Package ‘bolasso’

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Title Model Consistent Lasso Estimation Through the Bootstrap

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*Bootstrap-enhanced Lasso*

**Description**

This function implements model-consistent Lasso estimation through the bootstrap. It supports parallel processing by way of the `future` package, allowing the user to flexibly specify many parallelization methods. This method was developed as a variable-selection algorithm, but this package also supports making ensemble predictions on new data using the bagged Lasso models.

**Usage**

```r
bolasso(
  form,
  data,
  n.boot = 100,
  progress = TRUE,
  implement = "glmnet",
  x = NULL,
  y = NULL,
  ...
)
```

**Arguments**

- `form`: An optional object of class `formula` (or one that can be coerced to that class): a symbolic description of the model to be fitted. Can be omitted when `x` and `y` are non-missing.
- `data`: An optional object of class `data.frame` that contains the modeling variables referenced in `form`. Can be omitted when `x` and `y` are non-missing.
- `n.boot`: An integer specifying the number of bootstrap replicates.
- `progress`: A boolean indicating whether to display progress across bootstrap folds.
- `implement`: A character; either 'glmnet' or 'gamlr', specifying which Lasso implementation to utilize. For specific modeling details, see `glmnet::cv.glmnet` or `gamlr::cv.gamlr`.
- `x`: An optional predictor matrix in lieu of `form` and `data`.
- `y`: An optional response vector in lieu of `form` and `data`.
- `...`: Additional parameters to pass to either `glmnet::cv.glmnet` or `gamlr::cv.gamlr`.

**Value**

An object of class `bolasso`. This object is a list of length `n.boot` of `cv.glmnet` or `cv.gamlr` objects.
References


See Also

glmnet::cv.glmnet and gamlr::cv.gamlr for full details on the respective implementations and arguments that can be passed to . . . .

Examples

```r
mtcars[, c(2, 10:11)] <- lapply(mtcars[, c(2, 10:11)], as.factor)
idx <- sample(nrow(mtcars), 22)
mtcars_train <- mtcars[idx, ]
mtcars_test <- mtcars[-idx, ]

## Formula Interface
# Train model
set.seed(123)
bolasso_form <- bolasso(
  form = mpg ~ .,
  data = mtcars_train,
  n.boot = 20,
  nfolds = 5,
  implement = "glmnet"
)

# Extract selected variables
selected_vars(bolasso_form, threshold = 0.9, select = "lambda.min")

# Bagged ensemble prediction on test data
predict(bolasso_form,
       new.data = mtcars_test,
       select = "lambda.min")

## Alternal Matrix Interface
# Train model
set.seed(123)
bolasso_mat <- bolasso(
  x = model.matrix(mpg ~ . - 1, mtcars_train),
  y = mtcars_train[, 1],
  data = mtcars_train,
  n.boot = 20,
  nfolds = 5,
  implement = "glmnet"
)

# Extract selected variables
selected_vars(bolasso_mat, threshold = 0.9, select = "lambda.min")
```
# Bagged ensemble prediction on test data

```r
predict(bolasso_mat,
        new.data = model.matrix(mpg ~ . - 1, mtcars_test),
        select = "lambda.min")
```

## selected_vars

### Bolasso-selected Variables

#### Description
Identifies independent variables that are selected by the Bolasso algorithm at least the fraction of the time specified by the user-defined threshold. The typical value for this threshold is 0.9 and typically shouldn’t be lower than that.

#### Usage

```r
selected_vars(object, threshold = 0.9, summarise = TRUE, ...)
```

#### Arguments
- **object**: An object of class `bolasso`.
- **threshold**: A numeric between 0 and 1, specifying the fraction of bootstrap replicates for which Lasso must select a variable for it to be considered a selected variable.
- **summarise**: A Boolean indicator where `FALSE` indicates returning the full set of coefficients at the selected variable/bootstrap replicate level and `TRUE` indicates taking the average of each variable’s coefficient across bootstrap replicates. The default value is `TRUE` as it’s more efficient and interpretable.
- **...**: Additional arguments to pass to `predict` on objects with class `cv.glmnet` or `cv.gamlr`.

#### Value
A tibble with each selected variable and its respective coefficient for each bootstrap replicate.

#### See Also
- `glmnet::predict.glmnet()` and `gamlr::predict.gamlr` for details on additional arguments to pass to `...`.
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