Package: RANSAC (via r-universe)

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Title Robust Model Fitting Using the RANSAC Algorithm

Version 0.1.0

Description Provides tools for robust regression model fitting using the RANSAC (Random Sample Consensus) algorithm. RANSAC is an iterative method to estimate parameters of a model from a dataset that contains outliers. This package allows fitting both linear lm and nonlinear nls models using RANSAC, helping users obtain more reliable models in the presence of noisy or corrupted data. The methods are particularly useful in contexts where traditional least squares regression fails due to the influence of outliers. Implementations include support for performance metrics such as RMSE, MAE, and R^2 based on the inlier subset. For further details, see Fischler and Bolles (1981) <doi:10.1145/358669.358692>.

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Depends R (>= 4.0.0)

Imports stats

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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`metrics_ransac` *Performance Metrics for RANSAC Models*

Description

Calculates the root mean square error (RMSE), mean absolute error (MAE), and coefficient of determination (R^2) for a model fitted using the RANSAC algorithm.

Usage

```
metrics_ransac(model, data)
```

Arguments

`model`	A model fitted via RANSAC ('ransac_model' or 'ransac_nls').
`data`	Data frame containing the model variables.

Value

A data frame with RMSE, MAE, and R^2 calculated on the inliers.

Examples

```
set.seed(123)
D <- seq(10, 50, by = 5)
H <- seq(15, 30, length.out = length(D))
V <- 0.01 * D^2 * H + rnorm(length(D), sd = 5)
V[c(3, 7)] <- V[c(3, 7)] + 50  # add outliers
data <- data.frame(D = D, H = H, V = V)

model <- ransac_nls(V ~ a * D^b * H^c, data = data,
                    start = list(a = 0.01, b = 2, c = 1),
                    n_min = 4, n_iter = 100, tol = 10)

metrics_ransac(model, data)
```

ransac_nls *Robust Nonlinear Model Fitting via RANSAC*

Description

Fits a robust nonlinear model (‘nls‘) using the RANSAC algorithm.

Usage

```
ransac_nls(
  formula,
  data,
  start,
  n_min,
  n_iter = 100,
  tol = 0.2,
  verbose = FALSE
)
```

Arguments

formula	Model formula.
data	Data frame containing the model variables.
start	Named list of initial parameter estimates (as required by ‘nls‘).
n_min	Minimum number of points to fit the model.
n_iter	Number of iterations (higher values make the model more robust).
tol	Absolute tolerance to consider a point as an inlier.
verbose	If ‘TRUE‘, shows progress messages.

Value

An ‘nls‘ model fitted only to the inliers, with an additional class ‘"ransac_nls"‘ and an ‘"inliers"‘ attribute.

Examples

```
set.seed(123)
D <- seq(10, 50, by = 5)
H <- seq(15, 30, length.out = length(D))
V <- 0.01 * D^2 * H + rnorm(length(D), sd = 5)
V[c(3, 7)] <- V[c(3, 7)] + 50  # add outliers
data <- data.frame(D = D, H = H, V = V)

model <- ransac_nls(V ~ a * D^b * H^c, data = data,
                    start = list(a = 0.01, b = 2, c = 1),
                    n_min = 4, n_iter = 100, tol = 10)
summary(model)
```

ransac_reg *Robust Linear Model Fitting via RANSAC*

Description

Fits a robust linear model (‘lm‘) using the RANSAC algorithm.

Usage

```
ransac_reg(formula, data, n_min, n_iter = 100, tol = 0.2, verbose = FALSE)
```

Arguments

formula	Model formula (as in ‘lm‘).
data	Data frame containing the model variables.
n_min	Minimum number of points to fit the model (e.g., 2 for a straight line).
n_iter	Number of iterations (higher values make the model more robust).
tol	Absolute tolerance to consider a point as an inlier.
verbose	If ‘TRUE‘, shows progress messages.

Value

An ‘lm‘ model fitted only to the inliers, with an additional class ‘"ransac_model"‘ and an ‘"inliers"‘ attribute.

Examples

```
set.seed(123)
x <- 1:10
y <- c(1, 2, 3, 4, 5, 6, 7, 8, 50, 60) # some outliers
data <- data.frame(x = x, y = y)
model <- ransac_reg(y ~ x, data = data, n_min = 2, tol = 5)
summary(model)
```

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