R documentation

of '`ldlogistic.Rd`'

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`ldlogistic` *Locally D-optimal designs for Logistic model*

Description

Finds Locally D-optimal designs for Logistic and Logistic dose-response models which are defined as $E(y) = 1/(\exp(-a - bx) + 1)$ and $E(y) = 1/(\exp(-b(x - a)) + 1)$ with $Var(y) = E(y)(1 - E(y))$, respectively, where a and b are unknown parameters.

Usage

```
ldlogistic(a, b, form = 1 , lb, ub, user.points = NULL, user.weights = NULL,  ..., n.restarts =
```

Arguments

`a`	initial value for paremeter a.
`b`	initial value for paremeter b.
`form`	must be 1 or 2. If `form = 1`, then $E(y) = (1/(\exp(-a - bx) + 1))$; if 'form = 2', then $E(y) = 1/(\exp(b2(x - b1)) + 1)$.
`lb`	lower bound of design interval.
`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.

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

See Also

`cfisher`, `cfderiv` and `eff`.

Examples

```
ldlogistic(a = .9, b = .8, form = 2, lb = -5, ub = 5) ## $points -1.029256  2.829256

ldlogistic(a = .9, b = .8, form = 1, lb = -5, ub = 5) ## $points -3.0542559  0.8042557

## D-effecincy computation:
ldlogistic(a = .9 , b = .8, form = 1, lb = -5, ub = 5, user.points = c(-3, .804), user.weights = c(.5, .5)

## usage of n.sim and n.restars:
result <- list()
for (i in 1:20)
  result[[i]] <- ldlogistic(a = 20 , b = 10, form = 1, lb = -5, ub = 5)
sapply(result, "[", 1) ## Some (or all) points are NA

ldlogistic(a = 20 , b = 10, form = 1, lb = -5, ub = 5, n.restarts = 10, n.sim = 10) ## $points: -2.15434, -
```

```
## usage of precision:
ldlogistic(a = 22 , b = 10, form = 1, lb = -5, ub = 20, n.restarts = 10, n.sim = 10, user.points = c(20, 5)

ldlogistic(a = 22 , b = 10, form = 1, lb = -5, ub = 20, n.restarts = 10, n.sim = 10, user.points = c(20, 5)
```

Index