

# Package ‘DelayedMatrixStats’

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**Type** Package

**Title** Functions that Apply to Rows and Columns of 'DelayedMatrix' Objects

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**Description** A port of the 'matrixStats' API for use with DelayedMatrix objects from the 'DelayedArray' package. High-performing functions operating on rows and columns of DelayedMatrix objects, e.g. col / rowMedians(), col / rowRanks(), and col / rowSds(). Functions optimized per data type and for subsetting calculations such that both memory usage and processing time is minimized.

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---

`colAlls,DelayedMatrix-method`

*Check if all elements in a row (column) of a matrix-like object are equal to a value*

---

## Description

Check if all elements in a row (column) of a matrix-like object are equal to a value.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colAlls(
  x,
  rows = NULL,
  cols = NULL,
  value = TRUE,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

```
## S4 method for signature 'DelayedMatrix'
colAnys(
  x,
  rows = NULL,
  cols = NULL,
  value = TRUE,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

```
## S4 method for signature 'DelayedMatrix'
rowAlls(
  x,
  rows = NULL,
  cols = NULL,
  value = TRUE,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

```
## S4 method for signature 'DelayedMatrix'
rowAnys(
  x,
  rows = NULL,
  cols = NULL,
  value = TRUE,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

### Arguments

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <code>rows, cols</code>             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                    |
| <code>value</code>                  | The value to search for.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <code>na.rm</code>                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| <code>force_block_processing</code> | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| <code>...</code>                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>useNames</code>               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                                                            |

### Details

The S4 methods for `x` of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowAIs` / `matrixStats::colAIs`.

### Value

Returns a [logical vector](#) of length N (K).

### Author(s)

Peter Hickey

### See Also

- `matrixStats::rowAIs()` and `matrixStats::colAIs()` which are used when the input is a [matrix](#) or [numeric vector](#).
- For checks if *any* element is equal to a value, see [rowAnys\(\)](#).
- `base::all()`.

**Examples**

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                   ncol = 3))

# A DelayedMatrix with a 'SolidRleArraySeed' seed
dm_Rle <- RleArray(Rle(c(rep(1L, 5),
                           as.integer((0:4) ^ 2),
                           seq(-5L, -1L, 1L))),
                  dim = c(5, 3))

colAlls(dm_matrix, value = 1)
colAnys(dm_matrix, value = 2)
rowAlls(dm_Rle, value = 1)
rowAnys(dm_Rle, value = 2)
```

---

colAnyNAs,DelayedMatrix-method

*Check if any elements in a row (column) of a matrix-like object is missing*

---

**Description**

Check if any elements in a row (column) of a matrix-like object is missing.

**Usage**

```
## S4 method for signature 'DelayedMatrix'
colAnyNAs(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowAnyNAs(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

**Arguments**

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <code>rows, cols</code>             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                    |
| <code>force_block_processing</code> | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| <code>...</code>                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>useNames</code>               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                            |

**Details**

The S4 methods for `x` of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowAnyNAs` / `matrixStats::colAnyNAs`.

**Value**

Returns a [logical vector](#) of length N (K).

**Author(s)**

Peter Hickey

**See Also**

- `matrixStats::rowAnyNAs()` and `matrixStats::colAnyNAs()` which are used when the input is a [matrix](#) or [numeric vector](#).
- For checks if any element is equal to a value, see [rowAnys\(\)](#).
- `base::is.na()` and `base::any()`.

**Examples**

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'HDF5ArraySeed' seed
# NOTE: Requires that the HDF5Array package is installed
library(HDF5Array)
dm_HDF5 <- writeHDF5Array(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))
```

```
dm_matrix[dm_matrix > 3] <- NA
colAnyNAs(dm_matrix)
dm_HDF5[dm_HDF5 > 3] <- NA
rowAnyNAs(dm_HDF5)
```

---

colAvsPerRowSet,DelayedMatrix-method

*Calculates for each row (column) a summary statistic for equally sized subsets of columns (rows)*

---

## Description

Calculates for each row (column) a summary statistic for equally sized subsets of columns (rows).

## Usage

```
## S4 method for signature 'DelayedMatrix'
colAvsPerRowSet(
  X,
  W = NULL,
  cols = NULL,
  S,
  FUN = colMeans,
  ...,
  force_block_processing = FALSE,
  na.rm = NA,
  tFUN = FALSE
)
```

```
## S4 method for signature 'DelayedMatrix'
rowAvsPerColSet(
  X,
  W = NULL,
  rows = NULL,
  S,
  FUN = rowMeans,
  ...,
  force_block_processing = FALSE,
  na.rm = NA,
  tFUN = FALSE
)
```

## Arguments

|   |                                            |
|---|--------------------------------------------|
| X | A NxM <a href="#">DelayedMatrix</a> .      |
| W | An optional numeric NxM matrix of weights. |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S                      | An <a href="#">integer</a> KxJ matrix that specifying the J subsets. Each column hold K column (row) indices for the corresponding subset. The range of values is [1, M] ([1,N]).                                                                                                                                                                                                                                                                            |
| FUN                    | A row-by-row (column-by-column) summary statistic function. It is applied to to each column (row) subset of X that is specified by S.                                                                                                                                                                                                                                                                                                                        |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                             |
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| na.rm                  | (logical) Argument passed to FUN() as <code>na.rm = na.rm</code> . If NA (default), then <code>na.rm = TRUE</code> is used if X or S holds missing values, otherwise <code>na.rm = FALSE</code> .                                                                                                                                                                                                                                                            |
| tFUN                   | If TRUE, X is transposed before it is passed to FUN.                                                                                                                                                                                                                                                                                                                                                                                                         |
| rows, cols             | A <a href="#">vector</a> indicating the subset (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                            |

## Details

The S4 methods for x of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowAvgPerColSet` / `matrixStats::colAvgPerRowSet`.

## Value

Returns a numeric JxN (MxJ) matrix.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowAvgPerColSet()` and `matrixStats::colAvgPerRowSet()` which are used when the input is a matrix or numeric vector.

## Examples

```
# A DelayedMatrix with a 'DataFrame' seed
dm_DF <- DelayedArray(S4Vectors::DataFrame(C1 = rep(1L, 5),
                                           C2 = as.integer((0:4) ^ 2),
                                           C3 = seq(-5L, -1L, 1L)))
colAvgPerRowSet(dm_DF, S = matrix(1:2, ncol = 2))

rowAvgPerColSet(dm_DF, S = matrix(1:2, ncol = 1))
```

---

colCollapse,DelayedMatrix-method

*Extract one cell from each row (column) of a matrix-like object*


---

## Description

Extract one cell from each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colCollapse(
  x,
  idxs,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowCollapse(
  x,
  idxs,
  rows = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                        |
| idxs                   | An index <a href="#">vector</a> with the position to extract. It is recycled to match the number of rows (column)                                                                                                                                                                                                                                                                                                                                            |
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                             |
| useNames               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                            |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                    |

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowCollapse` / `matrixStats::colCollapse`.

## Value

Returns a `numeric vector` of length `N (K)`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowCollapse()` and `matrixStats::colCollapse()` which are used when the input is a matrix or numeric vector.

## Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'HDF5ArraySeed' seed
# NOTE: Requires that the HDF5Array package is installed
library(HDF5Array)
dm_HDF5 <- writeHDF5Array(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                ncol = 3))

# Extract the 4th row as a vector
# NOTE: An ordinary vector is returned regardless of the backend of
#       the DelayedMatrix object
colCollapse(dm_matrix, 4)
colCollapse(dm_HDF5, 4)

# Extract the 2nd column as a vector
# NOTE: An ordinary vector is returned regardless of the backend of
#       the DelayedMatrix object
rowCollapse(dm_matrix, 2)
rowCollapse(dm_HDF5, 2)
```

---

colCounts,DelayedMatrix-method

*Count how often an element in a row (column) of a matrix-like object is equal to a value*

---

## Description

Count how often an element in a row (column) of a matrix-like object is equal to a value.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colCounts(
  x,
  rows = NULL,
  cols = NULL,
  value = TRUE,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowCounts(
  x,
  rows = NULL,
  cols = NULL,
  value = TRUE,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                          |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                      |
| value                  | The value to search for.                                                                                                                                                                                                                                                       |
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                      |
| force_block_processing | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads |

one or more (depending on `\link[DelayedArray]{getAutoBlockSize}()`) columns (`colFoo()`) or rows (`rowFoo()`) into memory as an ordinary `base::array`.

... Additional arguments passed to specific methods.

useNames If `TRUE` (default), names attributes of result are set. Else if `FALSE`, no naming support is done.

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowCounts / matrixStats::colCounts`.

## Value

Returns a `integer vector` of length `N (K)`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowCounts()` and `matrixStats::colCounts()` which are used when the input is a matrix or numeric vector.
- For checks if any element is equal to a value, see `rowAnys()`. To check if all elements are equal, see `rowAlls()`.

## Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'DataFrame' seed
dm_DF <- DelayedArray(S4Vectors::DataFrame(C1 = rep(1L, 5),
                                           C2 = as.integer((0:4) ^ 2),
                                           C3 = seq(-5L, -1L, 1L)))

colCounts(dm_matrix, value = 1)
# Only count those in the first 4 rows
colCounts(dm_matrix, rows = 1:4, value = 1)

rowCounts(dm_DF, value = 5)
# Only count those in the odd-numbered rows of the 2nd column
rowCounts(dm_DF, rows = seq(1, nrow(dm_DF), 2), cols = 2, value = 5)
```

---

`colCummaxs,DelayedMatrix-method`*Calculates the cumulative maxima for each row (column) of a matrix-like object*

---

**Description**

Calculates the cumulative maxima for each row (column) of a matrix-like object.

**Usage**

```
## S4 method for signature 'DelayedMatrix'
colCummaxs(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

```
## S4 method for signature 'DelayedMatrix'
colCummins(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

```
## S4 method for signature 'DelayedMatrix'
colCumprods(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

```
## S4 method for signature 'DelayedMatrix'
colCumsums(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
```

```

    ...,
    useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowCummaxs(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowCummins(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowCumprods(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowCumsums(
  x,
  rows = NULL,
  cols = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

```

### Arguments

**x** A NxK [DelayedMatrix](#).

**rows, cols** A [vector](#) indicating the subset of rows (and/or columns) to operate over. If

`NULL`, no subsetting is done.

`force_block_processing` FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on `\link[DelayedArray]{getAutoBlockSize}()`) columns (`colFoo()`) or rows (`rowFoo()`) into memory as an ordinary `base::array`.

... Additional arguments passed to specific methods.

`useNames` If TRUE (default), names attributes of result are set. Else if FALSE, no naming support is done.

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowCummaxs` / `matrixStats::colCummaxs`.

## Value

Returns a `numeric matrix` with the same dimensions as `x`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowCummaxs()` and `matrixStats::colCummaxs()` which are used when the input is a matrix or numeric vector.
- For single maximum estimates, see `rowMaxs()`.
- `base::cummax()`.

## Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                           as.integer((0:4) ^ 2),
                                           seq(-5L, -1L, 1L)),
                                           ncol = 3))

colCummaxs(dm_matrix)

colCummins(dm_matrix)

colCumprods(dm_matrix)
```

```

colCumsums(dm_matrix)

# Only use rows 2-4
rowCummaxs(dm_Matrix, rows = 2:4)

# Only use rows 2-4
rowCummins(dm_Matrix, rows = 2:4)

# Only use rows 2-4
rowCumprods(dm_Matrix, rows = 2:4)

# Only use rows 2-4
rowCumsums(dm_Matrix, rows = 2:4)

```

---

colDiffs, DelayedMatrix-method

*Calculates the difference between each element of a row (column) of a matrix-like object*

---

## Description

Calculates the difference between each element of a row (column) of a matrix-like object.

## Usage

```

## S4 method for signature 'DelayedMatrix'
colDiffs(
  x,
  rows = NULL,
  cols = NULL,
  lag = 1L,
  differences = 1L,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowDiffs(
  x,
  rows = NULL,
  cols = NULL,
  lag = 1L,
  differences = 1L,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

```

**Arguments**

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                        |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                    |
| lag                    | An integer specifying the lag.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| differences            | An integer specifying the order of difference.                                                                                                                                                                                                                                                                                                                                                                                                               |
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                             |
| useNames               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                            |

**Details**

The S4 methods for x of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowDiffs / matrixStats::colDiffs`.

**Value**

Returns a [numeric matrix](#) with one column (row) less than x:  $Nx(K - 1)$  or  $(N - 1)xK$ .

**Author(s)**

Peter Hickey

**See Also**

- `matrixStats::rowDiffs()` and `matrixStats::colDiffs()` which are used when the input is a matrix or numeric vector.
- `base::diff()`.

**Examples**

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'HDF5ArraySeed' seed
# NOTE: Requires that the HDF5Array package is installed
library(HDF5Array)
dm_HDF5 <- writeHDF5Array(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
```

```

ncol = 3))

colDiffs(dm_matrix)

rowDiffs(dm_HDF5)
# In reverse column order
rowDiffs(dm_HDF5, cols = seq(ncol(dm_HDF5), 1, -1))

```

---

colIQRDiffs, DelayedMatrix-method

*Calculates the interquartile range of the difference between each element of a row (column) of a matrix-like object*

---

## Description

Calculates the interquartile range of the difference between each element of a row (column) of a matrix-like object.

## Usage

```

## S4 method for signature 'DelayedMatrix'
colIQRDiffs(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  diff = 1L,
  trim = 0,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
colMadDiffs(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  diff = 1L,
  trim = 0,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'

```

```
colSdDiffs(  
  x,  
  rows = NULL,  
  cols = NULL,  
  na.rm = FALSE,  
  diff = 1L,  
  trim = 0,  
  force_block_processing = FALSE,  
  ...,  
  useNames = TRUE  
)  
  
## S4 method for signature 'DelayedMatrix'  
colVarDiffs(  
  x,  
  rows = NULL,  
  cols = NULL,  
  na.rm = FALSE,  
  diff = 1L,  
  trim = 0,  
  force_block_processing = FALSE,  
  ...,  
  useNames = TRUE  
)  
  
## S4 method for signature 'DelayedMatrix'  
rowIQRDiffs(  
  x,  
  rows = NULL,  
  cols = NULL,  
  na.rm = FALSE,  
  diff = 1L,  
  trim = 0,  
  force_block_processing = FALSE,  
  ...,  
  useNames = TRUE  
)  
  
## S4 method for signature 'DelayedMatrix'  
rowMadDiffs(  
  x,  
  rows = NULL,  
  cols = NULL,  
  na.rm = FALSE,  
  diff = 1L,  
  trim = 0,  
  force_block_processing = FALSE,  
  ...,
```

```

    useNames = TRUE
  )

## S4 method for signature 'DelayedMatrix'
rowSdDiffs(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  diff = 1L,
  trim = 0,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowVarDiffs(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  diff = 1L,
  trim = 0,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

```

## Arguments

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>                      | A $N \times K$ <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <code>rows, cols</code>             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                    |
| <code>na.rm</code>                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| <code>diff</code>                   | An integer specifying the order of difference.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <code>trim</code>                   | A double in $[0, 1/2]$ specifying the fraction of observations to be trimmed from each end of (sorted) <code>x</code> before estimation.                                                                                                                                                                                                                                                                                                                                                     |
| <code>force_block_processing</code> | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link{DelayedArray}{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| <code>...</code>                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>useNames</code>               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                                                            |

**Details**

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowIQRDiffs` / `matrixStats::colIQRDiffs`.

**Value**

Returns a `numeric vector` of length `N (K)`.

**Author(s)**

Peter Hickey

**See Also**

- `matrixStats::rowIQRDiffs()` and `matrixStats::colIQRDiffs()` which are used when the input is a `matrix` or `numeric vector`.
- For the direct interquartile range see also `rowIQRs`.

**Examples**

```
# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                           as.integer((0:4) ^ 2),
                                           seq(-5L, -1L, 1L)),
                                           ncol = 3))

# A DelayedMatrix with a 'SolidRleArraySeed' seed
dm_Rle <- RleArray(Rle(c(rep(1L, 5),
                          as.integer((0:4) ^ 2),
                          seq(-5L, -1L, 1L))),
                  dim = c(5, 3))

colIQRDiffs(dm_Matrix)

colMadDiffs(dm_Matrix)

colSdDiffs(dm_Matrix)

colVarDiffs(dm_Matrix)

# Only using rows 2-4
rowIQRDiffs(dm_Rle, rows = 2:4)

# Only using rows 2-4
rowMadDiffs(dm_Rle, rows = 2:4)

# Only using rows 2-4
rowSdDiffs(dm_Rle, rows = 2:4)

# Only using rows 2-4
rowVarDiffs(dm_Rle, rows = 2:4)
```

---

colIQRs, DelayedMatrix-method

*Calculates the interquartile range for each row (column) of a matrix-like object*

---

## Description

Calculates the interquartile range for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colIQRs(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowIQRs(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                    |
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| force_block_processing | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                                                             |

useNames            If **TRUE** (default), names attributes of result are set. Else if **FALSE**, no naming support is done.

### Details

The S4 methods for x of type **matrix**, **array**, **table**, or **numeric** call `matrixStats::rowIQRs` / `matrixStats::colIQRs`.

### Value

Returns a **numeric vector** of length N (K).

### Author(s)

Peter Hickey

### See Also

- `matrixStats::rowIQRs()` and `matrixStats::colIQRs()` which are used when the input is a **matrix** or **numeric vector**.
- For a non-robust analog, see `rowSds()`. For a more robust version see `rowMads()`
- `stats::IQR()`.

### Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                             as.integer((0:4) ^ 2),
                                             seq(-5L, -1L, 1L)),
                                          ncol = 3))

colIQRs(dm_matrix)

# Only using rows 2-4
rowIQRs(dm_matrix, rows = 2:4)
```

## Description

Accurately calculates the logarithm of the sum of exponentials for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colLogSumExps(
  lx,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowLogSumExps(
  lx,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>lx</code>                     | A NxK <a href="#">DelayedMatrix</a> . Typically, <code>lx</code> are $\log(x)$ values.                                                                                                                                                                                                                                                                                                                                                                                              |
| <code>rows, cols</code>             | A <a href="#">vector</a> indicating the subset (and/or columns) to operate over. If <code>NULL</code> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                      |
| <code>na.rm</code>                  | If <code>TRUE</code> , missing values ( <code>NA</code> or <code>NaN</code> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| <code>force_block_processing</code> | <code>FALSE</code> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <code>TRUE</code> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <code>base::array</code> . |
| <code>...</code>                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <code>useNames</code>               | If <code>TRUE</code> (default), names attributes of result are set. Else if <code>FALSE</code> , no naming support is done.                                                                                                                                                                                                                                                                                                                                                         |

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowLogSumExps` / `matrixStats::colLogSumExps`.

**Value**

Returns a [numeric vector](#) of length N (K).

**Author(s)**

Peter Hickey

**See Also**

- `matrixStats::rowLogSumExps()` and `matrixStats::colLogSumExps()` which are used when the input is a matrix or numeric vector.
- [rowSums2\(\)](#)

**Examples**

```
x <- DelayedArray(matrix(runif(10), ncol = 2))
colLogSumExps(log(x))
rowLogSumExps(log(x))
```

---

colMads, DelayedMatrix-method

*Calculates the median absolute deviation for each row (column) of a matrix-like object*

---

**Description**

Calculates the median absolute deviation for each row (column) of a matrix-like object.

**Usage**

```
## S4 method for signature 'DelayedMatrix'
colMads(
  x,
  rows = NULL,
  cols = NULL,
  center = NULL,
  constant = 1.4826,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
colSds(
  x,
  rows = NULL,
```

```

    cols = NULL,
    na.rm = FALSE,
    center = NULL,
    force_block_processing = FALSE,
    ...,
    useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowMads(
  x,
  rows = NULL,
  cols = NULL,
  center = NULL,
  constant = 1.4826,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowSds(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  center = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

```

## Arguments

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                    |
| center                 | (optional) the center, defaults to the row means                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| constant               | A scale factor. See <code>stats::mad()</code> for details.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| force_block_processing | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |

... Additional arguments passed to specific methods.

useNames If **TRUE** (default), names attributes of result are set. Else if **FALSE**, no naming support is done.

## Details

The S4 methods for x of type **matrix**, **array**, **table**, or **numeric** call `matrixStats::rowMads` / `matrixStats::colMads`.

## Value

Returns a **numeric vector** of length N (K).

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowMads()` and `matrixStats::colMads()` which are used when the input is a matrix or numeric vector.
- For mean estimates, see `rowMeans2()` and `rowMeans()`.
- For non-robust standard deviation estimates, see `rowSds()`.

## Examples

```
# A DelayedMatrix with a 'data.frame' seed
dm_df <- DelayedArray(data.frame(C1 = rep(1L, 5),
                                C2 = as.integer((0:4) ^ 2),
                                C3 = seq(-5L, -1L, 1L)))

# A DelayedMatrix with a 'DataFrame' seed
dm_DF <- DelayedArray(S4Vectors::DataFrame(C1 = rep(1L, 5),
                                           C2 = as.integer((0:4) ^ 2),
                                           C3 = seq(-5L, -1L, 1L)))

colMads(dm_df)

colSds(dm_df)

rowMads(dm_DF)

rowSds(dm_DF)
```

---

colMeans2,DelayedMatrix-method

*Calculates the mean for each row (column) of a matrix-like object*


---

## Description

Calculates the mean for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colMeans2(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'Matrix'
colMeans2(x, rows = NULL, cols = NULL, na.rm = FALSE, ..., useNames = TRUE)

## S4 method for signature 'SolidRleArraySeed'
colMeans2(x, rows = NULL, cols = NULL, na.rm = FALSE, ..., useNames = TRUE)

## S4 method for signature 'DelayedMatrix'
rowMeans2(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'Matrix'
rowMeans2(x, rows = NULL, cols = NULL, na.rm = FALSE, ..., useNames = TRUE)
```

## Arguments

|            |                                                                                                                                           |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| x          | A NxK <a href="#">DelayedMatrix</a> .                                                                                                     |
| rows, cols | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done. |

na.rm            If **TRUE**, missing values (**NA** or **NaN**) are omitted from the calculations.

force\_block\_processing    FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to **TRUE** (typically not advised). The block-processing strategy loads one or more (depending on `\link[DelayedArray]{getAutoBlockSize}()`) columns (`colFoo()`) or rows (`rowFoo()`) into memory as an ordinary `base::array`.

...            Additional arguments passed to specific methods.

useNames        If **TRUE** (default), names attributes of result are set. Else if **FALSE**, no naming support is done.

### Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowMeans2` / `matrixStats::colMeans2`.

### Value

Returns a **numeric vector** of length `N(K)`.

### Author(s)

Peter Hickey

### See Also

- `matrixStats::rowMeans2()` and `matrixStats::colMeans2()` which are used when the input is a `matrix` or `numeric` vector.
- See also `rowMeans()` for the corresponding function in base R.
- For variance estimates, see `rowVars()`.
- See also the base R version `base::rowMeans()`.

### Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'SolidRleArraySeed' seed
dm_Rle <- RleArray(Rle(c(rep(1L, 5),
                           as.integer((0:4) ^ 2),
                           seq(-5L, -1L, 1L))),
                  dim = c(5, 3))

colMeans2(dm_matrix)

# NOTE: Temporarily use verbose output to demonstrate which method is
#       which method is being used
```

```

options(DelayedMatrixStats.verbose = TRUE)
# By default, this uses a seed-aware method for a DelayedMatrix with a
# 'SolidRleArraySeed' seed
rowMeans2(dm_Rle)
# Alternatively, can use the block-processing strategy
rowMeans2(dm_Rle, force_block_processing = TRUE)
options(DelayedMatrixStats.verbose = FALSE)

```

---

colMedians, DelayedMatrix-method

*Calculates the median for each row (column) of a matrix-like object*

---

## Description

Calculates the median for each row (column) of a matrix-like object.

## Usage

```

## S4 method for signature 'DelayedMatrix'
colMedians(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowMedians(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

```

## Arguments

|            |                                                                                                                                           |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| x          | A NxK <a href="#">DelayedMatrix</a> .                                                                                                     |
| rows, cols | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done. |
| na.rm      | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                 |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <code>base::array</code> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                          |
| useNames               | If <code>TRUE</code> (default), names attributes of result are set. Else if <code>FALSE</code> , no naming support is done.                                                                                                                                                                                                                                                                                                                               |

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowMedians` / `matrixStats::colMedians`.

## Value

Returns a `numeric vector` of length `N (K)`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowMedians()` and `matrixStats::colMedians()` which are used when the input is a `matrix` or `numeric vector`.
- For mean estimates, see `rowMeans2()` and `rowMeans()`.

## Examples

```
# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                           as.integer((0:4) ^ 2),
                                           seq(-5L, -1L, 1L)),
                                           ncol = 3))

colMedians(dm_Matrix)

rowMedians(dm_Matrix)
```

---

colOrderStats,DelayedMatrix-method

*Calculates an order statistic for each row (column) of a matrix-like object*

---

## Description

Calculates an order statistic for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colOrderStats(
  x,
  rows = NULL,
  cols = NULL,
  which,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowOrderStats(
  x,
  rows = NULL,
  cols = NULL,
  which,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                        |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                    |
| which                  | An integer index in [1,K] ([1,N]) indicating which order statistic to be returned                                                                                                                                                                                                                                                                                                                                                                            |
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                             |

useNames            If **TRUE** (default), names attributes of result are set. Else if **FALSE**, no naming support is done.

### Details

The S4 methods for x of type **matrix**, **array**, **table**, or **numeric** call **matrixStats::rowOrderStats** / **matrixStats::colOrderStats**.

### Value

Returns a **numeric vector** of length N (K).

### Author(s)

Peter Hickey

### See Also

- **matrixStats::rowOrderStats()** and **matrixStats::colOrderStats()** which are used when the input is a matrix or numeric vector.

### Examples

```
# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                           as.integer((0:4) ^ 2),
                                           seq(-5L, -1L, 1L)),
                                           ncol = 3))

# Only using columns 2-3
colOrderStats(dm_Matrix, cols = 2:3, which = 1)

# Different algorithms, specified by `which`, may give different results
rowOrderStats(dm_Matrix, which = 1)
rowOrderStats(dm_Matrix, which = 2)
```

---

colProds,DelayedMatrix-method

*Calculates the product for each row (column) of a matrix-like object*

---

### Description

Calculates the product for each row (column) of a matrix-like object.

**Usage**

```
## S4 method for signature 'DelayedMatrix'
colProds(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  method = c("direct", "expSumLog"),
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'SolidRleArraySeed'
colProds(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  method = c("direct", "expSumLog"),
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowProds(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  method = c("direct", "expSumLog"),
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

**Arguments**

|                        |                                                                                                                                                                             |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                       |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                   |
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                   |
| method                 | A character vector of length one that specifies the how the product is calculated. Note, that this is not a generic argument and not all implementation have to provide it. |
| force_block_processing | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if avail-                                                                            |

able). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on `\link[DelayedArray]{getAutoBlockSize}()`) columns (`colFoo()`) or rows (`rowFoo()`) into memory as an ordinary `base::array`.

... Additional arguments passed to specific methods.

useNames If `TRUE` (default), names attributes of result are set. Else if `FALSE`, no naming support is done.

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowProds / matrixStats::colProds`.

## Value

Returns a `numeric vector` of length `N (K)`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowProds()` and `matrixStats::colProds()` which are used when the input is a `matrix` or `numeric vector`.
- For sums across rows (columns), see `rowSums2()` (`colSums2()`)
- `base::prod()`.

## Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'HDF5ArraySeed' seed
# NOTE: Requires that the HDF5Array package is installed
library(HDF5Array)
dm_HDF5 <- writeHDF5Array(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))

colProds(dm_matrix)

rowProds(dm_matrix)
```

---

colQuantiles,DelayedMatrix-method

*Calculates quantiles for each row (column) of a matrix-like object*


---

## Description

Calculates quantiles for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colQuantiles(
  x,
  rows = NULL,
  cols = NULL,
  probs = seq(from = 0, to = 1, by = 0.25),
  na.rm = FALSE,
  type = 7L,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE,
  drop = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowQuantiles(
  x,
  rows = NULL,
  cols = NULL,
  probs = seq(from = 0, to = 1, by = 0.25),
  na.rm = FALSE,
  type = 7L,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE,
  drop = TRUE
)
```

## Arguments

|            |                                                                                                                                           |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| x          | A NxK <a href="#">DelayedMatrix</a> .                                                                                                     |
| rows, cols | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done. |
| probs      | A numeric vector of J probabilities in [0, 1].                                                                                            |
| na.rm      | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                 |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| type                   | An integer specifying the type of estimator. See <code>stats::quantile()</code> for more details.                                                                                                                                                                                                                                                                                                                                                         |
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <code>base::array</code> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                          |
| useNames               | If TRUE (default), names attributes of result are set. Else if FALSE, no naming support is done.                                                                                                                                                                                                                                                                                                                                                          |
| drop                   | If TRUE a vector is returned if <code>J == 1</code> .                                                                                                                                                                                                                                                                                                                                                                                                     |

### Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowQuantiles` / `matrixStats::colQuantiles`.

### Value

a `numeric` `NxJ` (`KxJ`) `matrix`, where `N` (`K`) is the number of rows (columns) for which the `J` values are calculated.

### Author(s)

Peter Hickey

### See Also

- `matrixStats::rowQuantiles()` and `matrixStats::colQuantiles()` which are used when the input is a matrix or numeric vector.
- `stats::quantile`

### Examples

```
# A DelayedMatrix with a 'data.frame' seed
dm_df <- DelayedArray(data.frame(C1 = rep(1L, 5),
                                C2 = as.integer((0:4) ^ 2),
                                C3 = seq(-5L, -1L, 1L)))

# colnames, if present, are preserved as rownames on output
colQuantiles(dm_df)

# Input has no rownames so output has no rownames
rowQuantiles(dm_df)
```

---

colRanks, DelayedMatrix-method

*Calculates the rank of the elements for each row (column) of a matrix-like object*

---

## Description

Calculates the rank of the elements for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colRanks(
  x,
  rows = NULL,
  cols = NULL,
  ties.method = c("max", "average", "first", "last", "random", "max", "min", "dense"),
  preserveShape = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowRanks(
  x,
  rows = NULL,
  cols = NULL,
  ties.method = c("max", "average", "first", "last", "random", "max", "min", "dense"),
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|               |                                                                                                                                                                        |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x             | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                  |
| rows, cols    | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                              |
| ties.method   | A character string specifying how ties are treated. Note that the default specifies fewer options than the original matrixStats package.                               |
| preserveShape | If TRUE the output matrix has the same shape as the input x. Note, that this is not a generic argument and not all implementation of this function have to provide it. |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <code>base::array</code> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                          |
| useNames               | If <code>TRUE</code> (default), names attributes of result are set. Else if <code>FALSE</code> , no naming support is done.                                                                                                                                                                                                                                                                                                                               |

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowRanks / matrixStats::colRanks`.

The `matrixStats::rowRanks()` function can handle a lot of different values for the `ties.method` argument. Users of the generic function should however only rely on `max` and `average` because the other ones are not guaranteed to be implemented:

`max` for values with identical values the maximum rank is returned

`average` for values with identical values the average of the ranks they cover is returned. Note, that in this case the return value is of type `numeric`.

## Value

A `matrix` of type `integer` is returned, unless `ties.method = "average"` when it is of type `numeric`.

The `rowRanks()` function always returns an `NxK matrix`, where `N` (`K`) is the number of rows (columns) whose ranks are calculated.

The `colRanks()` function returns an `NxK matrix`, if `preserveShape = TRUE`, otherwise a `KxN matrix`.

Any `names` of `x` are ignored and absent in the result.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowRanks()` and `matrixStats::colRanks()` which are used when the input is a `matrix` or `numeric` vector.
- `base::rank`

## Examples

```
# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                           as.integer((0:4) ^ 2),
                                           seq(-5L, -1L, 1L)),
                                           ncol = 3))
```

```
colRanks(dm_Matrix)
```

```
rowRanks(dm_Matrix)
```

---

```
colSums2,DelayedMatrix-method
```

*Calculates the sum for each row (column) of a matrix-like object*

---

## Description

Calculates the sum for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
```

```
colSums2(
```

```
  x,
```

```
  rows = NULL,
```

```
  cols = NULL,
```

```
  na.rm = FALSE,
```

```
  force_block_processing = FALSE,
```

```
  ...,
```

```
  useNames = TRUE
```

```
)
```

```
## S4 method for signature 'Matrix'
```

```
colSums2(x, rows = NULL, cols = NULL, na.rm = FALSE, ..., useNames = TRUE)
```

```
## S4 method for signature 'SolidRleArraySeed'
```

```
colSums2(x, rows = NULL, cols = NULL, na.rm = FALSE, ..., useNames = TRUE)
```

```
## S4 method for signature 'DelayedMatrix'
```

```
rowSums2(
```

```
  x,
```

```
  rows = NULL,
```

```
  cols = NULL,
```

```
  na.rm = FALSE,
```

```
  force_block_processing = FALSE,
```

```
  ...,
```

```
  useNames = TRUE
```

```
)
```

```
## S4 method for signature 'Matrix'
```

```
rowSums2(x, rows = NULL, cols = NULL, na.rm = FALSE, ..., useNames = TRUE)
```

**Arguments**

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <code>rows, cols</code>             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                    |
| <code>na.rm</code>                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| <code>force_block_processing</code> | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| <code>...</code>                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>useNames</code>               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                                                            |

**Details**

The S4 methods for `x` of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowSums2 / matrixStats::colSums2`.

**Value**

Returns a [numeric vector](#) of length N (K).

**Author(s)**

Peter Hickey

**See Also**

- `matrixStats::rowSums2()` and `matrixStats::colSums2()` which are used when the input is a [matrix](#) or [numeric vector](#).
- For mean estimates, see `rowMeans2()` and `rowMeans()`.
- `base::sum()`.

**Examples**

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                as.integer((0:4) ^ 2),
                                seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                           as.integer((0:4) ^ 2),
                                           seq(-5L, -1L, 1L)),
                                           ncol = 3))
```

```
colSums2(dm_matrix)

# NOTE: Temporarily use verbose output to demonstrate which method is
#       which method is being used
options(DelayedMatrixStats.verbose = TRUE)
# By default, this uses a seed-aware method for a DelayedMatrix with a
# 'SolidRleArraySeed' seed
rowSums2(dm_Matrix)
# Alternatively, can use the block-processing strategy
rowSums2(dm_Matrix, force_block_processing = TRUE)
options(DelayedMatrixStats.verbose = FALSE)
```

---

colTabulates,DelayedMatrix-method

*Tabulates the values in a matrix-like object by row (column)*

---

## Description

Tabulates the values in a matrix-like object by row (column).

## Usage

```
## S4 method for signature 'DelayedMatrix'
colTabulates(
  x,
  rows = NULL,
  cols = NULL,
  values = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowTabulates(
  x,
  rows = NULL,
  cols = NULL,
  values = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

x                    A NxK [DelayedMatrix](#).

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                    |
| values                 | the values to search for.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                             |
| useNames               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                            |

## Details

The S4 methods for `x` of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowTabulates` / `matrixStats::colTabulates`.

## Value

a [numeric](#)  $N \times J$  ( $K \times J$ ) [matrix](#), where  $N$  ( $K$ ) is the number of rows (columns) for which the  $J$  values are calculated.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowTabulates()` and `matrixStats::colTabulates()` which are used when the input is a [matrix](#) or [numeric](#) vector.
- `base::table()`

## Examples

```
# A DelayedMatrix with a 'DataFrame' seed
dm_DF <- DelayedArray(S4Vectors::DataFrame(C1 = rep(1L, 5),
                                           C2 = as.integer((0:4) ^ 2),
                                           C3 = seq(-5L, -1L, 1L)))

colTabulates(dm_DF)

rowTabulates(dm_DF)
```

---

colVars, DelayedMatrix-method

*Calculates the variance for each row (column) of a matrix-like object*


---

## Description

Calculates the variance for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colVars(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  center = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowVars(
  x,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  center = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                    |
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| center                 | (optional) the center, defaults to the row means.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| force_block_processing | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |

... Additional arguments passed to specific methods.

useNames If **TRUE** (default), names attributes of result are set. Else if **FALSE**, no naming support is done.

## Details

The S4 methods for x of type **matrix**, **array**, **table**, or **numeric** call `matrixStats::rowVars / matrixStats::colVars`.

## Value

Returns a **numeric vector** of length N (K).

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowVars()` and `matrixStats::colVars()` which are used when the input is a **matrix** or **numeric vector**.
- For mean estimates, see `rowMeans2()` and `rowMeans()`.
- For standard deviation estimates, see `rowSds()`.
- `stats::var()`.

## Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                ncol = 3))

# A DelayedMatrix with a 'HDF5ArraySeed' seed
# NOTE: Requires that the HDF5Array package is installed
library(HDF5Array)
dm_HDF5 <- writeHDF5Array(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                ncol = 3))

colVars(dm_matrix)

rowVars(dm_matrix)
```

---

colWeightedMads,DelayedMatrix-method

*Calculates the weighted median absolute deviation for each row (column) of a matrix-like object*

---

## Description

Calculates the weighted median absolute deviation for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colWeightedMads(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  constant = 1.4826,
  center = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowWeightedMads(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  constant = 1.4826,
  center = NULL,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|            |                                                                                                                                           |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| x          | A NxK <a href="#">DelayedMatrix</a> .                                                                                                     |
| w          | A <a href="#">numeric</a> vector of length K (N) that specifies by how much each element is weighted.                                     |
| rows, cols | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done. |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                    |
| constant               | A scale factor. See <code>stats::mad()</code> for details.                                                                                                                                                                                                                                                                                                                                                                                                   |
| center                 | (optional) the center, defaults to the row means                                                                                                                                                                                                                                                                                                                                                                                                             |
| force_block_processing | FALSE (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                             |
| useNames               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                            |

## Details

The S4 methods for `x` of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowWeightedMads` / `matrixStats::colWeightedMads`.

## Value

Returns a [numeric vector](#) of length `N(K)`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowWeightedMads()` and `matrixStats::colWeightedMads()` which are used when the input is a `matrix` or `numeric` vector.
- See also [rowMads](#) for the corresponding unweighted function.

## Examples

```
# A DelayedMatrix with a 'matrix' seed
dm_matrix <- DelayedArray(matrix(c(rep(1L, 5),
                                   as.integer((0:4) ^ 2),
                                   seq(-5L, -1L, 1L)),
                                ncol = 3))

colWeightedMads(dm_matrix, w = 1:5)

rowWeightedMads(dm_matrix, w = 3:1)
```

---

colWeightedMeans, DelayedMatrix-method

*Calculates the weighted mean for each row (column) of a matrix-like object*

---

## Description

Calculates the weighted mean for each row (column) of a matrix-like object.

## Usage

```
## S4 method for signature 'DelayedMatrix'
colWeightedMeans(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowWeightedMeans(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

## Arguments

|                        |                                                                                                                                                                              |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                        |
| w                      | A <a href="#">numeric</a> vector of length K (N) that specifies by how much each element is weighted.                                                                        |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                    |
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                    |
| force_block_processing | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by |

setting this to TRUE (typically not advised). The block-processing strategy loads one or more (depending on `\link[DelayedArray]{getAutoBlockSize}()`) columns (`colFoo()`) or rows (`rowFoo()`) into memory as an ordinary `base::array`.

... Additional arguments passed to specific methods.

useNames If `TRUE` (default), names attributes of result are set. Else if `FALSE`, no naming support is done.

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowWeightedMeans` / `matrixStats::colWeightedMeans`.

## Value

Returns a `numeric vector` of length `N (K)`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowWeightedMeans()` and `matrixStats::colWeightedMeans()` which are used when the input is a matrix or numeric vector.
- See also `rowMeans2` for the corresponding unweighted function.

## Examples

```
# A DelayedMatrix with a 'Matrix' seed
dm_Matrix <- DelayedArray(Matrix::Matrix(c(rep(1L, 5),
                                           as.integer((0:4) ^ 2),
                                           seq(-5L, -1L, 1L)),
                                           ncol = 3))

colWeightedMeans(dm_Matrix)
# Specifying weights inversely proportional to rowwise variances
colWeightedMeans(dm_Matrix, w = 1 / rowVars(dm_Matrix))
rowWeightedMeans(dm_Matrix, w = 1:3)
```

---

colWeightedMedians,DelayedMatrix-method

*Calculates the weighted median for each row (column) of a matrix-like object*

---

## Description

Calculates the weighted median for each row (column) of a matrix-like object.

**Usage**

```
## S4 method for signature 'DelayedMatrix'
colWeightedMedians(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowWeightedMedians(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

**Arguments**

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| w                      | A <a href="#">numeric</a> vector of length K (N) that specifies by how much each element is weighted.                                                                                                                                                                                                                                                                                                                                                                                        |
| rows, cols             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                                                                                                                                                                                                                                    |
| na.rm                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                                                                                                                                                                                                                                    |
| force_block_processing | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads one or more (depending on <code>\link[DelayedArray]{getAutoBlockSize}()</code> ) columns ( <code>colFoo()</code> ) or rows ( <code>rowFoo()</code> ) into memory as an ordinary <a href="#">base::array</a> . |
| ...                    | Additional arguments passed to specific methods.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| useNames               | If <a href="#">TRUE</a> (default), names attributes of result are set. Else if <a href="#">FALSE</a> , no naming support is done.                                                                                                                                                                                                                                                                                                                                                            |

**Details**

The S4 methods for x of type [matrix](#), [array](#), [table](#), or [numeric](#) call `matrixStats::rowWeightedMedians` / `matrixStats::colWeightedMedians`.

**Value**

Returns a [numeric vector](#) of length N (K).

**Author(s)**

Peter Hickey

**See Also**

- `matrixStats::rowWeightedMedians()` and `matrixStats::colWeightedMedians()` which are used when the input is a matrix or numeric vector.
- See also [rowMedians](#) for the corresponding unweighted function.

**Examples**

```
# A DelayedMatrix with a 'SolidRleArraySeed' seed
dm_Rle <- RleArray(Rle(c(rep(1L, 5),
                        as.integer((0:4) ^ 2),
                        seq(-5L, -1L, 1L))),
                  dim = c(5, 3))

# Specifying weights inversely proportional to rowwise MADs
colWeightedMedians(dm_Rle, w = 1 / rowMads(dm_Rle))
```

---

colWeightedSds,DelayedMatrix-method

*Calculates the weighted standard deviation for each row (column) of a matrix-like object*

---

**Description**

Calculates the weighted standard deviation for each row (column) of a matrix-like object.

**Usage**

```
## S4 method for signature 'DelayedMatrix'
colWeightedSds(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

```
## S4 method for signature 'DelayedMatrix'
colWeightedVars(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowWeightedSds(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)

## S4 method for signature 'DelayedMatrix'
rowWeightedVars(
  x,
  w = NULL,
  rows = NULL,
  cols = NULL,
  na.rm = FALSE,
  force_block_processing = FALSE,
  ...,
  useNames = TRUE
)
```

### Arguments

|                                     |                                                                                                                                                                                                                                                                                |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>                      | A NxK <a href="#">DelayedMatrix</a> .                                                                                                                                                                                                                                          |
| <code>w</code>                      | A <a href="#">numeric</a> vector of length K (N) that specifies by how much each element is weighted.                                                                                                                                                                          |
| <code>rows, cols</code>             | A <a href="#">vector</a> indicating the subset of rows (and/or columns) to operate over. If <a href="#">NULL</a> , no subsetting is done.                                                                                                                                      |
| <code>na.rm</code>                  | If <a href="#">TRUE</a> , missing values ( <a href="#">NA</a> or <a href="#">NaN</a> ) are omitted from the calculations.                                                                                                                                                      |
| <code>force_block_processing</code> | <a href="#">FALSE</a> (the default) means that a seed-aware, optimised method is used (if available). This can be overridden to use the general block-processing strategy by setting this to <a href="#">TRUE</a> (typically not advised). The block-processing strategy loads |

one or more (depending on `\link[DelayedArray]{getAutoBlockSize}()`) columns (`colFoo()`) or rows (`rowFoo()`) into memory as an ordinary `base::array`.

... Additional arguments passed to specific methods.

useNames If `TRUE` (default), names attributes of result are set. Else if `FALSE`, no naming support is done.

## Details

The S4 methods for `x` of type `matrix`, `array`, `table`, or `numeric` call `matrixStats::rowWeightedSds` / `matrixStats::colWeightedSds`.

## Value

Returns a `numeric vector` of length `N (K)`.

## Author(s)

Peter Hickey

## See Also

- `matrixStats::rowWeightedSds()` and `matrixStats::colWeightedSds()` which are used when the input is a matrix or numeric vector.
- See also `rowSds` for the corresponding unweighted function.

## Examples

```
# A DelayedMatrix with a 'SolidRleArraySeed' seed
dm_Rle <- RleArray(Rle(c(rep(1L, 5),
                        as.integer((0:4) ^ 2),
                        seq(-5L, -1L, 1L))),
                  dim = c(5, 3))

colWeightedSds(dm_Rle, w = 1 / rowMeans2(dm_Rle))

# Specifying weights inversely proportional to rowwise means
colWeightedVars(dm_Rle, w = 1 / rowMeans2(dm_Rle))

# Specifying weights inversely proportional to columnwise means
rowWeightedSds(dm_Rle, w = 1 / colMeans2(dm_Rle))

# Specifying weights inversely proportional to columnwise means
rowWeightedVars(dm_Rle, w = 1 / colMeans2(dm_Rle))
```

---

|                    |                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------|
| DelayedMatrixStats | <i>DelayedMatrixStats: Functions that apply to rows and columns of DelayedMatrix objects.</i> |
|--------------------|-----------------------------------------------------------------------------------------------|

---

## Description

**DelayedMatrixStats** is a port of the **matrixStats** API to work with *DelayedMatrix* objects from the **DelayedArray** package. High-performing functions operating on rows and columns of *DelayedMatrix* objects, e.g. `colMedians()` / `rowMedians()`, `colRanks()` / `rowRanks()`, and `colSds()` / `rowSds()`. Functions optimized per data type and for subsetting calculations such that both memory usage and processing time is minimized.

## Author(s)

**Maintainer:** Peter Hickey <peter.hickey@gmail.com> (**ORCID**)

Other contributors:

- Hervé Pagès <hpages.on.github@gmail.com> [contributor]
- Aaron Lun <infinite.monkeys.with.keyboards@gmail.com> [contributor]

## See Also

Useful links:

- <https://github.com/PeteHaitch/DelayedMatrixStats>
- Report bugs at <https://github.com/PeteHaitch/DelayedMatrixStats/issues>

---

|                                        |                                                      |
|----------------------------------------|------------------------------------------------------|
| from_DelayedArray_to_simple_seed_class | <i>Coerce DelayedArray to its 'simple seed' form</i> |
|----------------------------------------|------------------------------------------------------|

---

## Description

Coerce DelayedArray to its 'simple seed' form

## Usage

```
from_DelayedArray_to_simple_seed_class(x, drop = FALSE, do_transpose = TRUE)
```

## Arguments

|              |                                                                |
|--------------|----------------------------------------------------------------|
| x            | A <a href="#">DelayedArray</a>                                 |
| drop         | If TRUE the result is coerced to the lowest possible dimension |
| do_transpose | Should transposed input be physically transposed?              |

Details

Like `DelayedArray:::from_DelayedArray_to_array` but returning an object of the same class as `seedClass(x)` instead of an *array*. In doing so, all delayed operations are realised (including subsetting).

Value

An object of the same class as `seedClass(x)`.

Note

Can be more efficient to leave the transpose implicit (`do_transpose = FALSE`) and switch from a `row*()` method to a `col*()` method (or vice versa).

Only works on [DelayedArray](#) objects with 'simple seeds'

---

|           |                                             |
|-----------|---------------------------------------------|
| reexports | <i>Objects exported from other packages</i> |
|-----------|---------------------------------------------|

---

Description

These objects are imported from other packages. Follow the links below to see their documentation.

**DelayedArray** [colMaxs](#), [colMins](#), [colRanges](#), [rowMaxs](#), [rowMins](#), [rowRanges](#)

---

|                  |                  |
|------------------|------------------|
| subset_by_Nindex | subset_by_Nindex |
|------------------|------------------|

---

Description

`subset_by_Nindex()` is an internal generic function not aimed to be used directly by the user. It is basically an S4 generic for `DelayedArray:::subset_by_Nindex`.

Usage

`subset_by_Nindex(x, Nindex)`

Arguments

- |        |                                                                                                                                                                                                                                                                                                                               |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x      | An array-like object.                                                                                                                                                                                                                                                                                                         |
| Nindex | An unnamed list of subscripts as positive integer vectors, one vector per dimension in x. Empty and missing subscripts (represented by <code>integer(0)</code> and <code>NULL</code> list elements, respectively) are allowed. The subscripts can contain duplicated indices. They cannot contain NAs or non-positive values. |

**Details**

subset\_by\_Nindex(x, Nindex) conceptually performs the operation `x[Nindex[1], ..., Nindex[length(Nindex)]]`. subset\_by\_Nindex() methods need to support empty and missing subscripts, e.g., subset\_by\_Nindex(x, list(NULL, integer(0))) must return an M x 0 object of class class(x) and subset\_by\_Nindex(x, list(integer(0), integer(0))) a 0 x 0 object of class class(x).

Also, subscripts are allowed to contain duplicate indices so things like subset\_by\_Nindex(x, list(c(1:3, 3:1), 2L)) need to be supported.

**Value**

A object of class class(x) of the appropriate type (e.g., integer, double, etc.). For example, if x is a [data.frame](#) representing an M x N matrix of integers, subset\_by\_Nindex(x, list(NULL, 2L)) must return its 2nd column as a [data.frame](#) with M rows and 1 column of type integer.

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