R documentation

of ‘ldweibull.Rd’

February 26, 2013

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ldweibull *Locally D-optimal designs for Weibull model*

Description

Finds Locally D-optimal designs for Weibull regression model which is defined as $E(y) = a - b\exp(-\lambda * x^h)$ with $Var(y) = \sigma^2$, where a, b, λ, h and σ are unknown parameters.

Usage

```
ldweibull(a, b, lambda, h, lb, ub, user.points = NULL, user.weights = NULL,
...,  n.restarts = 1, n.sim = 1, tol = 1e-8, prec = 53)
```

Arguments

a	initial value for paremeter a.
b	initial value for paremeter b.
lambda	initial value for paremeter λ.
h	initial value for paremeter h.
lb	lower bound of design interval, must be greater than 0. Value 0 for lower bound is not allowed, instead of 0 a small value such as 10^-10 can be used.
ub	upper bound of design interval.
user.points	(optional) vector of user design points which calculation of its D-efficiency is aimed. Each element of `user.points` must be within the design interval.
user.weights	(optional) vector of weights which its elements correspond to `user.points` elements. The sum of weights should be 1; otherwise they will be normalized.
...	(optional) additional parameters will be passed to function `curve`.
prec	(optional) a number, the maximal precision to be used for D-efficiency calculation, in bite. Must be at least 2 (default 53), see ’Details’.
n.restarts	(optional optimization parameter) number of solver restarts required in optimization process (default 1), see ’Details’.
n.sim	(optional optimization parameter) number of random parameters to generate for every restart of solver in optimization process (default 1), see ’Details’.
tol	(optional optimization parameter) relative tolerance on feasibility and optimality in optimization process (default $1e-8$).

Details

While D-efficiency is NaN, an increase in prec can be beneficial to achieve a numeric value, however, it can slow down the calculation speed.

Values of n.restarts and n.sim should be chosen according to the length of design interval.

Value

plot of derivative function, see 'Note'.

a list containing the following values:

points	obtained design points
weights	corresponding weights to the obtained design points
det.value	value of Fisher information matrix determinant at the obtained design
user.eff	D-efficeincy of user design, if user.design and user.weights are not NULL.

Note

To verify optimality of obtained design, derivate function (symmetry of Frechet derivative with respect to the x-axis) will be plotted on the design interval. Based on the equivalence theorem (Kiefer, 1974), a design is optimal if and only if its derivative function are equal or less than 0 on the design interval. The equality must be achieved just at the obtained points.

Author(s)

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References

Masoudi, E., Sarmad, M. and Talebi, H. 2012, An Almost General Code in R to Find Optimal Design, In Proceedings of the 1st ISM International Statistical Conference 2012, 292-297.

Dette, H., Pepelyshev, A. (2008), Efficient Experimental Designs for Sigmoidal Growth Models, Statistical Planning and Inference, 138, 2-17.

Kiefer, J. C. 1974, General equivalence theory for optimum designs (approximate theory), Ann. Statist., 2, 849-879.

See Also

cfisher, cfderiv and eff.

Examples

```
ldweibull(a = 1, b = 1, lambda = 2, h = 1, lb = 10^-10, ub =3)
## $points: 0.0000000001 0.1713914120 0.8002692550 3.0000000000

## D-effecincy computation:
ldweibull(a = 1, b = 1, lambda = 2, h = 1, lb = 0.001, ub =3,
user.points = c(0.009,1,0.824,2), user.weights = rep(.25, 4))
## $user.eff: 0.28166

## usage of n.sim and n.restars:
result <- list()
for (i in 1:20)
```

```
  result[[i]] <- ldweibull(a = 1, b = 1, lambda = 3, h = 1, lb = 0.001, ub = 19)
sapply(result, "[", 1) ## unstable values for design points

ldweibull(a = 1, b = 1, lambda = 3, h = 1, lb = 0.001, ub = 19, n.sim = 10,
n.restarts = 10) ## $points: 0.0010000, 0.1205858,  0.5544623, 19.0000000
```

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