Package ‘L1pack’

November 14, 2017

Version 0.38.19
Date 2017-11-14
Title Routines for L1 Estimation
Description L1 estimation for linear regression, density, distribution function,
quantile function and random number generation for univariate and multivariate
Laplace distribution.
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Imports stats, grDevices, graphics
Suggests heavy
License GPL (>= 2.0)
URL http://l1pack.mat.utfsm.cl
LazyLoad yes
NeedsCompilation yes
Repository CRAN

Date/Publication 2017-11-14 20:54:16 UTC

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**Description**

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

**Usage**

```r
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**

- `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**

```r
l1fit(stack.x, stack.loss)
```

---

**Description**

Allows users to set parameters for `lad`.

**Usage**

```r
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 `lad`.

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

**Author(s)**

Felipe Osorio.

**Examples**

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

---

**lad**

*Least absolute deviations regression*

**Description**

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

**Usage**

```r
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 `environment(formula)`, typically the environment from which `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.
- **na.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 `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 `contrasts.arg` of `model.matrix.default`.

Value

an object of class `lad` representing the linear model fit. Generic function `print`, show the results of the fit.

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

Author(s)

The design was inspired by the R function `lm`.

References


Examples

```r
fm <- lad(stack.loss ~ ., data = stackloss, method = "BR")
summary(fm)
```
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, location = 0, scale = 1, log = FALSE)
plaplace(q, location = 0, scale = 1, lower.tail = TRUE, log.p = FALSE)
qlaplace(p, location = 0, scale = 1, lower.tail = TRUE, log.p = FALSE)
rlaplace(n, location = 0, 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 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**

`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.
simulate.lad

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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