Package: BMconcor (via r-universe)

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Title CONCOR for Structural- And Regular-Equivalence Blockmodeling

Version 2.0.0

Description The four functions svdcp() ('cp' for column partitioned), svdbip() or svdbip2() ('bip' for bipartitioned), and svdbips() ('s' for a simultaneous optimization of a set of 'r' solutions), correspond to a singular value decomposition (SVD) by blocks notion, by supposing each block depending on relative subspaces, rather than on two whole spaces as usual SVD does. The other functions, based on this notion, are relative to two column partitioned data matrices x and y defining two sets of subsets x_i and y_j of variables and amount to estimate a link between x_i and y_j for the pair (x_i, y_j) relatively to the links associated to all the other pairs. These methods were first presented in: Lafosse R. & Hanafi M.,(1997) <https://eudml.org/doc/106424> and Hanafi M. & Lafosse, R. (2001) <https://eudml.org/doc/106494>.

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URL https://fatelarico.github.io/BMconcor/

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Contents

`concor` *Relative links of several subsets of variables*

Description

Relative links of several subsets of variables Yj with another set X. SUCCESSIVE SOLUTIONS

Usage

```
concor(x, y, py, r)
```

Arguments

`x`	are the `n` times `p` and `n` times `q` matrices of `p` and `q` centered column
`y`	See `x`
`py`	The partition vector of y. A row vector containing the numbers `qi` for `i = 1,...,ky` of the `ky` subsets `yi` of `y` : `sum(qi)=sum(py)=q`.
`r`	The number of wanted successive solutions

Details

The first solution calculates 1+kx normed vectors: the vector `u[:,1]` of Rp associated to the ky vectors `vi[:,1]`'s of Rqi, by maximizing $\sum_i \mathrm{cov}(x*u[,k], y_i*v_i[,k])^2$, with 1+ky norm constraints on the axes. A component `(x)(u[,k])` is associated to ky partial components `(yi)(vi)[,k]` and to a global component `y*V[,k]`. $\mathrm{cov}((x)(u[,k]),(y)(V[,k]))^2 = \sum \mathrm{cov}((x)(u[,k]),(y_i)(v_i[,k]))^2$. `(y)(V[,k])` is a global component of the components `(yi)(vi[,k])`. The second solution is obtained from the same criterion, but after replacing each yi by $y_i - (y_i)(v_i[,1])(v_i[,1]')$. And so on for the successive solutions 1,2,...,r. The biggest number of solutions may be r = inf(n, p, qi), when the (x')(yi')(s) are supposed with full rank; then rmax = min(c(min(py),n,p)). For a set of r solutions, the matrix u'X'YV is diagonal and the matrices u'X'Yjvj are triangular (good partition of the link by the solutions). concor.m is the svdcp.m function applied to the matrix x'y.

Value

A `list` with following components:

- `u` — A `p` times `r` matrix of axes in `Rp` relative to `x`; `(u^prime)(u)` = `Identity`
- `v` — A `q` times `r` matrix of `ky` row blocks `vi` `(qi x r)` of axes in `Rqi` relative to `yi`; `vi^prime*vi` = `Identity`
- `V` — A `q` times `r` matrix of axes in `Rq` relative to `y`; `Vprime*V` = `Identity`
- `cov2` — A `ky` times `r` matrix; each column `k` contains `ky` squared covariances $\text{cov}(x * u[,k], y_i * v_i[,k])^2$, the partial measures of link

Author(s)

Lafosse, R.

References

Lafosse R. & Hanafi M.(1997) Concordance d'un tableau avec K tableaux: Definition de K+1 uples synthetiques. Revue de Statistique Appliquee vol.45,n.4.

Examples

```
# To make some "GPA" : so, by posing the compromise X = Y,
# "procrustes" rotations to the "compromise X" then are :
# Yj*(vj*u').
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
co <- concor(x,y,c(3,2,4),2)
```

`concorcano` *Canonical analysis of several sets with another set*

Description

Relative proximities of several subsets of variables Yj with another set X. SUCCESSIVE SOLUTIONS

Usage

```
concorcano(x, y, py, r)
```

Arguments

- `x` — are the `n` times `p` and `n` times `q` matrices of `p` and `q` centered column
- `y` — See `x`
- `py` — The partition vector of y. A row vector containing the numbers `qi` for `i = 1,...,ky` of the `ky` subsets `yi` of `y` : `sum(qi)=sum(py)=q`.
- `r` — The number of wanted successive solutions

Details

The first solution calculates a standardized canonical component `cx[,1]` of x associated to ky standardized components `cyi[,1]` of yi by maximizing $\sum_i \rho(cx[,1], cy_i[,1])^2$. The second solution is obtained from the same criterion, with ky orthogonality constraints for having `rho(cyi[,1],cyi[,2])=0` (that implies `rho(cx[,1],cx[,2])=0`). For each of the 1+ky sets, the r canonical components are 2 by 2 zero correlated. The ky matrices (cx)'*cyi are triangular. This function uses concor function.

Value

A `list` with following components:

`cx` a `n` times `r` matrix of the r canonical components of x

`cy` a `n.ky` times `r` matrix. The ky blocks cyi of the rows n*(i-1)+1 : n*i contain the r canonical components relative to Yi

`rho2` a `ky` times `r` matrix; each column k contains ky squared canonical correlations $\rho(cx[,k], cy_i[,k])^2$

Author(s)

Lafosse, R.

References

Hanafi & Lafosse (2001) Generalisation de la regression lineaire simple pour analyser la dependance de K ensembles de variables avec un K+1 eme. Revue de Statistique Appliquee vol.49, n.1

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
ca <- concorcano(x,y,c(3,2,4),2)
```

`concoreg` *Redundancy of sets yj by one set x*

Description

Regression of several subsets of variables Yj by another set X. SUCCESSIVE SOLUTIONS

Usage

```
concoreg(x, y, py, r)
```

Arguments

x	are the n times p and n times q matrices of p and q centered column
y	See x
py	The partition vector of y. A row vector containing the numbers qi for i = 1,...,ky of the ky subsets yi of y : sum(qi)=sum(py)=q.
r	The number of wanted successive solutions

Value

A list with following components:

cx	a n times rmatrix of the r explanatory components
v	is a $q \times r$ matrix of ky row blocks v_i ($q_i \times r$) of axes in Rqi relative to yi; $v_i' * v_i = \mathrm{Id}$
V	is a $q \times r$ matrix of axes in Rq relative to y; $V' * V = \mathrm{Id}$
varexp	is a $ky \times r$ matrix; each column k contains ky explained variances $\rho(cx[,k], y_i * v_i[,k])^2 \mathrm{var}(y_i * v_i[,k])$

Author(s)

Lafosse, R.

References

Lafosse R. & Hanafi M.(1997) Concordance d'un tableau avec K tableaux: Definition de K+1 uples synthetiques. Revue de Statistique Appliquee vol.45,n.4.

Chessel D. & Hanafi M. (1996) Analyses de la Co-inertie de K nuages de points. Revue de Statistique Appliquee vol.44, n.2. (this ACOM analysis of one multiset is obtained by the command : concoreg(Y,Y,py,r))

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
co <- concoreg(x,y,c(3,2,4),2)
```

---

concorgm *Analyzing a set of partial links between Xi and Yj*

Description

Analyzing a set of partial links between Xi and Yj, SUCCESSIVE SOLUTIONS

Usage

```
concorgm(x, px, y, py, r)
```

Arguments

`x`	are the `n` times `p` and `n` times `q` matrices of `p` and `q` centered column
`px`	A row vector which contains the numbers pi, i=1,...,kx, of the kx subsets xi of x : sum(pi)=sum(px)=p. px is the partition vector of x
`y`	See `x`
`py`	The partition vector of y. A row vector containing the numbers `qi` for `i = 1,...,ky` of the `ky` subsets `yi` of `y` : `sum(qi)=sum(py)=q`.
`r`	The number of wanted successive solutions rmax <= min(min(px),min(py),n)

Details

The first solution calculates 1+kx normed vectors: the vector `u[:,1]` of Rp associated to the ky vectors `vi[:,1]`'s of Rqi, by maximizing `sum(cov((x)(u[,k]),(y_i)(v_i[,k]))^2)`, with 1+ky norm constraints on the axes. A component `(x)(u[,k])` is associated to ky partial components `(yi)(vi)[,k]` and to a global component `y*V[,k]`. `cov((x)(u[,k]),(y)(V[,k]))^2 = sum(cov((x)(u[,k]),(y_i)(v_i[,k]))^2)(y)(V[,k])` is a global component of the components `(yi)(vi[,k])`. The second solution is obtained from the same criterion, but after replacing each yi by $y_i - (y_i)(v_i[,1])(v_i[,1]')$. And so on for the successive solutions 1,2,...,r. The biggest number of solutions may be r=inf(n, p, qi), when the (x')(yi')(s) are supposed with full rank; then rmax=min(c(min(py),n,p)). For a set of r solutions, the matrix u'X'YV is diagonal and the matrices u'X'Yjvj are triangular (good partition of the link by the solutions). concor.m is the svdcp.m function applied to the matrix x'y.

Value

A `list` with following components:

`u`	a `p` times `r` matrix of axes in `Rp` relative to `x`; `u^prime*u = Identity`
`v`	a `q` times `r` matrix of `ky` row blocks `vi (qi x r)` of axes in `Rqi` relative to `yi`; `vi^prime*vi = Identity`
`cov2`	a `ky` times `r` matrix; each column `k` contains `ky` squared covariances cov$((x)(u[,k]),(y_i)(v_i[,k]))^2$, the partial measures of link

Author(s)

Lafosse, R.

References

Kissita, Cazes, Hanafi & Lafosse (2004) Deux methodes d'analyse factorielle du lien entre deux tableaux de variables partitionn?es. Revue de Statistique Appliqu?e, Vol 52, n. 3, 73-92.

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
cg <- concorgm(x,c(2,3),y,c(3,2,4),2)
cg$cov2[1,1,]
```

---

concorgmcano *Canonical analysis of subsets Yj with subsets Xi*

Description

Canonical analysis of subsets Yj with subsets Xi. Relative valuations by squared correlations of the proximities of subsets Xi with subsets Yj. SUCCESSIVE SOLUTIONS

Usage

```
concorgmcano(x, px, y, py, r)
```

Arguments

x	are the `n` times `p` and `n` times `q` matrices of `p` and `q` centered column
px	The row vector which contains the numbers pi, i=1,...,kx, of the kx subsets xi of x : $\sum_i p_i$=sum(px)=p. px is the partition vector of x
y	See `x`
py	The partition vector of y. A row vector containing the numbers `qi` for `i = 1,...,ky` of the `ky` subsets `yi` of `y` : `sum(qi)=sum(py)=q`.
r	The number of wanted successive solutions rmax <= min(min(px),min(py),n)

Details

For the first solution, $sum_i sum_j \text{rho2}(cx_i[,1], cy_j[,1])$ is the optimized criterion. The other solutions are calculated from the same criterion, but with orthogonalities for having two by two zero correlated the canonical components defined for each xi, and also for those defined for each yj. Each solution associates kx canonical components to ky canonical components. When kx =1 (px=p), take `concorcano` function This function uses the concorgm function

Value

A `list` with following components:

cx	is a `n.kx` times `r` matrix of kx row blocks cxi (n x r). Each row block contains r partial canonical components
cy	is a `n.ky` times `r` matrix of ky row blocks cyj (n x r). Each row block contains r partial canonical components
rho2	is a `kx` time `ky` tims `r` array; for a fixed solution k, `rho2[,,k]` contains kxky squared correlations $rho2(cx[n*(i-1)+1:n*i,k], cy[n*(j-1)+1:n*j,k])$, simultaneously calculated between all the yj with all the xi

Author(s)

Lafosse, R.

References

Kissita G., Analyse canonique generalisee avec tableau de reference generalisee. Thesis, Ceremade Paris 9 Dauphine (2003).

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
cc <- concorgmcano(x,c(2,3),y,c(3,2,4),2)
cc$rho2[1,1,]
```

`concorgmreg` *Regression of subsets Yj by subsets Xi*

Description

Regression of subsets Yj by subsets Xi for comparing all the explanatory-explained pairs (Xi,Yj). SUCCESSIVE SOLUTIONS

Usage

```
concorgmreg(x, px, y, py, r)
```

Arguments

`x`	are the `n` times `p` and `n` times `q` matrices of `p` and `q` centered column
`px`	A row vector which contains the numbers pi, i = 1,...,kx, of the kx subsets xi of x : sum(pi)=sum(px)=p. px is the partition vector of x
`y`	See `x`
`py`	The partition vector of y. A row vector containing the numbers `qi` for `i` = `1,...,ky` of the `ky` subsets `yi` of `y` : `sum(qi)=sum(py)=q`.
`r`	The number of wanted successive solutions

Details

For the first solution, $\sum_i \sum_j \text{rho2}(cx_i[,1], y_j * v_j[,1])\text{var}(y_j * v_j[,1])$ is the optimized criterion. The second solution is calculated from the same criterion, but with $y_j - y_j * v_j[,1] * v_j[,1]'$ instead of the matrices yj and with orthogonalities for having two by two zero correlated the explanatory components defined for each matrix xi. And so on for the other solutions. One solution k associates kx explanatory components (in `cx[,k]`) to ky explained components. When kx =1 (px = p), take concoreg function This function uses the concorgm function

Value

A `list` with following components:

- `cx` — a `n` times `r`matrix of the r explanatory components
- `v` — is a $q \times r$ matrix of ky row blocks v_i $(q_i \times r)$ of axes in Rqi relative to yi; $v_i' * v_i = \mathrm{Id}$
- `varexp` — is a kx x ky x r array; for a fixed solution k, the matrix `varexp[,,k]` contains kxky explained variances obtained by a simultaneous regression of all the yj by all the xi, so the values rho2$(cx[n*(i-1)+1 : n*i, k], y_j*v_j[, k])var(y_j*v_j[, k])$

Author(s)

Lafosse, R.

References

Hanafi & Lafosse (2004) Regression of a multi-set by another based on an extension of the SVD. COMPSTAT'2004 Symposium

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
cr <- concorgmreg(x,c(2,3),y,c(3,2,4),2)
cr$varexp[1,1,]
```

`concors` *simultaneous concorgm*

Description

concorgm with the set of r solutions simultaneously optimized

Usage

```
concors(x, px, y, py, r)
```

Arguments

- `x` — are the `n` times `p` and `n` times `q` matrices of `p` and `q` centered column
- `px` — A row vector which contains the numbers pi, i=1,...,kx, of the kx subsets xi of x : sum(pi)=sum(px)=p. px is the partition vector of x
- `y` — See `x`
- `py` — The partition vector of y. A row vector containing the numbers `qi` for `i = 1,...,ky` of the `ky` subsets `yi` of `y` : `sum(qi)=sum(py)=q`.
- `r` — The number of wanted successive solutions rmax <= min(min(px),min(py),n)

Details

This function uses the svdbips function

Value

A `list` with following components:

- `u` — a `p` times `r` matrix of axes in `Rp` relative to `x`; `u^prime*u = Identity`
- `v` — a `q` times `r` matrix of `ky` row blocks `vi (qi x r)` of axes in `Rqi` relative to `yi`; `vi^prime*vi = Identity`
- `cov2` — a `ky` times `r` matrix; each column `k` contains `ky` squared covariances cov$(x * u[,k], y_i * v_i[,k])^2$, the partial measures of link

Author(s)

Lafosse, R.

References

Lafosse R. & Hanafi M.(1997) Concordance d'un tableau avec K tableaux: Definition de K+1 uples synthetiques. Revue de Statistique Appliquee vol.45,n.4.

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
cs <- concors(x,c(2,3),y,c(3,2,4),2)
cs$cov2[1,1,]
```

`concorscano` *simultaneous concorgmcano*

Description

concorgmcano with the set of r solutions simultaneously optimized

Usage

```
concorscano(x, px, y, py, r)
```

Arguments

x	are the n times p and n times q matrices of p and q centered column
px	A row vector which contains the numbers pi, i=1,...,kx, of the kx subsets xi of x : sum(pi)=sum(px)=p. px is the partition vector of x
y	See x
py	The partition vector of y. A row vector containing the numbers qi for i = 1,...,ky of the ky subsets yi of y : sum(qi)=sum(py)=q.
r	The number of wanted successive solutions rmax <= min(min(px),min(py),n)

Details

This function uses the concors function

Value

A list with following components:

cx	a n times r matrix of the r canonical components of x
cy	a n.ky times r matrix. The ky blocks cyi of the rows n*(i-1)+1 : n*i contain the r canonical components relative to Yi
cov2	a ky times r matrix; each column k contains ky squared covariances cov$(x * u[,k], y_i * v_i[,k])^2$, the partial measures of link

Author(s)

Lafosse, R.

References

Hanafi & Lafosse (2001) Generalisation de la regression lineaire simple pour analyser la dependance de K ensembles de variables avec un K+1 eme. Revue de Statistique Appliquee vol.49, n.1

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
cca <- concorscano(x,c(2,3),y,c(3,2,4),2)
cca$rho2[1,1,]
```

concorsreg *Redundancy of sets yj by one set x*

Description

Regression of several subsets of variables Yj by another set X. SUCCESSIVE SOLUTIONS

Usage

```
concorsreg(x, px, y, py, r)
```

Arguments

x	are the n times p and n times q matrices of p and q centered column
px	The row vector which contains the numbers pi, i = 1,...,kx, of the kx subsets xi of x : $\sum_i p_i$=sum(px)=p. px is the partition vector of x
y	See x
py	The partition vector of y. A row vector containing the numbers qi for i = 1,...,ky of the ky subsets yi of y : sum(qi)=sum(py)=q.
r	The number of wanted successive solutions

Value

A list with following components:

cx	a n times rmatrix of the r explanatory components
v	is a $q \times r$ matrix of ky row blocks v_i $(q_i \times r)$ of axes in Rqi relative to yi; $v_i' * v_i = \text{Id}$
varexp	is a $ky \times r$ matrix; each column k contains ky explained variances $\rho(cx[,k], y_i * v_i[,k])^2 \text{var}(y_i * v_i[,k])$

Author(s)

Lafosse, R.

Examples

```
x <- matrix(runif(50),10,5);y <- matrix(runif(90),10,9)
x <- scale(x);y <- scale(y)
crs <- concorsreg(x,c(2,3),y,c(3,2,4),2)
crs$varexp[1,1,]
```

svdbip *SVD for one bipartitioned matrix x*

Description

SVD for bipartitioned matrix x. r successive Solutions

Usage

```
svdbip(x, K, H, r)
```

Arguments

x	a p times q matrix
K	is a row vector which contains the numbers pk, k=1,...,kx, of the partition of x with kx row blocks : sum(pk)=p
H	is a row vector which contains the numbers qh, h=1,...,ky, of the partition of x with ky column blocks : sum(qh)=q
r	The number of wanted successive solutions

Details

The first solution calculates kx+ky normed vectors: kx vectors uk[:,1] of R^{p_k} associated to ky vectors vh[:,1]'s of R^{q_h}, by maximizing $\sum_k \sum_h (u_k[:,1]^prime * x_{kh} * v_h[:,1])^2$, with kx+ky norm constraints. A value $(u_k[,1]^prime * x_{kh} * v_h[,1])^2$ measures the relative link between R^{p_k} and R^{q_h} associated to the block xkh. The second solution is obtained from the same criterion, but after replacing each xhk by xkh-xkh*vh*vh'-uk*uk'xkh+uk*uk'xkh*vh*vh'. And so on for the successive solutions 1,2,...,r . The biggest number of solutions may be r=inf(pk,qh), when the xkh's are supposed with full rank; then rmax=min([min(K),min(H)]). When K=p (or H=q, with t(x)), svdcp function is better. When H=q and K=p, it is the usual svd (with squared singular values). Convergence of algorithm may be not global. So the below proposed initialisation of the algorithm may be not very suitable for some data sets. Several different random initialisations with normed vectors might be considered and the best result then choosen.

Value

A list with following components:

u	a p times r matrix of kx row blocks uk (pk x r); uk'*uk = Identity.
v	a q times r matrix of ky row blocks vi (qi x r) of axes in Rqi relative to yi; vi^prime*vi = Identity
s	a kx times ky times r array; with r fixed, each matrix contains kxky values $(u'_h * x_{kh} * v_k)^2$, the partial (squared) singular values relative to xkh.

Author(s)

Lafosse, R.

References

Kissita G., Cazes P., Hanafi M. & Lafosse (2004) Deux methodes d'analyse factorielle du lien entre deux tableaux de variables partitiones. Revue de Statistique Appliquee.

Examples

```
x <- matrix(runif(200),10,20)
s <- svdbip(x,c(3,4,3),c(5,15),3)
```

---

svdbip2 *SVD for bipartitioned matrix x*

Description

SVD for bipartitioned matrix x. r successive Solutions. As SVDBIP, but with another algorithm and another initialisation

Usage

```
svdbip2(x, K, H, r)
```

Arguments

`x`	a p times q matrix
`K`	is a row vector which contains the numbers pk, k=1,...,kx, of the partition of x with kx row blocks : `sum(pk)=p`
`H`	is a row vector which contains the numbers qh, h=1,...,ky, of the partition of x with ky column blocks : sum(qh)=q
`r`	The number of wanted successive solutions

Details

The first solution calculates kx+ky normed vectors: kx vectors `uk[:,1]` of Rpk associated to ky vectors `vh[,1]`'s of Rqh, by maximizing $\sum_k \sum_h (u_k[,1]' * x_{kh} * v_h[,1])^2$, with kx+ky norm constraints. A value $(u_k[,1]' * x_{kh} * v_h[,1])^2$ measures the relative link between R^{p_k} and R^{q_h} associated to the block xkh. The second solution is obtained from the same criterion, but after replacing each xhk by xkh-xkh*vh*vh'-uk*uk'xkh+uk*uk'xkh*vh*vh'. And so on for the successive solutions 1,2,...,r . The biggest number of solutions may be r=inf(pk,qh), when the xkh's are supposed with full rank; then `rmax=min([min(K),min(H)])`. When K=p (or H=q, with t(x)), svdcp function is better. When H=q and K=p, it is the usual svd (with squared singular values). Convergence of algorithm may be not global. So the below proposed initialisation of the algorithm may be not very suitable for some data sets. Several different random initialisations with normed vectors might be considered and the best result then choosen

Value

A `list` with following components:

`u`	a `p` times `r` matrix of kx row blocks uk (pk x r); uk'*uk = Identity.
`v`	a `q` times `r` matrix of `ky` row blocks `vi (qi x r)` of axes in `Rqi` relative to `yi; vi^prime*vi = Identity`
`s`	a `kx` times `ky` times `r` array; with r fixed, each matrix contains kxky values $(u_h' * x_{kh} * v_k)^2$, the partial (squared) singular values relative to xkh.

Author(s)

Lafosse, R.

References

Kissita G., Analyse canonique generalisee avec tableau de reference generalisee. Thesis, Ceremade Paris 9 Dauphine (2003)

Examples

```
x <- matrix(runif(200),10,20)
s2 <- svdbip2(x,c(3,4,3),c(5,5,10),3);s2$s2
s1 <- svdbip(x,c(3,4,3),c(5,5,10),3);s1$s2
```

---

svdbips — *SVD for bipartitioned matrix x*

Description

SVD for bipartitioned matrix x. SIMULTANEOUS SOLUTIONS. ("simultaneous svdbip")

Usage

```
svdbips(x, K, H, r)
```

Arguments

`x`	a `p` times `q` matrix
`K`	is a row vector which contains the numbers pk, k=1,...,kx, of the partition of x with kx row blocks : `sum(pk)=p`
`H`	is a row vector which contains the numbers qh, h=1,...,ky, of the partition of x with ky column blocks : sum(qh)=q
`r`	The number of wanted successive solutions

Details

One set of r solutions is calculated by maximizing $\sum_i \sum_k \sum_h (u_k[,i]' * x_{kh} * v_h[,i])^2$, with kx+ky orthonormality constraints (for each uk and each vh). For each fixed r value, the solution is totally new (does'nt consist to complete a previous calculus of one set of r-1 solutions). `rmax=min([min(K),min(H)])`. When r=1, it is svdbip (thus it is svdcp when r=1 and kx=1). Convergence of algorithm may be not global. So the below proposed initialisation of the algorithm may be not very suitable for some data sets. Several different random initialisations with normed vectors might be considered and the best result then choosen....

Value

A `list` with following components:

`u`	a `p` times `r` matrix of kx row blocks uk (pk x r); uk'*uk = Identity.
`v`	a `q` times `r` matrix of `ky` row blocks `vi` (`qi` x `r`) of axes in `Rqi` relative to `yi`; `vi^prime*vi` = `Identity`
`s`	a `kx` times `ky` times `r` array; with r fixed, each matrix contains kxky values $(u'_h * x_{kh} * v_k)^2$, the partial (squared) singular values relative to xkh.

Author(s)

Lafosse, R.

References

Lafosse R. & Ten Berge J. A simultaneous CONCOR method for the analysis of two partitioned matrices. submitted.

Examples

```
x <- matrix(runif(200),10,20)
s1 <- svdbip(x,c(3,4,3),c(5,5,10),2);sum(sum(sum(s1$s2)))
ss <- svdbips(x,c(3,4,3),c(5,5,10),2);sum(sum(sum(ss$s2)))
```

`svdcp` *SVD for a Column Partitioned matrix x*

Description

SVD for a Column Partitioned matrix x. r global successive solutions

Usage

```
svdcp(x, H, r)
```

Arguments

- `x` — a p times q matrix
- `H` — is a row vector which contains the numbers qh, h=1,...,ky, of the partition of x with ky column blocks : sum(qh)=q
- `r` — The number of wanted successive solutions

Details

The first solution calculates 1+kx normed vectors: the vector `u[,1]` of R^p associated to the kx vectors `vi[,1]`'s of R^{q_i}. by maximizing $\sum_i (u[,1]' * x_i * v_i[,1])^2$, with 1+kx norm constraints. A value $(u[,1]' * x_i * v_i[,1])^2$ measures the relative link between R^p and R^{q_i} associated to xi. It corresponds to a partial squared singular value notion, since $\sum_i (u[,1]' * x_i * v_i[,1])^2 = s^2$, where s is the usual first singular value of x. The second solution is obtained from the same criterion, but after replacing each xi by `xi-xi*vi[,1]*vi[,1]^prime`. And so on for the successive solutions 1,2,...,r . The biggest number of solutions may be r=inf(p,qi), when the xi's are supposed with full rank; then `rmax=min([min(H),p])`.

Value

A `list` with following components:

- `u` — a `p` times `r` matrix of kx row blocks uk (pk x r); uk'*uk = Identity.
- `v` — a `q` times `r` matrix of `ky` row blocks `vi (qi x r)` of axes in `Rqi` relative to `yi`; `vi^prime*vi = Identity`
- `s` — a `kx` times `ky` times `r` array; with r fixed, each matrix contains kxky values $(u_h' * x_{kh} * v_k)^2$, the partial (squared) singular values relative to xkh.

Author(s)

Lafosse, R.

References

Lafosse R. & Hanafi M.(1997) Concordance d'un tableau avec K tableaux: Definition de K+1 uples synthetiques. Revue de Statistique Appliquee vol.45,n.4.

Examples

```
x <- matrix(runif(200),10,20)
s <- svdcp(x,c(5,5,10),1)
ss <- svd(x);ss$d[1]^2
sum(s$s2)
```

Index