Package 'EnergyOnlineCPM'

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Type Package

Title EnergyOnlineCPM Package

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Depends parallel, energy, R (>= 3.3.2)

Description This R package provides users a new function for nonparametric Phase II multiple multivariate change points detection.

URL https://sites.google.com/site/EnergyOnlineCPM

Repository https://github.com/YafeiXu/EnergyOnlineCPM

License GPL (>= 2)

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`EnergyOnlineCPM` *Installation of the R package 'EnergyOnlineCPM' for nonparametric Phase II multiple change points detection for high dimensional time series.*

Description

This R package provides users a new function for nonparametric Phase II multiple multivariate change points detection. In example part of this section the installation is given.

Details

Package:	EnergyOnlineCPM
Type:	Package
Version:	1.3
Date:	2017-02-14
License:	GPL (>= 2)

Author(s)

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Examples

```
# Installation of the package from Github
install.packages("devtools")
library(devtools)
install_github("YafeiXu/EnergyOnlineCPM")
library(EnergyOnlineCPM)
```

`maxEneryCPMv` *Phase II Multiple Change Points Model for High Dimensional Time Series*

Description

This R function centers on nonparametric Phase II multiple change points detection for high dimensional time series. Three highlights are included in the function. Firstly, the new model is nonparametric which does not require any distributional pre-knowledge about the process. The test is based on the maximum energy statistic (see Gabor J. Szekely and Maria L. Rizzo 2004, Testing for Equal Distributions in High Dimension) and permutation samples. Secondly, the model is a Phase II change point model which is used for onlinely detection of stream data not for batch data. Phase II set-up has practical meaning in time series change detection. Thirdly, it is concentrated on high dimensional data, i.e. multivariate context. An important remark is that the data used in this function must be independent, i.e. every row in the N*d matrix must be an independent observation. If your data set contains not-independent observations then you need to handle the data using some filter functions, e.g. GARCH family to obtain the residuals which are theoretically independent.

Usage

```
maxEneryCPMv(data1, wNr, permNr, alpha)
```

Arguments

`data1`	an N*d matrix, N is the number of observations and d the dimensions.
`wNr`	a scalar of warm-up.
`permNr`	a scalar of times of permutation.
`alpha`	a scalar of significant level

Details

The function returns ONLY ONE vector containing even number components, where the first half stands for detection time vector and the rest half stands for the vector of change time locations.

Value

`result`	a vector of locations of detection time in the first half, locations of change time in the second half.

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Examples

```
library(MASS)

# simulate 300 length time series
simNr=300

# simulate 300 length 5 dimensonal standard Gaussian series
Sigma2 <- matrix(c(1,0,0,0,0,  0,1,0,0,0,   0,0,1,0,0,  0,0,0,1,0,  0,0,0,0,1),5,5)
Mean2=rep(1,5)
sim2=(mvrnorm(n = simNr, Mean2, Sigma2))

# simulate 300 length 5 dimensonal standard Gaussian series
Sigma3 <- matrix(c(1,0,0,0,0,  0,1,0,0,0,   0,0,1,0,0,  0,0,0,1,0,  0,0,0,0,1),5,5)
Mean3=rep(0,5)
sim3=(mvrnorm(n = simNr, Mean3, Sigma3))

# construct a data set of length equal to 90.
# first 20 points are from standard Gaussian.
# second 30 points from a Gaussian with a mean shift with 555.
# last 40 points are from standard Gaussian.
data1=sim6=rbind(sim2[1:20,],(sim3+555)[1:30,],sim2[1:40,])

# set warm-up number as 20, permutation 200 times, significant level 0.005
wNr=20
permNr=200
alpha=1/200
maxEnergyCPMv(data1,wNr,permNr,alpha)
```

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