

# Package ‘beachmat.tiledb’

April 23, 2025

**Version** 1.1.0

**Date** 2024-12-16

**Title** beachmat bindings for TileDB-backed matrices

**Description** Extends beachmat to initialize tatami matrices from TileDB-backed arrays.

This allows C++ code in downstream packages to directly call the TileDB C/C++ library to access array data,

without the need for block processing via DelayedArray.

Developers only need to import this package to automatically extend the capabilities of beachmat::initializeCpp to TileDBArray instances.

**Imports** methods, beachmat, tiledb, TileDBArray, DelayedArray, Rcpp

**Suggests** testthat, BiocStyle, knitr, rmarkdown, Matrix

**LinkingTo** Rcpp, assorthead, beachmat

**biocViews** DataRepresentation, DataImport, Infrastructure

**License** GPL-3

**NeedsCompilation** yes

**VignetteBuilder** knitr

**SystemRequirements** C++17

**URL** <https://github.com/tatami-inc/beachmat.tiledb>

**BugReports** <https://github.com/tatami-inc/beachmat.tiledb/issues>

**RoxygenNote** 7.3.2

**Encoding** UTF-8

**git\_url** <https://git.bioconductor.org/packages/beachmat.tiledb>

**git\_branch** devel

**git\_last\_commit** d6abf02

**git\_last\_commit\_date** 2025-04-15

**Repository** Bioconductor 3.22

**Date/Publication** 2025-04-23

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|---------------|------------------------------------------|
| initializeCpp | <i>Initialize TileDB-backed matrices</i> |
|---------------|------------------------------------------|

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## Description

Initialize C++ representations of TileDB-backed matrices based on their **TileDBArray** representations.

## Usage

```
## S4 method for signature 'TileDBArraySeed'
initializeCpp(
  x,
  tiledb.cache.size = getAutoBlockSize(),
  tiledb.realize = initializeOptions("realize"),
  tiledb.realize.num.threads = initializeOptions("realize.num.threads"),
  tiledb.concurrency.level = initializeOptions("concurrency.level"),
  ...
)
```

## Arguments

|                            |                                                                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                          | A <b>TileDBArray</b> seed object.                                                                                                                                                                              |
| tiledb.cache.size          | Integer scalar specifying the size of the cache in bytes during data extraction from a TileDB matrix. Larger values reduce disk I/O during random access to the matrix, at the cost of increased memory usage. |
| tiledb.realize             | See the realize option in <a href="#">initializeOptions</a> .                                                                                                                                                  |
| tiledb.realize.num.threads | See the realize.num.threads option in <a href="#">initializeOptions</a> .                                                                                                                                      |
| tiledb.concurrency.level   | See the concurrency.level option in <a href="#">initializeOptions</a> .                                                                                                                                        |
| ...                        | Further arguments, ignored.                                                                                                                                                                                    |

## Value

An external pointer that can be used in any **tatami**-compatible function.

## Author(s)

Aaron Lun

## Examples

```
library(TileDBArray)
y <- matrix(runif(1000), ncol=20, nrow=50)
z <- as(y, "TileDBArray")
ptr <- initializeCpp(z)
```

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|                   |                                    |
|-------------------|------------------------------------|
| initializeOptions | <i>Options for TileDB matrices</i> |
|-------------------|------------------------------------|

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## Description

Options for initializing TileDB matrices in [initializeCpp](#).

## Usage

```
initializeOptions(option, value)
```

## Arguments

|        |                                           |
|--------|-------------------------------------------|
| option | String specifying the name of the option. |
| value  | Value of the option.                      |

## Details

The following options are supported:

- `realize`, a logical scalar specifying whether to load the matrix data from TileDB into memory with [loadIntoMemory](#), and then cache it for future calls with [checkMemoryCache](#). This avoids time-consuming disk I/O when performing multiple passes through the matrix, at the expense of increased memory usage.
- `realize.num.threads`, an integer scalar specifying the number of threads that can be used by [loadIntoMemory](#) outside of TileDB calls. This is only relevant when `realize=TRUE`.
- `concurrency.level`, an integer scalar specifying the number of threads that can be used by the TileDB library. Alternatively NULL, in which case TileDB's default (i.e., all available cores on the machine) are used. Greater performance may be achieved when the product of `realize.num.threads` and `concurrency.level` does not exceed the number of available cores.

## Value

If value is missing, the current setting of option is returned.

If value is supplied, it is used to set the option, and the previous value of the option is invisibly returned.

## Author(s)

Aaron Lun

## Examples

```
initializeOptions("realize")
old <- initializeOptions("realize", TRUE) # setting to a new value
initializeOptions("realize") # new option takes affect
initializeOptions("realize", old) # setting it back
```

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loadIntoMemory

*Load a TileDB matrix into memory*


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## Description

Load a TileDB-backed matrix into memory as an external pointer to a **tatami**-compatible representation. This differs from the (default) behavior of `initializeCpp`, which only loads slices of the matrix on request.

## Usage

```
loadIntoMemory(
  x,
  cache.size = getAutoBlockSize(),
  num.threads = 1,
  concurrency.level = NULL
)
```

## Arguments

|                                |                                                                                                                                                                        |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>                 | A <b>TileDBArray</b> -derived matrix or seed object.                                                                                                                   |
| <code>cache.size</code>        | Integer scalar specifying the size of the cache in bytes during data extraction from a TileDB matrix.                                                                  |
| <code>num.threads</code>       | Integer scalar specifying the number of threads to use outside of the TileDB library.                                                                                  |
| <code>concurrency.level</code> | Integer scalar specifying the number of threads that can be used by the TileDB library. See the option of the same name in <code>initializeOptions</code> for details. |

## Value

An external pointer that can be used in **tatami**-based functions.

## Author(s)

Aaron Lun

## Examples

```
library(TileDBArray)
y <- matrix(runif(1000), ncol=20, nrow=50)
z <- as(y, "TileDBArray")
ptr <- loadIntoMemory(z)
```

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