Package ‘SGL’

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Type Package

Title Fit a GLM (or Cox Model) with a Combination of Lasso and Group Lasso Regularization

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Author Noah Simon, Jerome Friedman, Trevor Hastie, and Rob Tibshirani

Maintainer Noah Simon <nrsimon@uw.edu>

Description Fit a regularized generalized linear model via penalized maximum likelihood. The model is fit for a path of values of the penalty parameter. Fits linear, logistic and Cox models.

License GPL

LazyLoad yes

Repository CRAN

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SGL-package

Fit a GLM (or Cox Model) with a Combination of Lasso and Group Lasso Regularization

Description

Fit a regularized generalized linear model via penalized maximum likelihood. The model is fit for a path of values of the penalty parameter. Fits linear, logistic and Cox models.

Details

Package: SGL
Type: Package
Version: 1.0
Date: 2012-3-12
License: GPL
LazyLoad: yes

Only 4 functions: SGL cvSGL predictSGL plot.cvSGL

Author(s)

Noah Simon, Jerome Friedman, Trevor Hastie, and Rob Tibshirani
Maintainer: Noah Simon <nrsimon@uw.edu>

References


cvSGL

Fit and Cross-Validate a GLM with a Combination of Lasso and Group Lasso Regularization

Description

Fits and cross-validates a regularized generalized linear model via penalized maximum likelihood. The model is fit for a path of values of the penalty parameter, and a parameter value is chosen by cross-validation. Fits linear, logistic and Cox models.
cvSGL

Usage

cvSGL(data, index = rep(1, ncol(data$x)), type = "linear", maxit = 1000, thresh = 0.001, 
min.frac = 0.05, nlam = 20, gamma = 0.8, nfold = 10, standardize = TRUE, 
verbose = FALSE, step = 1, reset = 10, alpha = 0.95, lambdas = NULL, 
foldid = NULL)

Arguments

data  For type="linear" should be a list with $x$ an input matrix of dimension n-obs by p-vars, and $y$ a length n response vector. For type="logit" should be a list with $x$, an input matrix, as before, and $y$ a length n binary response vector. For type="cox" should be a list with x as before, time, an n-vector corresponding to failure/censor times, and status, an n-vector indicating failure (1) or censoring (0).

index A p-vector indicating group membership of each covariate

type model type: one of ("linear", "logit", "cox")

maxit Maximum number of iterations to convergence

thresh Convergence threshold for change in beta

min.frac The minimum value of the penalty parameter, as a fraction of the maximum value

nlam Number of lambda to use in the regularization path

gamma Fitting parameter used for tuning backtracking (between 0 and 1)
nfold Number of folds of the cross-validation loop

standardize Logical flag for variable standardization (scaling) prior to fitting the model.

verbose Logical flag for whether or not step number will be output

step Fitting parameter used for initial backtracking step size (between 0 and 1)

reset Fitting parameter used for taking advantage of local strong convexity in nesterov momentum (number of iterations before momentum term is reset)

alpha The mixing parameter. alpha = 1 is the lasso penalty.

lambdas A user inputted sequence of lambda values for fitting. We recommend leaving this NULL and letting SGL self-select values

foldid An optional user-specified vector indicating the cross-validation fold in which each observation should be included. Values in this vector should range from 1 to nfold. If left unspecified, SGL will randomly assign observations to folds

Details

The function runs SGL nfold+1 times; the initial run is to find the lambda sequence, subsequent runs are used to compute the cross-validated error rate and its standard deviation.
plot.cv.SGL

Value

An object with S3 class "cv.SGL"

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>lldiff</td>
<td>An nlambda vector of cross validated negative log likelihoods (squared error loss in the linear case, along the regularization path)</td>
</tr>
<tr>
<td>llSD</td>
<td>An nlambda vector of approximate standard deviations of lldiff</td>
</tr>
<tr>
<td>lambdas</td>
<td>The actual list of lambda values used in the regularization path.</td>
</tr>
<tr>
<td>type</td>
<td>Response type (linear/logic/cox)</td>
</tr>
<tr>
<td>fit</td>
<td>A model fit object created by a call to SGL on the entire dataset</td>
</tr>
<tr>
<td>foldid</td>
<td>A vector indicating the cross-validation folds that each observation is assigned to</td>
</tr>
<tr>
<td>prevals</td>
<td>A matrix of prevalidated predictions for each observation, for each lambda-value</td>
</tr>
</tbody>
</table>

Author(s)

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References


See Also

SGL

Examples

```r
set.seed(1)
n = 50; p = 100; size.groups = 10
index <- ceiling(1:p / size.groups)
X = matrix(rnorm(n * p), ncol = p, nrow = n)
beta = (-2:2)
y = X[,1:5] %*% beta + 0.1*rnorm(n)
data = list(x = X, y = y)
cvFit = cvSGL(data, index, type = "linear")
```

---

**plot.cv.SGL**

plots the cross-validated error curve produced by cv.SGL

Description

Plots the cross-validated error curve, and confidence bounds for each lambda in our regularization path.
**predictSGL**

Usage

```r
## S3 method for class 'cv.SGL'
plot(x, ...)
```

Arguments

- `x`: fitted "cv.SGL" object
- `...`: additional arguments to be passed to `plot`

Details

A cross validated deviance plot is produced. More regularized models are to the right (less regularized to the left)

Author(s)

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References

http://faculty.washington.edu/nrsimon/SGLpaper.pdf

See Also

SGL and cv.SGL.

Examples

```r
n = 50; p = 100; size.groups = 10
index <- ceiling(1:p / size.groups)
X = matrix(rnorm(n * p), ncol = p, nrow = n)
beta = (-2:2)
y = X[,1:5] %*% beta + 0.1*rnorm(n)
data = list(x = X, y = y)
cvFit = cvSGL(data, index, type = "linear")
plot(cvFit)
```

---

**predictSGL**

*Outputs Predicted Responses from an SGL Model for New Observations*

Description

Outputs predicted response values for new user input observations at a specified lambda value
Usage

predictSGL(x, newX, lam)

Arguments

- **x**: fitted "SGL" object
- **newX**: covariate matrix for new observations whose responses we wish to predict
- **lam**: the index of the lambda value for the model with which we desire to predict

Details

Predicted outcomes are given

Author(s)

Noah Simon, Jerome Friedman, Trevor Hastie, and Rob Tibshirani
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References

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See Also

SGL and cvSGL.

Examples

```r
n = 50; p = 100; size.groups = 10
index <- ceiling(1:p / size.groups)
X = matrix(rnorm(n * p), ncol = p, nrow = n)
beta = (-2:2)
y = X[,1:5] %*% beta + 0.1*rnorm(n)
data = list(x = X, y = y)
Fit = SGL(data, index, type = "linear")
X.new = matrix(rnorm(n * p), ncol = p, nrow = n)
predictSGL(Fit, X.new, 5)
```

print.SGL prints a summary of the SGL solution path

Description

Prints a short summary of the SGL solution path.
print.SGL

Usage

## S3 method for class 'SGL'
print(x, digits, ...)

Arguments

x f fitted "SGL" object
digits significant digits in printout
... additional print arguments

Details

The time of regression run, followed by a 2-column matrix with rows lambdas and num.nonzero. lambdas gives the lambda-value of each fit. num.nonzero gives the the number of non-zero coefficients.

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References

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See Also

SGL and cv.SGL.

Examples

n = 50; p = 100; size.groups = 10
index <- ceiling(1:p / size.groups)
X = matrix(rnorm(n * p), ncol = p, nrow = n)
beta = (-2:2)
y = X[,1:5] %*% beta + 0.1*rnorm(n)
data = list(x = X, y = y)
fit = SGL(data, index, type = "linear")
print(fit)
Fit a GLM with a Combination of Lasso and Group Lasso Regularization

**Description**

Fit a regularized generalized linear model via penalized maximum likelihood. The model is fit for a path of values of the penalty parameter. Fits linear, logistic and Cox models.

**Usage**

```r
SGL(data, index, type = "linear", maxit = 1000, thresh = 0.001,
    min.frac = 0.1, nlam = 20, gamma = 0.8, standardize = TRUE,
    verbose = FALSE, step = 1, reset = 10, alpha = 0.95, lambdas = NULL)
```

**Arguments**

- `data` For type="linear" should be a list with $x$ an input matrix of dimension n-obs by p-vars, and $y$ a length n response vector. For type="logit" should be a list with $x$, an input matrix, as before, and $y$ a length n binary response vector. For type="cox" should be a list with $x$ as before, $time$, an n-vector corresponding to failure/censor times, and $status$, an n-vector indicating failure (1) or censoring (0).
- `index` A p-vector indicating group membership of each covariate
- `type` model type: one of ("linear", "logit", "cox")
- `maxit` Maximum number of iterations to convergence
- `thresh` Convergence threshold for change in beta
- `min.frac` The minimum value of the penalty parameter, as a fraction of the maximum value
- `nlam` Number of lambda to use in the regularization path
- `gamma` Fitting parameter used for tuning backtracking (between 0 and 1)
- `standardize` Logical flag for variable standardization prior to fitting the model.
- `verbose` Logical flag for whether or not step number will be output
- `step` Fitting parameter used for inital backtracking step size (between 0 and 1)
- `reset` Fitting parameter used for taking advantage of local strong convexity in nesterov momentum (number of iterations before momentum term is reset)
- `alpha` The mixing parameter. alpha = 1 is the lasso penalty. alpha = 0 is the group lasso penalty.
- `lambdas` A user specified sequence of lambda values for fitting. We recommend leaving this NULL and letting SGL self-select values

**Details**

The sequence of models along the regularization path is fit by accelerated generalized gradient descent.
Value

An object with S3 class "SGL"

- **beta**: A \( p \) by \( n_{\lambda} \) matrix, giving the penalized MLEs for the \( n_{\lambda} \) different models, where the index corresponds to the penalty parameter \( \lambda \).

- **lambdas**: The actual sequence of \( \lambda \) values used (penalty parameter).

- **type**: Response type (linear/logic/cox).

- **intercept**: For some model types, an intercept is fit.

- **X.transform**: A list used in predict which gives the empirical mean and variance of the \( x \) matrix used to build the model.

- **lambdas**: A user specified sequence of \( \lambda \) values for fitting. We recommend leaving this NULL and letting SGL self-select values.

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**References**

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**See Also**

cv.SGL

**Examples**

```r
n = 50; p = 100; size.groups = 10
index <- ceiling(1:p / size.groups)
X = matrix(rnorm(n * p), ncol = p, nrow = n)
beta = (-2:2)
y = X[,1:5] %*% beta + 0.1*rnorm(n)
data = list(x = X, y = y)
fit = SGL(data, index, type = "linear")
```
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