

Package ‘MOutliers’

June 16, 2026

Title Multivariate Outlier Detection Methods

Version 0.1.2

Description Provides methods for detecting multivariate outliers in numeric datasets. The package implements classical Mahalanobis distance, robust Minimum Covariance Determinant (MCD), and Principal Component Analysis (PCA)-based approaches for outlier detection. The methodology is informed by Aggarwal (2017) <doi:10.1007/978-3-319-47578-3> and Grentzelos, Caroni and Barranco-Chamorro (2020) <doi:10.1002/cmm4.1129>. Visualization functions are included to aid interpretation of detected outliers. Mahalanobis distance calculations are accelerated using 'C++' through 'Rcpp'.

URL https://github.com/SenuYasara/Multivariate_Outlier_Detection_R_Package

BugReports

https://github.com/SenuYasara/Multivariate_Outlier_Detection_R_Package/issues

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Encoding UTF-8

RoxygenNote 7.3.3

LinkingTo Rcpp

Imports Rcpp, stats, MASS, ggplot2, gridExtra, cowplot, rlang

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

VignetteBuilder knitr

NeedsCompilation yes

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Repository CRAN

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detect_multivariate_outliers
Detect Multivariate Outliers

Description

Detects multivariate outliers using Mahalanobis, Minimum Covariance Determinant (MCD), or PCA-based distances. Supports robust detection by computing distance scores for each observation and comparing them against a chi-squared cutoff at a specified significance level.

Usage

```
detect_multivariate_outliers(data, method = "mahalanobis", alpha = 0.975)
```

Arguments

data	A numeric data frame or matrix.
method	Outlier detection method: "mahalanobis", "mcd", or "pca".
alpha	Significance level (default = 0.975).

Value

A data frame combining the original input data with distances and outlier flags.

Examples

```
df_mtcars <- mtcars[, c("mpg", "hp", "wt" )]  
head(df_mtcars)  
  
## Mahalanobis Distance  
result_mahal <- detect_multivariate_outliers(df_mtcars, method = "mahalanobis", alpha = 0.975)  
  
## Minimum Covariance Determinant (MCD)  
result_mcd <- detect_multivariate_outliers(df_mtcars, method = "mcd", alpha = 0.975)  
  
## Principal Component Analysis (PCA)  
result_pca <- detect_multivariate_outliers(df_mtcars, method = "pca", alpha = 0.975)
```

plot_outliers	<i>Plot Pairwise Outliers</i>
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Description

Generates 2D scatterplots for each pair of variables in the dataset, with outliers identified using Mahalanobis or MCD distances computed across all variables, without including each observation in its own distance calculation.

Usage

```
plot_outliers(data, method = c("mahalanobis", "mcd"), alpha = 0.975)
```

Arguments

data	A numeric data frame or matrix.
method	Outlier detection method: "mahalanobis" or "mcd".
alpha	The quantile cutoff for identifying outliers (default 0.975).

Value

A gtable object is returned invisibly. The function is primarily used for generating pairwise scatterplots with a shared legend as a side effect.

Examples

```
df_mtcars <- mtcars[, c("mpg", "hp", "wt" )]
head(df_mtcars)

## Pairwise Plots: Mahalanobis
plot_outliers(df_mtcars, method = "mahalanobis", alpha = 0.975)

## Pairwise Plots: MCD
plot_outliers(df_mtcars, method = "mcd", alpha = 0.975)
```

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