions))
```

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