Package ‘L1pack’

October 15, 2020

Type Package
Title Routines for L1 Estimation
Version 0.38.196
Date 2020-10-15
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Description L1 estimation for linear regression, density, distribution function,
quantile function and random number generation for univariate and multivariate
Laplace distribution.
Depends R(>= 3.5.0), fastmatrix
LinkingTo fastmatrix
Imports stats, grDevices, graphics
Suggests heavy
License GPL-3
URL http://l1pack.mat.utfsm.cl/
NeedsCompilation yes
LazyLoad yes
Repository CRAN
Date/Publication 2020-10-15 05:00:21 UTC

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l1fit

Minimum absolute residual (L1) regression

Description

Performs an L1 regression on a matrix of explanatory variables and a vector of responses.

Usage

l1fit(x, y, intercept = TRUE, tolerance = 1e-07, print.it = TRUE)

Arguments

x

vector or matrix of explanatory variables. Each row corresponds to an observation and each column to a variable. The number of rows of x should equal the number of data values in y, and there should be fewer columns than rows. Missing values are not allowed.

y

numeric vector containing the response. Missing values are not allowed.

intercept

logical flag. If TRUE, an intercept term is included in the regression model.

tolerance

numerical value used to test for singularity in the regression.

print.it

logical flag. If TRUE, then warnings about non-unique solutions and rank deficiency are given.

Details

The Barrodale-Roberts algorithm, which is a specialized linear programming algorithm, is used.

Value

list defining the regression (compare with function lsfit).

coefficients

vector of coefficients.

residuals

residuals from the fit.

message

vector of one or two character strings stating whether a non-unique solution is possible, or if the x matrix was found to be rank deficient.

References


l1pack.control

Examples

l1fit(stack.x, stack.loss)

l1pack.control

Set control parameters

Description

Allows users to set parameters for l1d.

Usage

l1pack.control(maxIter = 2000, tolerance = 1e-9)

Arguments

maxIter maximum number of iterations. The default is 2000.
tolerance the relative tolerance in the iterative algorithm.

Value

A list of control arguments to be used in a call to l1d.

A call to l1pack.control can be used directly in the control argument of a call to l1d.

Examples

ctrl <- l1pack.control(maxIter = 50, tol = 1e-07)
l1d(stack.loss ~ ., data = stackloss, control = ctrl)

lad

Least absolute deviations regression

Description

This function is used to fit linear models considering Laplace errors.

Usage

lad(formula, data, method = c("BR", "EM"), subset, na.action,
    control, model = TRUE, x = FALSE, y = FALSE, contrasts = NULL)
Arguments

formula an object of class "formula": a symbolic description of the model to be fitted.
data an optional data frame containing the variables in the model. If not found in data, the variables are taken from \texttt{environment(formula)}, typically the environment from which \texttt{lad} is called.
method character string specifying the algorithm to use. The default algorithm is the Barrodale and Roberts algorithm method = "BR". Other possible value is method = "EM" for an EM algorithm using IRLS.
subset an optional expression indicating the subset of the rows of data that should be used in the fit.
n.a.action a function that indicates what should happen when the data contain NAs.
control a list of control values for the estimation algorithm to replace the default values returned by the function \texttt{l1pack.control}.
model, x, y logicals. If TRUE the corresponding components of the fit (the model frame, the model matrix, the response) are returned.
contrasts an optional list. See the \texttt{contrasts.arg} of \texttt{model.matrix.default}.

Value

an object of class \texttt{lad} representing the linear model fit. Generic function \texttt{print}, show the results of the fit.

The functions \texttt{print} and \texttt{summary} are used to obtain and print a summary of the results. The generic accessor functions \texttt{coefficients}, \texttt{fitted.values} and \texttt{residuals} extract various useful features of the value returned by \texttt{lad}.

Author(s)

The design was inspired by the R function \texttt{lm}.

References


Examples

\begin{verbatim}
fm <- lad(stack.loss ~ ., data = stackloss, method = "BR")
summary(fm)
\end{verbatim}
The Laplace distribution

Description
Density, distribution function, quantile function and random generation for the Laplace distribution with location parameter location and scale parameter scale.

Usage
\[
dlaplace(x, \text{location} = 0, \text{scale} = 1, \text{log} = \text{FALSE})
\]
\[
plaplace(q, \text{location} = 0, \text{scale} = 1, \text{lower.tail} = \text{TRUE}, \text{log.p} = \text{FALSE})
\]
\[
qlaplace(p, \text{location} = 0, \text{scale} = 1, \text{lower.tail} = \text{TRUE}, \text{log.p} = \text{FALSE})
\]
\[
rlaplace(n, \text{location} = 0, \text{scale} = 1)
\]

Arguments
- x, q vector of quantiles.
- location, scale location and scale parameters. Scale must be positive.
- log, log.p logical; if TRUE, probabilities p are given as log(p).
- lower.tail logical; if TRUE (default), probabilities are \(P[X \leq x]\), otherwise, \(P[X > x]\).
- p vector of probabilities.
- n number of observations. If \text{length}(n) > 1, the length is taken to be the number required.

Details
If location or scale are not specified, they assume the default values of 0 and 1 respectively.

The Laplace distribution with location \(\mu\) and scale \(\phi\) has density
\[
f(x) = \frac{1}{\sqrt{2\phi}} \exp\left(-\sqrt{2} |x - \mu|/\phi \right)
\]

Value
dlaplace, plaplace, and qlaplace are respectively the density, distribution function and quantile function of the Laplace distribution. rlaplace generates random deviates from the Laplace.

The length of the result is determined by n for rlaplace, and is the maximum of the lengths of the numerical parameters for the other functions.

Author(s)
Felipe Osorio and Tymoteusz Wolodzko
References


See Also

Distributions for other standard distributions and rmLaplace for the random generation from the multivariate Laplace distribution.

Examples

```r
x <- rlaplace(1000)
## Q-Q plot for Laplace data against true theoretical distribution:
qqplot(qlaplace(ppoints(1000)), x, main = "Laplace Q-Q plot",
     xlab = "Theoretical quantiles", ylab = "Sample quantiles")
abline(c(0, 1), col = "red", lwd = 2)
```

---

### rmLaplace

**Multivariate Laplace Random Deviates**

**Description**

Random number generation from the multivariate Laplace distribution.

**Usage**

```r
rmLaplace(n = 1, center = rep(0, nrow(Scatter)), Scatter = diag(length(center)))
```

**Arguments**

- `n` the number of samples requested
- `center` a vector giving the locations of each variable
- `Scatter` a positive-definite dispersion matrix

**Details**

The function rmLaplace is an interface to C routines, which make calls to subroutines from LAPACK. The matrix decomposition is internally done using the Cholesky decomposition. If Scatter is not non-negative definite then there will be a warning message.

**Value**

If `n = 1` a vector of the same length as `center`, otherwise a matrix of `n` rows of random vectors.
References


Examples

```r
# dispersion parameters
Scatter <- matrix(c(1,.5,.5,1), ncol = 2)
Scatter

# generate the sample
y <- rmLaplace(n = 2000, Scatter = Scatter)

# scatterplot of a random bivariate Laplace sample with center
# vector zero and scale matrix 'Scatter'
par(pty = "s")
plot(y, xlab = "", ylab = ")
title("bivariate Laplace sample", font.main = 1)
```

simulate.lad  
*Simulate Responses from lad Models*

**Description**

Simulate one or more responses from the distribution corresponding to a fitted lad object.

**Usage**

```r
## S3 method for class 'lad'
simulate(object, nsim = 1, seed = NULL, ...)
```

**Arguments**

- `object` an object representing a fitted model.
- `nsim` number of response vectors to simulate. Defaults to 1.
- `seed` an object specifying if and how the random number generator should be initialized ("seeded"). For the "lad" method, either NULL or an integer that will be used in a call to set.seed before simulating the response vectors. If set, the value is saved as the "seed" attribute of the returned value. The default, NULL will not change the random generator state, and return .Random.seed as the "seed" attribute, see 'Value'.
- `...` additional optional arguments.
Value

For the "lad" method, the result is a data frame with an attribute "seed". If argument seed is NULL, the attribute is the value of .Random.seed before the simulation was started.

Author(s)

Tymoteusz Wolodzko and Felipe Osorio

Examples

```r
fm <- lad(stack.loss ~ ., data = stackloss)
sm <- simulate(fm, nsim = 4)
```
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