Package ‘OneStep’

July 13, 2020

Type Package

Title One-Step Maximum Likelihood Estimation

Version 0.9.0

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Description Provide principally an eponymic function that numerically computes the Le Cam one-step estimator which is asymptotically efficient (see e.g. L. Le Cam (1956) <https://projecteuclid.org/euclid.bsmsp/1200501652>) and can be computed faster than the maximum likelihood estimator.

License GPL (>= 2)

Encoding UTF-8

Depends fitdistrplus, numDeriv

Suggests actuar

NeedsCompilation no

Repository CRAN

Date/Publication 2020-07-13 10:00:06 UTC

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Description

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Details

The DESCRIPTION file:

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Author(s)

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References

See Also

See `fitdistrplus` for classic MLE, MME,...

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`benchonestep` | Performing benchmark of one-step MLE against other methods

**Description**

Performing benchmark of one-step MLE against other methods

**Usage**

```r
benchonestep(data, distr, methods, init, weights=NULL,...)
```

**Arguments**

- `data` A numeric vector of length `n`
- `distr` A character string "name" naming a distribution for which the corresponding density function `dname` and the corresponding distribution function `pname` must be classically defined.
- `methods` A list of methods.
- `init` A character vector for the initial guess method.
- `weights` UNUSED : an optional vector of weights to be used in the fitting process. Should be `NULL` or a numeric vector with strictly positive integers (typically the number of occurrences of each observation). If non-`NULL`, weighted MLE is used, otherwise ordinary MLE.
- `...` unused

**Value**

An array.

**Author(s)**

Alexandre Brouste, Darel Noutsa Mieniedou, Christophe Dutang

**References**

onestep  Executing Le Cam's one-step estimation

Description

Executing Le Cam's one-step estimation based on Le Cam (1956) and Kamatani and Uchida (2015).

Usage

onestep(data, distr, method, init, weights = NULL, keepdata = TRUE, keepdata.nb=100, control=list(), ...)

Arguments

data A numeric vector of length n

distr A character string "name" naming a distribution for which the corresponding density function dname and the corresponding distribution function pname must be classically defined.

method A character string coding for the fitting method: "closed formula" for explicit one-step and "numeric" for numeric computation. The default method is the "closed formula".

init A character vector for the initial guess method.

weights an optional vector of weights to compute the final likelihood. Should be NULL or a numeric vector with strictly positive integers (typically the number of occurrences of each observation).

keepdata a logical. If TRUE, dataset is returned, otherwise only a sample subset is returned.

keepdata.nb When keepdata=FALSE, the length (>1) of the subset returned.

control a list of control parameters. Currently, param_t is used when the characteristic function is needed, delta is used when the subsample of size n*delta is randomly selected for the initial guess in the generic Le Cam’s one step method.

... further arguments passe to mledist in case it is used.

Details

The Le Cam one-step estimation procedure is based on an initial sequence of guess estimators and a Fisher scoring step or a single Newton step on the loglikelihood function. For the user, the function onestep chooses automatically the best procedure to be used. The function OneStep presents internally several procedures depending on whether the sequence of initial guess estimators is in a closed form or not, and on whether the score and the Fisher information matrix can be elicited in a closed form. "Closed formula" distributions are treated with explicit score and Fisher information matrix (or Hessian matrix). For all other distributions, if the density function is well defined, the numerical computation (NumDeriv) of the Newton step in Le Cam’s one-step is proposed with an initial sequence of guess estimators which is the sequence of maximum likelihood estimators computed on a subsample.
**Value**

`onestep` returns an object of class "`onestep`" inheriting from "`fitdist`". So, it is a list with the following components:

- **estimate**: the parameter estimates.
- **method**: the character string coding for the fitting method: "closed formula" for closed-form MLE or closed-form one-step. "numeric" for numeric computation of the one-step estimation.
- **sd**: the estimated standard errors, `NA` if numerically not computable or `NULL` if not available.
- **cor**: the estimated correlation matrix, `NA` if numerically not computable or `NULL` if not available.
- **vcov**: the estimated variance-covariance matrix, `NULL` if not available.
- **loglik**: the log-likelihood.
- **aic**: the Akaike information criterion.
- **bic**: the the so-called BIC or SBC (Schwarz Bayesian criterion).
- **n**: the length of the data set.
- **data**: the data set.
- **distname**: the name of the distribution.
- **dots**: the list of further arguments passed in...to be used.
- **convergence**: an integer code for the convergence: 0 indicates successful convergence (from explicit formula or not). 10 indicates an error.
- **discrete**: the input argument or the automatic definition by the function to be passed to functions `gofstat`, `plotdist` and `cdfcomp`.
- **weights**: the vector of weight used in the estimation process or `NULL`.

Generic functions inheriting from "`fitdist`" objects:

- **print**: The print of a "`onestep`" object shows few traces about the fitting method and the fitted distribution.
- **summary**: The summary provides the parameter estimates of the fitted distribution, the log-likelihood, AIC and BIC statistics and when the maximum likelihood is used, the standard errors of the parameter estimates and the correlation matrix between parameter estimates.
- **plot**: The plot of an object of class "`onestep`" returned by `fitdist` uses the function `plotdist`. An object of class "`onestep`" or a list of objects of class "`onestep`" corresponding to various fits using the same data set may also be plotted using a cdf plot (function `cdfcomp`), a density plot (function `denscomp`), a density Q-Q plot (function `qqcomp`), or a P-P plot (function `ppcomp`).
- **logLik**: Extracts the estimated log-likelihood from the "`onestep`" object.
- **vcov**: Extracts the estimated var-covariance matrix from the "`onestep`" object.
- **coef**: Extracts the fitted coefficients from the "`onestep`" object.
Author(s)
Alexandre Brouste, Darel Noutsa Mieniedou, Christophe Dutang

References

See Also
See Also as `mledist` and `fitdist` in fitdistrplus.

Examples
```r
n <- 1000

# Gamma
theta <- c(2, 3)
o.sample <- rgamma(n, shape=theta[1], rate=theta[2])
onestep(o.sample, "gamma")

# Beta
theta <- c(0.5, 1.5)
o.sample <- rbeta(n, shape1=theta[1], shape2=theta[2])
onestep(o.sample, "beta")

# Negative Binomial
theta <- c(1, 5)
o.sample <- rnbinom(n, size=theta[1], mu=theta[2])
onestep(o.sample, "nbinom")

# Cauchy
theta <- c(2, 3)
o.sample <- rcauchy(n, location=theta[1], scale=theta[2])
onestep(o.sample, "cauchy", control = list(param_t=0.3))

# Generic (dweibull2)
theta <- c(0.8, 3)
dweibull2 <- function(x, shape, scale, log=FALSE)
  dweibull(x = x, shape = shape, scale = scale, log = log)
o.sample <- rweibull(n, shape = theta[1], scale = 1/theta[2])
onestep(o.sample, "weibull2", method="numeric", start=list(shape=1, scale=1))
```
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