

Package ‘SelectBoost’

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Type Package

Title A General Algorithm to Enhance the Performance of Variable Selection Methods in Correlated Datasets

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biocViews

Imports lars, glmnet, igraph, parallel, msgps, Rfast, methods, Cascade, graphics, grDevices, varbvs, spls, abind

Suggests knitr, rmarkdown, mixOmics, CascadeData

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Description An implementation of the selectboost algorithm (Bertrand et al. 2020, 'Bioinformatics', <[doi:10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)>), which is a general algorithm that improves the precision of any existing variable selection method. This algorithm is based on highly intensive simulations and takes into account the correlation structure of the data. It can either produce a confidence index for variable selection or it can be used in an experimental design planning perspective.

License GPL-3

Encoding UTF-8

Classification/MSC 62H11, 62J12, 62J99

LazyData true

VignetteBuilder knitr

RoxygenNote 7.1.1

URL <https://github.com/fbertran/SelectBoost>,
<http://www-irma.u-strasbg.fr/~fbertran/>

BugReports <https://github.com/fbertran/SelectBoost/issues>

NeedsCompilation no

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AICc_BIC_glmnetB *AICc and BIC for glmnet logistic models*

Description

Compute AICc and BIC for glmnet logistic models.

Usage

```
rerr(v1, v2)

ridge_logistic(X, Y, lambda, beta0, beta, maxiter = 1000, tol = 1e-10)

BIC_glmnetB(Z, Y, glmnet.model, alpha, modelSet, reducer = "median")

AICc_glmnetB(Z, Y, glmnet.model, alpha, modelSet, reducer = "median")
```

Arguments

| | |
|--------------|---|
| v1 | A numeric vector. |
| v2 | A numeric vector. |
| X | A numeric matrix |
| Y | A numeric 0/1 vector. |
| lambda | A numeric value. |
| beta0 | A numeric value Initial intercept value. |
| beta | A numeric vector. Initial coefficient values. |
| maxiter | A numeric value. Maximum number of iterations. |
| tol | A numeric value. Tolerance value. |
| Z | A numeric matrix |
| glmnet.model | A fitted glmnet model. |
| alpha | A numeric value. |
| modelSet | Modelset to consider. |
| reducer | A character value. Reducer function. Either 'median' or 'mean'. |

Details

Calculate AICc and BIC for glmnet logistic models from the glmnetB function of the package rLogistic <https://github.com/echi/rLogistic> and adapted to deal with non finite exponential values in AICc and BIC computations

Value

A list relevant to model selection.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

Robust Parametric Classification and Variable Selection by a Minimum Distance Criterion, Chi and Scott, Journal of Computational and Graphical Statistics, **23**(1), 2014, p111–128, doi: [10.1080/10618600.2012.737296](https://doi.org/10.1080/10618600.2012.737296).

See Also

[var_select](#)

Examples

```
set.seed(314)
xran=matrix(rnorm(150),30,5)
ybin=sample(0:1,30,replace=TRUE)
glmnet.fit <- glmnet::glmnet(xran,ybin,family="binomial",standardize=FALSE)
set.seed(314)
rerr(1:10,10:1)
```

```
set.seed(314)
ridge_logistic(xran,ybin,lambda=.5,beta0=rnorm(5),beta=rnorm(5,1))
```

```
set.seed(314)
if(is.factor(ybin)){ynum=unclass(ybin)-1} else {ynum=ybin}
subSample <- 1:min(ncol(xran),100)
BIC_glmnetB(xran,ynum,glmnet.fit,alpha=1,subSample, reducer='median')
```

```
set.seed(314)
if(is.factor(ybin)){ynum=unclass(ybin)-1} else {ynum=ybin}
subSample <- 1:min(ncol(xran),100)
AICc_glmnetB(xran,ynum,glmnet.fit,alpha=1,subSample, reducer='median')
```

auto.analyze

Find limits for selectboost analysis

Description

Find limits for selectboost analysis.

Usage

```
auto.analyze(x, ...)

## S3 method for class 'selectboost'
auto.analyze(x, ...)
```

Arguments

`x` Numerical matrix. Selectboost object.
... . Passed to the `summary.selectboost` function.

Details

`plot.summary.selectboost` returns an invisible list and creates four graphics. Two plots the proportion of selection with respect to `c0` (by step or according to real scale). On the third graph, no bar means a proportion of selection less than `prop.level`. Confidence intervals are computed at the `conf.int.level` level. Barplot of the confidence index ($1 - \min(c0, \text{such that } \text{proportion}(c0) > \text{conf.threshold})$).

Value

list of results.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[fastboost](#) and [autoboost](#)

Other Selectboost analyze functions: [plot.summary.selectboost\(\)](#), [trajC0\(\)](#)

Examples

```
data(autoboost.res.x)
auto.analyze(autoboost.res.x)

data(autoboost.res.x2)
auto.analyze(autoboost.res.x2)
```

autoboost

Autoboost

Description

All in one use of selectboost that avoids redundant fitting of distributions and saves some memory.

Usage

```
autoboost(
  X,
  Y,
  ncores = 4,
  group = group_func_1,
  func = lasso_msgps_AICc,
  corrfunc = "cor",
  use.parallel = FALSE,
  B = 100,
  step.num = 0.1,
  step.limit = "none",
  risk = 0.05,
  verbose = FALSE,
  step.scale = "quantile",
  normalize = TRUE,
  steps.seq = NULL,
  debug = FALSE,
  version = "lars",
  ...
)
```

Arguments

| | |
|--------------|---|
| X | Numerical matrix. Matrix of the variables. |
| Y | Numerical vector or factor. Response vector. |
| ncores | Numerical value. Number of cores for parallel computing. Defaults to 4. |
| group | Function. The grouping function. Defaults to group_func_1. |
| func | Function. The variable selection function. Defaults to lasso_msgps_AICc. |
| corrfunc | Character value or function. Used to compute associations between the variables. Defaults to "cor". |
| use.parallel | Boolean. To use parallel computing (doMC) download the extended package from Github. Set to FALSE. |
| B | Numerical value. Number of resampled fits of the model. Defaults to 100. |
| step.num | Numerical value. Step value for the c0 sequence. Defaults to 0.1. |
| step.limit | Character value. If "Pearson", truncates the c0 sequence using a Pearson based p-value. Defaults to "none". |

| | |
|------------|---|
| risk | Numerical value. Risk level when finding limits based on $c_0=0$ values. Defaults to 0.05. |
| verbose | Boolean. Defaults to FALSE. |
| step.scale | Character value. How to compute the c_0 sequence if not user-provided: either "quantile" or "linear". Defaults to "quantile". |
| normalize | Boolean. Shall the X matrix be centered and scaled? Defaults to TRUE. |
| steps.seq | Numeric vector. User provided sequence of c_0 values to use. Defaults to NULL. |
| debug | Boolean value. If more results are required. Defaults to FALSE. |
| version | Character value. Passed to the <code>boost.select</code> function. Defaults to lars |
| ... | . Arguments passed to the variable selection function used in <code>boost.apply</code> . |

Details

autoboost returns a numeric matrix. For each of the variable (column) and each of the c_0 (row), the entry is proportion of times that the variable was selected among the B resampled fits of the model. Fitting to the same group of variables is only performed once (even if it occurred for another value of c_0), which greatly speeds up the algorithm.

Value

A numeric matrix with attributes.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismaïl Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[boost](#), [fastboost](#), [plot.selectboost](#)

Other Selectboost functions: [boost](#), [fastboost\(\)](#), [plot_selectboost_cascade](#), [selectboost_cascade](#)

Examples

```
set.seed(314)
xran=matrix(rnorm(75),15,5)
ybin=sample(0:1,15,replace=TRUE)
yran=rnorm(15)
set.seed(314)
#For quick test purpose, not meaningful, should be run with greater value of B
#and disabling parallel computing as well
res.autoboost <- autoboost(xran,yran,B=3,use.parallel=FALSE)
```

```
autoboost(xran,yran)
#Customize resampling levels
autoboost(xran,yran,steps.seq=c(.99,.95,.9))

#Binary logistic regression
autoboost(xran,ybin,func=lasso_cv_glmnet_bin_min)
```

autoboost.res.x *Autoboost lasso diabetes first order.*

Description

Result of autoboost analysis of diabetes data from *lars* package with lasso and first order model

Usage

```
autoboost.res.x
```

Format

A numerical matrix frame with 13 rows and 10 variables with attributes.

autoboost.res.x.adapt *Autoboost adaptative lasso diabetes first order.*

Description

Result of autoboost analysis of diabetes data from *lars* package with adaptative lasso and first order model

Usage

```
autoboost.res.x.adapt
```

Format

A numerical matrix frame with 13 rows and 10 variables with attributes.

autoboost.res.x2 *Autoboost lasso diabetes second order.*

Description

Result of autoboost analysis of diabetes data from *lars* package with lasso and second order model

Usage

autoboost.res.x2

Format

A numerical matrix frame with 13 rows and 64 variables with attributes.

autoboost.res.x2.adapt
Autoboost adaptative lasso diabetes second order.

Description

Result of autoboost analysis of diabetes data from *lars* package with adaptative lasso and second order model

Usage

autoboost.res.x2.adapt

Format

A numerical matrix frame with 13 rows and 64 variables with attributes.

`boost`*Boost step by step functions*

Description

Step by step functions to apply the selectboost algorithm.

Usage

```
boost.normalize(X, eps = 1e-08)
```

```
boost.compcorrs(  
  Xnorm,  
  corrfunc = "cor",  
  verbose = FALSE,  
  testvarindic = rep(TRUE, ncol(Xnorm))  
)
```

```
boost.correlation_sign(Correlation_matrice, verbose = FALSE)
```

```
boost.findgroups(Correlation_matrice, group, corr = 1, verbose = FALSE)
```

```
boost.Xpass(nrowX, ncolX)
```

```
boost.adjust(  
  X,  
  groups,  
  Correlation_sign,  
  Xpass = boost.Xpass(nrowX, ncolX),  
  verbose = FALSE,  
  use.parallel = FALSE,  
  ncores = 4  
)
```

```
boost.random(  
  X,  
  Xpass,  
  vmf.params,  
  verbose = FALSE,  
  B = 100,  
  use.parallel = FALSE,  
  ncores = 4  
)
```

```
boost.apply(  
  X,  
  cols.simul,
```

```

    Y,
    func,
    verbose = FALSE,
    use.parallel = FALSE,
    ncores = 4,
    ...
)

```

```
boost.select(Boost.coeffs, eps = 10^(-4), version = "lars", verbose = FALSE)
```

Arguments

| | |
|---------------------|---|
| X | Numerical matrix. Matrix of the variables. |
| eps | Numerical value. Response vector. |
| Xnorm | Numerical matrix. Needs to be centered and l2 normalized. |
| corrfunc | Character value or function. The function to compute associations between the variables. |
| verbose | Boolean. Defaults to FALSE. |
| testvarindic | Boolean vector. Compute associations for a subset of variables. By default, the scope of the computation is the whole dataset, i.e. <code>rep(TRUE, ncol(Xnorm))</code> . |
| Correlation_matrice | Numerical matrix. |
| group | Character value or function. The grouping function. |
| corr | Numerical value. Thresholding value. Defaults to 1. |
| nrowX | Numerical value |
| ncolX | Numerical value. |
| groups | List. List of groups or communities (compact form). |
| Correlation_sign | Numerical -1/1 matrix. |
| Xpass | Numerical value. Transformation matrix. Defaults to <code>boost.Xpass(nrowX, ncolX)</code> , with <code>nrowX=nrow(X)</code> and <code>ncolX=ncol(X)</code> . |
| use.parallel | Boolean. Defaults to FALSE. |
| ncores | Numerical value. Number of cores to use. Defaults to 4. |
| vmf.params | List. List of the parameters of the fitted von-Mises distributions. |
| B | Integer value. Number of resampling. |
| cols.simul | Numerical value. Transformation matrix. |
| Y | Numerical vector or factor. Response. |
| func | Function. Variable selection function. |
| ... | . Additional parameters passed to the func function. |
| Boost.coeffs | Numerical matrix. l2 normed matrix of predictors. |
| version | Character value. "lars" (no intercept value) or "glmnet" (first coefficient is the intercept value). |

Details

`boost.normalize` returns a numeric matrix whose columns are centered and l2 normalized.

`boost.compcorrs` returns a correlation like matrix computed using the `corrfunc` function.

`boost.Xpass` returns the transformation matrix.

`boost.findgroups` returns a list of groups or communities found using the `group` function.

`boost.Xpass` returns the transformation matrix.

`boost.adjust` returns the list of the parameters of the fitted von-Mises distributions.

`boost.random` returns an array with the resampled datasets.

`boost.apply` returns a matrix with the coefficients estimated using the resampled datasets.

`boost.select` returns a vector with the proportion of times each variable was selected.

Value

Various types depending on the function.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[fastboost](#), [autoboost](#)

Other Selectboost functions: [autoboost\(\)](#), [fastboost\(\)](#), [plot_selectboost_cascade](#), [selectboost_cascade](#)

Examples

```
set.seed(314)
xran=matrix(rnorm(200),20,10)
yran=rnorm(20)
xran_norm <- boost.normalize(xran)

xran_corr<- boost.compcorrs(xran_norm)

xran_corr_sign <- boost.correlation_sign(xran_corr)

xran_groups <- boost.findgroups(xran_corr, group=group_func_1, .3)
xran_groups_2 <- boost.findgroups(xran_corr, group=group_func_2, .3)

xran_Xpass <- boost.Xpass(nrow(xran_norm),ncol(xran_norm))
```

```
xran_adjust <- boost.adjust(xran_norm, xran_groups$groups, xran_corr_sign)

#Not meaningful, should be run with B>=100
xran_random <- boost.random(xran_norm, xran_Xpass, xran_adjust$vmf.params, B=5)

xran_random <- boost.random(xran_norm, xran_Xpass, xran_adjust$vmf.params, B=100)

xran_apply <- boost.apply(xran_norm, xran_random, yran, lasso_msgps_AICc)

xran_select <- boost.select(xran_apply)
```

Cascade_confidence *Confidence indices*

Description

Result for confidence indices derivation using the Cascade package

Usage

```
net_confidence
net_confidence_5
net_confidence_thr
```

Format

A `network.confidence` object with four slots :

network.confidence The confidence matrix

name Names of the variables (genes)

F F array, see Cascade for more details

time_pt Repeated measurements

cv.subjects Logical. Was crossvalidation carried out subjectwise?

An object of class `network.confidence` of length 1.

An object of class `network.confidence` of length 1.

Cascade_example

Simulated Cascade network and inference

Description

Result for the reverse engineering of a simulated Cascade network

Usage

M

Net

Net_inf_C

Format

Three objects :

M Simulated microarray

Net Simulated network

Net_inf_C Inferred network

An object of class network of length 1.

An object of class network of length 1.

fastboost

Fastboost

Description

All in one use of selectboost that avoids redondant fitting of distributions and saves some memory.

Usage

```
fastboost(  
  X,  
  Y,  
  ncores = 4,  
  group = group_func_1,  
  func = lasso_msgps_AICc,  
  corrfunc = "cor",  
  use.parallel = FALSE,  
  B = 100,  
  step.num = 0.1,
```

```

    step.limit = "none",
    verbose = FALSE,
    step.scale = "quantile",
    normalize = TRUE,
    steps.seq = NULL,
    debug = FALSE,
    version = "lars",
    c0lim = TRUE,
    ...
)

```

Arguments

| | |
|--------------|--|
| X | Numerical matrix. Matrix of the variables. |
| Y | Numerical vector or factor. Response vector. |
| ncores | Numerical value. Number of cores for parallel computing. Defaults to 4. |
| group | Function. The grouping function. Defaults to <code>group_func_1</code> . |
| func | Function. The variable selection function. Defaults to <code>lasso_msgps_AICc</code> . |
| corrfunc | Character value or function. Used to compute associations between the variables. Defaults to <code>"cor"</code> . |
| use.parallel | Boolean. To use parallel computing (doMC) download the extended package from Github. Set to FALSE. |
| B | Numerical value. Number of resampled fits of the model. Defaults to 100. |
| step.num | Numerical value. Step value for the c0 sequence. Defaults to 0.1. |
| step.limit | Defaults to <code>"none"</code> . |
| verbose | Boolean. Defaults to FALSE. |
| step.scale | Character value. How to compute the c0 sequence if not user-provided: either <code>"quantile"</code> or <code>"linear"</code> , <code>"zoom_l"</code> , <code>"zoom_q"</code> and <code>"mixed"</code> . Defaults to <code>"quantile"</code> . |
| normalize | Boolean. Shall the X matrix be centered and scaled? Defaults to TRUE. |
| steps.seq | Numeric vector. User provided sequence of c0 values to use. Defaults to NULL. |
| debug | Boolean value. If more results are required. Defaults to FALSE. |
| version | Character value. Passed to the <code>boost.select</code> function. Defaults to <code>lars</code> |
| c0lim | Boolean. Shall the c0=0 and c0=1 values be used? Defaults to TRUE |
| ... | . Arguments passed to the variable selection function used in <code>boost.apply</code> . |

Details

`fastboost` returns a numeric matrix. For each of the variable (column) and each of the c0 (row), the entry is proportion of times that the variable was selected among the B resampled fits of the model. Fitting to the same group of variables is only performed once (even if it occurred for another value of c0), which greatly speeds up the algorithm. In order to limit memory usage, `fastboost` uses a compact way to save the group memberships, which is especially useful with community grouping function and fairly big datasets.

Value

A numeric matrix with attributes.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[boost](#), [autoboost](#), [plot.selectboost](#)

Other Selectboost functions: [autoboost\(\)](#), [boost](#), [plot_selectboost_cascade](#), [selectboost_cascade](#)

Examples

```
set.seed(314)
xran=matrix(rnorm(75),15,5)
ybin=sample(0:1,15,replace=TRUE)
yran=rnorm(15)
set.seed(314)
#For quick test purpose, not meaningful, should be run with greater value of B
#and disabling parallel computing as well
res.fastboost <- fastboost(xran,yran,B=3,use.parallel=FALSE)

fastboost(xran,yran)
#Customize resampling levels
fastboost(xran,yran,steps.seq=c(.99,.95,.9),c0lim=FALSE)
fastboost(xran,yran,step.scale="mixed",c0lim=TRUE)
fastboost(xran,yran,step.scale="zoom_l",c0lim=FALSE)
fastboost(xran,yran,step.scale="zoom_l",step.num = c(1,.9,.01),c0lim=FALSE)
fastboost(xran,yran,step.scale="zoom_q",c0lim=FALSE)
fastboost(xran,yran,step.scale="linear",c0lim=TRUE)
fastboost(xran,yran,step.scale="quantile",c0lim=TRUE)

#Binary logistic regression
fastboost(xran,ybin,func=lasso_cv_glmnet_bin_min)
```

fastboost.res.x *Fastboost lasso diabetes first order.*

Description

Result of fastboost analysis of diabetes data from *lars* package with lasso and first order model

Usage

fastboost.res.x

Format

A numerical matrix frame with 13 rows and 10 variables with attributes.

fastboost.res.x.adapt *Fastboost adaptative lasso diabetes first order.*

Description

Result of fastboost analysis of diabetes data from *lars* package with adaptative lasso and first order model

Usage

fastboost.res.x.adapt

Format

A numerical matrix frame with 13 rows and 10 variables with attributes.

fastboost.res.x2 *Fastboost lasso diabetes second order.*

Description

Result of fastboost analysis of diabetes data from *lars* package with lasso and second order model

Usage

fastboost.res.x2

Format

A numerical matrix frame with 13 rows and 64 variables with attributes.

fastboost.res.x2.adapt

Fastboost adaptative lasso diabetes second order.

Description

Result of fastboost analysis of diabetes data from *lars* package with adaptative lasso and second order model

Usage

fastboost.res.x2.adapt

Format

A numerical matrix frame with 13 rows and 64 variables with attributes.

force.non.inc

Non increasing post processing step for selectboost analysis

Description

Post processes a selectboost analysis.

Usage

force.non.inc(object)

Arguments

object Numerical matrix. Result of selectboost (autoboost, fastboost, ...).

Details

force.non.inc returns a vector after ensuring that the proportion of times each variable was selected is non increasing with respect to the 1-c0 value.

Value

A matrix with the results.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[fastboost](#), [autoboost](#)

Other Selectboost analyse functions: [plot.selectboost\(\)](#), [summary.selectboost\(\)](#)

Examples

```
data(autoboost.res.x)
res.fastboost.force.non.inc <- force.non.inc(autoboost.res.x)
```

| | |
|--------------|---|
| group_func_1 | <i>Generate groups by thresholding.</i> |
|--------------|---|

Description

group_func_1 creates groups of variables based on thresholding the input matrix.

Usage

```
group_func_1(absXcor, c0)
```

Arguments

| | |
|---------|---|
| absXcor | A numeric matrix. The absolute value of a correlation or distance matrix. |
| c0 | A numeric scalar. The thresholding |

Details

This is a function used to create a list of groups using an input matrix and a thresholding value c0. A group is made, for every column in the input matrix.

Value

A list with one entry: the list of groups. Attributes:

- "type": "normal"
- "length.groups" the length of each groups.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[group_func_2](#) and [boost.findgroups](#)

Examples

```
set.seed(314)
group_func_1(cor(matrix(rnorm(50), 10, 5)), .4)
```

| | |
|--------------|--|
| group_func_2 | <i>Generate groups using community analysis.</i> |
|--------------|--|

Description

group_func_2 creates groups of variables based on community analysis.

Usage

```
group_func_2(absXcor, c0)
```

Arguments

| | |
|---------|---|
| absXcor | A numeric matrix. The absolute value of a correlation or distance matrix. |
| c0 | A numeric scalar. The thresholding |

Details

This is a function used to create a list of groups using an input matrix and a thresholding value c0. A group is made, for every column in the input matrix. It uses the `infomap.community` function of the `igraph` package.

Value

A list with one entry: the list of groups. Attributes:

- "type": "normal"
- "length.groups" the length of each groups.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[group_func_2](#) [boost.findgroups](#), [infomap.community](#) and [igraph](#).

Examples

```
set.seed(314)
group_func_2(cor(matrix(rnorm(100),10,10)),.5)
```

miscplot

Miscellaneous plot functions

Description

Define some additional plot functions to be used in the demos of the package.

Usage

```
## S3 method for class 'matrix'
plot(x, ...)
```

Arguments

x A numeric matrix. A matrix to be plotted.
... . Additional arguments passed to the plot function.

Details

`matrixplot` plots a numeric matrix `x`.

Value

`matrixplot` returns 1.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr> with contributions from Nicolas Jung.

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

Examples

```
set.seed(3141)
randmat=matrix(rnorm(360),60,60)
plot(randmat)
```

```
network.confidence-class
```

Network confidence class.

Description

Some details about this class and my plans for it in the body.

Details

network.confidence Matrix of confidence indices.
name Vector.
array F array
time_pt Vector
cv.subjects Logical. Was crossvalidation carried out subjectwise?

```
plot.selectboost
```

Plot selectboost object

Description

Plot a selectboostboost object.

Usage

```
## S3 method for class 'selectboost'
plot(
  x,
  verbose = FALSE,
  prop.level = 0.95,
  conf.int.level = 0.95,
  conf.threshold = 0.95,
  ...
)
```

Arguments

| | |
|----------------|---|
| x | Numerical matrix. Result of selectboost (autoboost, fastboost, ...). |
| verbose | Boolean. Defaults to FALSE. |
| prop.level | Numeric value. Used to compute the proportion of selection is greater than prop.level. Defaults to .95. |
| conf.int.level | Numeric value. Confidence level for confidence intervals on estimated proportions of selection. Defaults to .95. |
| conf.threshold | Numeric value. Used to compute the number of steps (c0) for which the proportion of selection remains greater than conf.threshold. Defaults to .95. |
| ... | . Passed to the plotting functions. |

Details

plot.selectboost returns an invisible list and creates four graphics. Two plots the proportion of selection with respect to c0 (by step or according to real scale). On the third graph, no bar means a proportion of selection less than prop.level. Confidence intervals are computed at the conf.int.level level. Barplot of the confidence index (1-min(c0, such that proportionlc0>conf.threshold)).

Value

An invisible list.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[fastboost](#), [autoboost](#)

Other Selectboost analyse functions: [force.non.inc\(\)](#), [summary.selectboost\(\)](#)

Examples

```
set.seed(314)
xran=matrix(rnorm(75),15,5)
ybin=sample(0:1,15,replace=TRUE)
yran=rnorm(15)
layout(matrix(1:4,2,2))

data(autoboost.res.x)
plot(autoboost.res.x)
```

```
data(autoboost.res.x2)
plot(autoboost.res.x2)
```

```
plot.summary.selectboost
```

Plot a summary of selectboost results

Description

Plot a summary of selectboost results.

Usage

```
## S3 method for class 'summary.selectboost'
plot(x, ...)
```

Arguments

| | |
|-----|--|
| x | Numerical matrix. Summary of selectboost object. |
| ... | . Passed to the plotting functions. |

Details

plot.summary.selectboost returns an invisible list and creates four graphics. Two plots the proportion of selection with respect to c0 (by step or according to real scale). On the third graph, no bar means a proportion of selection less than prop.level. Confidence intervals are computed at the conf.int.level level. Barplot of the confidence index (1-min(c0, such that proportionlc0>conf.threshold)).

Value

An invisible list.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[fastboost](#), [autoboost](#) and [summary.selectboost](#)

Other Selectboost analyze functions: [auto.analyze\(\)](#), [trajC0\(\)](#)

Examples

```
data(autoboost.res.x)
plot(summary(autoboost.res.x))
```

```
data(autoboost.res.x2)
plot(summary(autoboost.res.x2))
```

```
plot_selectboost_cascade
      plot_Selectboost_cascade
```

Description

Plot result of Selectboost for Cascade inference.

Usage

```
## S4 method for signature 'network.confidence,ANY'
plot(x, col = gray((1:99)/100, alpha = NULL), ...)
```

Arguments

| | |
|-----|--|
| x | A network.confidence object to be plotted. |
| col | Colors for the plot. |
| ... | Additional arguments passed to the heatmap function. |

Details

Extending results from the Cascade package: providing confidence indices for the reverse engineered links.

Reference for the Cascade modelling Vallat, L., Kemper, C. a., Jung, N., Maumy-Bertrand, M., Bertrand, F., Meyer, N., Pocheville, A., Fisher, J. W., Gribben, J. G. et Bahram, S. (2013). Reverse-engineering the genetic circuitry of a cancer cell with predicted intervention in chronic lymphocytic leukemia. Proceedings of the National Academy of Sciences of the United States of America, 110(2), 459-64.

Reference for the Cascade package Jung, N., Bertrand, F., Bahram, S., Vallat, L. et Maumy-Bertrand, M. (2014). Cascade : A R package to study, predict and simulate the diffusion of a signal through a temporal gene network. Bioinformatics. ISSN 13674803..

Value

Nothing.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[boost](#), [fastboost](#), [selectboost](#), [inference](#)

Other Selectboost functions: [autoboost\(\)](#), [boost](#), [fastboost\(\)](#), [selectboost_cascade](#)

Examples

```
data(net_confidences)
plot(net_confidence)
plot(net_confidence_.5)
plot(net_confidence_thr)
```

results_simuls_reverse_engineering_v3

Simulations for reverse-engineering

Description

Result of fastboost analysis applied to biological network reverse engineering

Usage

test.seq_C

test.seq_PL

test.seq_PL2

test.seq_PL2_W

test.seq_PL2_tW

test.seq_PSel

test.seq_PSel.5

test.seq_PSel.e2

test.seq_PSel.5.e2

test.seq_PSel_W
test.seq_robust
test.seq_PB
test.seq_PB_095_075
test.seq_PB_075_075
test.seq_PB_W
sensitivity_C
sensitivity_PL
sensitivity_PL2
sensitivity_PL2_W
sensitivity_PL2_tW
sensitivity_PSel
sensitivity_PSel.5
sensitivity_PSel.e2
sensitivity_PSel.5.e2
sensitivity_PSel_W
sensitivity_robust
sensitivity_PB
sensitivity_PB_095_075
sensitivity_PB_075_075
sensitivity_PB_W
predictive_positive_value_C
predictive_positive_value_PL
predictive_positive_value_PL2

predictive_positive_value_PL2_W
predictive_positive_value_PL2_tW
predictive_positive_value_PSel
predictive_positive_value_PSel.5
predictive_positive_value_PSel.e2
predictive_positive_value_PSel.5.e2
predictive_positive_value_PSel_W
predictive_positive_value_robust
predictive_positive_value_PB
predictive_positive_value_PB_095_075
predictive_positive_value_PB_075_075
predictive_positive_value_PB_W
F_score_C
F_score_PL
F_score_PL2
F_score_PL2_W
F_score_PL2_tW
F_score_PSel
F_score_PSel.5
F_score_PSel.e2
F_score_PSel.5.e2
F_score_PSel_W
F_score_robust
F_score_PB

F_score_PB_095_075

F_score_PB_075_075

F_score_PB_W

nv_C

nv_PL

nv_PL2

nv_PL2_W

nv_PL2_tW

nv_PSel

nv_PSel.5

nv_PSel.e2

nv_PSel.5.e2

nv_PSel_W

nv_robust

nv_PB

nv_PB_095_075

nv_PB_075_075

nv_PB_W

Format

A numerical matrix frame with 100 rows and 200 variables or a numerical vector of length 100.

An object of class `matrix` (inherits from `array`) with 100 rows and 200 columns.

An object of class `matrix` (inherits from `array`) with 100 rows and 200 columns.

An object of class `matrix` (inherits from `array`) with 100 rows and 200 columns.

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An object of class `matrix` (inherits from `array`) with 100 rows and 200 columns.

An object of class `matrix` (inherits from `array`) with 100 rows and 200 columns.

SelectBoost

SelectBoost

Description

Motivation: With the growth of big data, variable selection has become one of the major challenges in statistics. Although many methods have been proposed in the literature their performance in terms of recall and precision are limited in a context where the number of variables by far exceeds the number of observations or in a high correlated setting. Results: This package implements a new general algorithm which improves the precision of any existing variable selection method. This algorithm is based on highly intensive simulations and takes into account the correlation structure of the data. Our algorithm can either produce a confidence index for variable selection or it can be used in an experimental design planning perspective.

References

F. Bertrand, I. Aouadi, N. Jung, R. Carapito, L. Vallat, S. Bahram, M. Maumy-Bertrand (2020). SelectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, *Bioinformatics*. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

SelectBoost was used to decypher networks in C. Schleiss, [...], M. Maumy-Bertrand, S. Bahram, F. Bertrand, and L. Vallat. (2021). Temporal multiomic modelling reveals a B-cell receptor proliferative program in chronic lymphocytic leukemia. *Leukemia*.

Examples

```
set.seed(314)
xran=matrix(rnorm(75),15,5)
ybin=sample(0:1,15,replace=TRUE)
yran=rnorm(15)

#For quick test purpose, not meaningful, should be run with greater value of B
#(disabling parallel computing as well)
res.fastboost <- fastboost(xran,yran,B=3,use.parallel=FALSE)

fastboost(xran,yran)
#Customize resampling levels
fastboost(xran,yran,steps.seq=c(.99,.95,.9),c0lim=FALSE)

#Binary logistic regression
fastboost(xran,ybin,func=lasso_cv_glmnet_bin_min)
```

selectboost_cascade *Selectboost_cascade*

Description

Selectboost for Cascade inference.

Usage

```
selectboost(M, ...)  
  
## S4 method for signature 'micro_array'  
selectboost(  
  M,  
  Fabhat,  
  K = 5,  
  eps = 10^-5,  
  cv.subjects = TRUE,  
  ncores = 4,  
  use.parallel = FALSE,  
  verbose = FALSE,  
  group = group_func_2,  
  c0value = 0.95  
)
```

Arguments

| | |
|--------------|--|
| M | Microarray class from the Cascade package. |
| ... | Additional arguments. Not used. |
| Fabhat | F matrix inferred using the inference function from the Cascade package. |
| K | Number of crossvalidation folds. |
| eps | Threshold for assigning a zero value to an inferred parameter. Defaults to 10^{-5} . |
| cv.subjects | Crossvalidation is made subjectwise using leave one out. Discards the K option. |
| ncores | Numerical value. Number of cores for parallel computing. Defaults to 4. |
| use.parallel | Boolean. To use parallel computing (doMC) download the extended package from Github. Set to FALSE. |
| verbose | Boolean. Defaults to FALSE. |
| group | Function. The grouping function. Defaults to group_func_2. |
| c0value | Numeric. c0 value to use for confidence computation. Defaults to TRUE |

Details

Extending results from the Cascade package: providing confidence indices for the reverse engineered links.

Reference for the Cascade modelling Vallat, L., Kemper, C. a., Jung, N., Maumy-Bertrand, M., Bertrand, F., Meyer, N., Pocheville, A., Fisher, J. W., Gribben, J. G. et Bahram, S. (2013). Reverse-engineering the genetic circuitry of a cancer cell with predicted intervention in chronic lymphocytic leukemia. *Proceedings of the National Academy of Sciences of the United States of America*, 110(2), 459-64.

Reference for the Cascade package Jung, N., Bertrand, F., Bahram, S., Vallat, L. et Maumy-Bertrand, M. (2014). Cascade : A R package to study, predict and simulate the diffusion of a signal through a temporal gene network. *Bioinformatics*. ISSN 13674803..

Value

A network.confidence object.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, *Bioinformatics*, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[boost](#), [fastboost](#), [plot.selectboost](#), [inference](#)

Other Selectboost functions: [autoboost\(\)](#), [boost](#), [fastboost\(\)](#), [plot_selectboost_cascade](#)

Examples

```
set.seed(314)
set.seed(314)
```

```
data(Cascade_example)
Fab_inf_C <- Net_inf_C@F
#By default community grouping of variables
set.seed(1)
net_confidence <- selectboost(M, Fab_inf_C)
net_confidence_.5 <- selectboost(M, Fab_inf_C, c0value = .5)
#With group_func_1, variables are grouped by thresholding the correlation matrix
net_confidence_thr <- selectboost(M, Fab_inf_C, group = group_func_1)
```

| | |
|------------|---|
| simulation | <i>Miscellaneous simulation functions</i> |
|------------|---|

Description

Define several simulation functions to be used in the demos of the package.

Usage

```
simulation_cor(group, cor_group, v = 1)

simulation_X(N, Cor)

simulation_DATA(X, supp, minB, maxB, stn)

compsim(x, ...)

## S3 method for class 'simuls'
compsim(x, result.boost, level = 1, ...)
```

Arguments

| | |
|--------------|---|
| group | A numeric vector. Group membership of each of the variables. |
| cor_group | A numeric vector. Intra-group Pearson correlation. |
| v | A numeric value. The diagonal value of the generated matrix. |
| N | A numeric value. The number of observations. |
| Cor | A numeric matrix. A correlation matrix to be used for random sampling. |
| X | A numeric matrix. Observations*variables. |
| supp | A numeric vector. The true predictors. |
| minB | A numeric value. Minimum absolute value for a beta coefficient. |
| maxB | A numeric value. Maximum absolute value for a beta coefficient. |
| stn | A numeric value. A scaling factor for the noise in the response. The higher, the smaller the noise. |
| x | List. Simulated dataset. |
| ... | For compatibility issues. |
| result.boost | Row matrix of numerical value. Result of selecboost for a given c0. |
| level | List. Threshold for proportions of selected variables. |

Details

`simulation_cor` returns a numeric symmetric matrix `c` whose order is the number of variables. An entry $c_{i,j}$ is equal to

- $i = j$, entries on the diagonal are equal to the `v` value
- $i <> j$, 0 if the variable `i` and `j` do not belong to the same group
- $i <> j$, `cor_group[k]` if the variable `i` and `j` belong to the group `k`

`simulation_X` returns a numeric matrix of replicates (by row) of random samples generated according to the `Cor` matrix.

`simulation_DATA` returns a list with the `X` matrix, the response vector `Y`, the true predictors, the beta coefficients, the scaling factor and the standard deviation.

`compsim.simuls` computes recall (sensitivity), precision (positive predictive value), and several Fscores (non-weighted Fscore, F1/2 and F2 weighted Fscores).

Value

`simulation_cor` returns a numeric matrix.

`simulation_X` returns a numeric matrix.

`simulation_DATA` returns a list.

`compsim.simuls` returns a numerical vector.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr> with contributions from Nicolas Jung.

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[glmnet](#), [cv.glmnet](#), [AICc_BIC_glmnetB](#), [lars](#), [cv.lars](#), [msgps](#)

Examples

```
N<-10
group<-c(rep(1:2,5))
cor_group<-c(.8,.4)
supp<-c(1,1,1,0,0,0,0,0,0)
minB<-1
maxB<-2
stn<-5
C<-simulation_cor(group,cor_group)
```

```

set.seed(314)
X<-simulation_X(10,C)
G<-abs(cor(X))
hist(G[lower.tri(G)])

set.seed(314)
DATA_exemple<-simulation_DATA(X,supp,1,2,stn)

set.seed(314)
result.boost = fastboost(DATA_exemple$X, DATA_exemple$Y, steps.seq = .7, c0lim = FALSE,
use.parallel = FALSE, B=10)
compsim(DATA_exemple, result.boost, level=.7)

```

summary.selectboost *Summarize a selectboost analysis*

Description

Summarize a selectboost analysis.

Usage

```

## S3 method for class 'selectboost'
summary(
  object,
  crit.func = mean,
  crit.int = "mean",
  custom.values.lim = NULL,
  index.lim = NULL,
  alpha.conf.level = 0.99,
  force.dec = TRUE,
  ...
)

```

Arguments

| | |
|-------------------|--|
| object | Numerical matrix. Result of selectboost (autoboost, fastboost, ...). |
| crit.func | Function . Defaults to the mean function. |
| crit.int | Character value. Mean or median based confidence intervals. Defaults to "mean" based confidence intervals. |
| custom.values.lim | Vector of numeric values. Defaults to NULL. |
| index.lim | Vector of numeric values. Defaults to NULL. |
| alpha.conf.level | Numeric value. Defaults to 0.99. |
| force.dec | Boolean. Force trajectories to be non-increasing. |
| ... | Additional arguments. Passed to the crit.func function. |

Details

summary.selectboost returns a list with the results.

Value

A list with the results.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[fastboost](#), [autoboost](#)

Other Selectboost analyse functions: [force.non.inc\(\)](#), [plot.selectboost\(\)](#)

Examples

```
data(autoboost.res.x)
summary(autoboost.res.x)
summary(autoboost.res.x, force.dec=FALSE)

data(autoboost.res.x.adapt)
summary(autoboost.res.x.adapt)

data(autoboost.res.x2)
summary(autoboost.res.x2)
summary(autoboost.res.x2, force.dec=FALSE)

data(autoboost.res.x2.adapt)
summary(autoboost.res.x2.adapt)

data(fastboost.res.x)
summary(fastboost.res.x)
summary(fastboost.res.x, force.dec=FALSE)

data(fastboost.res.x.adapt)
summary(fastboost.res.x.adapt)

data(fastboost.res.x2)
summary(fastboost.res.x2)
summary(fastboost.res.x2, force.dec=FALSE)

data(fastboost.res.x2.adapt)
```

```
summary(fastboost.res.x2.adapt)
```

| | |
|--------|--------------------------|
| trajC0 | <i>Plot trajectories</i> |
|--------|--------------------------|

Description

Plot trajectories.

Usage

```
trajC0(x, ...)

## S3 method for class 'selectboost'
trajC0(
  x,
  summary.selectboost.res,
  lasso.coef.path,
  type.x.axis = "noscale",
  type.graph = "boost",
  threshold.level = NULL,
  ...
)
```

Arguments

| | |
|-------------------------|---|
| x | Numerical matrix. Selectboost object. |
| ... | . Passed to the plotting functions. |
| summary.selectboost.res | List. Summary of selectboost object. |
| lasso.coef.path | List. Result of predict.lars. |
| type.x.axis | Character value. "scale" or "noscale" for the X axis. |
| type.graph | Character value. Type of graphs: "bars", "lasso" and "boost". |
| threshold.level | Numeric value. Threshold for the graphs. |

Details

trajC0 returns an invisible list and creates four graphics.

Value

An invisible list.
invisible list.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[fastboost](#), [autoboost](#) and [summary.selectboost](#)

Other Selectboost analyze functions: [auto.analyze\(\)](#), [plot.summary.selectboost\(\)](#)

Examples

```
data(autoboost.res.x)
data(diabetes, package="lars")

### With lasso trajectories
m.x<-lars::lars(diabetes$x,diabetes$y)
plot(m.x)
mm.x<-predict(m.x,type="coef",mode="lambda")
autoboost.res.x.mean = summary(autoboost.res.x)

par(mfrow=c(2,2),mar=c(4,4,1,1))
trajC0(autoboost.res.x,autoboost.res.x.mean,lasso.coef.path=mm.x,type.graph="lasso")
trajC0(autoboost.res.x,autoboost.res.x.mean)
trajC0(autoboost.res.x,autoboost.res.x.mean,type.graph="bars")
trajC0(autoboost.res.x,autoboost.res.x.mean,type.x.axis ="scale")
```

var_select

Variable selection functions

Description

Compute coefficient vector after variable selection.

Usage

```
lasso_cv_glmnet_bin_min(X, Y)
```

```
lasso_cv_glmnet_bin_1se(X, Y)
```

```
lasso_glmnet_bin_AICc(X, Y)
```



```

lasso_glmnet_bin_BIC(X, Y)
lasso_cv_lars_min(X, Y)
lasso_cv_lars_1se(X, Y)
lasso_cv_glmnet_min(X, Y)
lasso_cv_glmnet_min_weighted(X, Y, priors)
lasso_cv_glmnet_1se(X, Y)
lasso_cv_glmnet_1se_weighted(X, Y, priors)
lasso_msgps_Cp(X, Y, penalty = "enet")
lasso_msgps_AICc(X, Y, penalty = "enet")
lasso_msgps_GCV(X, Y, penalty = "enet")
lasso_msgps_BIC(X, Y, penalty = "enet")
enetf_msgps_Cp(X, Y, penalty = "enet", alpha = 0.5)
enetf_msgps_AICc(X, Y, penalty = "enet", alpha = 0.5)
enetf_msgps_GCV(X, Y, penalty = "enet", alpha = 0.5)
enetf_msgps_BIC(X, Y, penalty = "enet", alpha = 0.5)
lasso_cascade(M, Y, K, eps = 10^-5, cv.fun)

```

Arguments

| | |
|---------|---|
| X | A numeric matrix. The predictors matrix. |
| Y | A binary factor. The 0/1 classification response. |
| priors | A numeric vector. Weighting vector for the variable selection. When used with the glmnet estimation function, the weights share the following meanings: <ul style="list-style-type: none"> • 0: the variable is always included in the model • 1: neutral weight • Inf: variable is always excluded from the model |
| penalty | A character value to select the penalty term in msgps (Model Selection Criteria via Generalized Path Seeking). Defaults to "enet". "genet" is the generalized elastic net and "lasso" is the adaptive lasso, which is a weighted version of the lasso. |
| alpha | A numeric value to set the value of α on "enet" and "genet" penalty in msgps (Model Selection Criteria via Generalized Path Seeking). |

| | |
|--------|--|
| M | A numeric matrix. The transposed predictors matrix. |
| K | A numeric value. Number of folds to use. |
| eps | A numeric value. Threshold to set to 0 the inferred value of a parameter. |
| cv.fun | A function. Fonction used to create folds. Used to perform corss-validation subkectwise. |

Details

`lasso_cv_glmnet_bin_min` returns the vector of coefficients for a binary logistic model estimated by the lasso using the `lambda.min` value computed by 10 fold cross validation. It uses the `glmnet` function of the `glmnet` package.

`lasso_cv_glmnet_bin_1se` returns the vector of coefficients for a binary logistic model estimated by the lasso using the `lambda.1se` (`lambda.min+1se`) value computed by 10 fold cross validation. It uses the `glmnet` function of the `glmnet` package.

`lasso_glmnet_bin_AICc` returns the vector of coefficients for a binary logistic model estimated by the lasso and selected according to the bias-corrected AIC (AICC) criterion. It uses the `glmnet`

`lasso_glmnet_bin_BIC` returns the vector of coefficients for a binary logistic model estimated by the lasso and selected according to the BIC criterion. It uses the `glmnet`

`lasso_cv_lars_min` returns the vector of coefficients for a linear model estimated by the lasso using the `lambda.min` value computed by 5 fold cross validation. It uses the `lars` function of the `lars` package.

`lasso_cv_lars_1se` returns the vector of coefficients for a linear model estimated by the lasso using the `lambda.1se` (`lambda.min+1se`) value computed by 5 fold cross validation. It uses the `lars` function of the `lars` package.

`lasso_cv_glmnet_min` returns the vector of coefficients for a linear model estimated by the lasso using the `lambda.min` value computed by 10 fold cross validation. It uses the `glmnet` function of the `glmnet` package.

`lasso_cv_glmnet_min_weighted` returns the vector of coefficients for a linear model estimated by the weighted lasso using the `lambda.min` value computed by 10 fold cross validation. It uses the `glmnet` function of the `glmnet` package.

`lasso_cv_glmnet_1se` returns the vector of coefficients for a linear model estimated by the lasso using the `lambda.1se` (`lambda.min+1se`) value computed by 10 fold cross validation. It uses the `glmnet` function of the `glmnet` package.

`lasso_cv_glmnet_1se_weighted` returns the vector of coefficients for a linear model estimated by the weighted lasso using the `lambda.1se` (`lambda.min+1se`) value computed by 10 fold cross validation. It uses the `glmnet` function of the `glmnet` package.

`lasso_msgps_Cp` returns the vector of coefficients for a linear model estimated by the lasso selectd using Mallows' C_p . It uses the `msgps` function of the `msgps` package.

`lasso_msgps_AICc` returns the vector of coefficients for a linear model estimated by the lasso selected according to the bias-corrected AIC (AICC) criterion. It uses the `msgps` function of the `msgps` package.

`lasso_msgps_GCV` returns the vector of coefficients for a linear model estimated by the lasso selected according to the generalized cross validation criterion. It uses the `msgps` function of the `msgps` package.

lasso_msgps_BIC returns the vector of coefficients for a linear model estimated by the lasso selected according to the BIC criterion. It uses the msgps function of the msgps package.

enetf_msgps_Cp returns the vector of coefficients for a linear model estimated by the elastic net selected using Mallows' Cp. It uses the msgps function of the msgps package.

enetf_msgps_AICc returns the vector of coefficients for a linear model estimated by the elastic net selected according to the bias-corrected AIC (AICc) criterion. It uses the msgps function of the msgps package.

enetf_msgps_GCV returns the vector of coefficients for a linear model estimated by the elastic net selected according to the generalized cross validation criterion. It uses the msgps function of the msgps package.

enetf_msgps_BIC returns the vector of coefficients for a linear model estimated by the elastic net selected according to the BIC criterion. It uses the msgps function of the msgps package.

lasso_cascade returns the vector of coefficients for a linear model estimated by the lasso. It uses the lars function of the lars package.

Value

A vector of coefficients.

Author(s)

Frederic Bertrand, <frederic.bertrand@math.unistra.fr>

References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[glmnet](#), [cv.glmnet](#), [AICc_BIC_glmnetB](#), [lars](#), [cv.lars](#), [msgps](#)

Other Variable selection functions: [var_select_all](#)

Examples

```
set.seed(314)
xran=matrix(rnorm(150),30,5)
ybin=sample(0:1,30,replace=TRUE)
yran=rnorm(30)
set.seed(314)
lasso_cv_glmnet_bin_min(xran,ybin)

set.seed(314)
lasso_cv_glmnet_bin_1se(xran,ybin)

set.seed(314)
lasso_glmnet_bin_AICc(xran,ybin)
```

```
set.seed(314)
lasso_glmnet_bin_BIC(xran,ybin)

set.seed(314)
lasso_cv_lars_min(xran,yran)

set.seed(314)
lasso_cv_lars_1se(xran,yran)

set.seed(314)
lasso_cv_glmnet_min(xran,yran)

set.seed(314)
lasso_cv_glmnet_min_weighted(xran,yran,c(1000,0,0,1,1))

set.seed(314)
lasso_cv_glmnet_1se(xran,yran)

set.seed(314)
lasso_cv_glmnet_1se_weighted(xran,yran,c(1000,0,0,1,1))

set.seed(314)
lasso_msgps_Cp(xran,yran)

set.seed(314)
lasso_msgps_AICc(xran,yran)

set.seed(314)
lasso_msgps_GCV(xran,yran)

set.seed(314)
lasso_msgps_BIC(xran,yran)

set.seed(314)
enetf_msgps_Cp(xran,yran)

set.seed(314)
enetf_msgps_AICc(xran,yran)

set.seed(314)
enetf_msgps_GCV(xran,yran)

set.seed(314)
enetf_msgps_BIC(xran,yran)

set.seed(314)
lasso_cascade(t(xran),yran,5,cv.fun=lars::cv.folds)
```

Description

Compute coefficient vector after variable selection for the fitting criteria of a given model. May be used for a step by step use of Selectboost.

Usage

```
lasso_msgps_all(X, Y, penalty = "enet")
enet_msgps_all(X, Y, penalty = "enet", alpha = 0.5)
alasso_msgps_all(X, Y, penalty = "alasso")
alasso_enet_msgps_all(X, Y, penalty = "alasso", alpha = 0.5)
lasso_cv_glmnet_all_5f(X, Y)
spl_spls_all(X, Y, K.seq = c(1:5), eta.seq = (1:9)/10, fold.val = 5)
varbvs_linear_all(X, Y, include.threshold.list = (1:19)/20)
lasso_cv_glmnet_bin_all(X, Y)
lasso_glmnet_bin_all(X, Y)
spl_sda_spls_all(X, Y, K.seq = c(1:10), eta.seq = (1:9)/10)
sgpls_spls_all(X, Y, K.seq = c(1:10), eta.seq = (1:9)/10)
varbvs_binomial_all(X, Y, include.threshold.list = (1:19)/20)
```

Arguments

| | |
|------------------------|---|
| X | A numeric matrix. The predictors matrix. |
| Y | A binary factor. The 0/1 classification response. |
| penalty | A character value to select the penalty term in msgps (Model Selection Criteria via Generalized Path Seeking). Defaults to "enet". "genet" is the generalized elastic net and "alasso" is the adaptive lasso, which is a weighted version of the lasso. |
| alpha | A numeric value to set the value of α on "enet" and "genet" penalty in msgps (Model Selection Criteria via Generalized Path Seeking). |
| K.seq | A numeric vector. Number of components to test. |
| eta.seq | A numeric vector. Eta sequence to test. |
| fold.val | A numeric value. Number of folds to use. |
| include.threshold.list | A numeric vector. Vector of threshold to use. |
| K | A numeric value. Number of folds to use. |

Details

`lasso_msgps_all` returns the matrix of coefficients for an optimal linear model estimated by the LASSO estimator and selected by model selection criteria including Mallows' Cp, bias-corrected AIC (AICc), generalized cross validation (GCV) and BIC. The `msgps` function of the `msgps` package implements Model Selection Criteria via Generalized Path Seeking to compute the degrees of freedom of the LASSO.

`enet_msgps_all` returns the matrix of coefficients for an optimal linear model estimated by the ELASTIC NET estimator and selected by model selection criteria including Mallows' Cp, bias-corrected AIC (AICc), generalized cross validation (GCV) and BIC. The `msgps` function of the `msgps` package implements Model Selection Criteria via Generalized Path Seeking to compute the degrees of freedom of the ELASTIC NET.

`alasso_msgps_all` returns the matrix of coefficients for an optimal linear model estimated by the adaptive LASSO estimator and selected by model selection criteria including Mallows' Cp, bias-corrected AIC (AICc), generalized cross validation (GCV) and BIC. The `msgps` function of the `msgps` package implements Model Selection Criteria via Generalized Path Seeking to compute the degrees of freedom of the adaptive LASSO.

`alasso_enet_msgps_all` returns the matrix of coefficients for an optimal linear model estimated by the adaptive ELASTIC NET estimator and selected by model selection criteria including Mallows' Cp, bias-corrected AIC (AICc), generalized cross validation (GCV) and BIC. The `msgps` function of the `msgps` package implements Model Selection Criteria via Generalized Path Seeking to compute the degrees of freedom of the adaptive ELASTIC NET.

`lasso_cv_glmnet_all_5f` returns the matrix of coefficients for a linear model estimated by the LASSO using the `lambda.min` and `lambda.1se` (`lambda.min+1se`) values computed by 5 fold cross validation. It uses the `glmnet` and `cv.glmnet` functions of the `glmnet` package.

`spls_spls_all` returns the matrix of the raw (`coef.spls`) and `correct.spls` and bootstrap corrected coefficients for a linear model estimated by the SPLS (sparse partial least squares) and 5 fold cross validation. It uses the `spls`, `cv.spls`, `ci.spls`, `coef.spls` and `correct.spls` functions of the `spls` package.

`varbvs_linear_all` returns the matrix of the coefficients for a linear model estimated by the `varbvs` (variational approximation for Bayesian variable selection in linear regression, `family = gaussian`) and the requested threshold values. It uses the `varbvs`, `coef` and `variable.names` functions of the `varbvs` package.

`lasso_cv_glmnet_bin_all` returns the matrix of coefficients for a logistic model estimated by the LASSO using the `lambda.min` and `lambda.1se` (`lambda.min+1se`) values computed by 5 fold cross validation. It uses the `glmnet` and `cv.glmnet` functions of the `glmnet` package.

`lasso_glmnet_bin_all` returns the matrix of coefficients for a logistic model estimated by the LASSO using the `AICc_glmnetB` and `BIC_glmnetB` information criteria. It uses the `glmnet` function of the `glmnet` package and the `AICc_glmnetB` and `BIC_glmnetB` functions of the `SelectBoost` package that were adapted from the `AICc_glmnetB` and `BIC_glmnetB` functions of the `rLogistic` (<https://github.com/echi/rLogistic>) package.

`splsda_spls_all` returns the matrix of the raw (`coef.splsda`) coefficients for logistic regression model estimated by the SGPLS (sparse généralized partial least squares) and 5 fold cross validation. It uses the `splsda`, `cv.splsda` and `coef.splsda` functions of the `sgpls` package.

`sgpls_spls_all` returns the matrix of the raw (`coef.sgpls`) coefficients for logistic regression model estimated by the SGPLS (sparse généralized partial least squares) and 5 fold cross validation.

It uses the `sgpls`, `cv.sgpls` and `coef.sgpls` functions of the `sgpls` package.

`varbvs_binomial_all` returns the matrix of the coefficients for a linear model estimated by the `varbvs` (variational approximation for Bayesian variable selection in logistic regression, family = binomial) and the requested threshold values. It uses the `varbvs`, `coef` and `variable.names` functions of the `varbvs` package.

Value

A vector or matrix of coefficients.

Author(s)

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References

selectBoost: a general algorithm to enhance the performance of variable selection methods in correlated datasets, Frédéric Bertrand, Ismail Aouadi, Nicolas Jung, Raphael Carapito, Laurent Vallat, Seiamak Bahram, Myriam Maumy-Bertrand, Bioinformatics, 2020. doi: [10.1093/bioinformatics/btaa855](https://doi.org/10.1093/bioinformatics/btaa855)

See Also

[glmnet](#), [cv.glmnet](#), [msgps](#), [AICc_BIC_glmnetB](#), [spl](#)s, [cv.spls](#), [correct.spls](#), [spl](#)sda, [cv.splsda](#), [sgpls](#), [cv.sgpls](#), [varbvs](#)

Other Variable selection functions: [var_select](#)

Examples

```
set.seed(314)
xran <- matrix(rnorm(100*6),100,6)
beta0 <- c(3,1.5,0,0,2,0)
epsilon <- rnorm(100,sd=3)
yran <- c(xran %*% beta0 + epsilon)
ybin <- ifelse(yran>=0,1,0)
set.seed(314)
lasso_msgps_all(xran,yran)

set.seed(314)
enet_msgps_all(xran,yran)

set.seed(314)
alasso_msgps_all(xran,yran)

set.seed(314)
alasso_enet_msgps_all(xran,yran)

set.seed(314)
lasso_cv_glmnet_all_5f(xran,yran)

set.seed(314)
```

```
spls_spls_all(xran,yran)

set.seed(314)
varbvs_linear_all(xran,yran)

set.seed(314)
lasso_cv_glmnet_bin_all(xran,ybin)

set.seed(314)
lasso_glmnet_bin_all(xran,ybin)

set.seed(314)

splstda_spls_all(xran,ybin, K.seq=1:3)

set.seed(314)

sgpls_spls_all(xran,ybin, K.seq=1:3)

set.seed(314)
varbvs_binomial_all(xran,ybin)
```


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