Package ‘dynutils’

October 8, 2021

Type Package

Title Common Functionality for the 'dynverse' Packages

Version 1.0.9

Description Provides common functionality for the 'dynverse' packages. 'dynverse' is created to support the development, execution, and benchmarking of trajectory inference methods. For more information, check out <https://dynverse.org>.

License MIT + file LICENSE

URL https://github.com/dynverse/dynutils

BugReports https://github.com/dynverse/dynutils/issues

RoxygenNote 7.1.1

Depends R (>= 3.0.0)

Imports assertthat, crayon, desc, dplyr, magrittr, Matrix, methods, proxyC, purrr, Rcpp, remotes, stringr, tibble

Suggests covr, ggplot2, hdf5r (>= 1.3.4), knitr, rmarkdown, testthat

LinkingTo Rcpp

Encoding UTF-8

VignetteBuilder knitr

NeedsCompilation yes

Author Robrecht Cannoodt [aut, cre] (<https://orcid.org/0000-0003-3641-729X>, rcannood), Wouter Saelens [aut] (<https://orcid.org/0000-0002-7114-6248>, zouter)

Maintainer Robrecht Cannoodt <rcannood@gmail.com>

Repository CRAN

Date/Publication 2021-10-08 08:40:08 UTC
**add_class**

Add class to object whilst keeping the old classes

**Description**

Add class to object whilst keeping the old classes

**Usage**

```r
add_class(x, class)
```
all_in

Arguments

x a R object
class A character vector naming classes

Examples

library(purrr)
l <- list(important_number = 42) %>% add_class("my_list")

all_in(x = , table)
x %all_in% table

Arguments

x The values to be matched.
table The values to be matched against.

Examples

## Not run:
library(assertthat)
assert_that(c(1, 2) %all_in% c(0, 1, 2, 3, 4))
# TRUE

assert_that("a" %all_in% letters)
# TRUE

assert_that("A" %all_in% letters)
# Error: "A" is missing 1 element from letters: "A"

assert_that(1:10 %all_in% letters)
# Error: 1:10 is missing 10 elements from letters: 1L, 2L, 3L, ...

## End(Not run)
**apply_minmax_scale**

Apply a minmax scale.

**Description**

Anything outside the range of [0, 1] will be set to 0 or 1.

**Usage**

apply_minmax_scale(x, addend, multiplier)

**Arguments**

- **x**: A numeric vector, matrix or data frame.
- **addend**: A minimum vector for each column
- **multiplier**: A scaling vector for each column

**Value**

The scaled matrix or vector. The numeric centering and scalings used are returned as attributes.

---

**apply_quantile_scale**

Apply a quantile scale.

**Description**

Anything outside the range of [0, 1] will be set to 0 or 1.

**Usage**

apply_quantile_scale(x, addend, multiplier)

**Arguments**

- **x**: A numeric vector, matrix or data frame.
- **addend**: A minimum vector for each column
- **multiplier**: A scaling vector for each column

**Value**

The scaled matrix or vector. The numeric centering and scalings used are returned as attributes.
apply_uniform_scale

Apply a uniform scale

Description
Apply a uniform scale

Usage
apply_uniform_scale(x, addend, multiplier)

Arguments
x A numeric vector, matrix or data frame.
addend A centering vector for each column
multiplier A scaling vector for each column

Value
The centered, scaled matrix. The numeric centering and scalings used are returned as attributes.

calculate_distance

Calculate (column-wise) distances/similarity between two matrices

Description
These matrices can be dense or sparse.

Usage
calculate_distance(
  x,
  y = NULL,
  method = c("pearson", "spearman", "cosine", "euclidean", "chisquared", "hamming",
             "kullback", "manhattan", "maximum", "canberra", "minkowski"),
  margin = 1,
  diag = FALSE,
  drop0 = FALSE
)

list_distance_methods()
calculate_similarity(
  x,
  y = NULL,
Calculate a (weighted) mean between vectors or a list of vectors

This function supports the arithmetic, geometric and harmonic mean.

Usage

```
calculate_mean(..., method, weights = NULL)
calculate_harmonic_mean(..., weights = NULL)
calculate_geometric_mean(..., weights = NULL)
calculate_arithmetic_mean(..., weights = NULL)
```
check_packages

Arguments

... Can be:
  • One numeric vector
  • A list containing numeric vectors
  • Numeric vectors given as separate inputs

method The aggregation function. Must be one of "arithmetic", "geometric", and "harmonic".

weights Weights with the same length as ... .

Examples

calculate_arithmetic_mean(0.1, 0.5, 0.9)
calculate_geometric_mean(0.1, 0.5, 0.9)
calculate_harmonic_mean(0.1, 0.5, 0.9)
calculate_mean(.1, .5, .9, method = "harmonic")

# example with multiple vectors
calculate_arithmetic_mean(c(0.1, 0.9), c(0.2, 1))

# example with a list of vectors
vectors <- list(c(0.1, 0.2), c(0.4, 0.5))
calculate_geometric_mean(vectors)

# example of weighted means
calculate_geometric_mean(c(0.1, 10), c(0.9, 20), c(0.5, 2), weights = c(1, 2, 5))

check_packages  Check which packages are installed

Description

Check which packages are installed

Usage

check_packages(...)
dynutils

Common functionality for the dynverse packages

Description

Provides common functionality for the dynverse packages. dynverse is created to support the development, execution, and benchmarking of trajectory inference methods. For more information, check out dynverse.org.

Manipulation of lists

- **add_class()**: Add a class to an object
- **extend_with()**: Extend list with more data

Calculations

- **calculate_distance()**: Calculate pairwise distances between two (sparse) matrices
- **calculate_similarity()**: Calculate pairwise similarities between two (sparse) matrices
- **calculate_mean()**: Calculate a (weighted) mean between vectors or a list of vectors; supports the arithmetic, geometric and harmonic mean
- **project_to_segments()**: Project a set of points to set of segments

Manipulation of matrices

- **expand_matrix()**: Add rows and columns to a matrix

Scaling of matrices and vectors

- **scale_uniform()**: Rescale data to have a certain center and max range
- **scale_minmax()**: Rescale data to a [0, 1] range
- **scale_quantile()**: Cut off outer quantiles and rescale to a [0, 1] range

Manipulation of functions

- **inherit_default_params()**: Have one function inherit the default parameters from other functions

Manipulation of packages

- **check_packages()**: Easily checking whether certain packages are installed
- **install_packages()**: Install packages taking into account the remotes of another

Manipulation of vectors

- **random_time_string()**: Generates a string very likely to be unique
euclidean_distance

Tibble helpers

- `list_as_tibble()`: Convert a list of lists to a tibble whilst retaining class information
- `tibble_as_list()`: Convert a tibble back to a list of lists whilst retaining class information
- `extract_row_to_list()`: Extracts one row from a tibble and converts it to a list
- `mapdf()`: Apply a function to each row of a data frame

File helpers

- `safe_tempdir()`: Create an empty temporary directory and return its path

Assertion helpers

- `%all_in%()`: Check whether a vector are all elements of another vector
- `%has_names%()`: Check whether an object has certain names
- `is_single_numeric()`: Check whether a value is a single numeric
- `is_bounded()`: Check whether a value within a certain interval

Package helpers

- `recent_news()`: Print the most recent news (assumes NEWS.md file as specified by `news()`)

---

euclidean_distance These functions will be removed soon

Description

Use `calculate_distance()` instead.

Usage

euclidean_distance(x, y = NULL)
correlation_distance(x, y = NULL)

Arguments

- `x` A numeric matrix, dense or sparse.
- `y` (Optional) a numeric matrix, dense or sparse, with `nrow(x) == nrow(y)`. 
expand_matrix | Expand a matrix with given rownames and colnames

Description
Expand a matrix with given rownames and colnames

Usage
expand_matrix(mat, rownames = NULL, colnames = NULL, fill = 0)

Arguments
- **mat**: The matrix to expand
- **rownames**: The desired rownames
- **colnames**: The desired colnames
- **fill**: With what to fill missing data

Examples
```r
x <- matrix(runif(12), ncol = 4, dimnames = list(c("a", "c", "d"), c("D", "F", "H", "I")))
expand_matrix(x, letters[1:5], LETTERS[1:10], fill = 0)
```

extend_with | Extend an object

Description
Extend an object

Usage
extend_with(object, .class_name, ...)

Arguments
- **object**: A list
- **.class_name**: A class name to add
- **...**: Extra information in the list
Examples

```r
library(purrr)
l <- list(important_number = 42) %>% add_class("my_list")
  %>% extend_with(
    .class_name = "improved_list",
    url = "https://github.com/dynverse/dynverse"
  )
l
# extract_row_to_list

extract_row_to_list  Extracts one row from a tibble and converts it to a list

Description

Extracts one row from a tibble and converts it to a list

Usage

`extract_row_to_list(tib, row_id)`

Arguments

tib  the tibble
row_id  the index of the row to be selected, or alternatively an expression which will be evaluated to such an index

Value

the corresponding row from the tibble as a list

See Also

`list_as_tibble`, `tibble_as_list`, `mapdf`

Examples

```r
library(tibble)
tib <- tibble(
  a = c(1, 2),
  b = list(log10, sqrt),
  c = c(\"parrot\", \"quest\"),
  .object_class = list(c(\"myobject\", \"list\"), c(\"yourobject\", \"list\"))
)
extract_row_to_list(tib, 2)
extract_row_to_list(tib, which(a == 1))
```
## has_names

Check whether an object has certain names

### Description

Check whether an object has certain names

### Usage

```r
has_names(x, which)
```

```
x %has_names% which
```

### Arguments

- `x`: object to test
- `which`: name

### Examples

```r
## Not run:
library(assertthat)
li <- list(a = 1, b = 2)
assert_that(li %has_names% "a")
# TRUE

assert_that(li %has_names% "c")
# Error: li is missing 1 name from "c": "c"

assert_that(li %has_names% letters)
# Error: li is missing 24 names from letters: "c", "d", "e", ...

## End(Not run)
```

## inherit_default_params

Inherit default parameters from a list of super functions

### Description

Inherit default parameters from a list of super functions

### Usage

```r
inherit_default_params(super_functions, fun)
```
**install_packages**

**Arguments**

- `super_functions`: A list of super functions of which `fun` needs to inherit the default parameters
- `fun`: The function whose default parameters need to be overridden

**Value**

Function `fun`, but with the default parameters of the `super_functions`

**Examples**

```r
fun1 <- function(a = 10, b = 7) runif(a, -b, b)
fun2 <- function(c = 9) 2^c

fun3 <- inherit_default_params(
  super = list(fun1, fun2),
  fun = function(a, b, c) {
    list(x = fun1(a, b), y = fun2(c))
  }
)

fun3
```

---

**install_packages**  
*Check package availability*

**Description**

If the session is interactive, prompt the user whether to install the packages.

**Usage**

```r
install_packages(..., try_install = interactive())
```

**Arguments**

- `...`: The names of the packages to be checked
- `try_install`: Whether running interactivly, which will prompt the user before installation

**Examples**

```r
## Not run:
install_packages("SCORPIUS")

## End(Not run)
```
is_bounded  

Check whether a value within a certain interval

Description

Check whether a value within a certain interval

Usage

```r
is_bounded(
  x,
  lower_bound = -Inf,
  lower_closed = FALSE,
  upper_bound = Inf,
  upper_closed = FALSE
)
```

Arguments

- `x`: A value to be tested
- `lower_bound`: The lower bound
- `lower_closed`: Whether the lower bound is closed
- `upper_bound`: The upper bound
- `upper_closed`: Whether the upper bound is closed

Examples

```r
# Not run:
library(assertthat)
assert_that(is_bounded(10))
# TRUE

assert_that(is_bounded(10:30))
# TRUE

assert_that(is_bounded(Inf))
# Error: Inf is not bounded by (-Inf,Inf)

assert_that(is_bounded(10, lower_bound = 20))
# Error: 10 is not bounded by (20,Inf)

assert_that(is_bounded(
  10,
  lower_bound = 20,
  lower_closed = TRUE,
  upper_bound = 30,
  upper_closed = FALSE
))
```
**is_single_numeric**

# Error: 10 is not bounded by [20,30)
## End(Not run)

---

**is_single_numeric**  
*Check whether a value is a single numeric*

**Description**

Check whether a value is a single numeric

**Usage**

```r
is_single_numeric(x)
```

**Arguments**

- `x`: A value to be tested

**Examples**

```r
## Not run:
library(assertthat)
assert_that(is_single_numeric(1))  # TRUE
assert_that(is_single_numeric(Inf))  # TRUE
assert_that(is_single_numeric(1.6))  # TRUE
assert_that(is_single_numeric(NA))  # Error: NA is not a single numeric value
assert_that(is_single_numeric(1:6))  # Error: 1:6 is not a single numeric value
assert_that(is_single_numeric("pie"))  # Error: "pie" is not a single numeric value
## End(Not run)
```
is_sparse

Description
Check if an object is a sparse matrix

Usage
is_sparse(x)

Arguments
x An object to test

Examples
library(Matrix)
is_sparse(matrix(1:10)) # FALSE
is_sparse(Matrix::rsparsematrix(100, 200, .01)) # TRUE

list_as_tibble
Convert a list of lists to a tibble

Description
Convert a list of lists to a tibble

Usage
list_as_tibble(list_of_rows)

Arguments
list_of_rows The list to be converted to a tibble

Value
A tibble with the same number of rows as there were elements in list_of_rows

See Also
tibble_as_list extract_row_to_list mapdf
**Examples**

```r
library(purrr)

li <- list(
    list(a = 1, b = log10, c = "parrot") %>% add_class("myobject"),
    list(a = 2, b = sqrt, c = "quest") %>% add_class("yourobject")
)

tib <- list_as_tibble(li)

tib
```

---

**mapdf**

*Apply a function to each row of a data frame*

**Description**

The `mapdf` functions transform their input by applying a function to each row of a data frame and returning a vector the same length as the input. These functions work a lot like purrr’s `map()` functions.

**Usage**

```r
mapdf(.x, .f, ...)
mapdf_lgl(.x, .f, ...)
mapdf_chr(.x, .f, ...)
mapdf_int(.x, .f, ...)
mapdf_dbl(.x, .f, ...)
mapdf_dfr(.x, .f, ...)
mapdf_dfc(.x, .f, ...)
mapdf_lat(.x, .f, ...)
walkdf(.x, .f, ...)
```

**Arguments**

- `.x` A data.frame, data_frame, or tibble.
- `.f` A function or formula. If a function, the first argument will be the row as a list. If a formula, e.g. `~ .a`, the `.` is a placeholder for the row as a list.
- `...` Additional arguments passed on to the mapped function.
Details

- `mapdf()` always returns a list.
- `mapdf_lgl()`, `mapdf_int()`, `mapdf_dbl()` and `mapdf_chr()` return vectors of the corresponding type (or die trying).
- `mapdf_dfr()` and `mapdf_dfc()` return data frames created by row-binding and column-binding respectively. They require dplyr to be installed.
- `mapdf_lat()` returns a tibble by transforming outputted lists to a tibble using `list_as_tibble`.
- `walkdf()` calls .f for its side-effect and returns the input .x.

Examples

```r
library(dplyr)

tib <- tibble(
  a = c(1, 2),
  b = list(log10, sqrt),
  c = c("parrot", "quest"),
  .object_class = list(c("myobject", "list"), c("yourobject", "list"))
)

# map over the rows using a function
tib %>% mapdf(class)

# or use an anonymous function
tib %>% mapdf(function(row) paste0(row$b(row$a), ",", row$c))

# or a formula
tib %>% mapdf(~ .a)

# there are many more variations available
# see ?mapdf for more info

# map over the rows using a function
```

Description

Finds the projection index for a matrix of points x, when projected onto a set of segments defined by `segment_start` and `segment_end`.

Usage

```r
project_to_segments(x, segment_start, segment_end)
```
Arguments

- **x**: a matrix of data points.
- **segment_start**: a matrix of segment start points.
- **segment_end**: a matrix of segment end points.

Value

A list with components

- **x_proj**: a matrix of projections of **x** onto the given segments.
- **segment**: the index of the segment a point is projected on
- **progression**: the progression of a projection along its segment
- **distance**: the distance from each point in **x** to its projection in **x_proj**

Examples

```r
x <- matrix(rnorm(50, 0, .5), ncol = 2)
segfrom <- matrix(c(0, 1, 0, -1, 1, 0, -1, 0), ncol = 2, byrow = TRUE)
septo <- segfrom / 10
fit <- project_to_segments(x, segfrom, septo)
str(fit) # examine output
```

---

### random_time_string

**Generate random string**

Description

Generate a random string with first the current time, together with a random number.

Usage

```r
random_time_string(name = NULL)
```

Arguments

- **name**: Optional string to be added in the random_time_string

Examples

```r
random_time_string("test")
```
read_h5  
*Read/write R objects to a H5 file.*

**Description**

Read/write R objects to a H5 file.

**Usage**

```
read_h5(path)
read_h5_(file_h5)
write_h5(x, path)
write_h5_(x, file_h5, path)
```

**Arguments**

- `path`: Path to read from/write to.
- `file_h5`: A H5 file to read from/write to.
- `x`: R object to write.

---

recent_news  
*Print the most recent news*

**Description**

Print the most recent news

**Usage**

```
recent_news(path = NULL, package = detect_package_name(path = path), n = 2)
```

**Arguments**

- `path`: The path of the description in which the package resides
- `package`: The package name
- `n`: Number of recent news to print
safe_tempdir

Create an empty temporary directory and return its path

Description

Create an empty temporary directory and return its path

Usage

safe_tempdir(subfolder)

Arguments

subfolder Name of a subfolder to be created

Examples

```r
## Not run:
safe_tempdir("samson")
# "/tmp/Rtmp8xCGJe/file339a13bec763/samson"
## End(Not run)
```

scale_minmax

Rescale data to a [0, 1] range

Description

Rescale data to a [0, 1] range

Usage

scale_minmax(x)

Arguments

x A numeric vector, matrix or data frame.

Value

The centered, scaled matrix or vector. The numeric centering and scalings used are returned as attributes.
**Examples**

```r
## Generate a matrix from a normal distribution
## with a large standard deviation, centered at c(5, 5)
x <- matrix(rnorm(200*2, sd = 10, mean = 5), ncol = 2)

## Minmax scale the data
x_scaled <- scale_minmax(x)

## Plot rescaled data
plot(x_scaled)

## Show ranges of each column
apply(x_scaled, 2, range)
```

---

**scale_quantile**

*Cut off outer quantiles and rescale to a [0, 1] range*

**Description**

Cut off outer quantiles and rescale to a [0, 1] range

**Usage**

```r
scale_quantile(x, outlier_cutoff = 0.05)
```

**Arguments**

- `x`: A numeric vector, matrix or data frame.
- `outlier_cutoff`: The quantile cutoff for outliers (default 0.05).

**Value**

The centered, scaled matrix or vector. The numeric centering and scalings used are returned as attributes.

**Examples**

```r
## Generate a matrix from a normal distribution
## with a large standard deviation, centered at c(5, 5)
x <- matrix(rnorm(200*2, sd = 10, mean = 5), ncol = 2)

## Scale the dataset between [0,1]
x_scaled <- scale_quantile(x)

## Plot rescaled data
plot(x_scaled)

## Show ranges of each column
apply(x_scaled, 2, range)
```
**scale_uniform**

Rescale data to have a certain center and max range.

**Description**

scale_uniform uniformly scales a given matrix such that the returned space is centered on center, and each column was scaled equally such that the range of each column is at most max_range.

**Usage**

```r
scale_uniform(x, center = 0, max_range = 1)
```

**Arguments**

- `x` A numeric vector matrix or data frame.
- `center` The new center point of the data.
- `max_range` The maximum range of each column.

**Value**

The centered, scaled matrix. The numeric centering and scalings used are returned as attributes.

**Examples**

```r
## Generate a matrix from a normal distribution
## with a large standard deviation, centered at c(5, 5)
x <- matrix(rnorm(200*2, sd = 10, mean = 5), ncol = 2)

## Center the dataset at c(0, 0) with a minimum of c(-.5, -.5) and a maximum of c(.5, .5)
x_scaled <- scale_uniform(x, center = 0, max_range = 1)

## Plot rescaled data
plot(x_scaled)

## Show ranges of each column
apply(x_scaled, 2, range)
```

**switch_devel**

Switching of development stage within the dynverse

**Description**

Switching of development stage within the dynverse
Usage

switch_devel(file = "DESCRIPTION", desc = desc::desc(file = file))

switch_master(file = "DESCRIPTION", desc = desc::desc(file = file))

switch_cran(file = "DESCRIPTION", desc = desc::desc(file = file))

Arguments

file The description file, defaults to DESCRIPTION
desc The read in description using the desc package

test_h5_installation Tests whether hdf5 is correctly installed and can load/write data

Usage
test_h5_installation(detailed = FALSE)

get_h5_test_data()

Arguments
detailed Whether to do a detailed check

tibble_as_list Convert a tibble to a list of lists

Description

Convert a tibble to a list of lists

Usage
tibble_as_list(tib)

Arguments
tib A tibble
Value

A list with the same number of lists as there were rows in tib

See Also

list_as_tibble extract_row_to_list mapdf

Examples

library(tibble)

tib <- tibble(
  a = c(1, 2),
  b = list(log10, sqrt),
  c = c("parrot", "quest"),
  .object_class = list(c("myobject", "list"), c("yourobject", "list"))
)

li <- tibble_as_list(tib)

li
Index

%all_in% (all_in), 3
%has_names% (has_names), 12
%all_in%(), 9
%has_names%(), 9

add_class, 2
add_class(), 8
all_in, 3
apply_minmax_scale, 4
apply_quantile_scale, 4
apply_uniform_scale, 5

calculate_arithmetic_mean
  (calculate_mean), 6
calculate_distance, 5
calculate_distance(), 8, 9
calculate_geometric_mean
  (calculate_mean), 6
calculate_harmonic_mean
  (calculate_mean), 6
calculate_mean, 6
calculate_mean(), 8
calculate_similarity
  (calculate_distance), 5
calculate_similarity(), 8
check_packages, 7
check_packages(), 8
correlation_distance
  (euclidean_distance), 9
dynutils, 8
euclidean_distance, 9
expand_matrix, 10
expand_matrix(), 8
extend_with, 10
extend_with(), 8
extract_row_to_list, 11
extract_row_to_list(), 9

get_h5_test_data
  (test_h5_installation), 24

has_names, 12
inherit_default_params, 12
inherit_default_params(), 8
install_packages, 13
install_packages(), 8
is_bounded, 14
is_bounded(), 9
is_single_numeric, 15
is_single_numeric(), 9
is_sparse, 16
list_as_tibble, 16, 18
list_as_tibble(), 9
list_distance_methods
  (calculate_distance), 5
list_similarity_methods
  (calculate_distance), 5
map(), 17
mapdf, 17
mapdf(), 9
mapdf_chr (mapdf), 17
mapdf_dbl (mapdf), 17
mapdf_dfc (mapdf), 17
mapdf_dfr (mapdf), 17
mapdf_int (mapdf), 17
mapdf_lat (mapdf), 17
mapdf_lgl (mapdf), 17
news(), 9
project_to_segments, 18
project_to_segments(), 8
random_time_string, 19
random_time_string(), 8
read_h5, 20

26
INDEX

read_h5_(read_h5), 20
recent_news, 20
recent_news(), 9

safe_tempdir, 21
safe_tempdir(), 9
scale_minmax, 21
scale_minmax(), 8
scale_quantile, 22
scale_quantile(), 8
scale_uniform, 23
scale_uniform(), 8
switch_cran (switch_devel), 23
switch_devel, 23
switch_master (switch_devel), 23

test_h5_installation, 24
tibble_as_list, 24
tibble_as_list(), 9

walkdf (mapdf), 17
write_h5 (read_h5), 20
write_h5_ (read_h5), 20