

Package ‘AnchorRegression’

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Type Package

Title Perform AnchorRegression

Version 0.1.3

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Description Performs AnchorRegression proposed by Rothenhäusler et al. 2020.

The code is adapted from the original paper repository. (<<https://github.com/rothenhaeusler/anchor-regression>>)

The code was developed independently from the authors of the paper.

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URL <https://github.com/simzim96/AnchorRegression>

BugReports <https://github.com/simzim96/AnchorRegression/issues>

Depends R (>= 2.0.0)

Imports glmnet (>= 1.4), selectiveInference (>= 1.0.0), mgcv (>= 1.0)

Encoding UTF-8

RoxygenNote 7.1.1

Suggests knitr, rmarkdown, testthat

NeedsCompilation no

Repository CRAN

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Contents

anchor_prediction	2
anchor_prediction_gam	2
anchor_regression	3
anchor_regression_gam	4
anchor_stability	5
weighted_anchor_prediction	6
weighted_anchor_regression	7

Index	9
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anchor_prediction	<i>anchor_prediction</i>
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Description

Perform a prediction for an Anchor Regression model as described in Rothenhäusler et al.2020

Usage

```
anchor_prediction(anchor_model, x, anchor, gamma, target_variable)
```

Arguments

anchor_model	is the Anchor Regression model object
x	is a dataframe containing the matrix x containing the independent variables
anchor	is a dataframe containing the matrix anchor containing the anchor variable
gamma	is the regularization parameter for the Anchor Regression
target_variable	is the target variable name contained in the x dataframe

Value

A list of predictions.

Examples

```
x <- as.data.frame(matrix(data = rnorm(100),nrow = 100,ncol = 10))
anchor <- as.data.frame(matrix(data = rnorm(200),nrow = 100,ncol = 2))
colnames(anchor) <- c('X1','X2')
gamma <- 2
target_variable <- 'V2'
anchor_model <- anchor_regression(x, anchor, gamma, target_variable)
anchor_prediction(anchor_model$model, x, anchor, gamma, target_variable)
```

anchor_prediction_gam	<i>anchor_prediction</i>
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Description

Perform a prediction for an Anchor Regression model as described in Rothenhäusler et al.2020

Usage

```
anchor_prediction_gam(
  anchor_model,
  x,
  anchor,
  gamma,
  target_variable,
  bin_factor
)
```

Arguments

anchor_model	is the Anchor Regression model object
x	is a dataframe containing the matrix x containing the independent variables
anchor	is a dataframe containing the matrix anchor containing the anchor variable
gamma	is the regularization parameter for the Anchor Regression
target_variable	is the target variable name contained in the x dataframe
bin_factor	binary variable that can be transformed to a factor to partial out effects

Value

A list of predictions.

Examples

```
x <- as.data.frame(matrix(data = rnorm(10000),nrow = 1000,ncol = 10))
x$bin <- sample(nrow(x),x = c(1,0),prob = c(0.5,0.5),replace = TRUE)
anchor <- as.data.frame(matrix(data = rnorm(2000),nrow = 1000,ncol = 2))
colnames(anchor) <- c('X1','X2')
gamma <- 2
target_variable <- 'V2'

anchor_model <- anchor_regression_gam(x, anchor, gamma, target_variable,"bin")
anchor_prediction_gam(anchor_model$model, x, anchor, gamma, target_variable,"bin")
```

anchor_regression	<i>anchor_regression</i>
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Description

Perform an Anchor Regression as described in Rothenhäusler et al.2020

Usage

```
anchor_regression(x, anchor, gamma, target_variable, lambda = "CV")
```

Arguments

x	is a dataframe containing the matrix x containing the independent variables
anchor	is a dataframe containing the matrix anchor containing the anchor variable
gamma	is the regularization parameter for the Anchor Regression
target_variable	is the target variable name contained in the x dataframe
lambda	indicates the lambda that is used in the Anchor Regression. 'CV' is used if it should be estimated by cross validation on the full subset.

Value

A list with coefficient values and a list with the respective names overview_print. Additionally the transformed data as x and y plus the fixed lambda coefficient.

Examples

```
x <- as.data.frame(matrix(data = rnorm(1000),nrow = 100,ncol = 10))
anchor <- as.data.frame(matrix(data = rnorm(200),nrow = 100,ncol = 2))
colnames(anchor) <- c('X1','X2')
gamma <- 2
target_variable <- 'V2'
anchor_regression(x, anchor, gamma, target_variable)
```

anchor_regression_gam *anchor_regression_gam*

Description

Perform an Generalized Additive Anchor Regression

Usage

```
anchor_regression_gam(x, anchor, gamma, target_variable, bin_factor = NULL)
```

Arguments

x	is a dataframe containing the matrix x containing the independent variables
anchor	is a dataframe containing the matrix anchor containing the anchor variable
gamma	is the regularization parameter for the Anchor Regression
target_variable	is the target variable name contained in the x dataframe
bin_factor	binary variable that can be transformed to a factor to partial out effects

Value

A list with coefficient values and a list with the respective names overview_print. Additionally the transformed data as x and y plus the fixed lambda coefficient.

Examples

```
x <- as.data.frame(matrix(data = rnorm(10000),nrow = 1000,ncol = 10))
x$bin <- sample(nrow(x),x = c(1,0),prob = c(0.5,0.5),replace = TRUE)
anchor <- as.data.frame(matrix(data = rnorm(2000),nrow = 1000,ncol = 2))
colnames(anchor) <- c('X1','X2')
gamma <- 2
target_variable <- 'V2'
anchor_regression_gam(x, anchor, gamma, target_variable,bin_factor = "bin")
```

anchor_stability	<i>anchor_stability</i>
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Description

Perform an Anchor Stability Analysis as described in Rothenhäusler et al.2020

Usage

```
anchor_stability(
  x,
  anchor,
  target_variable,
  lambda = 0,
  alpha = 0.05,
  p_procedure = "naive"
)
```

Arguments

<code>x</code>	is a dataframe containing the matrix <code>x</code> containing the independent variables
<code>anchor</code>	is a dataframe containing the matrix <code>anchor</code> containing the anchor variable
<code>target_variable</code>	is the target variable name contained in the <code>x</code> dataframe
<code>lambda</code>	indicates the <code>lambda</code> that is used in the Anchor Regression. 'CV' is used if it should be estimated by cross validation on the full subset.
<code>alpha</code>	significance level for test decision on coefficient significance
<code>p_procedure</code>	procedure to estimate stability. Option 1: naive - stable if effect is non-zero in all cases; Option 2: post-lasso - post selection inference using SelectiveInference package

Value

A dataframe containing the stability values for each coefficient

Examples

```
x <- as.data.frame(matrix(data = rnorm(1000),nrow = 100,ncol = 10))
anchor <- as.data.frame(matrix(data = rnorm(200),nrow = 100,ncol = 2))
colnames(anchor) <- c('X1','X2')
gamma <- 2
target_variable <- 'V2'
anchor_stability(x, anchor, target_variable, lambda, alpha=0.05, p_procedure = "naive")
```

weighted_anchor_prediction
weighted_anchor_regression

Description

Perform a prediction for a Weighted Anchor Regression model

Usage

```
weighted_anchor_prediction(names, coeff, x, anchor, gamma, target_variable)
```

Arguments

names	list of variable names corresponding to the coefficients in coeff
coeff	list of coefficients corresponding to the coefficients in names
x	is a dataframe containing the matrix x containing the independent variables
anchor	is a dataframe containing the matrix anchor containing the anchor variable
gamma	is the regularization parameter for the Anchor Regression
target_variable	is the target variable name contained in the x dataframe

Value

A list of predictions.

Examples

```
# number of observed environments
environments <- 10

# populate list with generated data of x and anchor
data_x_list <- c()
data_anchor_list <- c()
for(e in 1:environments){
  x <- as.data.frame(matrix(data = rnorm(100),nrow = 100,ncol = 10))
  anchor <- as.data.frame(matrix(data = rnorm(200),nrow = 100,ncol = 2))
  colnames(anchor) <- c('X1','X2')
  data_x_list[[e]] <- x
```

```

    data_anchor_list[[e]] <- anchor
  }

  # estimate model
  gamma <- 2
  target_variable <- 'V2'
  weighted_anchor_model <- weighted_anchor_regression(data_x_list,
                                                    data_anchor_list,
                                                    gamma,
                                                    target_variable,
                                                    anchor_model_pre=NULL,
                                                    test_split=0.4,
                                                    lambda=0)

  weighted_anchor_prediction(weighted_anchor_model$names,
                             weighted_anchor_model$coeff,
                             x,
                             anchor,
                             gamma,
                             target_variable)

```

weighted_anchor_regression

weighted_anchor_regression

Description

Estimates weighted Anchor Regression coefficients

Usage

```

weighted_anchor_regression(
  data_x_list,
  data_anchor_list,
  gamma,
  target_variable,
  anchor_model_pre = NULL,
  test_split = 0.4,
  lambda = 0
)

```

Arguments

<code>data_x_list</code>	list containing coefficient dataframes for different environments
<code>data_anchor_list</code>	list containing anchor dataframes for different environments
<code>gamma</code>	is the regularization parameter for the Anchor Regression
<code>target_variable</code>	is the target variable name contained in the x dataframe

`anchor_model_pre` is the pre estimated model for the Anchor Regression. In case of NULL a new model is estimated.

`test_split` is desired test/train split for the estimation

`lambda` penalization coefficient for Anchor Shrinkage. Initially set to 0.

Value

A list estimated coefficients with names, weights and the raw coefficient matrix

Examples

```
environments <- 10 # number of observed environments

# populate list with generated data of x and anchor
data_x_list <- c()
data_anchor_list <- c()
for(e in 1:environments){
  x <- as.data.frame(matrix(data = rnorm(100),nrow = 100,ncol = 10))
  anchor <- as.data.frame(matrix(data = rnorm(200),nrow = 100,ncol = 2))
  colnames(anchor) <- c('X1','X2')
  data_x_list[[e]] <- x
  data_anchor_list[[e]] <- anchor
}

# estimate model
gamma <- 2
target_variable <- 'V2'
weighted_anchor_regression(data_x_list,
                           data_anchor_list,
                           gamma,
                           target_variable,
                           anchor_model_pre=NULL,
                           test_split=0.4,
                           lambda=0)
```

Index

anchor_prediction, [2](#)
anchor_prediction_gam, [2](#)
anchor_regression, [3](#)
anchor_regression_gam, [4](#)
anchor_stability, [5](#)

weighted_anchor_prediction, [6](#)
weighted_anchor_regression, [7](#)