Package 'dynutils'

October 28, 2026

Type Package

Title Common Functionality for the 'dynverse' Packages

Version 1.0.13

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>.

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

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

Depends R (>= 3.0.0)

Imports assertthat, crayon, desc, dplyr, magrittr, Matrix, methods, proxyC (>= 0.3.3), purrr, Rcpp, remotes, stringr, tibble

Suggests covr, ggplot2, hdf5r (>= 1.3.4), knitr, rmarkdown, testthat (>= 3.0.0)

LinkingTo Rcpp

Encoding UTF-8

VignetteBuilder knitr

Config/testthat/edition 3

Config/roxygen2/version 8.1.1

NeedsCompilation yes

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Repository CRAN

Date/Publication 2026-10-28 07:00:02 UTC

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`dynutils-package` *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 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

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()`)

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See Also

Useful links:

- https://github.com/dynverse/dynutils
- Report bugs at https://github.com/dynverse/dynutils/issues

---

add_class *Add class to object whilst keeping the old classes*

Description

Add class to object whilst keeping the old classes

Usage

```
add_class(x, class)
```

Arguments

x	an R object.
class	A character vector naming classes

Examples

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

all_in *Check whether a vector are all elements of another vector*

Description

Check whether a vector are all elements of another vector

Usage

```
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 nubnax 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 verctor. 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,
  margin = 1,
  method = c("spearman", "pearson", "cosine"),
  diag = FALSE,
  drop0 = FALSE
)

list_similarity_methods()
```

Arguments

x	A numeric matrix, dense or sparse.
y	(Optional) a numeric matrix, dense or sparse, with `nrow(x) == nrow(y)`.

method	Which distance method to use. Options are: "cosine", "pearson", "spearman", "euclidean", and "manhattan".
margin	integer indicating margin of similarity/distance computation. 1 indicates rows or 2 indicates columns.
diag	if TRUE, only compute diagonal elements of the similarity/distance matrix; useful when comparing corresponding rows or columns of x and y.
drop0	if TRUE, removes zero values to make the similarity/distance matrix sparse. It has no effect when dense = TRUE.

Examples

```
## Generate two matrices with 50 and 100 samples
library(Matrix)
x <- Matrix::rsparsematrix(50, 1000, .01)
y <- Matrix::rsparsematrix(100, 1000, .01)

dist_euclidean <- calculate_distance(x, y, method = "euclidean")
dist_manhattan <- calculate_distance(x, y, method = "manhattan")
dist_spearman <- calculate_distance(x, y, method = "spearman")
dist_pearson <- calculate_distance(x, y, method = "pearson")
dist_angular <- calculate_distance(x, y, method = "cosine")
```

---

calculate_mean *Calculate a (weighted) mean between vectors or a list of vectors*

Description

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)
```

Arguments

...	Can be: • One numeric vector • A list containg 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(...)
```

Arguments

...	A set of package names

Examples

```
check_packages("SCORPIUS", "dynutils")
check_packages(c("princurve", "mlr", "tidyverse"))
```

---

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

```
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

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

`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

```
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

```
has_names(x, which)

x %has_names% which
```

Arguments

x	object to test
which	name

Examples

```
## 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

```
inherit_default_params(super_functions, fun)
```

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

```
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

```
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

```
## 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

```
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

```
## 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
))
```

```
# 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

```
is_single_numeric(x)
```

Arguments

x	A value to be tested

Examples

```
## 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 *Check if an object is a sparse matrix*

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

```
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

```
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.

We now generally recommend against using `...` to pass additional (constant) arguments to `.f`. Instead use a shorthand anonymous function:

```
# Instead of
x |> map(f, 1, 2, collapse = ",")
# do:
x |> map(\(x) f(x, 1, 2, collapse = ","))
```

This makes it easier to understand which arguments belong to which function and will tend to yield better error messages.

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

```
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(~ .$b)

# there are many more variations available
# see ?mapdf for more info
tib %>% mapdf_lgl(~ .$a > 1)
tib %>% mapdf_chr(~ paste0("~", .$c, "~"))
tib %>% mapdf_int(~ nchar(.$c))
tib %>% mapdf_dbl(~ .$a * 1.234)
```

`project_to_segments` *Project a set of points to to set of segments*

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

```
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

```
x <- matrix(rnorm(50, 0, .5), ncol = 2)
segfrom <- matrix(c(0, 1, 0, -1, 1, 0, -1, 0), ncol = 2, byrow = TRUE)
segto <- segfrom / 10
fit <- project_to_segments(x, segfrom, segto)

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

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

Arguments

name	Optional string to be added in the random_time_string

Examples

```
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

```
## 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

```
## 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

```
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

```
## 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 uniformily 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

```
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

```
## 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*

Description

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

Usage

```
test_h5_installation(detailed = FALSE)

get_h5_test_data()
```

Arguments

detailed	Whether top 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
```

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