Package 'crsnls'

May 8, 2026

Type Package

Title Nonlinear Regression Parameters Estimation by 'CRS4HC' and 'CRS4HCe'

Version 0.2

Date 2016-04-26

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Description Functions for nonlinear regression parameters estimation by algorithms based on Controlled Random Search algorithm.
Both functions (crs4hc(), crs4hce()) adapt current search strategy by four heuristics competition. In addition, crs4hce() improves adaptability by adaptive stopping condition.

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Encoding UTF-8

RoxygenNote 5.0.1

NeedsCompilation no

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Repository CRAN

Date/Publication 2016-04-26 08:44:13

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crs4hc *Estimation of Nonlinear Regression Parameters with CRS4HC*

Description

This function estimates the regression coefficients of a nonlinear regression function using least squares. The minimization is performed by the CRS algorithm with four competing local heuristics. Algorithm is described in Tvrdík et al. (2007).

Usage

```
crs4hc(formula, data, a, b, N, my_eps, max_evals, delta, w0)
```

Arguments

formula	(obligatory) a nonlinear formula including variables and parameters
data	(obligatory) data frame in which to evaluate the variables in formula
a	(obligatory) a vector of length equal to number of parameters representing lower bounds of search space (bounds for parameters must be specified in the same order they appear on right-hand side of formula)
b	(obligatory) a vector of length equal to number of parameters representing upper bounds of search space (bounds for parameters must be specified in the same order they appear on right-hand side of formula)
N	(optional) size of population. Default value is 10*length(a).
my_eps	(optional) is used for stopping condition. Default value is 1e-15.
max_evals	(optional) is used for stopping condition, specifies maximum number of objective function evaluations per dimension (dimension=nonlinear model parameter). Default value is 40000.
delta	(optional) controls the competition of local heuristics. Default value is 0.05. delta > 0.
w0	(optional) controls the competition of local heuristics. Default value is 0.5. w0 > 0.

Details

There are implemented methods for generic functions print, summary, plot.

Value

An S3 object of class crs4hc. This object is a list of:

model	a list of two items, includes estimates of nonlinear model parameters and minimal residual sum of squares
algorithmInfo	a list of three items with some internal info about algorithm run
data	a data frame that was passed to function as the data argument
other	a list of four items which include info about nonlinear model formula

References

Tvrdík, J., Křivý, I., and Mišík, L. Adaptive Population-based search: Application to Estimation of Nonlinear Regression Parameters. *Computational Statistics and Data Analysis 52* (2007), 713–724. Preprint URL http://www1.osu.cz/~tvrdik/wp-content/uploads/CSDA-06SAS03e.pdf

Examples

```
x <- c(1,2,3,5,7,10)
y <- c(109,149,149,191,213,224)
df <- data.frame(x=x, y=y)
lowerBounds <- c(1, 0.1)
upperBounds <- c(1000, 2)
mod <- crs4hc(y ~ b1 * (1-exp(-b2*x)), df, lowerBounds, upperBounds)
mod
```

`crs4hce` *Estimation of Nonlinear Regression Parameters with CRS4HCe*

Description

This function estimates the regression coefficients of a nonlinear regression function using least squares. The minimization is performed by the CRS algorithm with four competing local heuristics and adaptive stopping condition. Algorithm is described in Tvrdík et al. (2007).

Usage

```
crs4hce(formula, data , a, b, N, my_eps0, gamma, max_evals, delta, w0)
```

Arguments

`formula`	(obligatory) a nonlinear formula including variables and parameters
`data`	(obligatory) data frame in which to evaluate the variables in `formula`
`a`	(obligatory) a vector of length equal to number of parameters representing lower bounds of search space (bounds for parameters must be specified in the same order they appear on right-hand side of `formula`)
`b`	(obligatory) a vector of length equal to number of parameters representing upper bounds of search space (bounds for parameters must be specified in the same order they appear on right-hand side of `formula`)
`N`	(optional) size of population. Default value is `10*length(a)`.
`my_eps0`	(optional) is used for adaptation of stopping condition. Default value is 1e-9.
`gamma`	(optional) is used for adaptation of stopping condition. Default value is 1e7.
`max_evals`	(optional) is used for stopping condition, specifies maximum number of objective function evaluations per dimension (dimension=nonlinear model parameter). Default values is 40000.

delta	(optional) controls the competition of local heuristics. Default value is 0.05. delta > 0.
w0	(optional) controls the competition of local heuristics. Default value is 0.5. w0 > 0.

Details

It´s recommended to modify values of my_eps0 and gamma together. There are implemented methods for generic functions print, summary, plot.

Value

An S3 object of class crs4hc. This object is a list of:

model	a list of two items, includes estimates of nonlinear model parameters and minimal residual sum of squares
algorithmInfo	a list of three items with some internal info about algorithm run
data	a data frame that was passed to function as the data argument
other	a list of four items which include info about nonlinear model formula

References

Tvrdík, J., Křivý, I., and Mišík, L. Adaptive Population-based search: Application to Estimation of Nonlinear Regression Parameters. *Computational Statistics and Data Analysis 52* (2007), 713–724. Preprint URL http://www1.osu.cz/~tvrdik/wp-content/uploads/CSDA-06SAS03e.pdf

Examples

```
x <- c(1,2,3,5,7,10)
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df <- data.frame(x=x, y=y)
lowerBounds <- c(1, 0.1)
upperBounds <- c(1000, 2)
mod <- crs4hce(y ~ b1 * (1-exp(-b2*x)), df, lowerBounds, upperBounds)
mod
```

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