Package 'sparsesvd'

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Title Sparse Truncated Singular Value Decomposition (from 'SVDLIBC')

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Description Wrapper around the 'SVDLIBC' library for (truncated) singular value decomposition of a sparse matrix.
Currently, only sparse real matrices in Matrix package format are supported.

Depends R (>= 3.0)

Imports Matrix, methods

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URL http://tedlab.mit.edu/~dr/SVDLIBC/,
http://wordspace.r-forge.r-project.org/

NeedsCompilation yes

LazyData true

Author Doug Rohde [aut],
Michael Berry [aut],
Theresa Do [aut],
Gavin O'Brien [aut],
Vijay Krishna [aut],
Sowmini Varadhan [aut],
University of Tennessee Research Foundation [cph] (files src/las2.c, src/svdlib.[ch], src/svdutil.[ch]),
Stefan Evert [cre, aut, cph] (copyright holder for files src/main.c, R/*, man/*, tests/*)

Maintainer Stefan Evert <stefan.evert@fau.de>

Repository CRAN

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R topics documented:

sparsesvd *Singular Value Decomposition of a Sparse Matrix.*

Description

Compute the (usually truncated) singular value decomposition (SVD) of a sparse real matrix. This function is a shallow wrapper around the SVDLIBC implementation of Berry's (1992) single Lanczos algorithm.

Usage

```
sparsesvd(M, rank=0L, tol=1e-15, kappa=1e-6)
```

Arguments

M	a sparse real matrix in **Matrix** package format. The preferred format is a dgCMatrix and other storage formats will automatically be converted if possible.
rank	an integer specifying the desired number of singular components, i.e. the rank of the truncated SVD. Specify 0 to return all singular values of magnitude larger than tol (default).
tol	exclude singular values whose magnitude is smaller than tol
kappa	accuracy parameter κ of the SVD algorithm (with SVDLIBC default)

Value

The truncated SVD decomposition

$$M_r = U_r D V_r^T$$

where M_r is the optimal rank r approximation of M. Note that r may be smaller than the requested number rank of singular components.

The returned value is a list with components

d	a vector containing the first r singular values of M
u	a column matrix of the first r left singular values of M
v	a column matrix of the first r right singular values of M

References

http://tedlab.mit.edu/~dr/SVDLIBC/

Berry, Michael~W. (1992). Large scale sparse singular value computations. *International Journal of Supercomputer Applications*, **6**, 13–49.

See Also

svd, sparseMatrix

Examples

```
M <- rbind(
  c(20, 10, 15,  0,  2),
  c(10,  5,  8,  1,  0),
  c( 0,  1,  2,  6,  3),
  c( 1,  0,  0, 10,  5))
M <- Matrix::Matrix(M, sparse=TRUE)
print(M)

res <- sparsesvd(M, rank=2L) # compute first 2 singular components
print(res, digits=3)

M2 <- res$u %*% diag(res$d) %*% t(res$v) # rank-2 approximation
print(M2, digits=1)

print(as.matrix(M) - M2, digits=2) # approximation error
```

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