Package ‘ensr’

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Title Elastic Net SearcheR
Version 0.1.0
Description Elastic net regression models are controlled by two parameters, lambda, a measure of shrinkage, and alpha, a metric defining the model’s location on the spectrum between ridge and lasso regression. glmnet provides tools for selecting lambda via cross validation but no automated methods for selection of alpha. Elastic Net SearcheR automates the simultaneous selection of both lambda and alpha. Developed, in part, with support by NICHD R03 HD094912.

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Author Peter DeWitt [aut, cre],
Tell Bennett [ctb]
Maintainer Peter DeWitt <peter.dewitt@ucdenver.edu>
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Description

Search a grid of values of alpha and lambda for minimum mean CV error

Usage

```r
ensr(x, y, alphas = seq(0, 1, length = 10), nlambda = 100L,
     standardize = TRUE, nfolds = 10L, foldid, ...)
```

Arguments

- `x`  
  x matrix as in `glmnet`.
- `y`  
  response y as in `glmnet`.
- `alphas`  
  a sequence of alpha values
- `nlambda`  
  The number of lambda values - default is 100.
- `standardize`  
  Logical flag for x variable standardization, prior to fitting the model sequence. The coefficients are always returned on the original scale. Default is `standardize=TRUE`. If variables are in the same units already, you might not wish to standardize. See details below for y standardization with family="gaussian".
- `nfolds`  
  number of folds - default is 10. Although `nfolds` can be as large as the sample size (leave-one-out CV), it is not recommended for large datasets. Smallest value allowable is `nfolds=3`
- `foldid`  
  an optional vector of values between 1 and `nfold` identifying what fold each observation is in. If supplied, `nfold` can be missing.
- `...`  
  Other arguments that can be passed to `glmnet`
Description

Construct a data frame with values for lambda and alpha with an indicator to know if the model is worth fitting.

Usage

lambda_alpha_grid(lambdas, alphas, nlambda = 10L, lmin_factor = 1e-04)

Arguments

- lambdas: a vector of max lambda values for each alpha given
- alphas: a vector of alpha values corresponding to the max lambdas
- nlambda: number of lambdas to generate for each alpha before creating the grid
- lmin_factor: the smallest lambda value is defined as lmin_factor * max(lambda) where max(lambda) is determined by this function.

Examples

data(tbi)
Xmat <- model.matrix(~ . - injury1 - injury2 - injury3 - 1, data = tbi)
Yvec <- matrix(tbi$injury1, ncol = 1)
alphas <- seq(0, 1, length = 20)
lga <- lambda_alpha_grid(alphas = alphas, lambdas = lambda_max(Yvec, Xmat, alpha = alphas))

ggplot2::ggplot() +
  ggplot2::theme_bw() +
  ggplot2::aes_string(x = "a", y = "log10(l)") +
  ggplot2::geom_path(data = lga$top) +
  ggplot2::geom_point(data = lga$lgrid,
                     mapping = ggplot2::aes(color = cos(a) + sin(log10(l)))) +
  ggplot2::geom_contour(data = lga$lgrid,
                        mapping = ggplot2::aes(z = cos(a) + sin(log10(l)))) +
  ggplot2::scale_color_gradient2(low = "blue", high = "red", mid = "grey")
**lambda_max**

**Description**

Determine the lambda_max value that would be generated from a call to `glmnet` without making that call.

**Usage**

```r
lambda_max(y, x, standardize = TRUE, alpha = 0, lmin_factor = 1e-04, ...
```

**Arguments**

- `y`: the response vector
- `x`: the predictor matrix
- `standardize`: logical, should the `x` matrix be standardized?
- `alpha`: the glmnet alpha value
- `lmin_factor`: the smallest lambda value is defined as `lmin_factor * max(lambda)` where `max(lambda)` is determined by this function.
- `...`: other args

**Examples**

```r
data(tbi)
Xmat <- model.matrix(~ . - injury1 - injury2 - injury3 - 1, data = tbi)
Yvec <- matrix(tbi$injury1, ncol = 1)

alphas <- seq(0, 1, length = 20)
lambda_max(Yvec, Xmat, alpha = alphas)

# Look at different options for standardizing the inputs.

dat <-
  expand.grid(standardize = c(TRUE, FALSE),
              alpha = alphas)

lmax <-
  Map(lambda_max,
       standardize = dat$standardize,
       alpha = dat$alpha,
       MoreArgs = list(y = Yvec, x = Xmat))

gmax <-
  Map(glmnet::glmnet,
```
landfill

Water Percolation Through A Landfill

Description

A computer simulation of water moving through a landfill. Detailed explanation for the variables and the construction of the data set is found in vignette("ensr\-datasets", package = "ensr")

Usage

landfill

Format

An object of class data.table (inherits from data.frame) with 974 rows and 48 columns.

See Also

vignette("ensr\-datasets", package = "ensr")
predict  

*Predict Methods for ensr objects*

**Description**

Using either the `lambda.min` or `lambda.1se`, find the preferable model from the `ensr` object and return a prediction.

**Usage**

```r
## S3 method for class 'ensr'
predict(object, ...)  
## S3 method for class 'ensr'
coef(object, ...)  
```

**Arguments**

- `object`: a `ensr` object
- `...`: other arguments passed along to `predict`

**Details**

The `glmnet::predict` argument `s` is ignored if specified and attempted to be passed via `...`. The value of `s` that is passed to `glmnet::predict` is determined by the value of `lambda.min` or `lambda.1se` found from a call to `preferable`.

preferable  

*Preferable Elastic Net Model*

**Description**

Find the preferable Elastic Net Model from an `ensr` object. The preferable model is defined as the model with the lowest mean cross validation error and largest alpha value.

**Usage**

```r
preferable(object, ...)  
```

**Arguments**

- `object`: an `ensr` object
- `...`: not currently used.
standardize

**Description**

Center and scale vectors by mean/standard deviation or median/IQR with the option to base the standardization only on unique observations.

**Usage**

```r
standardize(x, stats = list(center = "mean", scale = "sd"), use_unique = TRUE, margin)
```

**Arguments**

- **x**: numeric data to standardize
- **stats**: a list defining the centering and scaling statistics.
- **use_unique**: use only unique values of x when determining the values for the stats.
- **margin**: passed to apply if x is a matrix or array. If you want to use all the data in the array for the calculation of the statistics pass margin = 0.

**Examples**

```r
x <- 1:100
standardize(x)
standardize(x, stats = list(center = "median", scale = "IQR"))

xmat <- matrix(1:50, nrow = 10)
standardize(xmat, margin = 0)
standardize(xmat, margin = 1)
standardize(xmat, margin = 2)

xarray <- array(1:60, dim = c(5, 2, 6))
standardize(xarray, margin = 0)
standardize(xarray, margin = 1:2)

# Standardize a data.frame
standardize(mtcars)

# a generic list object
alist <- list(x = rep(1:10, 2), y = rnorm(100), z = matrix(1:10, nrow = 2))
standardize(alist, margin = 0)
standardize(alist, margin = 1)
```
Synthetic Data Set for Traumatic Brain Injuries

Description

This data is synthetic, that is, it is random data generated to have similar properties to a data set used for studying traumatic brain injuries. The pcode1 ... pcode6, ncode1 ... ncode6 columns are indicators for procedure or billing codes associated with a hospital stay for TBI.

Usage
tbi

Format

a data.table with 1323 rows and 18 columns. Each row of the tbi data.table is a unique subject.

- **age** age, in days
- **female** indicator for sex, 1 == female, 0 == male
- **los** length of stay in the hospital
- **pcode1** indicator for if the patient had pcode1
- **pcode2** indicator for if the patient had pcode2
- **pcode3** indicator for if the patient had pcode3
- **pcode4** indicator for if the patient had pcode4
- **pcode5** indicator for if the patient had pcode5
- **pcode6** indicator for if the patient had pcode6
- **ncode1** indicator for if the patient had ncode1
- **ncode2** indicator for if the patient had ncode2
- **ncode3** indicator for if the patient had ncode3
- **ncode4** indicator for if the patient had ncode4
- **ncode5** indicator for if the patient had ncode5
- **ncode6** indicator for if the patient had ncode6
- **injury1** First of three specific types of TBI
- **injury2** Second of three specific types of TBI
- **injury3** Third of three specific types of TBI

See Also

vignette("ensr-datasets", package = "ensr")
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