Package 'ACA'

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Type Package

Title Abrupt Change-Point or Aberration Detection in Point Series

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Depends R (>= 3.2.2)

Imports graphics, grDevices, stats, utils

Description Offers an interactive function for the detection of breakpoints in series.

License GPL

RoxygenNote 6.0.1

NeedsCompilation no

Repository CRAN

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Contents

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amorese.data.txt   *Dataset amorese.data.txt*

Description

This data set is a small simulated time series to test the ACA package.

Format

This data set contains 2 columns. The first column is an index, from 1 to 410. The second column are the values of a synthetic combination of normal distributions. This is a modified version of the data example from James & Mattesons (2014) study: a sequence of 100 independent samples from normal distributions (N(0, 1), N(0, 3), N(2, 1) and N(2, 4)). The notation N(??, ??) means normally distributed with mean ?? and standard deviation ??. This synthetic data set is slighty upgraded by adding an extra N(0, 3) very short (10 samples) segment at the end of the initial sequence. This extra tip is added in order to assess the detection capability for a breakpoint close to series??? end, where an edge effect may be significant. Moreover, a 5 per cent slope is added to this synthetic series to simulate a series with upward trend. This synthetic series is plotted in Figures 2b and 2d in Amorese & al. (2018).

Source

James, N.A. & Matteson, D.S., ecp: an R package for nonparametric multiple change point analysis of multivariate data, *J. Stat. Softw.*, 62(7), 1???25 (2014).

Amorese, D., Grasso, J. R., Garambois, S., and Font, M., "Change-point analysis of geophysical time-series: application to landslide displacement rate (Sechilienne rock avalanche, France)", *Geophysical Journal International*, 213(2), 1231-1243 (2018).

SDScan	*This is the workhorse function of the ACA. It detects significant change-points in serial data.*

Description

This is the workhorse function of the ACA. It detects significant change-points in serial data.

Usage

```
SDScan(namefi = NULL, xleg = NULL, yleg = NULL, titl = NULL,
  onecol = NULL, daty = NULL, gray = NULL)
```

Arguments

namefi	- a character string specifying the data file to be loaded
xleg	- character. The x-label of the plot
yleg	- character. The y-label of the plot
titl	- character. The title of the plot
onecol	- character. Option for the data format. If onecol is "y", it is assumed that the input file is a single column file (varying parameter) else the input file is a 2 column file (independent variable, varying parameter)
daty	- character. Option for the data processing. If daty is "y", the scan of the series is launched with the gradients (rates of change) of the data else it is launched with the data itself
gray	- character. Option for the plot. If gray is "y", the background of the plot is gray else it is white

Details

if one of the arguments above is NULL, then the user will be prompted to enter the missing value. SDScan() produces two files: the *SDS.res* file includes the statistics for each detected breakpoint; the *SDS.png* file is the plot of the series where the detected breakpoints are shown. In the *SDS.res* file, there is a line for each breakpoint: it includes the x and y values for the breakpoint, its index in the series, the noise variance due to the discontinuity, the noise variance due to the trend, the noise variance due to the discontinuity (posterior value), the noise variance due to the trend (posterior value), the change-point Signal-to-Noise Ratio (posterior value), the biweight mean of the left segment, the biweight mean of the right segment. Values are separated by the "&" symbol. A change-point plot is returned by SDScan(). This plot shows the series and the detected change-points. Horizontal lines are drawn to represent the biweight means of the two segments defined by each change-point. The legend of the plot shows 4 numerical values for each change-point: from left to right, the rank of the change-point (as defined by the detection sequence), its location along the X-axis, its signal-to-noise ratio, and the probability value for the two-tail robust rank-order test, that was obtained right after the change-point detection

Author(s)

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References

D. Amorese, "Applying a change-point detection method on frequency-magnitude distributions", *Bull. seism. Soc. Am.* (2007) 97, doi:10.1785\/0120060181 Lanzante, J. R., "Resistant, robust and non-parametric techniques for the analysis of climate data: Theory and examples, including applications to historical radiosonde station data", *International Journal of Climatology* (1996) 16(11), 1197-1226 Amorese, D., Grasso, J. R., Garambois, S., and Font, M., "Change-point analysis of geophysical time-series: application to landslide displacement rate (Sechilienne rock avalanche, France)", *Geophysical Journal International* (2018) 213(2), 1231-1243

Examples

```
data <- system.file("extdata","soccer.data.txt", package = "ACA")
SDScan(namefi=data, xleg="Time", yleg="Goals per game", titl="Goals in
England: 1888-2014", onecol="n", daty="n", gray="y")


data <- system.file("extdata","amorese.data.txt", package = "ACA")

SDScan(namefi=data, xleg="Index", yleg="Value", titl="Change in
a Gaussian Sequence (with trend)", onecol="n", daty="n", gray="y")
```

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soccer.data.txt   *Dataset soccer.data.txt*

Description

This data set is a small time series to test the ACA package.

Format

This data set contains 2 columns. The first column is the football season year. The second column is the average goals-per-game in each season. Data are derived from all English professional league soccer results from 1888-2014 (engsoccerdata R package).

Source

James P. Curley, engsoccerdata: English Soccer Data 1871- 2016. R package version 0.1.5 (2016), doi: 10.5281/zenodo.13158.

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