matrix_decomposition Documentation

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CHAPTER 1

Matrix decompositions

Several matrix decompositions are supported. They are available in *matrix.decompositions*:

1.1 LL decomposition

class matrix.decompositions.**LL_Decomposition**(*L*, *p=None*)

Bases: *matrix.decompositions.DecompositionBase*

A matrix decomposition where LL^H is the decomposed (permuted) matrix.

L is a lower triangle matrix with ones on the diagonal. This decomposition is also called Cholesky decomposition.

Parameters

- **L** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix *L* of the decomposition.
- **p** (*numpy.ndarray*) – The permutation vector used for the decomposition. This decomposition is of A[p[:, np.newaxis], p[np.newaxis, :]] where A is a matrix. optional, default: no permutation

L

numpy.matrix or scipy.sparse.spmatrix – The matrix *L* of the decomposition.

P

scipy.sparse.dok_matrix – The permutation matrix. P @ A @ P.H is the matrix A permuted by the permutation of the decomposition

composed_matrix

numpy.matrix or scipy.sparse.spmatrix – The composed matrix represented by this decomposition.

is_permuted

bool – Whether this is a decompositon with permutation.

is_sparse
`bool` – Whether this is a sparse decompositon.

n
`int` – The dimension of the squared decomposed matrix.

p
`numpy.ndarray` – The permutation vector. A[p[:, np.newaxis], p[np.newaxis, :]] is the matrix A permuted by the permutation of the decomposition

p_inverse
`numpy.ndarray` – The permutation vector that undos the permutation.

permute_matrix(*A*)
Permute a matrix by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be permuted.

Returns The matrix *A* permuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

unpermute_matrix(*A*)
Unpermute a matrix permuted by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be unpermuted.

Returns The matrix *A* unpermuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

1.2 LDL decomposition

class matrix.decompositions.**LDL_Decomposition**(*L*, *d*, *p=None*)
Bases: *matrix.decompositions.DecompositionBase*

A matrix decomposition where LDL^H is the decomposed (permuted) matrix.

L is a lower triangle matrix with ones on the diagonal. *D* is a diagonal matrix. Only the diagonal values of *D* are stored.

Parameters

- **L** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix *L* of the decomposition.
- **d** (*numpy.ndarray*) – The vector of the diagonal components of *D* of the decompositon.
- **p** (*numpy.ndarray*) – The permutation vector used for the decomposition. This decomposition is of A[p[:, np.newaxis], p[np.newaxis, :]] where A is a matrix. optional, default: no permutation

D
`scipy.sparse.dia_matrix` – The permutation matrix.

L
`numpy.matrix` or `scipy.sparse.spmatrix` – The matrix *L* of the decomposition.

LD
numpy.matrix or scipy.sparse.spmatrix – A matrix whose diagonal values are the diagonal values of D and whose off-diagonal values are those of L.

P
scipy.sparse.dok_matrix – The permutation matrix. P @ A @ P.H is the matrix A permuted by the permutation of the decomposition

composed_matrix
numpy.matrix or scipy.sparse.spmatrix – The composed matrix represented by this decomposition.

d
numpy.ndarray – The diagonal vector of the matrix D of the decomposition.

is_permuted
bool – Whether this is a decompositon with permutation.

is_sparse
bool – Whether this is a sparse decompositon.

n
int – The dimension of the squared decomposed matrix.

p
numpy.ndarray – The permutation vector. A[p[:, np.newaxis], p[np.newaxis, :]] is the matrix A permuted by the permutation of the decomposition

p_inverse
numpy.ndarray – The permutation vector that undos the permutation.

permute_matrix(*A*)
Permute a matrix by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be permuted.

Returns The matrix A permuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

unpermute_matrix(*A*)
Unpermute a matrix permuted by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be unpermuted.

Returns The matrix A unpermuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

1.3 LDL decomposition compressed

class matrix.decompositions.**LDL_DecompositionCompressed**(*LD*, *p=None*)
Bases: *matrix.decompositions.DecompositionBase*

A matrix decomposition where LDL^H is the decomposed (permuted) matrix.

L is a lower triangle matrix with ones on the diagonal. D is a diagonal matrix. L and D are stored in one matrix whose diagonal values are the diagonal values of D and whose off-diagonal values are those of L.

Parameters

- **LD** (*numpy.ndarray or scipy.sparse.spmatrix*) – A matrix whose diagonal values are the diagonal values of D and whose off-diagonal values are those of L.
- **p** (*numpy.ndarray*) – The permutation vector used for the decomposition. This decomposition is of A[p[:, np.newaxis], p[np.newaxis, :]] where A is a matrix. optional, default: no permutation

D
scipy.sparse.dia_matrix – The permutation matrix.

L
numpy.matrix or scipy.sparse.spmatrix – The matrix L of the decomposition.

LD
numpy.matrix or scipy.sparse.spmatrix – A matrix whose diagonal values are the diagonal values of D and whose off-diagonal values are those of L.

P
scipy.sparse.dok_matrix – The permutation matrix. P @ A @ P.H is the matrix A permuted by the permutation of the decomposition

composed_matrix
numpy.matrix or scipy.sparse.spmatrix – The composed matrix represented by this decomposition.

d
numpy.ndarray – The diagonal vector of the matrix D of the decomposition.

is_permuted
bool – Whether this is a decompositon with permutation.

is_sparse
bool – Whether this is a sparse decompositon.

n
int – The dimension of the squared decomposed matrix.

p
numpy.ndarray – The permutation vector. A[p[:, np.newaxis], p[np.newaxis, :]] is the matrix A permuted by the permutation of the decomposition

p_inverse
numpy.ndarray – The permutation vector that undos the permutation.

permute_matrix(*A*)
Permute a matrix by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be permuted.

Returns The matrix A permuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

unpermute_matrix(*A*)
Unpermute a matrix permuted by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be unpermuted.

Returns The matrix A unpermuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

1.4 base decomposition

class matrix.decompositions.**DecompositionBase**(*p=None*)

Bases: object

A matrix decomposition.

This class is a base class for matrix decompositions.

Parameters **p** (*numpy.ndarray*) – The permutation vector used for the decomposition. This decomposition is of A[p[:, np.newaxis], p[np.newaxis, :]] where A is a matrix. optional, default: no permutation

P

scipy.sparse.dok_matrix – The permutation matrix. P @ A @ P.H is the matrix A permuted by the permutation of the decomposition

composed_matrix

numpy.matrix or scipy.sparse.spmatrix – The composed matrix represented by this decomposition.

is_permuted

bool – Whether this is a decompositon with permutation.

is_sparse

bool – Whether this is a sparse decompositon.

n

int – The dimension of the squared decomposed matrix.

p

numpy.ndarray – The permutation vector. A[p[:, np.newaxis], p[np.newaxis, :]] is the matrix A permuted by the permutation of the decomposition

p_inverse

numpy.ndarray – The permutation vector that undos the permutation.

permute_matrix(*A*)

Permute a matrix by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be permuted.

Returns The matrix *A* permuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

unpermute_matrix(*A*)

Unpermute a matrix permuted by the permutation of the decomposition.

Parameters **A** (*numpy.ndarray or scipy.sparse.spmatrix*) – The matrix that should be unpermuted.

Returns The matrix *A* unpermuted by the permutation of the decomposition.

Return type numpy.ndarray or scipy.sparse.spmatrix

CHAPTER 2

Changelog

2.1 v0.1

- several decompositons types added (LL, LDL, LDL compressed)
- permutation capabilities added

CHAPTER 3

Indices and tables

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