Package ‘ccTensor’

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Title CUR/CX Tensor Decomposition
Version 1.0.2
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Depends R (>= 4.1.0)
Imports methods, fields, MASS, igraph, rTensor
Suggests testthat, nnTensor
Description CUR/CX decomposition factorizes a matrix into two factor matrices and Multidimensional CX Decomposition factorizes a tensor into a core tensor and some factor matrices. See the reference section of GitHub README.md <https://github.com/rikenbit/ccTensor>, for details of the methods.
License Artistic-2.0
URL https://github.com/rikenbit/ccTensor
NeedsCompilation no
Author Koki Tsuyuzaki [aut, cre],
Itoshi Nikaido [aut]
Maintainer Koki Tsuyuzaki <k.t.the-answer@hotmail.co.jp>
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Description

CUR/CX decomposition factorizes a matrix into two factor matrices and Multidimensional CX Decomposition factorizes a tensor into a core tensor and some factor matrices. See the reference section of GitHub README.md <https://github.com/rikenbit/ccTensor>, for details of the methods.

Details

The DESCRIPTION file:

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Type: Package
Title: CUR/CX Tensor Decomposition
Version: 1.0.2
Date: 2021-08-02
Authors@R: c(person("Koki", "Tsuyuzaki", role = c("aut", "cre"), email = "k.t.the-answer@hotmail.co.jp"), person("Itoshi", "Nikaido", role = "aut"))
Depends: R (>= 4.1.0)
Imports: methods, fields, MASS, igraph, rTensor
Suggests: testthat, nnTensor
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URL: https://github.com/rikenbit/ccTensor
Author: Koki Tsuyuzaki [aut, cre], Itoshi Nikaido [aut]
Maintainer: Koki Tsuyuzaki <k.t.the-answer@hotmail.co.jp>

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- `MultiCX`
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Author(s)

NA

Maintainer: NA

References


Maria F. K. B. et. al. (2019). Multidimensional CX Decomposition of Tensors. *WCNPS*

**See Also**

`CX`, `CUR`, `MultiCX`

**Examples**

```
ls("package:ccTensor")
```

---

**Description**

The input data is assumed to be a matrix. CUR decomposes the matrix to three low-dimensional factor matrices. C and R are not estimated values but the actual column and row vectors sampled from the matrix.

**Usage**

```
CUR(A, c.rank=NULL, r.rank=NULL, thr=0.9,
    c.method=c("best.match", "random", "exact.num.random", "top.scores"),
    u.method=c("invCR", "invW"),
    r.method=c("best.match", "random", "exact.num.random", "top.scores"))
```

**Arguments**

- `A`: The input matrix which has N-rows and M-columns.
- `c.rank`: The number of low-dimension of C (J1 < N,M). If this argument is not specified or specified as NULL, the low-dimension is estimated based on the cumulative singular value (Default: NULL).
- `r.rank`: The number of low-dimension of R (J2 < N,M). If this argument is not specified or specified as NULL, the low-dimension is estimated based on the cumulative singular value (Default: NULL).
- `thr`: The threshold to determine the low-dimension J1 and J2. The value must be range 0 to 1 (Default: 0.9).
- `c.method`: The column sampling algorithm (Default: best.match).
- `u.method`: The algorithm to calculate U (Default: invCR).
- `r.method`: The row sampling algorithm (Default: best.match).

**Value**

- `C`: A N-rows and J1-columns matrix contains the sampled column vectors from the input matrix A.
- `U`: A J1-rows and J2-columns matrix. R: A J2-rows and M-columns matrix contains the sampled row vectors from the input matrix A. indC: The sampled column indices. indR: The sampled row indices. RecError : The reconstruction error between data matrix and reconstructed matrix from C and X.
**Author(s)**

Koki Tsuyuzaki

**References**


**Examples**

```r
library("ccTensor")
library("nnTensor")
# Test data
matdata <- toyModel(model = "NMF")
# Simple usage
out <- CUR(matdata, c.rank=3, r.rank=4)
```

---

**CX**

*CX Matrix Decomposition*

**Description**

The input data is assumed to be a matrix. CX decomposes the matrix to two low-dimensional factor matices. C is not an estimated values but the actual column vectors sampled from the matrix.

**Usage**

```r
CX(A, rank=NULL, thr=0.9,
c.method=c("best.match", "random", "exact.num.random", "top.scores"))
```

**Arguments**

- **A** The input matrix which has N-rows and M-columns.
- **rank** The number of low-dimension (J < N,M). If this argument is not specified or specified as NULL, the low-dimension is estimated based on the cumulative singular value (Default: NULL).
- **thr** The threshold to determine the low-dimension J. The value must be range 0 to 1 (Default: 0.9).
- **c.method** The column sampling algorithm (Default: best.match).

**Value**

- **C**: A N-rows and J-columns matrix contains the sampled column vectors from the input matrix A. **X**: A J-rows and M-columns matrix. **indC**: The sampled column indices. **RecError**: The reconstruction error between data matrix and reconstructed matrix from C and X.
Author(s)
Koki Tsuyuzaki

References

Examples
```r
library("ccTensor")
library("nnTensor")
# Test data
matdata <- toyModel(model = "NMF")
# Simple usage
out <- CX(matdata, rank=5)
```

---

MultiCX

**MultiCX Tensor Decomposition**

Description
The input data is assumed to be a tensor. MultiCX decomposes the tensor into a core tensor and some factor matrices. The factor matrices are not estimated values but the actual column vectors sampled from the unfolded matrix in each mode.

Usage
```
MultiCX(Y, rank=NULL, modes=1:3, thr=0.9,
c.method=c("best.match", "random", "exact.num.random", "top.scores"))
```

Arguments
- **Y**
  The input tensor (e.g. N times M times L).
- **rank**
  The number of low-dimension of factor matrices (e.g. J1, J2, and J3). If this argument is not specified or specified as NULL, the low-dimension is estimated based on the cumulative singular value (Default: NULL).
- **modes**
  The vector of the modes on which to perform the decomposition (Default: 1:3 <all modes>).
- **thr**
  The threshold to determine the low-dimension of factor matrices. The value must be range 0 to 1 (Default: 0.9).
- **c.method**
  The column sampling algorithm (Default: best.match).

Value
- **U**: Core tensor (e.g. J1 times J2 times J3). **C**: Factor matrices (e.g. C_1: ???????) **RecError**: The reconstruction error between data tensor and reconstructed tensor from C and X.
Author(s)

Koki Tsuyuzaki

References

Maria F. K. B. et. al. (2019). Multidimensional CX Decomposition of Tensors. WCNPS

Examples

```r
library("ccTensor")
library("nnTensor")
# Test data
tenstdata <- toyModel(model = "CP")
# Simple usage
out <- MultiCX(tensdata, rank=c(3,4,5))
```
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