Package 'sglOptim'

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Type Package

Title Generic Sparse Group Lasso Solver

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Description Fast generic solver for sparse group lasso optimization problems. The loss (objective) function must be defined in a C++ module. The optimization problem is solved using a coordinate gradient descent algorithm. Convergence of the algorithm is established (see reference) and the algorithm is applicable to a broad class of loss functions. Use of parallel computing for cross validation and subsampling is supported through the 'foreach' and 'doParallel' packages. Development version is on GitHub, please report package issues on GitHub.

URL https://dx.doi.org/10.1016/j.csda.2013.06.004, https://github.com/nielsrhansen/sglOptim

BugReports https://github.com/nielsrhansen/sglOptim/issues

License GPL (>= 2)

LazyLoad yes

Imports methods, stats, tools, utils

Depends R (>= 3.2.4), Matrix, foreach, doParallel

LinkingTo Rcpp, RcppProgress, RcppArmadillo, BH

Suggests knitr, rmarkdown

VignetteBuilder knitr

RoxygenNote 6.1.1

NeedsCompilation yes

Author Martin Vincent [aut], Niels Richard Hansen [ctb, cre]

Maintainer Niels Richard Hansen <niels.r.hansen@math.ku.dk>

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R topics documented:

`add_data` *Add data to a sgldata data object*

Description

Addes a data to a sgldata data object

Usage

```
add_data(data, x, name, ...)
```

Arguments

`data`	sgldata object
`x`	data object to add,
`name`	name of data object
`...`	additional parameters

Author(s)

Martin Vincent

`add_data.sgldata` *Add data to a sgldata data object*

Description

Addes a data to a sgldata data object

Usage

```
## S3 method for class 'sgldata'
add_data(data, x, name, default = NULL,
  type = element_class(x), sparse = is(x, "sparseMatrix"), ...)
```

Arguments

`data`	sgldata object
`x`	matrix or vector,
`name`	name of the data object
`default`	default value, returned if x is null
`type`	data type, 'numeric' or 'integer'
`sparse`	if TRUE y will be treated as sparse, if FALSE y will be treated as dens.
`...`	not used

Author(s)

Martin Vincent

See Also

Other sgldata: `create.sgldata`, `prepare.args.sgldata`, `prepare.args`, `prepare_data`, `rearrange.sgldata`, `subsample.sgldata`

---

best_model *Index of best model*

Description

Returns the index of the best model

Usage

```
best_model(object, ...)
```

Arguments

`object`	an sgl object
`...`	additional parameters (optional)

Value

index of the best model.

Author(s)

Martin Vincent

---

best_model.sgl *Index of best model*

Description

Returns the index of the best model, in terms of lowest error rate

Usage

```
## S3 method for class 'sgl'
best_model(object, pkg, ...)
```

Arguments

object	a sgl object
pkg	name of calling package
...	additional parameters (optional)

Value

index of the best model.

Author(s)

Martin Vincent

---

coef.sgl *Extracting the nonzero coefficients*

Description

This function returns the nonzero coefficients (that is the nonzero entries of the $beta$ matrices)

Usage

```
## S3 method for class 'sgl'
coef(object, index = 1:nmod(object), parameter = "beta",
  ...)
```

Arguments

object	a sgl object
index	indices of the models
parameter	name of the parameter (deafult is 'beta')
...	ignored

Value

a list of with nonzero coefficients of the models

Author(s)

Martin Vincent

compute_error *Helper function for computing error rates*

Description

This function can be used to compute mean error rates. It is consist with the use cases of the `Err` genetic function. The loss function should be of the form `function(x, y)` and must return a single numeric number, with x a list of true responses and y a list of responses (one list element for each sample).

Usage

```
compute_error(x, response_name, true_response, loss,
  transposed_response = FALSE)
```

Arguments

`x`	sgl object containing responses
`response_name`	the name of the response.
`true_response`	the true response
`loss`	the loss function.
`transposed_response`	have the response list been transposed with `transpose_response_elements`

Value

a vector or matrrix with the computed error rates

Author(s)

Martin Vincent

create.sgldata *Create a sgldata object*

Description

Creates a sgldata object from a design matrix and an optional response vector or matrix.

Usage

```
create.sgldata(x, y, response_dimension = .get_response_dimension(y),
  response_names = .get_response_names(y), sparseX = is(x,
  "sparseMatrix"), sparseY = is(y, "sparseMatrix"),
  typeX = element_class(x), typeY = element_class(y))
```

Arguments

x	the design matrix, a matrix of size $N \times p$ (will be parsed to the loss module as X).
y	the responses, NULL, a vector or a matrix (will be parsed to the loss module as matrix Y)..
response_dimension	number of models, that is the dimension of the returned response.
response_names	names of models, that is the names of the elements of the returned response.
sparseX	if TRUE x will be treated as sparse, if FALSE x will be treated as dens.
sparseY	if TRUE y will be treated as sparse, if FALSE y will be treated as dens.
typeX	type of the elements of x.
typeY	type of the elements of y.

Author(s)

Martin Vincent

See Also

Other sgldata: add_data.sgldata, prepare.args.sgldata, prepare.args, prepare_data, rearrange.sgldata, subsample.sgldata

---

element_class *Retur the element class of an object.*

Description

Return the element class of an object. The object must be a matrix, vector or NULL. The element class of NULL is NULL

Usage

```
element_class(x)
```

Arguments

x	a matrix, vector or NULL

Author(s)

Martin Vincent

Err *Generic function for computing error rates*

Description

Compute and returns an error rate for each model contained in `x`. See details for generic use cases.

Usage

```
Err(object, data, response, ...)
```

Arguments

`object`	an object
`data`	a data object
`response`	a response object
`...`	additional parameters (optional)

Details

The following generic use case should be supported (see for example **msgl** package for an implementation):

1. With `fit` a sgl fit object with models estimated using `x` data, the code
   `Err(fit, x)`
   should return a vector with the *training errors* of the models.
2. With `x.new` a new data set with known responses `response.new`, the code
   `Err(fit, x.new, response.new)`
   should return a vector with the errors of the models when applied to the new data set.
3. With `fit.cv` a sgl cross validation object, the code
   `Err(fit.cv)`
   should return a vector with estimates of the *expected generalization errors* of the models (i.e. the cross validation errors).
4. If subsampling is supported then, with `fit.sub` a sgl subsampling object, the code
   `Err(fit.sub)`
   should return a matrix with the test errors (each column corresponding to a model, i.e. rows corresponds to tests).

Value

a vector of length `nmod(object)` or a matrix with `nmod(object)` columns containing error rates for the models

Author(s)

Martin Vincent

See Also

compute_error

`Err.sgl` *Error Rates*

Description

Compute and return the root-mean-square error for each model. This method is only intended for testing.

The root-mean-square error (RMSE) is

$$\frac{1}{K}\sum_{i=1}^{K}\sqrt{\frac{1}{N}\sum_{j=1}^{N}Y_{ji}-(X\hat{\beta})_{ji}}$$

RMSE is the default error.

Usage

```
## S3 method for class 'sgl'
Err(object, data = NULL, response = object$Y.true, ...)
```

Arguments

`object`	a lsgl object.
`data`	a design matrix (the X matrix).
`response`	a matrix of the true responses (the Y matrix).
`...`	ignored.

Value

a vector of errors.

Author(s)

Martin Vincent

features *Extracts nonzero features*

Description

Generic function for extracting nonzero features.

Usage

```
features(object, ...)
```

Arguments

object	an object
...	additional parameters (optional)

Value

a list of length nmod(x) containing the nonzero features of the models.

Author(s)

Martin Vincent

features.sgl *Extracting nonzero features*

Description

Extract the nonzero features of the fitted models

Usage

```
## S3 method for class 'sgl'
features(object, ...)
```

Arguments

object	a sgl object
...	ignored

Value

a list of vectors containing the nonzero features (that is nonzero columns of the $beta$ matrices)

Author(s)

Martin Vincent

features_stat *Extract feature statistics*

Description

Generic function for extracting feature statistics.

Usage

```
features_stat(object, ...)
```

Arguments

object	an object
...	additional parameters (optional)

Value

an object conting the computed statistics.

Author(s)

Martin Vincent

features_stat.sgl *Extract feature statistics*

Description

Extracts the number of nonzero features (or group) in each model.

Usage

```
## S3 method for class 'sgl'
features_stat(object, ...)
```

Arguments

object	an object
...	ignored

Value

a vector of length `nmod(x)` or a matrix containing the number of nonzero features (or group) of the models.

Author(s)

Martin Vincent

`get_coef` *Get the nonzero coefficients*

Description

Extracting nonzero coefficients from list (of lists) of matrices

Usage

```
get_coef(object, index = 1:length(object))
```

Arguments

`object`	a list of lists of matrices or a list of matrices
`index`	indices to be extracted from

Value

a list (of lists) with the nonzero coefficients

Author(s)

Martin Vincent

`models` *Extract fitted models*

Description

Generic function for extracting the fitted models. Returns the fitted models.

Usage

```
models(object, index, ...)
```

Arguments

`object`	an object
`index`	a vector of indices of the models to be returned
`...`	additional parameters (optional)

Value

a list of length `length(index)` containing the models

Author(s)

Martin Vincent

---

models.sgl *Extract the estimated models*

Description

This function returns the estimated models (that is the $beta$ matrices)

Usage

```
## S3 method for class 'sgl'
models(object, index = 1:nmod(object), ...)
```

Arguments

`object`	a sgl object
`index`	indices of the models to be returned
`...`	ignored

Value

a list of sparse matrices

Author(s)

Martin Vincent

---

nmod *Number of models used for fitting*

Description

Generic function for counting the number of models used for fitting the object. Returns the number of models used for fitting. However, note that the objects returned by `msgl.cv` and `msgl.subsampling` does not contain any models even though `nmod` returns a nonzero number.

Usage

```
nmod(object, ...)
```

Arguments

object	an object
...	additional parameters (optional)

Value

the number of models used when fitting the object x.

Author(s)

Martin Vincent

---

nmod.sgl *Returns the number of models in a sgl object*

Description

Returns the number of models used for fitting.

Usage

```
## S3 method for class 'sgl'
nmod(object, ...)
```

Arguments

object	a sgl object
...	ignored

Details

Note that cv and subsampling objects does not conating any models even though nmod returns a positiv number.

Value

the number of models in object

Author(s)

Martin Vincent

parameters *Extracts nonzero parameters*

Description

Generic function for extracting nonzero parameters for each model.

Usage

```
parameters(object, ...)
```

Arguments

object	an object
...	additional parameters (optional)

Value

a list of length nmod(x) containing the nonzero parameters of the models.

Author(s)

Martin Vincent

parameters.sgl *Extracting nonzero parameters*

Description

Extract the nonzero parameters in each model. Only the parameters of nonzero features (columns of the $beta$ matrices) are returned.

Usage

```
## S3 method for class 'sgl'
parameters(object, ...)
```

Arguments

object	a sgl object
...	ignored

Value

a list of vectors containing the nonzero parameters (that is nonzero entries of the $beta$ matrices)

Author(s)

Martin Vincent

`parameters_stat` *Extract parameter statistics*

Description

Generic function for extracting parameter statistics.

Usage

```
parameters_stat(object, ...)
```

Arguments

`object`	an object
`...`	additional parameters (optional)

Value

an object conting the computed statistics.

Author(s)

Martin Vincent

`parameters_stat.sgl` *Extracting parameter statistics*

Description

Extracts the number of nonzero parameters in each model.

Usage

```
## S3 method for class 'sgl'
parameters_stat(object, ...)
```

Arguments

`object`	an object
`...`	ignored

Value

a vector of length `nmod(x)` or a matrix containing the number of nonzero parameters of the models.

Author(s)

Martin Vincent

`prepare.args` *Generic function for preparing the sgl call arguments*

Description

Compute and prepare the sgl call arguments for the objective function

$$\text{loss}(\text{data})(\beta) + \lambda \left((1-\alpha) \sum_{J=1}^{m} \gamma_J \|\beta^{(J)}\|_2 + \alpha \sum_{i=1}^{n} \xi_i |\beta_i| \right)$$

where loss is a loss/objective function. The n parameters are organized in the parameter matrix β with dimension $q \times p$. The vector $\beta^{(J)}$ denotes the J parameter group, the dimension of $\beta^{(J)}$ is denote by d_J. The dimensions d_J must be multiple of q, and $\beta = (\beta^{(1)} \cdots \beta^{(m)})$. The group weights $\gamma \in [0, \infty)^m$ and the parameter weights $\xi \in [0, \infty)^{qp}$.

Usage

```
prepare.args(data, ...)
```

Arguments

`data`	a data object
`...`	additional parameters

Value

`block_dim`	a vector of length m, containing the dimensions d_J of the groups (i.e. the number of parameters in the groups)
`groupWeights`	a vector of length m, containing the group weights
`parameterWeights`	a matrix of dimension $q \times p$, containing the parameter weights
`alpha`	the α value
`data`	the data parsed to the loss module
`group_order`	original order of the columns of β. Before sgl routines return β will be reorganized according to this order.

Author(s)

Martin Vincent

See Also

prepare.args.sgldata

Other sgldata: add_data.sgldata, create.sgldata, prepare.args.sgldata, prepare_data, rearrange.sgldata, subsample.sgldata

---

`prepare.args.sgldata` *Prepare sgl function arguments*

Description

Prepare sgl function arguments using sgldata.

Usage

```
## S3 method for class 'sgldata'
prepare.args(data, parameterGrouping = NULL,
  groupWeights = NULL, parameterWeights = NULL,
  parameterNames = NULL, alpha, test_data = NULL, ...)
```

Arguments

`data`	a sgldata object
`parameterGrouping`	grouping of parameters, a vector of length p. Each element of the vector specifying the group of the parameters in the corresponding column of β.
`groupWeights`	the group weights, a vector of length `length(unique(parameterGrouping))` (the number of groups).
`parameterWeights`	a matrix of size $q \times p$, that is the same dimension as β.
`parameterNames`	dim-names of parameters, if NULL `dimnames(parameterWeights)` will be used.
`alpha`	the α value 0 for group lasso, 1 for lasso, between 0 and 1 gives a sparse group lasso penalty.
`test_data`	optional test data to be prepared (a sgldata object)
`...`	not used

Author(s)

Martin Vincent

See Also

Other sgldata: add_data.sgldata, create.sgldata, prepare.args, prepare_data, rearrange.sgldata, subsample.sgldata

prepare_data *Prepare a sgldata data object*

Description

Creates a sgldata data object from a matrix or vector

Usage

```
prepare_data(x, default = NULL, type = "numeric", sparse = is(x,
  "sparseMatrix"))
```

Arguments

x	the matrix,
default	default value, returned if x is null
type	data type, 'numeric' or 'integer'
sparse	if TRUE y will be treated as sparse, if FALSE y will be treated as dens.

Author(s)

Martin Vincent

See Also

Other sgldata: add_data.sgldata, create.sgldata, prepare.args.sgldata, prepare.args, rearrange.sgldata, subsample.sgldata

print_with_metric_prefix *Print a numeric with metric prefix*

Description

Print a numeric with metric prefix

Usage

```
print_with_metric_prefix(x, digits = 3)
```

Arguments

x	numeric to be printed
digits	number of significant digits

Value

a string

Author(s)

Martin Vincent

`rearrange` *Generic rearrange function*

Description

Rearrange the order of the covariates in the `data` object.

Usage

```
rearrange(data, covariate.order, ...)
```

Arguments

`data`	a data object
`covariate.order`	the new order of the covariates
`...`	additional parameters

Value

a rearranged data object of same class as `data`

Author(s)

Martin Vincent

See Also

rearrange.sgldata

rearrange.sgldata *Rearrange sgldata*

Description

Rearrange the order of the covariates in a sgldata object.

Usage

```
## S3 method for class 'sgldata'
rearrange(data, covariate.order, ...)
```

Arguments

data	a sgldata object
covariate.order	the new order of the covariates
...	not used

Value

a sgldata object with the covariates reordered

Author(s)

Martin Vincent

See Also

Other sgldata: add_data.sgldata, create.sgldata, prepare.args.sgldata, prepare.args, prepare_data, subsample.sgldata

sgl.algorithm.config *Create a new algorithm configuration*

Description

With the exception of verbose it is not recommended to change any of the default values.

Usage

```
sgl.algorithm.config(tolerance_penalized_main_equation_loop = 1e-10,
  tolerance_penalized_inner_loop_alpha = 1e-04,
  tolerance_penalized_inner_loop_beta = 1,
  tolerance_penalized_middel_loop_alpha = 0.01,
  tolerance_penalized_outer_loop_alpha = 0.01,
  tolerance_penalized_outer_loop_beta = 0,
  tolerance_penalized_outer_loop_gamma = 1e-05,
  use_bound_optimization = TRUE,
  use_stepsize_optimization_in_penalizeed_loop = TRUE,
  stepsize_opt_penalized_initial_t = 1, stepsize_opt_penalized_a = 0.1,
  stepsize_opt_penalized_b = 0.1, max_iterations_outer = 10000,
  inner_loop_convergence_limit = 10000, verbose = TRUE)
```

Arguments

`tolerance_penalized_main_equation_loop`	tolerance threshold.
`tolerance_penalized_inner_loop_alpha`	tolerance threshold.
`tolerance_penalized_inner_loop_beta`	tolerance threshold.
`tolerance_penalized_middel_loop_alpha`	tolerance threshold.
`tolerance_penalized_outer_loop_alpha`	tolerance threshold.
`tolerance_penalized_outer_loop_beta`	tolerance threshold.
`tolerance_penalized_outer_loop_gamma`	tolerance threshold.
`use_bound_optimization`	if `TRUE` hessian bound check will be used.
`use_stepsize_optimization_in_penalizeed_loop`	if `TRUE` step-size optimization will be used.
`stepsize_opt_penalized_initial_t`	initial step-size.
`stepsize_opt_penalized_a`	step-size optimization parameter.
`stepsize_opt_penalized_b`	step-size optimization parameter.
`max_iterations_outer`	max iteration of outer loop
`inner_loop_convergence_limit`	inner loop convergence limit.
`verbose`	If `TRUE` some information, regarding the status of the algorithm, will be printed in the R terminal.

Value

A configuration.

Author(s)

Martin Vincent

Examples

```
config.no_progressbar <- sgl.algorithm.config(verbose = FALSE)
```

---

sgl.c.config *Featch information about the C side configuration of the package*

Description

Featch information about the C side configuration of the package

Usage

```
sgl.c.config()
```

Value

list

Author(s)

Martin Vicnet

---

sgl.standard.config *Standard algorithm configuration*

Description

`sgl.standard.config <- sgl.algorithm.config()`

Usage

```
sgl.standard.config
```

Format

An object of class `list` of length 15.

Author(s)

Martin Vicnet

sglOptim *sglOptim: Generic Sparse Group Lasso Solver*

Description

Fast generic solver for sparse group lasso optimization problems. The loss (objective) function must be defined in a C++ module. The optimization problem is solved using a coordinate gradient descent algorithm. Convergence of the algorithm is established (see reference) and the algorithm is applicable to a broad class of loss functions. Use of parallel computing for cross validation and subsampling is supported through the 'foreach' and 'doParallel' packages. Development version is on GitHub, please report package issues on GitHub.

Details

Computes a sequence of minimizers (one for each lambda given in the `lambda` argument) of

$$\text{loss}(\beta) + \lambda \left((1-\alpha) \sum_{J=1}^{m} \gamma_J \|\beta^{(J)}\|_2 + \alpha \sum_{i=1}^{n} \xi_i |\beta_i| \right)$$

where loss is the loss/objective function specified by `module_name`. The parameters are organized in the parameter matrix β with dimension $q \times p$. The vector $\beta^{(J)}$ denotes the J parameter group. The group weights $\gamma \in [0, \infty)^m$ and the parameter weights $\xi = (\xi^{(1)}, \ldots, \xi^{(m)}) \in [0, \infty)^n$ with $\xi^{(1)} \in [0, \infty)^{n_1}, \ldots, \xi^{(m)} \in [0, \infty)^{n_m}$.

The package includes generic functions for:

- Fitting models using sparse group lasso, that is computing the minimizers of the above equation.
- Cross validation using parallel computing.
- Generic subsampling using parallel computing.
- Applying the fitted models on new data and predicting responses.
- Computing lambda sequences.
- Navigating the models and computing error rates.

Author(s)

Martin Vincent

sgl_cv *Generic sparse group lasso cross validation using multiple possessors*

Description

Generic sparse group lasso cross validation using multiple possessors

Usage

```
sgl_cv(module_name, PACKAGE, data, parameterGrouping = NULL,
  groupWeights = NULL, parameterWeights = NULL, alpha, lambda,
  d = 100, compute_lambda = length(lambda) == 1, fold = 2,
  sampleGroups = NULL, cv.indices = list(), responses = NULL,
  max.threads = NULL, use_parallel = FALSE,
  algorithm.config = sgl.standard.config)
```

Arguments

module_name	reference to objective specific C++ routines.
PACKAGE	name of the calling package.
data	a list of data objects – will be parsed to the specified module.
parameterGrouping	grouping of parameters, a vector of length p. Each element of the vector specifying the group of the parameters in the corresponding column of β.
groupWeights	the group weights, a vector of length `length(unique(parameterGrouping))` (the number of groups).
parameterWeights	a matrix of size $q \times p$.
alpha	the α value 0 for group lasso, 1 for lasso, between 0 and 1 gives a sparse group lasso penalty.
lambda	lambda.min relative to lambda.max (if `compute_lambda = TRUE`) or the lambda sequence for the regularization path, a vector or a list of vectors (of the same length) with the lambda sequence for the subsamples.
d	length of lambda sequence (ignored if `compute_lambda = FALSE`)
compute_lambda	should the lambda sequence be computed
fold	the fold of the cross validation, an integer larger than 1 and less than $N + 1$. Ignored if `cv.indices != NULL`. If `fold`$\leq$`max(table(classes))` then the data will be split into `fold` disjoint subsets keeping the ration of classes approximately equal. Otherwise the data will be split into `fold` disjoint subsets without keeping the ration fixed.
sampleGroups	grouping of samples, the algorithm computing the cv.indices will try to equally divide the groups among the subsamples.
cv.indices	a list of indices of a cross validation splitting. If `cv.indices = NULL` then a random splitting will be generated using the `fold` argument.

responses	a vector of responses to simplify and return (if NULL (deafult) no formating will be done)
max.threads	Deprecated (will be removed in 2018), instead use use_parallel = TRUE and registre parallel backend (see package 'doParallel'). The maximal number of threads to be used.
use_parallel	If TRUE the foreach loop will use %dopar%. The user must registre the parallel backend.
algorithm.config	the algorithm configuration to be used.

Value

Y.true	the response, that is the y object in data as created by create.sgldata.
responses	content will depend on the C++ response class
cv.indices	the cross validation splitting used
features	number of features used in the models
parameters	number of parameters used in the models
lambda	the lambda sequence used.

Author(s)

Martin Vincent

---

sgl_fit *Fit a Sparse Group Lasso Regularization Path.*

Description

Computes a sequence of minimizers (one for each lambda given in the lambda argument) of

$$\text{loss}(\beta) + \lambda \left((1-\alpha) \sum_{J=1}^{m} \gamma_J \|\beta^{(J)}\|_2 + \alpha \sum_{i=1}^{n} \xi_i |\beta_i| \right)$$

where loss is the loss/objective function specified by module_name. The parameters are organized in the parameter matrix β with dimension $q \times p$. The vector $\beta^{(J)}$ denotes the J parameter group. The group weights $\gamma \in [0, \infty)^m$ and the parameter weights $\xi = (\xi^{(1)}, \ldots, \xi^{(m)}) \in [0, \infty)^n$ with $\xi^{(1)} \in [0, \infty)^{n_1}, \ldots, \xi^{(m)} \in [0, \infty)^{n_m}$.

Usage

```
sgl_fit(module_name, PACKAGE, data, parameterGrouping = NULL,
  groupWeights = NULL, parameterWeights = NULL, alpha, lambda,
  d = 100, compute_lambda = length(lambda) == 1,
  return_indices = NULL, algorithm.config = sgl.standard.config)
```

Arguments

module_name	reference to objective specific C++ routines.
PACKAGE	name of the calling package.
data	a list of data objects – will be parsed to the specified module.
parameterGrouping	grouping of parameters, a vector of length p. Each element of the vector specifying the group of the parameters in the corresponding column of β.
groupWeights	the group weights, a vector of length `length(unique(parameterGrouping))` (the number of groups).
parameterWeights	a matrix of size $q \times p$.
alpha	the α value 0 for group lasso, 1 for lasso, between 0 and 1 gives a sparse group lasso penalty.
lambda	lambda.min relative to lambda.max (if `compute_lambda = TRUE`) or the lambda sequence for the regularization path, a vector or a list of vectors (of the same length) with the lambda sequence for the subsamples.
d	length of lambda sequence (ignored if `compute_lambda = FALSE`)
compute_lambda	should the lambda sequence be computed
return_indices	the indices of lambda values for which to return fitted parameters.
algorithm.config	the algorithm configuration to be used.

Value

Y.true	the response, that is the `y` object in data as created by `create.sgldata`.
beta	the fitted parameters – a list of length `length(return)` with each entry a matrix of size $q \times (p + 1)$ holding the fitted parameters.
loss	the values of the loss function.
objective	the values of the objective function (i.e. loss + penalty).
lambda	the lambda values used.

Author(s)

Martin Vincent

sgl_lambda_sequence *Computing a Lambda Sequence*

Description

Computes a decreasing lambda sequence of length d. The sequence ranges from a data determined maximal lambda $\lambda_{\max}$ to the user supplied lambda.min.

Usage

```
sgl_lambda_sequence(module_name, PACKAGE, data, parameterGrouping = NULL,
  groupWeights = NULL, parameterWeights = NULL, alpha, d = 100,
  lambda.min, algorithm.config = sgl.standard.config,
  lambda.min.rel = FALSE)
```

Arguments

module_name	reference to objective specific C++ routines.
PACKAGE	name of the calling package.
data	list of data objects – will be parsed to the specified module.
parameterGrouping	grouping of parameters, a vector of length p. Each element of the vector specifying the group of the parameters in the corresponding column of β.
groupWeights	group weights, a vector of length length(unique(parameterGrouping)) (the number of groups).
parameterWeights	parameters weights, a matrix of size $q \times p$.
alpha	the α value, 0 for group lasso, 1 for lasso, between 0 and 1 gives a sparse group lasso penalty.
d	the length of the lambda sequence.
lambda.min	the smallest lambda value in the computed sequence.
algorithm.config	the algorithm configuration.
lambda.min.rel	is lambda.min relative to lambda.max ? (i.e. actual lambda min used is lambda.min*lambda.max, with lambda.max the computed maximal lambda value)

Value

a vector of length d containing the compute lambda sequence.

Author(s)

Martin Vincent

`sgl_predict` *Predict*

Description

Predict and return responses as defined in the module.

Usage

```
sgl_predict(module_name, PACKAGE, object, data, responses = NULL,
  auto_response_names = TRUE, ...)
```

Arguments

`module_name`	reference to objective specific C++ routines.
`PACKAGE`	name of the calling package.
`object`	a sgl object containing a list of estimated models.
`data`	a list of data objects – will be parsed to the specified module.
`responses`	a vector of responses to simplify and return (if NULL (deafult) no formating will be done)
`auto_response_names`	set response names
`...`	not used.

Details

If no formating is done (i.e. if `responses = NULL`) then the `responses` field contains a list of lists structured in the following way:

- sample 1
  - model (lambda) index 1
    - response elements
  - model (lambda) index 2
    - response elements
  - ...
- sample 2
  - model (lambda) index 1
    - response elements
  - model (lambda) index 2
    - response elements
  - ...
- ...

If `responses = "rname"` with `rname` the name of the response then a list at `responses$rname` will be returned. The content of the list will depend on the type of the response.

- *scalar:* a matrix of size $n \times d$ with the responses (where n is the number of samples and d the length of the lambda sequence).
- *vector:* a list of length d with each element a matrix of dimension $n \times q$ containing the responses for the corresponding model (where q is the dimension of the response).
- *matrix:* a list with format samples -> models - > the response matrix.

Value

`responses`	list of lists structured as described in details. Content of the response elements will depend on the C++ response class
`lambda`	the lambda sequence used.

Author(s)

Martin Vincent

---

sgl_print *Print information about sgl object*

Description

Prints information about sgl object

Usage

```
sgl_print(x)
```

Arguments

`x`	a object of sgl family class

Author(s)

Martin Vincent

sgl_subsampling *Generic sparse group lasso subsampling procedure*

Description

Subsampling procedure with support parallel computations.

Usage

```
sgl_subsampling(module_name, PACKAGE, data, parameterGrouping = NULL,
  groupWeights = NULL, parameterWeights = NULL, alpha, lambda,
  d = 100, compute_lambda = length(lambda) == 1, training = NULL,
  test = NULL, responses = NULL, auto_response_names = TRUE,
  collapse = FALSE, max.threads = NULL, use_parallel = FALSE,
  algorithm.config = sgl.standard.config)
```

Arguments

module_name	reference to objective specific C++ routines.
PACKAGE	name of the calling package.
data	a list of data objects – will be parsed to the specified module.
parameterGrouping	grouping of parameters, a vector of length p. Each element of the vector specifying the group of the parameters in the corresponding column of β.
groupWeights	the group weights, a vector of length `length(unique(parameterGrouping))` (the number of groups).
parameterWeights	a matrix of size $q \times p$.
alpha	the α value 0 for group lasso, 1 for lasso, between 0 and 1 gives a sparse group lasso penalty.
lambda	lambda.min relative to lambda.max (if `compute_lambda = TRUE`) or the lambda sequence for the regularization path, a vector or a list of vectors (of the same length) with the lambda sequence for the subsamples.
d	length of lambda sequence (ignored if `compute_lambda = FALSE`)
compute_lambda	should the lambda sequence be computed
training	a list of training samples, each item of the list corresponding to a subsample. Each item in the list must be a vector with the indices of the training samples for the corresponding subsample. The length of the list must equal the length of the `test` list.
test	a list of test samples, each item of the list corresponding to a subsample. Each item in the list must be vector with the indices of the test samples for the corresponding subsample. The length of the list must equal the length of the `training` list.

`responses` a vector of responses to simplify and return (if NULL (deafult) no formating will be done)

`auto_response_names` set response names

`collapse` if `TRUE` the results will be collapsed and ordered into one result, resembling the output of `sgl_predict` (this is only valid if the test samples are not overlapping)

`max.threads` Deprecated (will be removed in 2018), instead use `use_parallel = TRUE` and registre parallel backend (see package 'doParallel'). The maximal number of threads to be used.

`use_parallel` If `TRUE` the `foreach` loop will use `%dopar%`. The user must registre the parallel backend.

`algorithm.config` the algorithm configuration to be used.

Details

If no formating is done (i.e. if `responses = NULL`) then the `responses` field contains a list of lists structured in the following way:

subsamples 1:

- sample `test[[1]][1]`
  - model (lambda) index 1
    - response elements
  - model (lambda) index 2
    - response elements
  - ...
- sample `test[[1]][2]`
  - model (lambda) index 1
    - response elements
  - model (lambda) index 2
    - response elements
  - ...
- ...

subsamples 2: ...

If `responses = "rname"` with `rname` the name of the response then a list at `responses$rname` will be returned. The content of the list will depend on the type of the response.

- vector A list with format subsamples -> models -> matrix of dimension $n_i \times q$ containing the responses for the corresponding model and subsample (where q is the dimension of the response).
- matrix A list with format subsamples -> samples -> models - > the response matrix.

Value

`Y.true`	the response, that is the `y` object in data as created by `create.sgldata`.
`responses`	content will depend on the C++ response class
`features`	number of features used in the models
`parameters`	number of parameters used in the models
`lambda`	the lambda sequences used (a vector or list of length `length(training)`).

Author(s)

Martin Vincent

---

sgl_test *Test a sgl-Objective*

Description

This function will run tests on the gradient and hessian functions implemented in a C++ objective module. Detected problems will be printed to the console.'

Usage

```
sgl_test(module_name, PACKAGE, data, parameterGrouping, groupWeights,
  parameterWeights, algorithm.config = sgl.standard.config)
```

Arguments

`module_name`	reference to objective specific C++ routines.
`PACKAGE`	name of the calling package.
`data`	a list of data objects – will be parsed to the specified module.
`parameterGrouping`	grouping of parameters, a vector of length p. Each element of the vector specifying the group of the parameters in the corresponding column of β.
`groupWeights`	the group weights, a vector of length `length(unique(parameterGrouping))` (the number of groups).
`parameterWeights`	a matrix of size $q \times p$.
`algorithm.config`	the algorithm configuration to be used.

Value

The number of found problems

Author(s)

Martin Vincent

sparseMatrix_from_C_format

Convert to sparse matrix

Description

Convert sparse matrix retunred from .Call to sparseMatrix.

Usage

```
sparseMatrix_from_C_format(x)
```

Arguments

x	.Call retunred list

Author(s)

Martin Vincent

sparseMatrix_to_C_format

Prepare sparse matrix for .Call

Description

Prepare sparse matrix for .Call

Usage

```
sparseMatrix_to_C_format(x)
```

Arguments

x	a spares matrix

Author(s)

Martin Vincent

subsample *Subsample*

Description

Pick out a subsample of an object

Usage

```
subsample(data, indices, ...)
```

Arguments

data	a data object
indices	a vector of indices to pick out
...	not used

Value

a data object of the same class as data

Author(s)

Martin Vincent

subsample.sgldata *Subsample sgldata*

Description

Pick out a subsample of a sgldata object

Usage

```
## S3 method for class 'sgldata'
subsample(data, indices, ...)
```

Arguments

data	a sgldata object
indices	a vector of indices to pick out
...	not used

Value

a sgldata

Author(s)

Martin Vincent

See Also

Other sgldata: add_data.sgldata, create.sgldata, prepare.args.sgldata, prepare.args, prepare_data, rearrange.sgldata

---

test.data *Simulated data set*

Description

This data set is for testing only.

---

test_rtools *Test internal rtools*

Description

This function runs some internal tests and is not intended for users of the package.

Usage

```
test_rtools()
```

Author(s)

Martin Vincent

---

transpose_response_elements *Transpose response elements*

Description

Transpose response elements in a response list and sub lists

Usage

```
transpose_response_elements(x)
```

Arguments

x	response list or matrix

Value

response list with all matrices transposed

Author(s)

Martin Vincent

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