Package: AdaptiveBoxplot (via r-universe)

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Title FDR(BH) Boxplot and FWER(Holm) Boxplot

Version 0.1.1

Description Implements a framework for creating boxplots where the whisker lengths are determined by formal multiple testing procedures, making them adaptive to sample size and data characteristics. The function bh_boxplot() generates boxplots that control the False Discovery Rate (FDR) via the Benjamini-Hochberg procedure, and the function holm_boxplot() generates boxplots that control the Family-Wise Error Rate (FWER) via the Holm procedure. The methods are based on the framework in Gang, Lin, and Tong (2025) <doi:10.48550/arXiv.2510.20259>.

License GPL (>= 3)

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NeedsCompilation no

Author Bowen Gang [aut, cre], Hongmei Lin [aut], Tiejun Tong [aut]

Maintainer Bowen Gang <`gangbowen02@gmail.com`>

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`bh_boxplot` *False Discovery Rate (FDR) Boxplot*

Description

Generates a boxplot where whisker lengths are determined by the Benjamini-Hochberg procedure to control the False Discovery Rate (FDR), making the outlier detection rule adaptive to sample size and data characteristics.

Usage

```
bh_boxplot(data, alpha = 0.01, group_col = NULL, value_col = NULL, ...)
```

Arguments

`data`	A numeric vector for a single boxplot, or a data frame for grouped boxplots.
`alpha`	The target FDR level. Defaults to 0.01.
`group_col`	A string specifying the name of the grouping column in ‘data‘.
`value_col`	A string specifying the name of the value column in ‘data‘.
`...`	Additional arguments passed to the base `boxplot` function.

Details

This function is a graphical implementation of the p-value pipeline proposed by Gang, Lin, and Tong (2025). It uses robust estimators for the mean and standard deviation based on quartiles to calculate p-values for each observation, then applies the Benjamini-Hochberg (BH) procedure to determine an adaptive p-value threshold for outlier detection. Outliers are points falling beyond the fences defined by this threshold.

Value

A plot is drawn on the current graphics device.

References

Gang, B., Lin, H., & Tong, T. (2025). Unifying Boxplots: A Multiple Testing Perspective.

See Also

`holm_boxplot`

Examples

```
# Single group example
set.seed(123)
data_single <- c(rnorm(50), 10, 12)
bh_boxplot(data_single, alpha = 0.05, main = "FDR Boxplot (Single Group)")

# Grouped data example
data_grouped <- data.frame(
  Category = rep(c("A", "B"), each = 100),
  Value = c(rnorm(100), rnorm(100, mean = 2, sd = 1.5))
)
bh_boxplot(data_grouped, group_col = "Category", value_col = "Value")
```

`holm_boxplot` *Family-Wise Error Rate (FWER) Boxplot*

Description

Generates a boxplot where whisker lengths are determined by the Holm procedure to control the Family-Wise Error Rate (FWER), providing a conservative yet principled approach to outlier detection.

Usage

```
holm_boxplot(
  data,
  alpha = 0.05,
  kfwer = 1,
  group_col = NULL,
  value_col = NULL,
  ...
)
```

Arguments

`data`	A numeric vector for a single boxplot, or a data frame for grouped boxplots.
`alpha`	The target FWER level. Defaults to 0.05.
`kfwer`	The "k" in k-FWER control. Defaults to 1 for standard FWER.
`group_col`	A string specifying the name of the grouping column in ‘data‘.
`value_col`	A string specifying the name of the value column in ‘data‘.
`...`	Additional arguments passed to the base `boxplot` function.

Details

This function is a graphical implementation of the p-value pipeline proposed by Gang, Lin, and Tong (2025). It uses robust estimators for the mean and standard deviation based on quartiles to calculate p-values for each observation, then applies the Holm procedure to determine a p-value threshold that controls the FWER. This method is generally more conservative than the FDR boxplot.

Value

A plot is drawn on the current graphics device.

References

Gang, B., Lin, H., & Tong, T. (2025). Unifying Boxplots: A Multiple Testing Perspective.

See Also

`bh_boxplot`

Examples

```
# Single group example
set.seed(123)
data_single <- c(rnorm(50), 10, 12)
holm_boxplot(data_single, alpha = 0.05, main = "FWER Boxplot (Single Group)")

# Grouped data example
data_grouped <- data.frame(
  Category = rep(c("A", "B"), each = 100),
  Value = c(rnorm(100), rnorm(100, mean = 2, sd = 1.5))
)
holm_boxplot(data_grouped, group_col = "Category", value_col = "Value")
```

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