Package 'Styperidge.reg'

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Type Package

Title S-Type Ridge Regression

Version 0.1.0

Description Implements S-type ridge regression, a robust and multicollinearity-aware linear regression estimator that combines S-type robust weighting (via the 'Stype.est' package) with ridge penalization; automatically selects the ridge parameter using the 'ridgregextra' approach targeting a close to 1 variance inflation factor (VIF), and returns comprehensive outputs (coefficients, fitted values, residuals, mean squared error (MSE), etc.) with an easy x/y interface and optional user-supplied weights. See Sazak and Mutlu (2021) <doi:10.1080/03610918.2021.1928196>, Karadag et al. (2023) <https://CRAN.R-project.org/package=ridgregextra> and Sazak et al. (2025) <https://CRAN.R-project.org/package=Stype.est>.

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Encoding UTF-8

Depends R (>= 4.0.0)

Imports stats, mctest, isdals, ridgregextra, Stype.est

Suggests knitr, rmarkdown

URL https://github.com/filizkrdg/Styperidge.reg

BugReports https://github.com/filizkrdg/Styperidge.reg/issues

RoxygenNote 7.3.3

NeedsCompilation no

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`regstyperidge` *Full regression results using the S-type robust ridge regression estimators*

Description

Full regression results using the S-type robust ridge regression estimators

Usage

```
regstyperidge(x, y)
```

Arguments

x	Explanatory variables (data.frame, matrix)
y	Dependent variables (data.frame, vector)

Value

A list of lists

Examples

```
library("mctest")
x <- Hald[,-1]
y <- Hald[,1]
regstyperidge(x,y)

library(isdals)
data(bodyfat)
x <- bodyfat[,-1]
y <- bodyfat[,1]
regstyperidge(x,y)
```

`Weightedridge.reg` *Weighted ridge regression*

Description

Fits a ridge regression model with observation-specific weights. The weights can be supplied as a vector, data frame, or a square weight matrix. If a vector or data frame is supplied, it is internally converted to a diagonal weight matrix. In the example below, the weight vector `W` is generated from a Uniform(0, 1) distribution purely to illustrate how to call the function. In practice, users should provide weights that reflect the structure of their data.

Usage

```
Weightedridge.reg(x, y, W)
```

Arguments

`x`	Explanatory variables. A data.frame or matrix with observations in rows and predictors in columns.
`y`	Dependent variable. A numeric vector, data.frame, or matrix. For a univariate response, this should be a length-`n` vector or an `n x 1` matrix.
`W`	Observation weights. Can be • a numeric vector of length `n`, or • a single-column data.frame of length `n`, or • an `n x n` weight matrix. If `W` is a vector or data.frame, the function converts it to `diag(W)` internally.

Value

A `list` with the following components:

cc Numeric scalar. The selected ridge parameter `k`.

beta Numeric matrix (`p x 1`). Ridge regression coefficients on the standardized scale (no intercept).

betaor Numeric matrix (`(p+1) x 1`). Coefficients on the original (unstandardized) scale, including the intercept in the first row.

e Numeric matrix (`n x 1`). Residuals on the standardized scale (`yr - yhat`).

ew Numeric matrix (`n x 1`). Weighted residuals (`W^(1/2) %*% e`).

yhat Numeric matrix (`n x 1`). Fitted values on the standardized scale (`xr %*% beta`).

yhatw Numeric matrix (`n x 1`). Fitted values in the weighted standardized space (`xrw %*% beta`).

yhator Numeric matrix (`n x 1`). Fitted values on the original scale using `betaor`.

MSE Numeric scalar. Mean squared error (MSE) computed from weighted residuals.

F Numeric scalar. Overall model F statistic based on the weighted ANOVA decomposition.

sig Numeric scalar. P-value associated with `F`.

varbeta Numeric matrix (p x p). Estimated covariance matrix of beta on the standardized scale.

stdbeta Numeric vector (length p). Standard errors of beta.

R2 Numeric scalar. Weighted coefficient of determination (R-squared).

R2adj Numeric scalar. Adjusted weighted R-squared.

anovatable A data.frame. ANOVA-style table with sums of squares, degrees of freedom, mean squares, F, and p-value.

confint Numeric matrix (2 x p). Confidence intervals for beta; first row is lower, second row is upper.

Examples

```
## Example: Weighted ridge regression using the bodyfat data from isdals
library(isdals)
data(bodyfat)

## Explanatory variables (x) and response (y)
x <- bodyfat[ , -1]   # all columns except the first: predictors
y <- bodyfat[ ,  1]   # first column: response (body fat percentage)

## Generate observation weights uniformly on [0, 1]

n <- nrow(x)
W <- runif(n, min = 0, max = 1)

## Fit the weighted ridge regression model
fit <- Weightedridge.reg(x, y, W)

## Inspect some key outputs
fit$beta        # coefficients in the standardized scale
fit$betaor      # coefficients in the original scale (including intercept)
fit$R2          # R-squared
fit$R2adj       # Adjusted R-squared
fit$anovatable  # ANOVA table
```

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