Package 'runDRT'

May 9, 2026

Title Run Doubly Ranked Tests

Version 0.1.0

Description Doubly ranked tests are nonparametric tests for grouped functional and multivariate data. The testing procedure first ranks a matrix (or three dimensional array) of data by column (if a matrix) or by cell (across the third dimension if an array).
By default, it calculates a sufficient statistic for the subject's order within the sample using the observed ranks, taken over the columns or cells.
Depending on the number of groups, G, the summarized ranks are then analyzed using either a Wilcoxon Rank Sum test (G = 2) or a Kruskal-Wallis (G greater than 2).

Encoding UTF-8

RoxygenNote 7.3.1

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Suggests fda (>= 6.1.4), FDboost (>= 1.1.2), refund (>= 0.1.32), testthat (>= 3.0.0)

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NeedsCompilation no

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run_drt *Run Doubly Ranked Tests*

Description

Performs two (or more) sample doubly ranked tests on pre-processed functional data, formatted as either a matrix (for functions) or an array (for surfaces).

Usage

```
run_drt(X, G, method = c("suff.rank", "avg.rank"), data.names = NULL)

## Default S3 method:
run_drt(X, G, method = c("suff.rank", "avg.rank"), data.names = NULL)

## S3 method for class 'formula'
run_drt(formula, ...)
```

Arguments

X	an n by T matrix or an S by T by n array containing the functions (or surfaces) to analyze.
G	a vector of length n containing the grouping variable.
method	statistic for summarizing the ranks: 'suff.rank' for sufficient statistic (the default) or 'avg.rank' for arithmetic average.
data.names	a vector of length two containing names that describe X and G.
formula	a formula of the form X ~ G.
...	additional arguments to pass to run_drt.default(), e.g. method.

Details

Doubly ranked tests are non-parametric tests that first rank functions (or surfaces) by time (or location). Next, the procedure summarizes the observed ranks using a statistic. The summarized ranks are then analyzed using either a Wilcoxon rank sum test or a Kruskal-Wallis test. To perform a doubly ranked test, realizations of functions must be stored in an n by T matrix where n is the total number of observed functions and T is the number of realizations per function (commonly time points or locations). Surface data in an S by T by n array can be analyzed as well, although currently this feature has under gone only limited testing.

By default, run_drt() implements a sufficient statistic when summarizing the ranks of each observed function across T, i.e. the argument method defaults to method = suff.rank. This statistic has the form

$$t(z) = \frac{1}{T}\sum_{t=1}^{T} \log\left[\left(\frac{z_t}{n} - \frac{1}{2n}\right) \Big/ \left(1 - \frac{z_t}{n} + \frac{1}{2n}\right)\right],$$

where z_t is the observed rank at time t. See Meyer (2024) for additional details. The average rank may also be used by setting `method = 'avg.rank'`, although this summary has not undergone testing in the doubly ranked context.

Regardless of the statistic used, the summarized ranks are the analyzed using either `wilcox.test()` or `kruskal.test()`, depending on the number of groups in `G`.

For functional data, Meyer (2024) suggests using `refund::fpca.face()` for pre-processing the data, but `X` can be pre-processed using any functional data approach or it can just be the raw data. `run_drt()` itself performs no pre-processing and takes `X` as inputted.

Value

A list with class "`htest`" containing the following components:

`statistic`	the value of the test statistic with a name describing it.
`parameter`	the parameter(s) for the exact distribution of the test statistic.
`p.value`	the p-value for the test.
`null.value`	the location parameter.
`alternative`	a character string describing the alternative hypothesis.
`data.name`	a character string giving the names of the data.
`test_details`	the output from the internally run Wilcoxon rank sum or Kruskal-Wallis test.
`method`	character string giving the type of doubly ranked test performed.
`ranks`	a list containing the ranks by column (if `X` is a matrix) and the summarized ranks.
`data`	a list containing `X` and `G`.

References

Meyer, MJ (2024). Doubly ranked tests for grouped functional data. *Available on arXiv* at https://arxiv.org/abs/2306.14761.

Examples

```
#### Two Sample Problem: Resin Viscosity ####
library(FDboost)
data("viscosity")

Xv   <- matrix(viscosity$visAll, nrow = nrow(viscosity$visAll), ncol = ncol(viscosity$visAll))
fXv   <- refund::fpca.face(Xv)
Yvis  <- fXv$Yhat
TR  <- viscosity$T_A
```

```
run_drt(Yvis ~ TR)

#### Four Sample Problem: Canadian Weather ####
R     <- fda::CanadianWeather$region
XT    <- t(fda::CanadianWeather$dailyAv[,,'Temperature.C'])
fXT   <- refund::fpca.face(XT)
YT    <- fXT$Yhat

run_drt(YT ~ R)
```

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