

Package ‘mlr3misc’

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Title Helper Functions for 'mlr3'

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Description Frequently used helper functions and assertions used in 'mlr3' and its companion packages. Comes with helper functions for functional programming, for printing, to work with 'data.table', as well as some generally useful 'R6' classes. This package also supersedes the package 'BBmisc'.

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R topics documented:

mlr3misc-package	3
assert_ro_binding	4
as_factor	4

as_short_string	5
calculate_hash	6
capitalize	6
check_packages_installed	7
chunk_vector	8
compat-map	9
compose	11
compute_mode	12
count_missing	13
crate	13
cross_join	14
Dictionary	15
dictionary_sugar_get	18
did_you_mean	19
distinct_values	20
encapsulate	21
enframe	22
extract_vars	23
format_bib	24
formulate	25
get_private	25
get_seed	26
has_element	26
ids	27
insert_named	28
invoke	29
is_scalar_na	30
keep_in_bounds	30
leanify_r6	31
load_dataset	32
map_values	32
modify_if	33
named_list	34
named_vector	34
names2	35
open_help	36
printf	36
rcbind	37
rd_info	38
recycle_vectors	39
register_namespace_callback	39
reorder_vector	40
require_namespaces	41
rowwise_table	42
sequence_helpers	42
set_class	43
set_names	44
shuffle	45

<i>mlr3misc-package</i>	3
str_collapse	45
str_indent	46
str_trunc	47
topo_sort	48
to_decimal	48
transpose_list	49
unnest	50
which_min	50
with_package	51
%nin%	52
Index	53

mlr3misc-package	<i>mlr3misc: Helper Functions for 'mlr3'</i>
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Description

Frequently used helper functions and assertions used in 'mlr3' and its companion packages. Comes with helper functions for functional programming, for printing, to work with 'data.table', as well as some generally useful 'R6' classes. This package also supersedes the package 'BBmisc'.

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See Also

Useful links:

- <https://mlr3misc.mlr-org.com>
- <https://github.com/mlr-org/mlr3misc>
- Report bugs at <https://github.com/mlr-org/mlr3misc/issues>

assert_ro_binding *Assertion for Active Bindings in R6 Classes*

Description

This assertion is intended to be called in active bindings of an `R6::R6Class` which does not allow assignment. If rhs is not missing, an exception is raised.

Usage

```
assert_ro_binding(rhs)
```

Arguments

rhs (any)
If not missing, an exception is raised.

Value

Nothing.

as_factor *Convert to Factor*

Description

Converts a vector to a `factor()` and ensures that levels are in the order of the provided levels.

Usage

```
as_factor(x, levels, ordered = is.ordered(x))
```

Arguments

x (atomic vector())
Vector to convert to factor.

levels (character())
Levels of the new factor.

ordered (logical(1))
If TRUE, create an ordered factor.

Value

(factor()).

Examples

```
x = factor(c("a", "b"))
y = factor(c("a", "b"), levels = c("b", "a"))

# x with the level order of y
as_factor(x, levels(y))

# y with the level order of x
as_factor(y, levels(x))
```

`as_short_string`*Convert R Object to a Descriptive String*

Description

This function is intended to be convert any R object to a short descriptive string, e.g. in `base::print()` functions.

The following rules apply:

- if `x` is `atomic()` with length 0 or 1: printed as-is.
- if `x` is `atomic()` with length greater than 1, `x` is collapsed with `" "`, and the resulting string is truncated to `trunc_width` characters.
- if `x` is an expression: converted to character.
- Otherwise: the class is printed.

If `x` is a list, the above rules are applied (non-recursively) to its elements.

Usage

```
as_short_string(x, width = 30L, num_format = "%.4g")
```

Arguments

<code>x</code>	(any) Arbitrary object.
<code>width</code>	(integer(1)) Truncate strings to width <code>width</code> .
<code>num_format</code>	(character(1)) Used to format numerical scalars via <code>base::sprintf()</code> .

Value

(character(1)).

Examples

```
as_short_string(list(a = 1, b = NULL, "foo", c = 1:10))
```

calculate_hash	<i>Calculate a Hash for Multiple Objects</i>
----------------	--

Description

Calls `digest::digest()` to calculate the hash for all objects provided.

The following operations are performed to make hashing more robust:

- If an object is a `function()`, the formals and the body are hashed separately. This ensures that the bytecode or parent environment are not be included in the hash.
- If an object is a `data.table::data.table()`, the data.table is converted to a regular list. This ensures that keys and indices are not included in the hash.

Note that this only applies to top level objects, these transformations are not done recursively.

Usage

```
calculate_hash(...)
```

Arguments

```
...          (any)  
             Objects to hash.
```

Value

```
(character(1)).
```

Examples

```
calculate_hash(iris, 1, "a")
```

capitalize	<i>Capitalize the First Letter of Strings</i>
------------	---

Description

Takes a character vector and changes the first letter of each element to uppercase.

Usage

```
capitalize(str)
```

Arguments

```
str          (character()).
```

Value

Character vector, same length as `str`.

Examples

```
capitalize("foo bar")
```

```
check_packages_installed
```

Check that packages are installed, without loading them

Description

Calls `find.package()` to check if the all packages are installed.

Usage

```
check_packages_installed(  
  pkgs,  
  warn = TRUE,  
  msg = "The following packages are required but not installed: %s"  
)
```

Arguments

<code>pkgs</code>	(<code>character()</code>) Packages to check.
<code>warn</code>	(<code>logical(1)</code>) If TRUE, signals a warning of class "packageNotFoundWarning" about the missing packages.
<code>msg</code>	(<code>character(1)</code>) Format of the warning message. Use "%s" as placeholder for the list of packages.

Value

(`logical()`) named with package names. TRUE if the respective package is installed, FALSE otherwise.

Examples

```
check_packages_installed(c("mlr3misc", "foobar"), warn = FALSE)  
  
# catch warning  
tryCatch(check_packages_installed(c("mlr3misc", "foobaaar")),  
  packageNotFoundWarning = function(w) as.character(w))
```

 chunk_vector

Chunk Vectors

Description

Chunk atomic vectors into parts of roughly equal size. `chunk()` takes a vector length `n` and returns an integer with chunk numbers. `chunk_vector()` uses `base::split()` and `chunk()` to split an atomic vector into chunks.

Usage

```
chunk_vector(x, n_chunks = NULL, chunk_size = NULL, shuffle = TRUE)
```

```
chunk(n, n_chunks = NULL, chunk_size = NULL, shuffle = TRUE)
```

Arguments

<code>x</code>	(vector()) Vector to split into chunks.
<code>n_chunks</code>	(integer(1)) Requested number of chunks. Mutually exclusive with <code>chunk_size</code> and <code>props</code> .
<code>chunk_size</code>	(integer(1)) Requested number of elements in each chunk. Mutually exclusive with <code>n_chunks</code> and <code>props</code> .
<code>shuffle</code>	(logical(1)) If TRUE, permutes the order of <code>x</code> before chunking.
<code>n</code>	(integer(1)) Length of vector to split.

Value

`chunk()` returns a `integer()` of chunk indices, `chunk_vector()` a `list()` of integer vectors.

Examples

```
x = 1:11

ch = chunk(length(x), n_chunks = 2)
table(ch)
split(x, ch)

chunk_vector(x, n_chunks = 2)

chunk_vector(x, n_chunks = 3, shuffle = TRUE)
```

Description

map-like functions, similar to the ones implemented in **purrr**:

- `map()` returns the results of `.f` applied to `.x` as list. If `.f` is not a function, `map` will call `[[` on all elements of `.x` using the value of `.f` as index.
- `imap()` applies `.f` to each value of `.x` (passed as first argument) and its name (passed as second argument). If `.x` does not have names, a sequence along `.x` is passed as second argument instead.
- `pmap()` expects `.x` to be a list of vectors of equal length, and then applies `.f` to the first element of each vector of `.x`, then the second element of `.x`, and so on.
- `map_if()` applies `.f` to each element of `.x` where the predicate `.p` evaluates to TRUE.
- `map_at()` applies `.f` to each element of `.x` referenced by `.at`. All other elements remain unchanged.
- `keep()` keeps those elements of `.x` where predicate `.p` evaluates to TRUE.
- `discard()` discards those elements of `.x` where predicate `.p` evaluates to TRUE.
- `every()` is TRUE if predicate `.p` evaluates to TRUE for each `.x`.
- `some()` is TRUE if predicate `.p` evaluates to TRUE for at least one `.x`.
- `detect()` returns the first element where predicate `.p` evaluates to TRUE.
- `walk()`, `iwalk()` and `pwalk()` are the counterparts to `map()`, `imap()` and `pmap()`, but just visit (or change by reference) the elements of `.x`. They return input `.x` invisibly.

Additionally, the functions `map()`, `imap()` and `pmap()` have type-safe variants with the following suffixes:

- `*_lgl()` returns a `logical(length(.x))`.
- `*_int()` returns a `integer(length(.x))`.
- `*_dbl()` returns a `double(length(.x))`.
- `*_chr()` returns a `character(length(.x))`.
- `*_br()` returns an object where the results of `.f` are put together with `base::rbind()`.
- `*_bc()` returns an object where the results of `.f` are put together with `base::cbind()`.
- `*_dtr()` returns a `data.table::data.table()` where the results of `.f` are put together in an `base::rbind()` fashion.
- `*_dtc()` returns a `data.table::data.table()` where the results of `.f` are put together in an `base::cbind()` fashion.

Usage

```
map(.x, .f, ...)  
map_lgl(.x, .f, ...)  
map_int(.x, .f, ...)  
map_dbl(.x, .f, ...)  
map_chr(.x, .f, ...)  
map_br(.x, .f, ...)  
map_bc(.x, .f, ...)  
map_dtr(.x, .f, ..., .fill = FALSE, .idcol = NULL)  
map_dtc(.x, .f, ...)  
pmap(.x, .f, ...)  
pmap_lgl(.x, .f, ...)  
pmap_int(.x, .f, ...)  
pmap_dbl(.x, .f, ...)  
pmap_chr(.x, .f, ...)  
pmap_dtr(.x, .f, ..., .fill = FALSE, .idcol = NULL)  
pmap_dtc(.x, .f, ...)  
imap(.x, .f, ...)  
imap_lgl(.x, .f, ...)  
imap_int(.x, .f, ...)  
imap_dbl(.x, .f, ...)  
imap_chr(.x, .f, ...)  
imap_dtr(.x, .f, ..., .fill = FALSE, .idcol = NULL)  
imap_dtc(.x, .f, ...)  
keep(.x, .f, ...)
```

```

discard(.x, .p, ...)

map_if(.x, .p, .f, ...)

## Default S3 method:
map_if(.x, .p, .f, ...)

map_at(.x, .at, .f, ...)

every(.x, .p, ...)

some(.x, .p, ...)

detect(.x, .p, ...)

walk(.x, .f, ...)

iwalk(.x, .f, ...)

pwalk(.x, .f, ...)

```

Arguments

<code>.x</code>	(<code>list()</code> <code>atomic vector()</code>).
<code>.f</code>	(<code>function()</code> <code>character()</code> <code>integer()</code>) Function to apply, or element to extract by name (if <code>.f</code> is <code>character()</code>) or position (if <code>.f</code> is <code>integer()</code>).
<code>...</code>	(any) Additional arguments passed down to <code>.f</code> or <code>.p</code> .
<code>.fill</code>	(<code>logical(1)</code>) Passed down to <code>data.table::rbindlist()</code> .
<code>.idcol</code>	(<code>logical(1)</code>) Passed down to <code>data.table::rbindlist()</code> .
<code>.p</code>	(<code>function()</code> <code>logical()</code>) Predicate function.
<code>.at</code>	(<code>character()</code> <code>integer()</code> <code>logical()</code>) Index vector.

compose

Composition of Functions

Description

Composes two or more functions into a single function. The returned function calls all provided functions in reverse order: The return value of the last function servers as input for the next to last function, and so on.

Usage

```
compose(...)
```

Arguments

```
...          (functions)
             Functions to compose.
```

Value

(function()) which calls the functions provided via ... in reverse order.

Examples

```
f = compose(function(x) x + 1, function(x) x / 2)
f(10)
```

```
compute_mode
```

```
Compute The Mode
```

Description

Computes the mode (most frequent value) of an atomic vector.

Usage

```
compute_mode(x, ties_method = "random", na_rm = TRUE)
```

Arguments

```
x          (vector()).
ties_method (character(1))
           Handling of ties. One of "first", "last" or "random" to return the first tied value,
           the last tied value, or a randomly selected tied value, respectively.
na_rm      (logical(1))
           If TRUE, remove missing values prior to computing the mode.
```

Value

(vector(1)): mode value.

Examples

```
compute_mode(c(1, 1, 1, 2, 2, 2, 3))
compute_mode(c(1, 1, 1, 2, 2, 2, 3), ties_method = "last")
compute_mode(c(1, 1, 1, 2, 2, 2, 3), ties_method = "random")
```

count_missing	<i>Count Missing Values in a Vector Same as <code>sum(is.na(x))</code>, but without the allocation.</i>
---------------	---

Description

Count Missing Values in a Vector
 Same as `sum(is.na(x))`, but without the allocation.

Usage

```
count_missing(x)
```

Arguments

x [vector\(\)](#)
 Supported are logical, integer, double, complex and string vectors.

Value

(integer(1)) number of missing values.

Examples

```
count_missing(c(1, 2, NA, 4, NA))
```

crate	<i>Isolate a Function from its Environment</i>
-------	--

Description

Put a function in a "lean" environment that does not carry unnecessary baggage with it (e.g. references to datasets).

Usage

```
crate(.fn, ..., .parent = .GlobalEnv)
```

Arguments

.fn (function())
 function to crate

... (any)
 The objects, which should be visible inside .fn.

.parent (environment)
 Parent environment to look up names. Default so the global environment.

Examples

```
meta_f = function(z) {  
  x = 1  
  y = 2  
  crate(function() {  
    c(x, y, z)  
  }, x)  
}  
x = 100  
y = 200  
z = 300  
f = meta_f(1)  
f()
```

cross_join

Cross-Join for data.table

Description

A safe version of `data.table::CJ()` in case a column is called sorted or unique.

Usage

```
cross_join(dots, sorted = TRUE, unique = FALSE)
```

Arguments

dots	(named list()) Vectors to cross-join.
sorted	(logical(1)) See <code>data.table::CJ()</code> .
unique	(logical(1)) See <code>data.table::CJ()</code> .

Value

`data.table()`.

Examples

```
cross_join(dots = list(sorted = 1:3, b = letters[1:2]))
```

Dictionary

Key-Value Storage

Description

A key-value store for `R6::R6` objects. On retrieval of an object, the following applies:

- If the object is a `R6ClassGenerator`, it is initialized with `new()`.
- If the object is a function, it is called and must return an instance of a `R6::R6` object.
- If the object is an instance of a `R6` class, it is returned as-is.

Default argument required for construction can be stored alongside their constructors by passing them to `$add()`.

S3 methods

- `as.data.table(d)`
`Dictionary` -> `data.table::data.table()`
Converts the dictionary to a `data.table::data.table()`.

Public fields

`items (environment())`
Stores the items of the dictionary

Methods

Public methods:

- `Dictionary$new()`
- `Dictionary$format()`
- `Dictionary$print()`
- `Dictionary$keys()`
- `Dictionary$has()`
- `Dictionary$get()`
- `Dictionary$mget()`
- `Dictionary$add()`
- `Dictionary$remove()`
- `Dictionary$required_args()`
- `Dictionary$clone()`

Method `new()`: Construct a new Dictionary.

Usage:

`Dictionary$new()`

Method `format()`: Format object as simple string.

Usage:

```
Dictionary$format()
```

Method print(): Print object.

Usage:

```
Dictionary$print()
```

Method keys(): Returns all keys which comply to the regular expression pattern. If pattern is NULL (default), all keys are returned.

Usage:

```
Dictionary$keys(pattern = NULL)
```

Arguments:

pattern (character(1)).

Returns: character() of keys.

Method has(): Returns a logical vector with TRUE at its i-th position if the i-th key exists.

Usage:

```
Dictionary$has(keys)
```

Arguments:

keys (character()).

Returns: logical().

Method get(): Retrieves object with key key from the dictionary. Additional arguments must be named and are passed to the constructor of the stored object.

Usage:

```
Dictionary$get(key, ...)
```

Arguments:

key (character(1)).

... (any)

Passed down to constructor.

Returns: Object with corresponding key.

Method mget(): Returns objects with keys keys in a list named with keys. Additional arguments must be named and are passed to the constructors of the stored objects.

Usage:

```
Dictionary$mget(keys, ...)
```

Arguments:

keys (character()).

... (any)

Passed down to constructor.

Returns: Named list() of objects with corresponding keys.

Method `add()`: Adds object `value` to the dictionary with key `key`, potentially overwriting a previously stored item. Additional arguments in `...` must be named and are passed as default arguments to `value` during construction. The names of all additional arguments which are mandatory for construction and missing in `...` should be listed in `required_args`.

Usage:

```
Dictionary$add(key, value, ..., required_args = character())
```

Arguments:

`key` (`character(1)`).

`value` (`any`).

`...` (`any`)

Passed down to constructor.

`required_args` (`character()`).

Returns: Dictionary.

Method `remove()`: Removes objects with from the dictionary.

Usage:

```
Dictionary$remove(keys)
```

Arguments:

`keys` (`character()`)

Keys of objects to remove.

Returns: Dictionary.

Method `required_args()`: Returns the names of arguments required to construct the object.

Usage:

```
Dictionary$required_args(key)
```

Arguments:

`key` (`character(1)`)

Key of object to query for required arguments.

Returns: `character()` of names of required arguments.

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

```
Dictionary$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

Examples

```
library(R6)
item1 = R6Class("Item", public = list(x = 1))
item2 = R6Class("Item", public = list(x = 2))
d = Dictionary$new()
d$add("a", item1)
d$add("b", item2)
```

```
d$add("c", item1$new())
d$keys()
d$get("a")
d$mget(c("a", "b"))
```

dictionary_sugar_get *A Quick Way to Initialize Objects from Dictionaries*

Description

Given a [Dictionary](#), retrieve objects with provided keys.

- `dictionary_sugar_get()` to retrieve a single object with key `.key`.
- `dictionary_sugar_mget()` to retrieve a list of objects with keys `.keys`.
- `dictionary_sugar()` is deprecated in favor of `dictionary_sugar_get()`.
- If `.key` or `.keys` is missing, the dictionary itself is returned.

Arguments in `...` must be named and are consumed in the following order:

1. All arguments whose names match the name of an argument of the constructor are passed to the `$get()` method of the [Dictionary](#) for construction.
2. All arguments whose names match the name of a parameter of the `paradox::ParamSet` of the constructed object are set as parameters. If there is no `paradox::ParamSet` in `obj$params`, this step is skipped.
3. All remaining arguments are assumed to be regular fields of the constructed R6 instance, and are assigned via `<-`.

Usage

```
dictionary_sugar_get(dict, .key, ...)
```

```
dictionary_sugar(dict, .key, ...)
```

```
dictionary_sugar_mget(dict, .keys, ...)
```

Arguments

<code>dict</code>	(Dictionary).
<code>.key</code>	(<code>character(1)</code>) Key of the object to construct.
<code>...</code>	(<code>any</code>) See description.
<code>.keys</code>	(<code>character()</code>) Keys of the objects to construct.

Value

`R6::R6Class()`

Examples

```
library(R6)
item = R6Class("Item", public = list(x = 0))
d = Dictionary$new()
d$add("key", item)
dictionary_sugar_get(d, "key", x = 2)
```

did_you_mean	<i>Suggest Alternatives</i>
--------------	-----------------------------

Description

Helps to suggest alternatives from a list of strings, based on the string similarity in `utils::adist()`.

Usage

```
did_you_mean(str, candidates)
```

Arguments

str	(character(1)) String.
candidates	(character()) Candidate strings.

Value

(character(1)). Either a phrase suggesting one or more candidates from candidates, or an empty string if no close match is found.

Examples

```
did_you_mean("yep", c("yes", "no"))
```

distinct_values	<i>Get Distinct Values</i>
-----------------	----------------------------

Description

Extracts the distinct values of an atomic vector, with the possibility to drop levels and remove missing values.

Usage

```
distinct_values(x, drop = TRUE, na_rm = TRUE)
```

Arguments

x	(atomic vector()).
drop	:: logical(1) If TRUE, only returns values which are present in x. If FALSE, returns all levels for <code>factor()</code> and <code>ordered()</code> , as well as TRUE and FALSE for <code>logical()</code> s.
na_rm	:: logical(1) If TRUE, missing values are removed from the vector of distinct values.

Value

(atomic vector()) with distinct values in no particular order.

Examples

```
# for factors:
x = factor(c(letters[1:2], NA), levels = letters[1:3])
distinct_values(x)
distinct_values(x, na_rm = FALSE)
distinct_values(x, drop = FALSE)
distinct_values(x, drop = FALSE, na_rm = FALSE)

# for logicals:
distinct_values(TRUE, drop = FALSE)

# for numerics:
distinct_values(sample(1:3, 10, replace = TRUE))
```

Description

Evaluates a function while both recording an output log and measuring the elapsed time. There are currently three different modes implemented to encapsulate a function call:

- "none": Just runs the call in the current session and measures the elapsed time. Does not keep a log, output is printed directly to the console. Works well together with [traceback\(\)](#).
- "evaluate": Uses the package **evaluate** to call the function, measure time and do the logging.
- "callr": Uses the package **callr** to call the function, measure time and do the logging. This encapsulation spawns a separate R session in which the function is called. While this comes with a considerable overhead, it also guards your session from being teared down by segfaults.

Usage

```
encapsulate(
  method,
  .f,
  .args = list(),
  .opts = list(),
  .pkgs = character(),
  .seed = NA_integer_,
  .timeout = Inf
)
```

Arguments

method	(character(1)) One of "none", "evaluate" or "callr".
.f	(function()) Function to call.
.args	(list()) Arguments passed to .f.
.opts	(named list()) Options to set for the function call. Options get reset on exit.
.pkgs	(character()) Packages to load (not attach).
.seed	(integer(1)) Random seed to set before invoking the function call. Gets reset to the previous seed on exit.
.timeout	(numeric(1)) Timeout in seconds. Uses setTimelimit() for "none" and "evaluate" encapsulation. For "callr" encapsulation, the timeout is passed to callr::r() .

Value

(named `list()`) with three fields:

- "result": the return value of `.f`
- "elapsed": elapsed time in seconds. Measured as `proc.time()` difference before/after the function call.
- "log": `data.table()` with columns "class" (ordered factor with levels "output", "warning" and "error") and "message" (`character()`).

Examples

```
f = function(n) {
  message("hi from f")
  if (n > 5) {
    stop("n must be <= 5")
  }
  runif(n)
}

encapsulate("none", f, list(n = 1), .seed = 1)

if (requireNamespace("evaluate", quietly = TRUE)) {
  encapsulate("evaluate", f, list(n = 1), .seed = 1)
}

if (requireNamespace("callr", quietly = TRUE)) {
  encapsulate("callr", f, list(n = 1), .seed = 1)
}
```

enframe

Convert a Named Vector into a data.table and Vice Versa

Description

`enframe()` returns a `data.table::data.table()` with two columns: The names of `x` (or `seq_along(x)` if unnamed) and the values of `x`.

`deframe()` converts a two-column `data.frame` to a named vector. If the `data.frame` only has a single column, an unnamed vector is returned.

Usage

```
enframe(x, name = "name", value = "value")
```

```
deframe(x)
```

Arguments

x	(vector() (enframe()) or data.frame() (deframe())) Vector to convert to a <code>data.table::data.table()</code> .
name	(character(1)) Name for the first column with names.
value	(character(1)) Name for the second column with values.

Value

`data.table::data.table()` or named vector.

Examples

```
x = 1:3
enframe(x)

x = set_names(1:3, letters[1:3])
enframe(x, value = "x_values")
```

extract_vars

Extract Variables from a Formula

Description

Given a `formula()` `f`, returns all variables used on the left-hand side and right-hand side of the formula.

Usage

```
extract_vars(f)
```

Arguments

f (formula()).

Value

(list()) with elements "lhs" and "rhs", both character().

Examples

```
extract_vars(Species ~ Sepal.Width + Sepal.Length)
extract_vars(Species ~ .)
```

`format_bib`*Format Bibentries in Roxygen*

Description

Operates on a named list of `bibentry()` entries and formats them nicely for documentation with **roxygen2**.

- `format_bib()` is intended to be called in the `@references` section and prints the complete entry using `toRd()`.
- `cite_bib()` returns the family name of the first author (if available, falling back to the complete author name if not applicable) and the year in format "[LastName] (YYYY)".

Usage

```
format_bib(..., bibentries = NULL, envir = parent.frame())
```

```
cite_bib(..., bibentries = NULL, envir = parent.frame())
```

Arguments

<code>...</code>	(<code>character()</code>) One or more names of bibentries.
<code>bibentries</code>	(<code>named list()</code>) Named list of bibentries.
<code>envir</code>	(<code>environment</code>) Environment to lookup bibentries if not provided.

Value

(`character(1)`).

Examples

```
bibentries = list(checkmate = citation("checkmate"), R = citation())
format_bib("checkmate")
format_bib("R")
cite_bib("checkmate")
cite_bib("checkmate", "R")
```

formulate	<i>Create Formulas</i>
-----------	------------------------

Description

Given the left-hand side and right-hand side as character vectors, generates a new `stats::formula()`.

Usage

```
formulate(lhs = character(), rhs = character(), env = NULL, quote = "right")
```

Arguments

lhs	(character()) Left-hand side of formula. Multiple elements will be collapsed with " + ".
rhs	(character()) Right-hand side of formula. Multiple elements will be collapsed with " + ".
env	(environment()) Environment for the new formula. Defaults to NULL.
quote	(character(1)) Which side of the formula to quote? Subset of ("left", "right"), defaulting to "right".

Value

`stats::formula()`.

Examples

```
formulate("Species", c("Sepal.Length", "Sepal.Width"))  
formulate(rhs = c("Sepal.Length", "Sepal.Width"))
```

get_private	<i>Extract Private Fields of R6 Objects</i>
-------------	---

Description

Provides access to the private members of `R6::R6Class` objects.

Usage

```
get_private(x)
```

Arguments

x (any)
Object to extract the private members from.

Value

environment() of private members, or NULL if x is not an R6 object.

Examples

```
library(R6)
item = R6Class("Item", private = list(x = 1))$new()
get_private(item)$x
```

get_seed	<i>Get the Random Seed</i>
----------	----------------------------

Description

Retrieves the current random seed (.Random.seed in the global environment), and initializes the RNG first, if necessary.

Usage

```
get_seed()
```

Value

integer(). Depends on the `base::RNGkind()`.

Examples

```
str(get_seed())
```

has_element	<i>Check if an Object is Element of a List</i>
-------------	--

Description

Simply checks if a list contains a given object.

- NB1: Objects are compared with identity.
- NB2: Only use this on lists with complex objects, for simpler structures there are faster operations.
- NB3: Clones of R6 objects are not detected.

Usage

```
has_element(.x, .y)
```

Arguments

```
.x          (list() | atomic vector()).  
.y          (any)  
            Object to test for.
```

Examples

```
has_element(list(1, 2, 3), 1)
```

ids	<i>Extract ids from a List of Objects</i>
-----	---

Description

None.

Usage

```
ids(xs)
```

Arguments

```
xs          (list())  
            Every element must have a slot 'id'.
```

Value

(character()).

Examples

```
xs = list(a = list(id = "foo", a = 1), bar = list(id = "bar", a = 2))  
ids(xs)
```

 insert_named

Insert or Remove Named Elements

Description

Insert elements from `y` into `x` by name, or remove elements from `x` by name. Works for vectors, lists, environments and data frames and data tables. Objects with reference semantic (`environment()` and `data.table::data.table()`) might be modified in-place.

Usage

```
insert_named(x, y)

## Default S3 method:
insert_named(x, y)

## S3 method for class 'environment'
insert_named(x, y)

## S3 method for class 'data.frame'
insert_named(x, y)

## S3 method for class 'data.table'
insert_named(x, y)

remove_named(x, nn)

## S3 method for class 'environment'
remove_named(x, nn)

## S3 method for class 'data.frame'
remove_named(x, nn)

## S3 method for class 'data.table'
remove_named(x, nn)
```

Arguments

<code>x</code>	<code>(vector() list() environment() data.table::data.table())</code> Object to insert elements into, or remove elements from. Changes are by-reference for environments and data tables.
<code>y</code>	<code>(list())</code> List of elements to insert into <code>x</code> .
<code>nn</code>	<code>(character())</code> Character vector of elements to remove.

Value

Modified object.

Examples

```
x = list(a = 1, b = 2)
insert_named(x, list(b = 3, c = 4))
remove_named(x, "b")
```

 invoke

Invoke a Function Call

Description

An alternative interface for `do.call()`, similar to the deprecated function in **purrr**. This function tries hard to not evaluate the passed arguments too eagerly which is important when working with large R objects.

It is recommended to pass all arguments named in order to not rely on positional argument matching.

Usage

```
invoke(
  .f,
  ...,
  .args = list(),
  .opts = list(),
  .seed = NA_integer_,
  .timeout = Inf
)
```

Arguments

<code>.f</code>	(function()) Function to call.
<code>...</code>	(any) Additional function arguments passed to <code>.f</code> .
<code>.args</code>	(list()) Additional function arguments passed to <code>.f</code> , as (named) <code>list()</code> . These arguments will be concatenated to the arguments provided via <code>...</code> .
<code>.opts</code>	(named list()) List of options which are set before the <code>.f</code> is called. Options are reset to their previous state afterwards.
<code>.seed</code>	(integer(1)) Random seed to set before invoking the function call. Gets reset to the previous seed on exit.
<code>.timeout</code>	(numeric(1)) Timeout in seconds. Uses <code>setTimeLimit()</code> . Note that timeouts are only triggered on a user interrupt, not in compiled code.

Examples

```
invoke(mean, .args = list(x = 1:10))
invoke(mean, na.rm = TRUE, .args = list(1:10))
```

is_scalar_na	<i>Check for a Single Scalar Value</i>
--------------	--

Description

Check for a Single Scalar Value

Usage

```
is_scalar_na(x)
```

Arguments

x	(any) Argument to check.
---	-----------------------------

Value

(logical(1)).

keep_in_bounds	<i>Remove All Elements Out Of Bounds</i>
----------------	--

Description

Filters vector x to only keep elements which are in bounds [lower, upper]. This is equivalent to the following, but tries to avoid unnecessary allocations:

```
x[!is.na(x) & x >= lower & x <= upper]
```

Currently only works for integer x.

Usage

```
keep_in_bounds(x, lower, upper)
```

Arguments

x	(integer()) Vector to filter.
lower	(integer(1)) Lower bound.
upper	(integer(1)) Upper bound.

Value

(integer()) with only values in [lower, upper].

Examples

```
keep_in_bounds(sample(20), 5, 10)
```

leanify_r6

Move all methods of an R6 Class to an environment

Description

leanify_r6 moves the content of an `R6::R6Class`'s functions to an environment, usually the package's namespace, to save space during serialization of R6 objects. leanify_package move all methods of *all* R6 Classes to an environment.

The function in the class (i.e. the object generator) is replaced by a stump function that does nothing except calling the original function that now resides somewhere else.

It is possible to call this function after the definition of an `R6::R6` class inside a package, but it is preferred to use `leanify_package()` to just leanify all `R6::R6` classes inside a package.

Usage

```
leanify_r6(cls, env = cls$parent_env)
```

```
leanify_package(pkg_env = parent.frame(), skip_if = function(x) FALSE)
```

Arguments

cls	(<code>R6::R6Class</code>) Class generator to modify.
env	(environment) The target environment where the function should be stored. This should be either <code>cls\$parent_env</code> (default) or one of its parent environments, otherwise the stump function will not find the moved (original code) function.
pkg_env	:: environment The namespace from which to leanify all R6 classes. Does not have to be a package namespace, but this is the intended usecase.
skip_if	:: function Function with one argument: Is called for each individual <code>R6::R6Class</code> . If it returns TRUE, the class is skipped. Default function evaluating to FALSE always (i.e. skipping no classes).

Value

NULL.

load_dataset	<i>Retrieve a Single Data Set</i>
--------------	-----------------------------------

Description

Loads a data set with name `id` from package `package` and returns it. If the package is not installed, an error with condition "packageNotFoundError" is raised. The name of the missing packages is stored in the condition as `packages`.

Usage

```
load_dataset(id, package, keep_rownames = FALSE)
```

Arguments

<code>id</code>	(character(1)) Name of the data set.
<code>package</code>	(character(1)) Package to load the data set from.
<code>keep_rownames</code>	(logical(1)) Keep possible row names (default: FALSE).

Examples

```
head(load_dataset("iris", "datasets"))
```

map_values	<i>Replace Elements of Vectors with New Values</i>
------------	--

Description

Replaces all values in `x` which match `old` with values in `new`. Values are matched with `base::match()`.

Usage

```
map_values(x, old, new)
```

Arguments

<code>x</code>	(vector()).
<code>old</code>	(vector()) Vector with values to replace.
<code>new</code>	(vector()) Values to replace with. Will be forced to the same length as <code>old</code> with <code>base::rep_len()</code> .

Value

(vector()) of the same length as x.

Examples

```
x = letters[1:5]

# replace all "b" with "_b_", and all "c" with "_c_"
old = c("b", "c")
new = c("_b_", "_c_")
map_values(x, old, new)
```

 modify_if

Selectively Modify Elements of a Vector

Description

Modifies elements of a vector selectively, similar to the functions in **purrr**.

modify_if() applies a predicate function .p to all elements of .x and applies .f to those elements of .x where .p evaluates to TRUE.

modify_at() applies .f to those elements of .x selected via .at.

Usage

```
modify_if(.x, .p, .f, ...)
```

```
modify_at(.x, .at, .f, ...)
```

Arguments

.x	(vector()).
.p	(function()) Predicate function.
.f	(function()) Function to apply on .x.
...	(any) Additional arguments passed to .f.
.at	((integer() character())) Index vector to select elements from .x.

Examples

```
x = modify_if(iris, is.factor, as.character)
str(x)

x = modify_at(iris, 5, as.character)
x = modify_at(iris, "Sepal.Length", sqrt)
str(x)
```

named_list	<i>Create a Named List</i>
------------	----------------------------

Description

Create a Named List

Usage

```
named_list(nn = character(0L), init = NULL)
```

Arguments

nn	(character()) Names of new list.
init	(any) All list elements are initialized to this value.

Value

(named list()).

Examples

```
named_list(c("a", "b"))
named_list(c("a", "b"), init = 1)
```

named_vector	<i>Create a Named Vector</i>
--------------	------------------------------

Description

Creates a simple atomic vector with init as values.

Usage

```
named_vector(nn = character(0L), init = NA)
```

Arguments

nn	(character()) Names of new vector
init	(atomic) All vector elements are initialized to this value.

Value

(named vector()).

Examples

```
named_vector(c("a", "b"), NA)
named_vector(character())
```

names2

A Type-Stable names() Replacement

Description

A simple wrapper around `base::names()`. Returns a character vector even if no names attribute is set. Values NA and "" are treated as missing and replaced with the value provided in `missing_val`.

Usage

```
names2(x, missing_val = NA_character_)
```

Arguments

x	(any Object.
missing_val	(atomic(1)) Value to set for missing names. Default is NA_character_.

Value

(character(length(x))).

Examples

```
x = 1:3
names(x)
names2(x)

names(x)[1:2] = letters[1:2]
names(x)
names2(x, missing_val = "")
```

open_help	<i>Opens a Manual Page</i>
-----------	----------------------------

Description

Simply opens a manual page specified in "package::topic" syntax.

Usage

```
open_help(man)
```

Arguments

man	(character(1)) Manual page to open in "package::topic" syntax.
-----	---

Value

Nothing.

printf	<i>Functions for Formatted Output and Conditions</i>
--------	--

Description

`catf()`, `messagef()`, `warningf()` and `stopf()` are wrappers around `base::cat()`, `base::message()`, `base::warning()` and `base::stop()`, respectively. The call is not included for warnings and errors.

Usage

```
catf(msg, ..., file = "", wrap = FALSE)
```

```
messagef(msg, ..., wrap = FALSE)
```

```
warningf(msg, ..., wrap = FALSE)
```

```
stopf(msg, ..., wrap = FALSE)
```

Arguments

msg	(character(1)) Format string passed to <code>base::sprintf()</code> .
...	(any) Arguments passed down to <code>base::sprintf()</code> .
file	(character(1)) Passed to <code>base::cat()</code> .
wrap	(integer(1) logical(1)) If set to a positive integer, <code>base::strwrap()</code> is used to wrap the string to the provided width. If set to TRUE, the width defaults to $0.9 * \text{getOption("width")}$. If set to FALSE, wrapping is disabled (default). If wrapping is enabled, all white-space characters (<code>[[[:space:]]</code>) are converted to spaces, and consecutive spaces are converted to a single space.

Examples

```
messagef("
  This is a rather long %s
  on multiple lines
  which will get wrapped.
", "string", wrap = 15)
```

rcbind

Bind Columns by Reference

Description

Performs `base::cbind()` on `data.tables`, possibly by reference.

Usage

```
rcbind(x, y)
```

Arguments

x	(<code>data.table::data.table()</code>) <code>data.table::data.table()</code> to add columns to.
y	(<code>data.table::data.table()</code>) <code>data.table::data.table()</code> to take columns from.

Value

(`data.table::data.table()`): Updated x .

Examples

```
x = data.table::data.table(a = 1:3, b = 3:1)
y = data.table::data.table(c = runif(3))
rbind(x, y)
```

rd_info

*Helpers to Create Manual Pages***Description**

rd_info() is an internal generic to generate Rd or markdown code to be used in manual pages. rd_format_string() and rd_format_range() are string functions to assist generating proper Rd code.

Usage

```
rd_info(obj, ...)

rd_format_range(lower, upper)

rd_format_string(str, quote = c("\\dQuote{", "}"))

rd_format_packages(packages)
```

Arguments

obj	(any) Object of the respective class.
...	(any) Additional arguments.
lower	(numeric(1)) Lower bound.
upper	(numeric(1)) Upper bound.
str	(character()) Vector of strings.
quote	(character()) Quotes to use around each element of x. Will be replicated to length 2.
packages	(character()) Vector of package names.

Value

character(), possibly with markdown code.

recycle_vectors	<i>Recycle List of Vectors to Common Length</i>
-----------------	---

Description

Repeats all vectors of a list `.x` to the length of the longest vector using `rep()` with argument `length.out`. This operation will only work if the length of the longest vectors is an integer multiple of all shorter vectors, and will throw an exception otherwise.

Usage

```
recycle_vectors(.x)
```

Arguments

`.x` (list()).

Value

(list()) with vectors of same size.

Examples

```
recycle_vectors(list(a = 1:3, b = 2))
```

register_namespace_callback	<i>Registers a Callback on Namespace load/unLoad Events</i>
-----------------------------	---

Description

Register a function callback to be called after a namespace is loaded. Calls `callback` once if the namespace has already been loaded before and also adds an unload-hook that removes the load hook.

Usage

```
register_namespace_callback(pkgname, namespace, callback)
```

Arguments

<code>pkgname</code>	(character(1)) Name of the package which registers the callback.
<code>namespace</code>	(character(1)) Namespace to react on.
<code>callback</code>	(function()) Function to call on namespace load.

Value

NULL.

reorder_vector *Reorder Vector According to Second Vector*

Description

Returns an integer vector to order vector x according to vector y.

Usage

```
reorder_vector(x, y, na_last = NA)
```

Arguments

x	(vector()).
y	(vector()).
na_last	(logical(1)) What to do with values in x which are not in y? <ul style="list-style-type: none">• NA: Extra values are removed.• FALSE: Extra values are moved to the beginning of the new vector.• TRUE: Extra values are moved to the end of the new vector.

Value

(integer()).

Examples

```
# x subset of y
x = c("b", "a", "c", "d")
y = letters
x[reorder_vector(x, y)]

# y subset of x
y = letters[1:3]
x[reorder_vector(x, y)]
x[reorder_vector(x, y, na_last = TRUE)]
x[reorder_vector(x, y, na_last = FALSE)]
```

require_namespaces	<i>Require Multiple Namespaces</i>
--------------------	------------------------------------

Description

Packages are loaded (not attached) via `base::requireNamespace()`. If at least one package can not be loaded, an exception of class "packageNotFoundError" is raised. The character vector of missing packages is stored in the condition as `packages`.

Usage

```
require_namespaces(  
  pkgs,  
  msg = "The following packages could not be loaded: %s",  
  quietly = FALSE  
)
```

Arguments

<code>pkgs</code>	(character()) Packages to load.
<code>msg</code>	(character(1)) Message to print on error. Use "%s" as placeholder for the list of packages.
<code>quietly</code>	(logical(1)) If TRUE then returns TRUE if all packages available, otherwise FALSE.

Value

(named character()) of loaded packages (invisibly).

Examples

```
require_namespaces("mlr3misc")  
  
# catch condition, return missing packages  
tryCatch(require_namespaces(c("mlr3misc", "foobaaar")),  
  packageNotFoundError = function(e) e$packages)
```

rowwise_table	<i>Row-Wise Constructor for 'data.table'</i>
---------------	--

Description

Similar to the **tibble** function `tribble()`, this function allows to construct tabular data in a row-wise fashion.

The first arguments passed as formula will be interpreted as column names. The remaining arguments will be put into the resulting table.

Usage

```
rowwise_table(..., .key = NULL)
```

Arguments

...	(any) Arguments: Column names in first rows as formulas (with empty left hand side), then the tabular data in the following rows.
.key	(character(1)) If not NULL, set the key via <code>data.table::setkeyv()</code> after constructing the table.

Value

`data.table::data.table()`.

Examples

```
rowwise_table(
  ~a, ~b,
  1, "a",
  2, "b"
)
```

sequence_helpers	<i>Sequence Construction Helpers</i>
------------------	--------------------------------------

Description

`seq_row()` creates a sequence along the number of rows of `x`, `seq_col()` a sequence along the number of columns of `x`. `seq_len0()` and `seq_along0()` are the 0-based counterparts to `base::seq_len()` and `base::seq_along()`.

Usage

```
seq_row(x)
```

```
seq_col(x)
```

```
seq_len0(n)
```

```
seq_along0(x)
```

Arguments

x	(any) Arbitrary object. Used to query its rows, cols or length.
n	(integer(1)) Length of the sequence.

Examples

```
seq_len0(3)
```

set_class

Set the Class

Description

Simple wrapper for `class(x) = classes`.

Usage

```
set_class(x, classes)
```

Arguments

x	(any).
classes	(character(1)) Vector of new class names.

Value

Object x, with updated class attribute.

Examples

```
set_class(list(), c("foo1", "foo2"))
```

`set_names`*Set Names*

Description

Sets the names (or colnames) of `x` to `nm`. If `nm` is a function, it is used to transform the already existing names of `x`.

Usage

```
set_names(x, nm = x, ...)
```

```
set_col_names(x, nm, ...)
```

Arguments

<code>x</code>	(any.) Object to set names for.
<code>nm</code>	(character() function()) New names, or a function which transforms already existing names.
<code>...</code>	(any) Passed down to <code>nm</code> if <code>nm</code> is a function.

Value

`x` with updated names.

Examples

```
x = letters[1:3]

# name x with itself:
x = set_names(x)
print(x)

# convert names to uppercase
x = set_names(x, toupper)
print(x)
```

shuffle	<i>Safe Version of Sample</i>
---------	-------------------------------

Description

A version of `sample()` which does not treat positive scalar integer `x` differently. See example.

Usage

```
shuffle(x, n = length(x), ...)
```

Arguments

<code>x</code>	(<code>vector()</code>) Vector to sample elements from.
<code>n</code>	(<code>integer()</code>) Number of elements to sample.
<code>...</code>	(<code>any</code>) Arguments passed down to <code>base::sample.int()</code> .

Examples

```
x = 2:3  
sample(x)  
shuffle(x)
```

```
x = 3  
sample(x)  
shuffle(x)
```

str_collapse	<i>Collapse Strings</i>
--------------	-------------------------

Description

Collapse multiple strings into a single string.

Usage

```
str_collapse(str, sep = ", ", quote = character(), n = Inf, ellipsis = "[...]")
```

Arguments

str	(character()) Vector of strings.
sep	(character(1)) String used to collapse the elements of x.
quote	(character()) Quotes to use around each element of x. Will be replicated to length 2.
n	(integer(1)) Number of elements to keep from x. See utils::head() .
ellipsis	(character(1)) If the string has to be shortened, this is signaled by appending ellipsis to str. Default is "[...]".

Value

(character(1)).

Examples

```
str_collapse(letters, quote = "'", n = 5)
```

str_indent	<i>Indent Strings</i>
------------	-----------------------

Description

Formats a text block for printing.

Usage

```
str_indent(initial, str, width = 0.9 * getOption("width"), exdent = 2L, ...)
```

Arguments

initial	(character(1)) Initial string, passed to strwrap() .
str	(character()) Vector of strings.
width	(integer(1)) Width of the output.
exdent	(integer(1)) Indentation of subsequent lines in paragraph.
...	(any) Additional parameters passed to str_collapse() .

Value

(character()).

Examples

```
cat(str_indent("Letters:", str_collapse(letters), width = 25), sep = "\n")
```

str_trunc

Truncate Strings

Description

str_trunc() truncates a string to a given width.

Usage

```
str_trunc(str, width = 0.9 * getOption("width"), ellipsis = "[...]")
```

Arguments

str	(character()) Vector of strings.
width	(integer(1)) Width of the output.
ellipsis	(character(1)) If the string has to be shortened, this is signaled by appending ellipsis to str. Default is "[...]".

Value

(character()).

Examples

```
str_trunc("This is a quite long string", 20)
```

topo_sort

Topological Sorting of Dependency Graphs

Description

Topologically sort a graph, where we are passed node labels and a list of direct parents for each node, as labels, too. A node can be 'processed' if all its parents have been 'processed', and hence occur at previous indices in the resulting sorting. Returns a table, in topological row order for IDs, and an entry depth, which encodes the topological layer, starting at 0. So nodes with `depth == 0` are the ones with no dependencies, and the one with maximal depth are the ones on which nothing else depends on.

Usage

```
topo_sort(nodes)
```

Arguments

nodes `(data.table::data.table())`
 Has 2 columns:

- id of type character, contains all node labels.
- parents of type list of character, contains all direct parents label of id.

Value

`(data.table::data.table())` with columns id, depth, sorted topologically for IDs.

Examples

```
nodes = rowwise_table(
  ~id, ~parents,
  "a", "b",
  "b", "c",
  "c", character()
)
topo_sort(nodes)
```

to_decimal

Convert a Vector of Bits to a Decimal Number

Description

Converts a logical vector from binary to decimal. The bit vector may have any length, the last position is the least significant, i.e. bits are multiplied with $2^{(n-1)}$, $2^{(n-2)}$, ..., 2^1 , 2^0 where n is the length of the bit vector.

Usage

```
to_decimal(bits)
```

Arguments

`bits` (logical())
Logical vector of input values. Missing values are treated as being FALSE. If `bits` is longer than 30 elements, an exception is raised.

Value

```
(integer(1)).
```

<code>transpose_list</code>	<i>Transpose lists of lists</i>
-----------------------------	---------------------------------

Description

Transposes a list of list, and turns it inside out, similar to the function `transpose()` in package **purrr**.

Usage

```
transpose_list(.l)
```

Arguments

`.l` (list() of list()).

Value

```
list().
```

Examples

```
x = list(list(a = 2, b = 3), list(a = 5, b = 10))
str(x)
str(transpose_list(x))

# list of data frame rows:
transpose_list(iris[1:2, ])
```

unnest	<i>Unnest List Columns</i>
--------	----------------------------

Description

Transforms list columns to separate columns, possibly by reference. The original columns are removed from the returned table. All non-atomic objects in the list columns are expand to new list column.

Usage

```
unnest(x, cols, prefix = NULL)
```

Arguments

x	(data.table::data.table()) data.table::data.table() with columns to unnest.
cols	(character()) Column names of list columns to operate on.
prefix	(logical(1) character(1)) String to prefix the new column names with. Use "{col}" (without the quotes) as placeholder for the original column name.

Value

([data.table::data.table\(\)](#)).

Examples

```
x = data.table::data.table(
  id = 1:2,
  value = list(list(a = 1, b = 2), list(a = 2, b = 2))
)
print(x)
unnest(data.table::copy(x), "value")
unnest(data.table::copy(x), "value", prefix = "{col}.")
```

which_min	<i>Index of the Minimum/Maximum Value, with Correction for Ties</i>
-----------	---

Description

Works similar to [base::which.min\(\)/base::which.max\(\)](#), but corrects for ties. Missing values are treated as Inf for which_min and as -Inf for which_max().

Usage

```
which_min(x, ties_method = "random", na_rm = FALSE)
```

```
which_max(x, ties_method = "random", na_rm = FALSE)
```

Arguments

x	(numeric()) Numeric vector.
ties_method	(character(1)) Handling of ties. One of "first", "last" or "random" (default) to return the first index, the last index, or a random index of the minimum/maximum values.
na_rm	(logical(1)) Remove NAs before computation?

Value

(integer()): Index of the minimum/maximum value. Returns an empty integer vector for empty input vectors and vectors with no non-missing values (if na_rm is TRUE). Returns NA if na_rm is FALSE and at least one NA is found in x.

Examples

```
x = c(2, 3, 1, 3, 5, 1, 1)
which_min(x, ties_method = "first")
which_min(x, ties_method = "last")
which_min(x, ties_method = "random")

which_max(x)
which_max(integer(0))
which_max(NA)
which_max(c(NA, 1))
```

with_package

Execute code with a modified search path

Description

Attaches a package to the search path (if not already attached), executes code and eventually removes the package from the search path again, restoring the previous state.

Note that this function is deprecated in favor of the (now fixed) version in **withr**.

Usage

```
with_package(package, code, ...)
```

Arguments

package	(character(1)) Name of the package to attach.
code	(expression) Code to run.
...	(any) Additional arguments passed to <code>library()</code> .

Value

Result of the evaluation of code.

See Also

withr package.

%nin%	<i>Negated in-operator</i>
-------	----------------------------

Description

This operator is equivalent to `!(x %in% y)`.

Usage

`x %nin% y`

Arguments

x	(vector()) Values that should not be in y.
y	(vector()) Values to match against.

Index

- * **Dictionary**
 - Dictionary, [15](#)
- * **Internal**
 - rd_info, [38](#)
- [%nin%](#), [52](#)

- [as_factor](#), [4](#)
- [as_short_string](#), [5](#)
- [assert_ro_binding](#), [4](#)

- [base::cat\(\)](#), [36](#), [37](#)
- [base::cbind\(\)](#), [9](#), [37](#)
- [base::match\(\)](#), [32](#)
- [base::message\(\)](#), [36](#)
- [base::names\(\)](#), [35](#)
- [base::print\(\)](#), [5](#)
- [base::rbind\(\)](#), [9](#)
- [base::rep_len\(\)](#), [32](#)
- [base::requireNamespace\(\)](#), [41](#)
- [base::RNGkind\(\)](#), [26](#)
- [base::sample.int\(\)](#), [45](#)
- [base::seq_along\(\)](#), [42](#)
- [base::seq_len\(\)](#), [42](#)
- [base::split\(\)](#), [8](#)
- [base::sprintf\(\)](#), [5](#), [37](#)
- [base::stop\(\)](#), [36](#)
- [base::strwrap\(\)](#), [37](#)
- [base::warning\(\)](#), [36](#)
- [base::which.max\(\)](#), [50](#)
- [base::which.min\(\)](#), [50](#)
- [bibentry\(\)](#), [24](#)

- [calculate_hash](#), [6](#)
- [callr::r\(\)](#), [21](#)
- [capitalize](#), [6](#)
- [catf \(printf\)](#), [36](#)
- [check_packages_installed](#), [7](#)
- [chunk \(chunk_vector\)](#), [8](#)
- [chunk_vector](#), [8](#)
- [cite_bib \(format_bib\)](#), [24](#)

- [compat-map](#), [9](#)
- [compose](#), [11](#)
- [compute_mode](#), [12](#)
- [count_missing](#), [13](#)
- [crate](#), [13](#)
- [cross_join](#), [14](#)

- [data.table\(\)](#), [14](#)
- [data.table::CJ\(\)](#), [14](#)
- [data.table::data.table\(\)](#), [6](#), [9](#), [15](#), [22](#), [23](#), [28](#), [37](#), [42](#), [48](#), [50](#)
- [data.table::rbindlist\(\)](#), [11](#)
- [data.table::setkeyv\(\)](#), [42](#)
- [data.tables](#), [37](#)
- [deframe \(enframe\)](#), [22](#)
- [detect \(compat-map\)](#), [9](#)
- [Dictionary](#), [15](#), [15](#), [18](#)
- [dictionary_sugar](#)
 - [\(dictionary_sugar_get\)](#), [18](#)
- [dictionary_sugar_get](#), [18](#)
- [dictionary_sugar_mget](#)
 - [\(dictionary_sugar_get\)](#), [18](#)
- [did_you_mean](#), [19](#)
- [digest::digest\(\)](#), [6](#)
- [discard \(compat-map\)](#), [9](#)
- [distinct_values](#), [20](#)
- [do.call\(\)](#), [29](#)

- [encapsulate](#), [21](#)
- [enframe](#), [22](#)
- [every \(compat-map\)](#), [9](#)
- [extract_vars](#), [23](#)

- [factor\(\)](#), [4](#), [20](#)
- [find.package\(\)](#), [7](#)
- [format_bib](#), [24](#)
- [formula\(\)](#), [23](#)
- [formulate](#), [25](#)
- [function\(\)](#), [6](#)

- [get_private](#), [25](#)

- get_seed, 26
- has_element, 26
- ids, 27
- imap (compat-map), 9
- imap_chr (compat-map), 9
- imap_dbl (compat-map), 9
- imap_dtc (compat-map), 9
- imap_dtr (compat-map), 9
- imap_int (compat-map), 9
- imap_lgl (compat-map), 9
- insert_named, 28
- invoke, 29
- is_scalar_na, 30
- iwalk (compat-map), 9
- keep (compat-map), 9
- keep_in_bounds, 30
- leanify_package (leanify_r6), 31
- leanify_package(), 31
- leanify_r6, 31
- library(), 52
- load_dataset, 32
- logical(), 20
- map (compat-map), 9
- map_at (compat-map), 9
- map_bc (compat-map), 9
- map_br (compat-map), 9
- map_chr (compat-map), 9
- map_dbl (compat-map), 9
- map_dtc (compat-map), 9
- map_dtr (compat-map), 9
- map_if (compat-map), 9
- map_int (compat-map), 9
- map_lgl (compat-map), 9
- map_values, 32
- messagef (printf), 36
- mlr3misc (mlr3misc-package), 3
- mlr3misc-package, 3
- modify_at (modify_if), 33
- modify_if, 33
- named_list, 34
- named_vector, 34
- names2, 35
- open_help, 36
- ordered(), 20
- paradox::ParamSet, 18
- pmap (compat-map), 9
- pmap_chr (compat-map), 9
- pmap_dbl (compat-map), 9
- pmap_dtc (compat-map), 9
- pmap_dtr (compat-map), 9
- pmap_int (compat-map), 9
- pmap_lgl (compat-map), 9
- printf, 36
- proc.time(), 22
- pwalk (compat-map), 9
- R6::R6, 15, 31
- R6::R6Class, 4, 25, 31
- R6::R6Class(), 19
- rcbind, 37
- rd_format_packages (rd_info), 38
- rd_format_range (rd_info), 38
- rd_format_string (rd_info), 38
- rd_info, 38
- recycle_vectors, 39
- register_namespace_callback, 39
- remove_named (insert_named), 28
- reorder_vector, 40
- rep(), 39
- require_namespaces, 41
- rowwise_table, 42
- seq_along0 (sequence_helpers), 42
- seq_col (sequence_helpers), 42
- seq_len0 (sequence_helpers), 42
- seq_row (sequence_helpers), 42
- sequence_helpers, 42
- set_class, 43
- set_col_names (set_names), 44
- set_names, 44
- setTimelimit(), 21, 29
- shuffle, 45
- some (compat-map), 9
- stats::formula(), 25
- stopf (printf), 36
- str_collapse, 45
- str_collapse(), 46
- str_indent, 46
- str_trunc, 47
- strwrap(), 46
- to_decimal, 48

topo_sort, [48](#)
toRd(), [24](#)
traceback(), [21](#)
transpose_list, [49](#)

unnest, [50](#)
utils::adist(), [19](#)
utils::head(), [46](#)

vector(), [13](#)

walk (compat-map), [9](#)
warningf (printf), [36](#)
which_max (which_min), [50](#)
which_min, [50](#)
with_package, [51](#)