Package 'SparseChol'

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Type Package

Title Sparse Cholesky LDL Decomposition of Symmetric Matrices

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Description 'C++' implementation of sparse LDL decomposition of symmetric matrices and solvers described by Timothy A. Davis (2016) <https://fossies.org/linux/SuiteSparse/LDL/Doc/ldl_userguide.pdf>. Provides the header file 'SparseChol.h' that specifies the 'SparseChol' class to implement sparse LDL decomposition in 'Rcpp' functions. A limited set of 'R' functions that implement the method are also included.

License GPL (>= 2)

Imports Rcpp (>= 1.0.7)

LinkingTo Rcpp (>= 1.0.7)

RoxygenNote 7.2.1

NeedsCompilation yes

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URL https://github.com/samuel-watson/SparseChol

BugReports https://github.com/samuel-watson/SparseChol/issues

Suggests testthat

Biarch true

Depends R (>= 3.4.0), Matrix (>= 1.3-4)

SystemRequirements GNU make

Encoding UTF-8

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R topics documented:

`SparseChol-package` *Sparse Cholesky LDL Decomposition of Symmetric Matrices*

Description

'C++' implementation of sparse LDL decomposition of symmetric matrices and solvers described by Timothy A. Davis (2016) <https://fossies.org/linux/SuiteSparse/LDL/Doc/ldl_userguide.pdf>. Provides the header file 'SparseChol.h' that specifies the 'SparseChol' class to implement sparse LDL decomposition in 'Rcpp' functions. A limited set of 'R' functions that implement the method are also included.

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Maintainer

NA

Author(s)

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LDL_Cholesky *Generate LDL decomposition from Matrix class 'dsCMatrix'*

Description

Generates the Cholesky decomposition L as A == LL^T from a sparse matrix

Usage

```
LDL_Cholesky(mat)
```

Arguments

mat	A matrix of class 'dsCMatrix'

Value

A list of matrices L and D

LL_Cholesky *Generate Cholesky decomposition from Matrix class 'dsCMatrix'*

Description

Generates the Cholesky decomposition L as A == LL^T from a sparse matrix

Usage

```
LL_Cholesky(mat)
```

Arguments

mat	A matrix of class 'dsCMatrix'

Value

A matrix of class 'ddiMatrix'

`sparse_chol` *Sparse Cholesky decomposition*

Description

Sparse Cholesky decomposition

Usage

```
sparse_chol(n, Ap, Ai, Ax)
```

Arguments

`n`	Integer specifying the dimension of the matrix
`Ap`	numeric (integer valued) vector of pointers, one for each column (or row), to the initial (zero-based) index of elements in the column (or row).
`Ai`	Integer vector specifying the row positions of the non-zero values of the matrix
`Ax`	values of the non-zero matrix entries

Details

Generates the LDL decomposition of a symmetrix, sparse matrix using the method described by Timothy Davis (see references). Required input is a matrix in sparse format from the matrix package, see sparseMatrix

Value

A list with elements n, Ai, Ap, Ax (corresponding to above arguments) for matrix L, and element D, which contains the diagonal values of matrix D.

Examples

```
n <- 10
Ap  <- c(0, 1, 2, 3, 4, 6, 7, 9, 11, 15, 19)
Ai <- c(1, 2, 3, 4, 2,5, 6, 5,7, 5,8, 1,5,8,9, 2,5,7,10)
Ax = c(1.7, 1., 1.5, 1.1, .02,2.6, 1.2, .16,1.3, .09,1.6,
          .13,.52,.11,1.4, .01,.53,.56,3.1)
out <-sparse_chol(n,Ap,Ai,Ax)
sparse_L(out)
sparse_D(out)
```

sparse_D *Generate matrix D from 'sparse_chol' output*

Description

Generates the D matrix of the LDL decomposition from the output of the 'sparse_chol' function

Usage

```
sparse_D(mat)
```

Arguments

mat	List returned by 'sparse_chol'

Value

A matrix of class 'ddiMatrix'

sparse_L *Generate matrix L from 'sparse_chol' output*

Description

Generates the L matrix of the LDL decomposition from the output of the 'sparse_chol' function

Usage

```
sparse_L(mat)
```

Arguments

mat	List returned by 'sparse_chol'

Value

A matrix of class 'dsCMatrix'

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