Package 'rtrend'

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Title Trend Estimating Tools

Description The traditional linear regression trend, Modified Mann-Kendall (MK) non-parameter trend and bootstrap trend are included in this package. Linear regression trend is rewritten by '.lm.fit'. MK trend is rewritten by 'Rcpp'. Finally, those functions are about 10 times faster than previous version in R.
Reference:
Hamed, K. H., & Rao, A. R. (1998). A modified Mann-Kendall trend test for autocorrelated data. Journal of hydrology, 204(1-4), 182-196. <doi:10.1016/S0022-1694(97)00125-X>.

Version 0.1.3

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Encoding UTF-8

RoxygenNote 7.1.2

LinkingTo Rcpp, RcppArmadillo

Imports Rcpp, fftwtools, boot, magrittr, matrixStats, terra, plyr, ggplot2

Suggests covr, testthat (>= 3.0.0)

URL https://github.com/rpkgs/rtrend

BugReports https://github.com/rpkgs/rtrend/issues

Config/testthat/edition 3

NeedsCompilation yes

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R topics documented:

`mkTrend_r` *Modified Mann Kendall*

Description

If valid observations <= 5, NA will be returned.

Usage

```
mkTrend_r(y, ci = 0.95, IsPlot = FALSE)

mkTrend(y, x = seq_along(y), ci = 0.95, IsPlot = FALSE)
```

Arguments

`y`	numeric vector
`ci`	critical value of autocorrelation
`IsPlot`	boolean
`x`	(optional) numeric vector

Details

mkTrend is 4-fold faster with `.lm.fit`.

Value

- `Z0` : The original (non corrected) Mann-Kendall test Z statistic.
- `pval0`: The original (non corrected) Mann-Kendall test p-value
- `Z` : The new Z statistic after applying the correction
- `pval` : Corrected p-value after accounting for serial autocorrelation `N/n*s` Value of the correction factor, representing the quotient of the number of samples N divided by the effective sample size `n*s`
- `slp` : Sen slope, The slope of the (linear) trend according to Sen test

Note

slp is significant, if pval < alpha.

Author(s)

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References

Hipel, K.W. and McLeod, A.I. (1994), *Time Series Modelling of Water Resources and Environmental Systems*. New York: Elsevier Science.

Libiseller, C. and Grimvall, A., (2002), Performance of partial Mann-Kendall tests for trend detection in the presence of covariates. *Environmetrics* 13, 71–84, doi: 10.1002/env.507.

See Also

`fume::mktrend` and `trend::mk.test`

Examples

```
x <- c(4.81, 4.17, 4.41, 3.59, 5.87, 3.83, 6.03, 4.89, 4.32, 4.69)
r <- mkTrend(x)
r_cpp <- mkTrend(x, IsPlot = TRUE)
```

`movmean` *movmean*

Description

NA and Inf values in the y will be ignored automatically.

Usage

```
movmean(y, halfwin = 1L, SG_style = FALSE, w = NULL)

movmean2(y, win_left = 1L, win_right = 0L, w = NULL)

movmean_2d(mat, win_left = 3L, win_right = 0L)
```

Arguments

`y`	A numeric vector.
`halfwin`	Integer, half of moving window size
`SG_style`	If true, head and tail values will be in the style of SG (more weights on the center point), else traditional moving mean style.
`w`	Corresponding weights of y, with the same length.
`win_left, win_right`	windows size in the left and right
`mat`	numeric matrix

Examples

```
x <- 1:100
x[50] <- NA; x[80] <- Inf
s1 <- movmean(x, 2, SG_style = TRUE)
s2 <- movmean(x, 2, SG_style = FALSE)
movmean2(c(4, 8, 6, -1, -2, -3, -1), 2, 0)
movmean2(c(4, 8, NA, -1, -2, Inf, -1), 2, 0)
```

`slope_sen` *slope*

Description

- `slope` : linear regression slope
- `slope_p` : linear regression slope and p-value
- `slope_mk` : mann kendall Sen's slope and p-value
- `slope_sen` : same as `slope_mk`, but with no p-value
- `slope_boot`: bootstrap slope and p-value

Usage

```
slope_sen(y, x = NULL)

slope(y, x, ...)

slope_p(y, x, fast = TRUE)

slope_sen_r(y, x = seq_along(y), ...)

slope_mk(y, x = NULL, ...)

slope_boot(y, x = NULL, slope_FUN = slope, times = 100, alpha = 0.1, seed, ...)
```

Arguments

`y`	vector of observations of length n, or a matrix with n rows.
`x`	vector of predictor of length n, or a matrix with n rows.
`...`	ignored.
`fast`	Boolean. If true, `stats:.lm.fit()` will be used, which is 10x faster than `stats::lm()`.
`slope_FUN`	one of `slope()`, `slope_p()`, `slope_mk()`
`times`	The number of bootstrap replicates.
`alpha`	significant level, defalt 0.1
`seed`	a single value, interpreted as an integer, or `NULL` (see 'Details').

Value

- `slope` : linear regression coefficient
- `pvalue` : p-value <= 0.05`` means that corresponding slope‘ is significant.
- `sd` : Std. Error

For `slope_boot`, slope is estimated in many times. The lower, mean, upper and standard deviation (sd) are returned.

Examples

```
y <- c(4.81,4.17,4.41,3.59,5.87,3.83,6.03,4.89,4.32,4.69)
r    <- slope(y)
r_p  <- slope_p(y)
r_mk <- slope_mk(y)
r_boot <- slope_boot(y)
```

`smooth_wSG` *Weighted Savitzky-Golay*

Description

NA and Inf values in the y has been ignored automatically.

Usage

```
smooth_wSG(y, halfwin = 1L, d = 1L, w = NULL)

smooth_SG(y, halfwin = 1L, d = 1L)
```

Arguments

`y`	colvec
`halfwin`	halfwin of Savitzky-Golay
`d`	polynomial of degree. When d = 1, it becomes moving average.
`w`	colvec of weight

Examples

```
y <- c(1, 3, 2, 5, 6, 8, 10, 1)
w <- seq_along(y)/length(y)

halfwin = 2
d = 2
s1 <- smooth_wSG(y, halfwin, d, w)
s2 <- smooth_SG(y, halfwin, d)
```

summary_lm *summary_lm*

Description

summary method for class ".lm.fit".. It's 200 times faster than traditional `lm`.

Usage

```
summary_lm(obj, ...)
```

Arguments

`obj`	Object returned by `.lm.fit`.
`...`	ignored

Value

a p x 4 matrix with columns for the estimated coefficient, its standard error, t-statistic and corresponding (two-sided) p-value. Aliased coefficients are omitted.

Examples

```
set.seed(129)
n <- 100
p <- 2
X <- matrix(rnorm(n * p), n, p) # no intercept!
y <- rnorm(n)

obj <- .lm.fit (x = cbind(1, X), y = y)
info <- summary_lm(obj)
```

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