Package 'atable'

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Type Package

Title Create Tables for Reporting Clinical Trials

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Description Create Tables for Reporting Clinical Trials.
Calculates descriptive statistics and hypothesis tests,
arranges the results in a table ready for reporting with LaTeX, HTML or Word.

License GPL-3

Depends R (>= 3.5)

Encoding UTF-8

LazyData true

RoxygenNote 7.1.1

VignetteBuilder knitr

Imports stats (>= 3.4), doBy (>= 4.6), plyr (>= 1.8.4), reshape2 (>=
1.4.3), Hmisc (>= 4.1), settings (>= 0.2.4), DescTools (>=
0.99.24), effsize (>= 0.7.1)

Suggests testthat, knitr, officer, flextable, survival, rmarkdown

URL <https://github.com/arminstroebel/atable>

BugReports <https://github.com/arminstroebel/atable/issues>

NeedsCompilation no

Repository CRAN

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R topics documented:

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add_observation_column

Adds a column to a data.frame

Description

The new column has name `atable_options('colname_for_observations')` and class `'count_me'`.

Usage

```
add_observation_column(DD)
```

Arguments

DD   A data.frame.

Details

Throws an error if a column of that name is already present in `DD`.

Value

As DD now with one more column.

---

atable   *Create Tables for Reporting of Clinical Trials*

Description

Applies descriptive statistics and hypothesis tests to data, and arranges the results for printing.

Usage

```
atable(x, ...)

## S3 method for class 'data.frame'
atable(
  x,
  target_cols,
  group_col = NULL,
  split_cols = NULL,
  format_to = atable_options("format_to"),
  drop_levels = TRUE,
  add_levels_for_NA = FALSE,
  blocks = NULL,
  ...
)

## S3 method for class 'formula'
atable(formula, data, ...)
```

Arguments

x
: An object. If x is a data.frame, it must have unique and syntactically valid colnames, see [is_syntactically_valid_name]. If x is a formula, then its format must be target_cols ~ group_col | split_cols. See other arguments for more details.

...
: Passed from and to other methods. You can use the ellipsis ... to modify atable: For example the default-statistics for numeric variables are mean and sd. To change these statistics pass a function to argument statistics.numeric, that calculates the statistics you prefer for your data.

  See examples below how to modify atable by ... .

  Actually statistics.numeric is passed to [statistics] and thus documented there, but for convenience it also documented here.

  Here is a list of the statistics and hypothesis tests that can be modfied by ... :

  - statistics.numeric: Either NULL or a function. Default is NULL. If a function, then it will replace atable:::statistics.numeric when atable is called. The function must mimic [statistics]: see the help there.
  - statistics.factor: Analog to argument statistics.numeric.
  - statistics.ordered: Analog to argument statistics.numeric.

- two_sample_htest.numeric: Either NULL or a function. Default is NULL.
  If a function, then it will replace atable:::two_sample_htest.numeric
  when atable is called. The function must mimic two_sample_htest: see
  the help there.
- two_sample_htest.factor: Analog to argument two_sample_htest.numeric
- two_sample_htest.ordered: Analog to argument two_sample_htest.numeric
- multi_sample_htest.numeric: Either NULL or a function. Default is
  NULL. If a function, then it will replace atable:::multi_sample_htest.numeric
  when atable is called. The function must mimic multi_sample_htest: see
  the help there.
- multi_sample_htest.factor: Analog to argument multi_sample_htest.numeric
- multi_sample_htest.ordered: Analog to argument multi_sample_htest.numeric
- format_statistics.statistics_numeric: Either NULL or a function.
  Default is NULL. If a function, then it will replace atable:::format_statistics.statistics_numeric
  The function must mimic format_statistics: see the help there.
- format_statistics.statistics_factor: Analog to argument format_statistics.statistics_numeric
- format_tests.htest: Either NULL or a function. Default is NULL. If a
  function, then it will replace format_tests.htest. The function must
  mimic format_tests: see the help there.
- format_tests.htest_with_effect_size: Analog to argument format_tests.htest

target_cols   A character vector containing some column names of x.

Descriptive statistics and hypothesis test are applied to these columns depending on their class. The descriptive statistics are defined by statistics; their representation and format by format_statistics.

Hypothesis test are defined by two_sample_htest or multi_sample_htest (depending on the number of levels of group_col); their representation and format by format_tests. Note that atable always adds one name to target_cols to count the number of obsservations. This name is stored in atable_options('colname_for_observations').

group_col   A character of length 1 containing a column of x or NULL. This column defines the groups that are compared by the hypothesis tests. as.factor is applied to this column before further processing. Default is NULL, meaning that no hypothesis tests are applied.

split_cols   A character vector containing some of colnames(x) or NULL. x is splitted by these columns before descriptive statistics and hypothesis test are applied. as.factor is applied to this column before further processing. Default is NULL, meaning that no splitting is done.

format_to   A character vector of length 1. Specifies the format of the output of atable. Possible values are 'Latex', 'Word', 'Raw', 'HTML', 'Console', 'markdown', 'md'. Default is defined in atable_options.

drop_levels   A logical. If TRUE then droplevels is called on group_col and split_cols beforefurther processsing. Default is TRUE.

add_levels_for_NA

                If TRUE then addNA is called on group_col and split_cols before further processsing. Default is FALSE.

blocks   NULL or a list. If blocks is a list, then the names of the list must be non-NA
                characters. The elements of the list must be some of target_cols, retaining the
                order of target_cols. Also in this case split_cols must be NULL as simulta-
                neous blocking and splitting is not supported. Default is NULL, meaning that no
                blocking is done. Variables of a block are additionally indented. Blocking has
                no effect on the statistics, it only affects the indentation of the resulting table.
                See Examples.

formula   A formula of the form target_cols ~ group_col | split_cols. The | sepa-
                rates the group_col from the split_cols. Read the | as 'given' as in a condi-
                tional probability P(target_cols | split_cols). target_cols and split_cols
                may contain multiple names separated by +. group_col must be a single name
                if given. group_col and split_cols may be omitted and can be replaced by 1
                in this case. The | may also be omitted if no split_cols are given.

data   Passed to atable(x = data, ...).

Value

Results depend on format_to:

- 'Raw': A list with two elemtents called 'statistics_result' and 'tests_result', that
  contain all results of the descriptve statistics and the hypothesis tests. This format useful,
  when extracting a specific result unformated (when format_to is not 'Raw' all numbers are
  also returned, but as rounded characters for printing and squeezed into a data.frame).

  - 'statistics_result': contains a data.frame with colnames c(split_cols, group_col, target_cols.
    split_cols and group_col retain their original values (now as factor). target_cols
    contain lists with the results of function statistics. As the result of function statistics
    is also a list, target_cols contain lists of lists.
  - 'tests_result': has the same structure as 'statistics_result', but contains the
    results of two_sample_htest and multi_sample_htest. Note that tests_result only
    exists if split_cols is not NULL.

- 'Word': A data.frame. Column atable_options('colname_for_group') contains all com-
  binations of the levels of split_cols and the names of the results of function format_statistics.

  Further columns are the levels of group_col the names of the results of format_tests.

  The levels of split_cols and the statistics are arranged vertically. The hypothesis test are
  arranged horizontally.

- 'HTML': Same as for format_to = 'Word' but a different character indents the first column.
  #'

- 'Console': Meant for printing in the R console for interactive analysis. Same as for format_to
  = 'Word' but a different character indents the first column.

- 'Latex': Same as for format_to = 'Word' but a different character indents the first column
  and with translate_to_LaTeX applied afterwards.

Methods (by class)

- data.frame: applies descriptive statistics and hypothesis tests, arranges the results for print-
  ing.

- formula: parses the formula and passes its parts to atable.

Examples

```
# See vignette for more examples:
# utils::vignette('atable_usage', package = 'atable')

# Analyse datasets::ToothGrowth:
# Length of tooth for each dose level and delivery method:
atable::atable(datasets::ToothGrowth,
  target_cols = 'len',
  group_col = 'supp',
  split_cols = 'dose',
  format_to = 'Word')
# Print in .docx with e.g. flextable::regulartable and officer::body_add_table

# Analyse datasets::ChickWeight:
# Weight of chickens for each time point and diet:
atable(weight ~ Diet | Time, datasets::ChickWeight, format_to = 'Latex')
# Print as .pdf with e.g. Hmisc::latex

# Analyse atable::test_data:
atable(Numeric + Logical + Factor + Ordered ~ Group | Split1 + Split2,
  atable::test_data, format_to = 'HTML')
# Print as .html with e.g. knitr::kable and options(knitr.kable.NA = '')

# Modify atable: calculate median and MAD for numeric variables
new_stats  <- function(x, ...){list(Median = median(x, na.rm = TRUE),
                                     MAD = mad(x, na.rm = TRUE))}
atable(atable::test_data,
       target_cols = c('Numeric', 'Numeric2'),
       statistics.numeric = new_stats,
       format_to = 'Console')
# Print in Console with format_to = 'Console'.

# Analyse mtcars and add labels and units of via package Hmisc
mtcars <- within(datasets::mtcars, {gear <- factor(gear)})
# Add labels and units.
attr(mtcars$mpg, 'alias') = 'Consumption [Miles (US)/ gallon]'
Hmisc::label(mtcars$qsec) = 'Quarter Mile Time'
units(mtcars$qsec) = 's'

# apply atable
atable::atable(mpg + hp + gear + qsec ~ cyl | vs,
               mtcars,
               format_to = 'Console')

# Blocks
# In datasets::mtcars the variables cyl, disp and mpg are related to the engine and am and gear are
# related to the gearbox. So grouping them together is desireable.
atable::atable(datasets::mtcars,
               target_cols = c("cyl", "disp", "hp", "am", "gear", "qsec") ,
               blocks = list("Engine" = c("cyl", "disp", "hp"),
                             "Gearbox" = c("am", "gear")),
               format_to = "Console")
```

```
# Note that Variable qsec is not blocked and thus not indented.
```

---

atable_options *Set or get options*

Description

Set or get options for the atable-package via the [settings](#) package.

Usage

```
atable_options(...)
```

Arguments

...   Option names to retrieve option values or [key]=[value] pairs to set options.

Details

These options control some aspects of the atable package.

For restoring the default values see [atable_options_reset](#).

Supported options

The following options are supported:

- replace_NA_by: A character with length 1, or NULL. Default is 'missing'. Used in function [replace_NA](#). This character will show up in the results of [atable](#), so it can be modified.
- colname_for_variable: A character with length 1. Default is 'variable___'. Used in function add_name_to_tests and add_name_to_statistics. This character will not show up in the results and is only used internally for intermediate data.frames. There may be name clashes with user-supplied data.frames; so modification may be necessary.
- colname_for_observations: A character with length 1. Default is 'Observations'. Used in function add_observation_column. This character will show up in the results of [atable](#), so it can be modified. There may be name clashes with user-supplied data.frames; so modification may be necessary.
- colname_for_blocks: A character with length 1. Default is 'block_name___'. Used in function indent_data_frame_with_blocks. This character will not show up in the results and is only used internally for intermediate data.frames. There may be name clashes with user-supplied data.frames; so modification may be necessary.
- labels_TRUE_FALSE: A character of length 2. Default is c('yes','no'). Currently used in function statistics.logical (see [statistics](#)) to cast logical to factor. TRUE is mapped to labels_TRUE_FALSE[1] and FALSE to labels_TRUE_FALSE[2]. This characters may show up in the results of [atable](#), so it can be modified.
- labels_Mean_SD: A character length 1. Default is 'Mean (SD)'. Currently used in function [format_statistics](#) as a name for the mean and standard deviation of numeric variables. This character may show up in the results of [atable](#), so it can be modified.

- labels_valid_missing: A character length 1. Default is 'valid (missing)'. Currently used in function format_statistics as a name for the number of valid and missing values of numeric variables. This character may show up in the results of atable, so it can be modified.

- format_to: A character length 1. Default is 'Latex'. Currently used in function atable.

- colname_for_group: A character of length 1. Default is 'Group'. This character will show up in the results of atable. This column will contain all values of DD[split_cols] and DD[target_cols].

- colname_for_value: A character of length 1. Default is 'value'. This character shows up in the results of atable when group_col is NULL. The column will contain the results of the statistics.

- statistics.numeric: Either NULL or a function. Default is NULL. If a function, then it will replace atable:::statistics.numeric when atable is called. The function must mimic statistics: see the help there.

- statistics.factor: Analog to argument statistics.numeric.

- statistics.ordered: Analog to argument statistics.numeric.

- two_sample_htest.numeric: Either NULL or a function. Default is NULL. If a function, then it will replace atable:::two_sample_htest.numeric when atable is called. The function must mimic two_sample_htest: see the help there.

- two_sample_htest.factor: Analog to argument two_sample_htest.numeric

- two_sample_htest.ordered: Analog to argument two_sample_htest.numeric

- multi_sample_htest.numeric: Either NULL or a function. Default is NULL. If a function, then it will replace atable:::multi_sample_htest.numeric when atable is called. The function must mimic multi_sample_htest: see the help there.

- multi_sample_htest.factor: Analog to argument multi_sample_htest.numeric

- multi_sample_htest.ordered: Analog to argument multi_sample_htest.numeric

- format_statistics.statistics_numeric: Either NULL or a function. Default is NULL. If a function, then it will replace atable:::format_statistics.statistics_numeric. The function must mimic format_statistics: see the help there.

- format_statistics.statistics_factor: Analog to argument format_statistics.statistics_numeric

- format_tests.htest: Either NULL or a function. Default is NULL. If a function, then it will replace format_tests.htest. The function must mimic format_tests: arguments are x and the ellipsis ... . Result is a data.frame with 1 rows and unique colnames.

- format_tests.htest_with_effect_size: Analog to argument format_tests.htest

- format_p_values: A function with one argument returning a character with same length as the argument. This functions is called by format_tests to produce printable p-values.

- format_percent: A function with one argument returning a character with same length as the argument. This functions is called by format_statistics for factors to produce printable percentages.

- format_numbers: A function with one argument returning a character with same length as the argument. This functions is called by format_statistics and format_tests for number, that are not p-values or percentages.

- digits: 2. How many digits a number should have in the table. Used by format_percent and format_percent and passed to [format](#).

- get_alias.default: A function with one argument x and ... returning a character or NULL. This functions is called by get_alias and create_alias_mapping to retrieve alternative Variable names to print in the table.

- get_alias.labelled: A function with one argument x and ..., that must return a character. This functions is called by get_alias on the columns that have class labelled.

- modifiy_colnames_without_alias: A function with one argument x and ... returning a character. This functions is called by create_alias_mapping on the columns that have is.NULL(get_alias(x)).

Examples

```
atable_options() # show all options
atable_options('replace_NA_by' = 'no value') # set a new value
atable_options('replace_NA_by') # return the new value
```

---

atable_options_reset   *Reset atable_options to default*

Description

Does as the name implies. See also [atable_options](#).

Usage

```
atable_options_reset()
```

Examples

```
atable_options('replace_NA_by') # show options
atable_options('replace_NA_by' = 'foo bar') # set a new value
atable_options('replace_NA_by') # show options
atable_options_reset() # restore all defaults
atable_options('replace_NA_by') # as before
```

---

atable_package   *atable: Create Tables for Reporting Clinical Trials*

Description

The packages provides functions for descriptive statistics and hypothesis tests, and arranging the results for printing.

Details

The main function is [atable](#). See documentation there.

---

check_format_statistics
                    Checks the output of function format_statistics

---

Description

Checks the output of function [format_statistics](#).

Usage

```
check_format_statistics(x)
```

Arguments

x   Result of function format_statistics.

Value

TRUE if x has the following properties: x is a non-empty data.frame with 2 columns called 'tag' and 'value'. Column 'tag' has class factor and no duplicates. Column 'value' is a character. Else throws an error.

---

check_format_tests   *Checks the output of functions format_test*

Description

Checks the output of function `format_tests`.

Usage

```
check_format_tests(x)
```

Arguments

x   Result of function `format_tests`.

Value

TRUE if x has the following properties: x is a data.frame with exactly one row and with unique colnames. Else throws an error.

---

check_statistics   *Checks the output of function statistics*

Description

Checks the output of function `statistics`.

Usage

```
check_statistics(x)
```

Arguments

x   Result of function `statistics`.

Value

TRUE if x has the following properties: x is a named list with length > 0. The names of the list must not have duplicates. The names may contain NA. Else an error.

---

check_tests   *Checks   the   output   of   functions   two_sample_htest   and*
                               multi_sample_htest

Description

Checks the output of function `two_sample_htest` and `multi_sample_htest`.

Usage

```
check_tests(x)
```

Arguments

x   Result of function `two_sample_htest` or `multi_sample_htest`.

Value

TRUE if `x` has the following properties: `x` is a named list with length > 0. The names of the list must
not have duplicates. The names may contain NA. Else an error.

Most hypothesis-test-functions in R like `t.test` or `chisq.test` return an object of class htest. This
object passes this checks. Additional fields can be added to these objects and they will still pass this
check.

---

create_alias_mapping   *Get Aliases of column names*

Description

Column names of data.frame in atable must have syntactically valid colnames, see `is_syntactically_valid_name`.
So no blanks or special characters allowed. But Reporting in human readable language needs spe-
cial characters. These functions here allow atable to handle arbitrary character for pretty printing.

Usage

```
create_alias_mapping(DD, ...)
```

Arguments

DD   A data.frame

...   Passed from and to other methods.

Details

We use [attributes](#) here, to assign alternative names to columns. Also class `labelled` created by Hmisc's [label](#) is supported.

See `create_alias_mapping` for the function that does the actual work.

If no aliases are found, then underscores in the column names of DD will be replaced by blanks. See Examples in `?atable`.

Value

`create_alias_mapping` returns a data.frame with two columns `old` and `new` and as many rows as DD has columns. Column `old` contains the original column names of DD and column `new` their aliases.

`format_statistics`	*Format statistics*

Description

The results of function `statistics` must be formated before printing. `format_statistics` does this.

Usage

```
format_statistics(x, ...)

## S3 method for class 'statistics_numeric'
format_statistics(x, format_statistics.statistics_numeric = NULL, ...)

## S3 method for class 'statistics_factor'
format_statistics(x, format_statistics.statistics_factor = NULL, ...)

## S3 method for class 'statistics_count_me'
format_statistics(x, ...)

## Default S3 method:
format_statistics(x, ...)
```

Arguments

x	An object.
...	Passed from and to other methods.
format_statistics.statistics_numeric	
	Either NULL or a function. Default is NULL. If a function, then it will replace `atable:::format_statistics.statistics_numeric`. The function must mimic [format_statistics](#): arguments are x and the ellipsis ... . Result is a non-empty data.frame with 2 columns called `'tag'` and `'value'`.
format_statistics.statistics_factor	
	Analog to argument format_statistics.statistics_numeric

Details

This function defines which statistics are printed in the final table and how they are formated.

The format depends on the class x. See section methods.

If you are not pleased with the current format you may alter these functions. But you must keep the original output-format, see section Value. Function `check_format_statistics` checks if the output of statistics is suitable for further processing.

Value

A non-empty data.frame with 2 columns called `'tag'` and `'value'`. Column `'tag'` has class factor and no duplicates. Column `'value'` is a character. See also function `check_format_statistics`.

Methods (by class)

- `statistics_numeric`: Defines how to format class `statistics_numeric`. Returns a data.frame with 2 rows. Column `'tag'` contains `'Mean_SD'` and `'valid_missing'`. Column `'value'` contains two values: first value is the rounded mean and standard deviation, pasted them together. The standard deviation is bracketed. Second value is the number of non-missing and missing values pasted together. The number of missing values is bracketed.

- `statistics_factor`: Defines how to format class `statistics_factor`. Returns a data.frame. Column `'tag'` contains all names of x. Column `'value'` contains the percentages and the total number of values in brackets.

- `statistics_count_me`: Defines how to format class `statistics_count_me`. Returns a data.frame. Column `'tag'` contains the empty character `''`. The empty character is choosen because `colname_for_observations` already appears in the final table. Column `'value'` contains the number of observations. See also `'colname_for_observations'` in `atable_options`.

- `default`: Returns a data.frame. Column `'tag'` contains all names of x. Column `'value'` contains all elements of x, rounded by `format`.

---

format_tests   *Formats hypothesis test results*

Description

The results of function `two_sample_htest` and `multi_sample_htest` must be formated before printing. `format_tests` does this.

Usage

```
format_tests(x, ...)

## S3 method for class 'htest'
format_tests(x, format_tests.htest = NULL, ...)

## S3 method for class 'htest_with_effect_size'
```

```
format_tests(x, format_tests.htest_with_effect_size = NULL, ...)

## Default S3 method:
format_tests(x, ...)
```

Arguments

x   An object.

...   Passed from and to other methods.

format_tests.htest

Either NULL or a function. Default is NULL. If a function, then it will replace
`format_tests.htest`. The function must mimic [format_tests](): arguments
are x and the ellipsis ... . Result is a data.frame with 1 rows and unique colnames.

format_tests.htest_with_effect_size

Analog to argument format_tests.htest

Details

This function defines which test results are printed in the final table and how they are formated.

The format depends on the class x. See section methods.

If you are not pleased with the current format you may alter these functions. But you must keep the
original output-format, see section Value. Function [check_format_tests]() checks if the output of
`format_tests` is suitable for further processing.

Value

A non-empty data.frame with one row. See also function [check_format_tests]().

Methods (by class)

- `htest`: Defines how to format class htest. Returns a data.frame with 1 rows. Column p
  contains the p-value of the x.

- `htest_with_effect_size`: Defines how to format class htest_with_effect_size. Returns
  a data.frame with 1 rows. Column p contains the p-value of the x. Column stat contains the
  teststatistic. Column Effect Size (CI) contains a effect size and its 95% Confidence interval.

- `default`: Tries to cast to data.frame with one row. Uses the names of the list as colnames.

---

get_alias   *Get Aliases of column names*

Description

Retrieves attributes label and units of class labelled and attribute alias otherwise.

Usage

```
get_alias(x, ...)

## S3 method for class 'labelled'
get_alias(x, ...)

## Default S3 method:
get_alias(x, ...)

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

## S3 method for class 'list'
get_alias(x, ...)
```

Arguments

x   An object. Aliases will be retrieved of x.

...   Passed from and to other methods.

Details

We use [attributes](#) here, to assign alternative names to columns. Also class labelled created by
Hmisc's [label](#) is supported.

This is a workhorse function, see create_alias_mapping for the high level function

Value

For atomic vectors a character of NULL; for non-atomic vectors the results of get_alias applied to
its elements.

Methods (by class)

- labelled: Retrieve attributes label and units, if available. Units are bracketed by '[]'. See
  also [label](#) and [units](#). The user may alter this method via [atable_options](#), see help there.

- default: Retrieve attribute alias via [attr](#). This attribute may be an arbitrary character. If
  there is no attribute alias, then get_alias.default returns NULL.

- data.frame: Calls get_alias on every column.

- list: Calls get_alias on every element of the list.

---

indent_data_frame   *Indents data.frames*

Description

Indents data.frames for printing them as tables.

Usage

```
indent_data_frame(
  DD,
  keys,
  values = setdiff(colnames(DD), keys),
  character_empty = "",
  numeric_empty = NA,
  indent_character = "\\quad",
  colname_indent = "Group"
)
```

Arguments

DD	A data.frame. Should be sorted by `keys` with `keys[1]` varying slowest and `keys[length(keys)]` varying fastest.
keys	A character. Subset of `colnames(DD)` with `length(keys)>=2`. The combination of keys must be unique. `DD[keys]` must be class character or factor.
values	A character. Subset of colnames(DD). DD[keys] must be class character, factor or numeric.
character_empty	
	A character. Default ". This character will be put in the new lines in class character columns.
numeric_empty	A numeric. Default NA. This character will be put in the new lines in class numeric columns.
indent_character	
	A character. character for one indent. Default is '\quad' (meant for latex). Can also be ' ' for Word.
colname_indent	A character. Default 'Group'. Name of the new column with the indented keys.

Details

Squeeze multiple key-columns into one column and indents the values accordingly. Adds new lines with the indented keys to the data.frame. Meant for wide tables that need to be narrower and more 'readable' Meant for plotting with e.g. xtable::xtable or Hmisc::latex or officer::body_add_table. Look at the examples for a more precise description. Meant for left-aligned columns. Thats why the `indent_character` is inserted to the left of the original values.

Value

A data.frame. Columns: c(colname_indent,values). Column colname_indent contains all combination of DD[keys], but now indented and squeezed in this column and casted to character. Columns 'values' contain all values of DD[values] unchanged. Number of rows is sum(cumprod(nlevels(DD[keys]))).

Examples

```
DD <- expand.grid(Arm = paste0('Arm ', c(1,2,4)),
                  Gender = c('Male', 'Female'),
                  Haircolor = c('Red', 'Green', 'Blue'),
                  Income = c('Low', 'Med', 'High'), stringsAsFactors = TRUE)

DD <- doBy::orderBy(~ Arm + Gender + Haircolor + Income, DD)

DD$values1 <- runif(dim(DD)[1])
DD$values2 <- 1
DD$values3 <- sample(letters[1:4], size = nrow(DD), replace = TRUE)

keys = c('Arm', 'Gender', 'Haircolor', 'Income')
values = c('values1', 'values2', 'values3')
## Not run:
DDD <- indent_data_frame(DD, keys, indent_character = '   ')

# print both:

Hmisc::latex(DD,
      file = '',
      longtable = TRUE,
      caption = 'Original table',
      rowname = NULL)

Hmisc::latex(DDD,
      file = '',
      longtable = TRUE,
      caption = 'Indented table',
      rowname = NULL)

## End(Not run)
```

---

is_syntactically_valid_name

Checks if valid name

Description

Checks for valid names by make.names, i.e. x is valid iff make.names does nothing with x.

Usage

```
is_syntactically_valid_name(x)
```

Arguments

x   An object.

Value

A logical with length 1. TRUE when x is a character with length > 0 without duplicates and is valid.
Else FALSE and a warning what's wrong.

Examples

```
x <- c('asdf', NA,'.na', '<y', 'asdf', 'asdf.1')
is_syntactically_valid_name(x)
is_syntactically_valid_name(x[FALSE]) # FALSE because empty
is_syntactically_valid_name(NA) # FALSE because not character
is_syntactically_valid_name(as.character(NA)) # FALSE because NA
is_syntactically_valid_name('NA') # FALSE. make.names changes 'NA' to 'NA.'
is_syntactically_valid_name(letters) # TRUE
```

---

multi_sample_htest   *Calculates multi sample hypothesis tests*

Description

Calculates multi sample hypothesis tests depending on the class of its input.

Usage

```
multi_sample_htest(value, group, ...)

## S3 method for class 'logical'
multi_sample_htest(value, group, ...)

## S3 method for class 'factor'
multi_sample_htest(value, group, multi_sample_htest.factor = NULL, ...)

## S3 method for class 'character'
multi_sample_htest(value, group, ...)

## S3 method for class 'ordered'
multi_sample_htest(value, group, multi_sample_htest.ordered = NULL, ...)

## S3 method for class 'numeric'
multi_sample_htest(value, group, multi_sample_htest.numeric = NULL, ...)
```

Arguments

`value`	An atomic vector.
`group`	A factor, same length as `value`.
`...`	Passed to methods.

`multi_sample_htest.factor`

Analog to argument two_sample_htest.numeric

`multi_sample_htest.ordered`

Analog to argument two_sample_htest.numeric

`multi_sample_htest.numeric`

Either NULL or a function. Default is NULL. If a function, then it will replace `atable:::multi_sample_htest.numeric`. The function must mimic `multi_sample_htest.numeric`: arguments are `value`, `group` and the ellipsis ... . Result is a named list with `length > 0` with unique names.

Details

Calculates multi sample hypothesis tests depending on the class of its input.

Results are passed to function `format_tests` for the final table.

If you are not pleased with the current hypothesis tests you may alter these functions. But you must keep the original output-format, see section Value. Function `check_tests` checks if the output of statistics is suitable for further processing.

The function `multi_sample_htest` is essentially a wrapper to standardize the arguments of various hypothesis test functions.

Value

A named list with length > 0.

Most hypothesis-test-functions in R like `t.test` or `chisq.test` return an object of class 'htest'. 'htest'-objects are a suitable output for function two_sample_htest. Function `check_tests` checks if the output is suitable for further processing.

Methods (by class)

- `logical`: Casts to factor and then calls method `multi_sample_htest` again.

- `factor`: Calls `chisq.test`.

- `character`: Casts value to factor and then calls method `multi_sample_htest` again.

- `ordered`: Calls `kruskal.test`.

- `numeric`: Calls `multi_sample_htest`'s method on `ordered(value)`.

---

replace_consecutive *Replaces consecutive elements*

Description

If `x[i+1]=x[i]` then `x[i+1]` is replaced by by for `i=1,...length(x)-1`.

Usage

```
replace_consecutive(x, by = "", fun_for_identical = base::identical)
```

Arguments

x	A character or factor.
by	A character with length 1.
fun_for_identical	
	A function with two arguments called x and y.

Details

The = is defined by function identical by default. This function can be changed by argument fun_for_identical

Value

A character, same length as x, now with consecutives replaced by by. If `length(x) < 2`, x is returned unchanged.

Examples

```
x <- rep(c('a','b','c','d'), times=c(2,4,1,3))
x
## Not run: replace_consecutive(x)
# NA should not be identical. So change fun_for_identical
fun_for_identical <- function(x,y) !is.na(x) && !is.na(y) && identical(x,y)
x <- c(1,1,3,3,NA,NA, 4)
x
## Not run: replace_consecutive(x, by="99")
## Not run: replace_consecutive(x, by="99", fun_for_identical = fun_for_identical)
```

---

replace_NA   *Replaces NA*

Description

Replaces NA in characters, factors and data.frames.

Usage

```
replace_NA(x, ...)

## S3 method for class 'character'
replace_NA(x, replacement = atable_options("replace_NA_by"), ...)

## S3 method for class 'factor'
replace_NA(x, ...)

## S3 method for class 'ordered'
replace_NA(x, ...)

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

## S3 method for class 'list'
replace_NA(x, ...)

## Default S3 method:
replace_NA(x, ...)
```

Arguments

x	An object.
...	Passed to methods.
replacement	A character of length 1. Default value is defined in `atable_options('replace_NA_by')`, see `atable_options`.

Details

The atable package aims to create readable tables. For non-computer-affine readers NA has no meaning. So `replace_NA` exists.

Methods for character, factor, ordered, list and data.frame available. Default method returns x unchanged.

Gives a warning when `replacement` is already present in x and does the replacement.

Silently returns x unchanged when there are no NA in x.

Silently returns x unchanged when replacement is not a character of length 1 or when replacement is NA.

Value

Same class as x, now with NA replaced by `replacement`.

Methods (by class)

- `character`: replaces NA with `replacement`.
- `factor`: applies `replace_NA` to the levels of the factor. A factor with length > 0 without levels will get the level `replacement`.
- `ordered`: as factor.
- `data.frame`: applies `replace_NA` to all columns.
- `list`: applies `replace_NA` to all elements of the list.
- `default`: return x unchanged.

Examples

```
Character <- c(NA,letters[1:3], NA)
Factor <- factor(Character)
Ordered <- ordered(Factor)
Numeric <- rep(1, length(Factor))
Factor_without_NA <- factor(letters[1:length(Factor)])

DD <- data.frame(Character, Factor, Ordered,
                 Numeric, Factor_without_NA,
                 stringsAsFactors = FALSE)
## Not run:
DD2 <- replace_NA(DD, replacement = 'no value')

summary(DD)
summary(DD2) # now with 'no value' instead NA in column Character, Factor and Ordered

atable_options(replace_NA_by = 'not measured') # use atable_options to set replacement
DD3 <- replace_NA(DD)
summary(DD3) # now with 'not measured' instead NA

atable_options_reset() # set 'replace_NA_by' back to default

## End(Not run)
```

---

standardized_test_data

A data.frame with standardized random data of various classes

---

Description

A data.frame intended for testing the atable function with standardized random data and missing values in various classes.

Usage

```
standardized_test_data
```

Format

A data frame with 1080 rows and 7 variables:

Split1 A factor with 2 levels without NA. The two levels have the same frequency (540).

Split2 A factor with 2 levels with NA. The two levels and the NA have the same frequency (360).

Group A factor with 2 levels with NA. The two levels and the NA have the same frequency (360).

Logical A logical.

Factor A factor with 3 levels.

Ordered Class ordered with 4 levels.

Numeric Class numeric.

Details

For every subset defined by a triplet of the levels of Split1, Split2 and Group the variables have the following properties:

- 60 observations

- Logical has exactly the same number of TRUE and FALSE and NA (20).

- Factor has exactly the same number of levels taken and NA (15).

- Ordered has exactly the same number of levels taken and NA (12).

- Numeric is sampled from a normal distribution and then standardized to sd 1 and with 6 NA. Its mean is 12 when Group is 'Treatment' and 10 otherwise (up to 10^-17).

Examples

```
atable::atable(Logical+ Numeric + Factor + Ordered ~ Group | Split1 + Split2,
 atable::standardized_test_data, add_levels_for_NA = TRUE, format_to = 'Word')
```

---

statistics *Calculates descriptive statistics*

Description

Calculates descriptive statistics depending on the class of its input.

Usage

```
statistics(x, ...)

## S3 method for class 'numeric'
statistics(x, statistics.numeric = NULL, ...)

## S3 method for class 'factor'
statistics(x, statistics.factor = NULL, ...)

## S3 method for class 'logical'
statistics(x, labels_TRUE_FALSE = atable_options("labels_TRUE_FALSE"), ...)

## S3 method for class 'character'
statistics(x, ...)

## S3 method for class 'ordered'
statistics(x, statistics.ordered = NULL, ...)

## S3 method for class 'count_me'
statistics(x, ...)
```

Arguments

x   An object. Statistics will be calculated of x.

...   Passed from and to other methods.

statistics.numeric

Either NULL or a function. Default is NULL. If a function, then it will replace
atable:::statistics.numeric. The function must mimic [statistics](): ar-
guments are x and the ellipsis ... . Result is a named list with length > 0 with
unique names.

statistics.factor

Analog to argument statistics.numeric

labels_TRUE_FALSE

For relabeling logicals. See also [atable_options]().

statistics.ordered

Analog to argument statistics.numeric

Details

Calculates descriptive statistics depending on the class of its input.

Results are passed to function [format_statistics]().

If you are not pleased with the current descriptive statistics you may alter these functions. But you
must keep the original output-format, see section Value. Function [check_statistics]() checks if the
output of statistics is suitable for further processing.

Value

The results of `statistics` are passed to function `format_statistics`. So the results of `statistics` must have a class for which the generic `format_statistics` has a method.

`format_statistics` has a default method, which accepts lists. So the results of `statistics` can be a named list with length > 0. The names of the list must have no duplicates.

Function `check_statistics` checks if the output of statistics is suitable for further processing.

Methods (by class)

- `numeric`: Descriptive statistics are: length, number of missing values, mean and standard deviation. Class of the result is `'statistics_numeric'` and there is a method `format_statistics_to_Latex.statisti`. This function is meant for interval scaled variables.

- `factor`: Counts the numbers of occurrences of the levels of `x` with function `table`. This function is meant for nominal and ordinal scaled variables.

- `logical`: Casts `x` to factor, then applies `statistics` again. The labels for `TRUE` and `FALSE` can also be modfied by setting `atable_options('labels_TRUE_FALSE')`.

- `character`: Casts `x` to factor, then applies `statistics` again.

- `ordered`: Casts `x` to factor, then applies `statistics` again.

- `count_me`: Returns the `length` of `x`. For class `'count_me'` see `add_observation_column`.

---

test_data   *A data.frame with random data of various classes*

Description

A data.frame intended for testing the atable function with random data and missing values in various classes.

Usage

```
test_data
```

Format

A data frame with 129 rows and 11 variables:

Split1 A factor with 2 levels, drawn uniformly.

Split2 A factor with 3 levels, drawn uniformly.

Group A factor with 2 levels, drawn uniformly.

Group2 A factor with 3 levels, drawn uniformly.

Numeric A sample from the standard normal distribution.

Numeric2 A sample from the normal distribution with mean 4 and sd 3.

Logical A Logical, drawn uniformly from `TRUE`, `FALSE` and `NA`.

Factor A factor with 4 level drawn with weigths `1:1:2:2`.

Ordered Class Ordered with 3 levels, drawn uniformly.

Character Class character drawn uniformly from `c('a','b','')`.

Date Class Date, generated by adding `2001-05-25` to a sample of the Poisson distribution with lambda 42.

6 Missing values were randomly added to each of Numeric, Numeric2, Factor, Ordered, Character and Date.

---

translate_to_LaTeX   *A wrapper for latexTranslate*

Description

Translate_to_LaTeX calls latexTranslate.

Usage

```
translate_to_LaTeX(x, ...)

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

## S3 method for class 'list'
translate_to_LaTeX(x, ...)

## S3 method for class 'character'
translate_to_LaTeX(
  x,
  inn = NULL,
  out = NULL,
  pb = FALSE,
  greek = FALSE,
  na = "",
  ...
)

## S3 method for class 'numeric'
translate_to_LaTeX(x, ...)

## S3 method for class 'factor'
translate_to_LaTeX(x, ...)

## S3 method for class 'logical'
translate_to_LaTeX(x, ...)
```

Arguments

x   An object.

inn, out, pb, greek, na, ...

              As in latex.

Details

Result is suitable for print with latex.

Translate_to_LaTeX uses S3 object system. See seection methods.

Value

Same length as x, now translated to latex.

Methods (by class)

- data.frame: Applies latexTranslate to rownames(x), colnames(x) and all columns of x.
- list: Translates all elements of x.
- character: As latexTranslate.
- numeric: Casts to character and then translates.
- factor: Translates the levels of the factor.
- logical: Casts to character and then translates.

---

two_sample_htest   *Two sample hypothesis tests and effect size*

Description

Calculates two sample hypothesis tests and effect size depending on the class of its input.

Usage

```
two_sample_htest(value, group, ...)

## S3 method for class 'character'
two_sample_htest(value, group, ...)

## S3 method for class 'factor'
two_sample_htest(value, group, two_sample_htest.factor = NULL, ...)

## S3 method for class 'logical'
two_sample_htest(value, group, ...)

## S3 method for class 'numeric'
two_sample_htest(value, group, two_sample_htest.numeric = NULL, ...)
```

```
## S3 method for class 'ordered'
two_sample_htest(value, group, two_sample_htest.ordered = NULL, ...)
```

Arguments

value	An atomic vector. These values will be tested.
group	A factor with two levels and same length as value. Defines the two groups of value, that are compared by a two sample hypothesis tests.
...	Passed to methods.
two_sample_htest.factor	
	Analog to argument two_sample_htest.numeric
two_sample_htest.numeric	
	Either NULL or a function. Default is NULL. If a function, then it will replace atable:::two_sample_htest.numeric. The function must mimic two_sample_htest.numeric: arguments are value, group and the ellipsis ... . Result is a named list with length > 0 with unique names.
two_sample_htest.ordered	
	Analog to argument two_sample_htest.numeric

Details

Results are passed to function format_tests for the final table. So the results of two_sample_htest must have a class for which the generic format_tests has a method.

If you are not pleased with the current hypothesis tests you may alter these functions. But you must keep the original output-format, see section Value.

Note that the various statistical test functions in R have heterogeneous arguments: for example chisq.test and ks.test do not have formula/data as arguments, whereas wilcox.test and kruskal.test do. So the function two_sample_htest is essentially a wrapper to standardize the arguments of various hypothesis test functions.

As two_sample_htest is only intended to be applied to unpaired two sample data, the two arguments value and group are sufficient to describe the data.

Note that e.g. for class numeric the p-value is calculated by ks.test and the effects size 95% CI by cohen.d. As these are two different functions the results may be contradicting: the p-value of ks.test can be smaller than 0.05 and the CI of cohen.d contains 0 at the same time.

Value

A named list with length > 0, where all elements of the list are atomic and have the same length.

Most hypothesis-test-functions in R like t.test or chisq.test return an object of class 'htest'. 'htest'-objects are a suitable output for function two_sample_htest. Function check_tests checks if the output is suitable for further processing.

Methods (by class)

- character: Casts value to factor and then calls method two_sample_htest again.

- factor: Calls `chisq.test` on value. Effect size is the odds ratio calculated by `fisher.test` (if value has two levels), or Cramer's V by `CramerV`.

- logical: Casts value to factor and then calls two_sample_htest again.

- numeric: Calls `ks.test` on value. Effect size is Cohen's d calculated by `cohen.d`.

- ordered: Calls `wilcox.test` on value. Effect size is Cliff's delta calculated by `cliff.delta`.

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