Package: robusttseq (via r-universe)

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Title Robust Statistical Methods with Huber Estimators

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Description Provides robust statistical methods for analyzing numeric data, including robust estimation of location and scale using Huber M-estimators and a robust two-sample t-test. Methods are based on Huber (1981, ISBN:0471418056) ``Robust Statistics'' and Smyth (2004) <doi:10.2202/1544-6115.1027>.

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Imports limma, stats

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`huber_estimation` *Huber M-estimator for location and scale*

Description

Computes robust estimates of mean (`mu`) and scale (`sigma`) using Huber's M-estimator.

Usage

```
huber_estimation(x, c = 1.345, tol = 1e-06, max_iter = 100)
```

Arguments

`x`	Numeric vector of observations.
`c`	Tuning constant (default 1.345). Larger values make the estimator closer to the mean, smaller values make it more robust.
`tol`	Convergence tolerance (default 1e-6).
`max_iter`	Maximum number of iterations (default 100).

Value

A list with two elements:

mu Estimated robust mean

sigma Estimated robust scale (standard deviation)

Examples

```
set.seed(123)
x <- c(rnorm(100), 10)  # outlier at 10
huber_estimation(x)
```

`robust_huber_moderated` *Robust Huber-Moderated t-Test for Gene Expression*

Description

Performs a moderated two-sample t-test on count data using Huber M-estimators and empirical Bayes variance shrinkage (via limma::squeezeVar).

Usage

```
robust_huber_moderated(counts, group, c_huber = 1.345, robust_prior = TRUE)
```

Arguments

`counts`	Numeric matrix of counts (genes in rows, samples in columns).
`group`	Factor indicating group membership for each column/sample.
`c_huber`	Tuning constant for Huber estimator (default 1.345).
`robust_prior`	Logical; if TRUE, uses a robust empirical Bayes prior (default TRUE).

Value

Numeric vector of p-values, one per gene.

Examples

```
library(limma)
counts <- matrix(rpois(200, lambda = 10), nrow = 20)
group <- factor(rep(c("A", "B"), each = 5))
pvals <- robust_huber_moderated(counts, group)
```

`robust_t_test` *Two-Sample Robust t-Test (Huber)*

Description

Performs a robust two-sample t-test using Huber M-estimators for location and scale.

Usage

```
robust_t_test(x, y, c = 1.345)
```

Arguments

`x`	Numeric vector of sample 1.
`y`	Numeric vector of sample 2.
`c`	Tuning constant for Huber estimator (default 1.345).

Value

An object of class "htest" similar to `t.test`.

Examples

```
set.seed(123)
x <- rnorm(30, mean = 5)
y <- rnorm(35, mean = 6)
robust_t_test(x, y)
```

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