

Package ‘TrendTM’

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Type Package

Title Trend of High-Dimensional Time Series Matrix Estimation

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Description Matrix factorization for multivariate time series with both low rank and temporal structures. The procedure is the one proposed by Alquier, P. and Marie, N. Matrix factorization for multivariate time series analysis. Electronic journal of statistics, 13(2), 4346-4366 (2019).

Depends R (>= 3.5.0)

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.1.1

Imports softImpute, capushe, fda

NeedsCompilation no

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Description

Matrix Factorization for Multivariate Time Series Analysis

Usage

```
TrendTM(
  X,
  k.select = FALSE,
  k.max = 20,
  struct.temp = "none",
  tau.select = FALSE,
  tau.max = floor(n/2),
  type.soft = "als"
)
```

Arguments

<code>X</code>	the data matrix with d rows and n columns containing the d temporal series with size n .
<code>k.select</code>	a boolean indicating if the rank of the matrix X will be selected. Default is <code>FALSE</code> .
<code>k.max</code>	the fixed rank of X if <code>k.select=FALSE</code> . The maximal value of the rank if <code>k.select=TRUE</code> (must be lower than the minimum between d and n). Default is 20.
<code>struct.temp</code>	a name indicating the temporal structure. Could be <code>none</code> , <code>periodic</code> or <code>smooth</code> . Default is <code>none</code> .
<code>tau.select</code>	a boolean indicating if the parameter <code>tau</code> will be selected. This can be possible only when <code>struct.temp=smooth</code> . Default is <code>FALSE</code> .
<code>tau.max</code>	the fixed value for <code>tau</code> if <code>tau.select=FALSE</code> . The maximal value of <code>tau</code> if <code>tau.select=TRUE</code> (must be lower than n). Default is <code>floor(n/2)</code> .
<code>type.soft</code>	the option type of the function <code>softImpute</code> . Default is <code>als</code> .

Details

The penalty constant(s) is(are) calibrated using the slope heuristic from package `capushe`. We adapt this heuristic as follows: the final dimension is the one correspond to the majority of the selected dimension for the considered different penalties.

Value

A list containing

- `k.est` the selected rank if `k.select==TRUE` or `k.max` if `k.select==FALSE`.
- `tau.est` the selected tau if `tau.select==TRUE` or `tau.max` if `tau.select==FALSE`.
- `U.est` the component U of the decomposition of the final estimator `M.est`.
- `V.est` the component V of the decomposition of the final estimator `M.est`.
- `M.est` the estimation of M.
- contrast the Frobenius norm of `X-M.est`. This is a value when `k.select==FALSE` and `tau.select==FALSE`, a vector when `k.select==TRUE` or `tau.select==TRUE`, and a matrix when `k.select==TRUE` and `tau.select==TRUE` with `k.max` rows and `tau.max` columns.

Examples

```
data(DataX)
k.max=3
result=TrendTM(X, k.max=k.max)
```

X

Example of data

Description

A simulated matrix with a low rank `k` and with temporal structure based on independent Gaussian.

Usage

```
data(DataX)
```

Format

A matrix with 30 rows (30 times series) and 100 columns (size of each temporal series).

Examples

```
library(TrendTM)
data(DataX)
head(X)
k.max=3
tau.max=dim(X)[2]
TrendTM(X, k.max=k.max)
```

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