

Package ‘cauchyreg’

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Type Package

Title Cauchy Regression

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Imports Compositional, glmnet, Rfast, stats

Description Cauchy regression modelling and LASSO to perform variable selection are included in this package. Cross-validation is performed to choose the optimal value of the lambda parameter. LASSO is based on the IRLS algorithm. A relevant paper is <[doi:10.1109/ICIST.2014.6920341](https://doi.org/10.1109/ICIST.2014.6920341)>.

License GPL (>= 2)

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cauchyreg-package	<i>Cauchy Regression</i>
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Description

Cauchy regression modelling and LASSO to perform variable selection are included in this package. Cross-validation is performed to choose the optimal value of the lambda parameter. LASSO is based on the IRLS algorithm.

Details

Package:	cauchyreg
Type:	Package
Version:	1.0
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Maintainers

Michail Tsagris <mtsagris@uoc.gr>.

Author(s)

Michail Tsagris <mtsagris@uoc.gr>

cauchy.reg	<i>Cauchy regression</i>
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Description

Cauchy regression

Usage

```
cauchy.reg(y, x, tol = 1e-07, maxit = 100, xnew = NULL)
```

Arguments

y	A numerical vector with the response values.
x	A numerical matrix or a data.frame with predictor variables.
tol	The tolerance value to terminate the IRLS algorithm.
maxit	The maximum number of iterations to perform the IRLS algorithm.
xnew	If you have new values for the predictors put them here.

Details

Cauchy regression is performed.

Value

A list including:

be	The regression coefficients.
sigma	The scale parameter.
iters	The number of iterations the Newton-Raphson required.
loglik	The log-likelihood value.
est	The estimated values if xnew is not NULL, otherwise this is NULL.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

References

Liu T. and Tao D. (2014, April). On the robustness and generalization of Cauchy regression. In 2014 4th IEEE International Conference on Information Science and Technology (pp. 100-105). IEEE.

See Also

[cauchy.regs](#), [cauchy.reg.lasso](#)

Examples

```
y <- iris[, 1]
x <- as.matrix(iris[, 2:4])
mod <- cauchy.reg(y, x)
```

cauchy.reg.lasso	<i>LASSO Cauchy regression</i>
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Description

LASSO Cauchy regression

Usage

```
cauchy.reg.lasso(y, x, lambda = NULL, nlambdas = 100,
  tol = 1e-07, maxit = 100, xnew = NULL)
```

Arguments

<code>y</code>	A numerical vector with the response values.
<code>x</code>	A numerical matrix with predictor variables.
<code>lambda</code>	The user may supply their own lambda values. If NULL, the function computes the grid of values.
<code>nlambda</code>	If the user does not provide a vector of lambda values they may specify how many shall the function use.
<code>tol</code>	The tolerance value to terminate the IRLS algorithm.
<code>maxit</code>	The maximum number of iterations to perform the IRLS algorithm.
<code>xnew</code>	If you have new values for the predictors put them here.

Details

LASSO is implemented using a path of lambda values.

Value

A list including:

<code>B</code>	A matrix with the stimated coefficients for each value of lambda. The rows correspond to the predictors and the columns to the lambda values.
<code>est</code>	A matrix with the estimated response values if xnew is not NULL. Each column corresponds to a different value of lambda.
<code>lambda</code>	The lambda values used.
<code>norm</code>	The sum of the absolute values of the coefficients for each value of lambda.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

See Also

[cv.cauchyreglasso](#), [cauchy.reg](#)

Examples

```
y <- iris[, 1]
x <- as.matrix(iris[, 2:4])
mod <- cauchy.reg.lasso(y, x)
```

cauchy.regs	<i>Many simple Cauchy regressions</i>
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Description

Many simple Cauchy regressions

Usage

```
cauchy.regs(y, x, tol = 1e-07, maxit = 100)
```

Arguments

y	A numerical vector with the response values.
x	A numerical matrix with predictor variables.
tol	The tolerance value to terminate the IRLS algorithm.
maxit	The maximum number of iterations to perform the IRLS algorithm.

Details

The function performs many simply Cauchy regressions, one for each column of x.

Value

A matrix with 4 columns, the constant terms, the slope coefficients, the scale parameters and the log-likelihood values. Each row corresponds to a column in x.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

References

Liu T. and Tao D. (2014, April). On the robustness and generalization of Cauchy regression. In 2014 4th IEEE International Conference on Information Science and Technology (pp. 100-105). IEEE.

See Also

[cauchy.reg](#), [cauchy.reg.lasso](#)

Examples

```
y <- iris[, 1]
x <- as.matrix(iris[, 2:4])
mod <- cauchy.regs(y, x)
```

cv.cauchyreglasso	<i>LASSO Cauchy regression</i>
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Description

Cross-validation for the LASSO Cauchy regression

Usage

```
cv.cauchyreglasso(y, x, lambda = NULL, nlambda = 100, tol = 1e-07, maxit = 100,  
folds = NULL, nfolds = 10, seed = NULL)
```

Arguments

y	A numerical vector with the response values.
x	A numerical matrix with predictor variables.
lambda	The user may supply their own lambda values. If NULL, the function computes the grid of values.
nlambda	If the user does not provide a vector of lambda values they may specify how many shall the function use.
tol	The tolerance value to terminate the IRLS algorithm.
maxit	The maximum number of iterations to perform the IRLS algorithm.
folds	If you have the list with the folds supply it here. You can also leave it NULL and the function will create folds.
nfolds	If the user did not pass the folds argument, then they need to specify the number of folds to produce.
seed	You can specify your own seed number here or leave it NULL.

Details

The function performs K-fold cross-validation to select the optimal value of lambda.

Value

A matrix with two columns, the lambda values and their corresponding MSE values.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

See Also

[cauchy.regs](#), [cauchy.reg.lasso](#)

Examples

```
y <- iris[, 1]  
x <- as.matrix(iris[, 2:4])
```

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