

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 (>= 3.5.0)

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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.

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, ...)
```

```
## 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 col-names, 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 modified 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_hptest.numeric`: Either NULL or a function. Default is NULL. If a function, then it will replace `atable::multi_sample_hptest.numeric` when `atable` is called. The function must mimic `multi_sample_hptest`: see the help there.
- `multi_sample_hptest.factor`: Analog to argument `multi_sample_hptest.numeric`
- `multi_sample_hptest.ordered`: Analog to argument `multi_sample_hptest.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.hptest`: Either NULL or a function. Default is NULL. If a function, then it will replace `format_tests.hptest`. The function must mimic `format_tests`: see the help there.
- `format_tests.hptest_with_effect_size`: Analog to argument `format_tests.hptest`

<code>target_cols</code>	A character vector containing some column names of <code>x</code> . Descriptive statistics and hypothesis test are applied to these columns depending on their class. The descriptive statistics are defined by <code>statistics</code> ; their representation and format by <code>format_statistics</code> . Hypothesis test are defined by <code>two_sample_hptest</code> or <code>multi_sample_hptest</code> (depending on the number of levels of <code>group_col</code>); their representation and format by <code>format_tests</code> . Note that <code>atable</code> always adds one name to <code>target_cols</code> to count the number of observations. This name is stored in <code>atable_options('colname_for_observat</code>
<code>group_col</code>	A character of length 1 containing a column of <code>x</code> or NULL. This column defines the groups that are compared by the hypothesis tests. <code>as.factor</code> is applied to this column before further processing. Default is NULL, meaning that no hypothesis tests are applied.
<code>split_cols</code>	A character vector containing some of <code>colnames(x)</code> or NULL. <code>x</code> is splitted by these columns before descriptive statistics and hypothesis test are applied. <code>as.factor</code> is applied to this column before further processing. Default is NULL, meaning that no splitting is done.
<code>format_to</code>	A character vector of length 1. Specifies the format of the output of <code>atable</code> . Possible values are 'Latex', 'Word', 'Raw', 'HTML', 'Console'. Default is defined in <code>atable_options</code> .
<code>drop_levels</code>	A logical. If TRUE then <code>droplevels</code> is called on <code>group_col</code> and <code>split_cols</code> before further processing. Default is TRUE.
<code>add_levels_for_NA</code>	If TRUE then <code>addNA</code> is called on <code>group_col</code> and <code>split_cols</code> before further processing. Default is FALSE.
<code>formula</code>	A formula of the form <code>target_cols ~ group_col split_cols</code> . The <code> </code> separates the <code>group_col</code> from the <code>split_cols</code> . Read the <code> </code> as 'given' as in a conditional probability $P(\text{target_cols} \mid \text{split_cols})$. <code>target_cols</code> and <code>split_cols</code> may contain multiple names separated by <code>+</code> . <code>group_col</code> must be a single name if given. <code>group_col</code> and <code>split_cols</code> may be omitted and can be replaced by 1 in this case. The <code> </code> may also be omitted if no <code>split_cols</code> are given.
<code>data</code>	Passed to <code>atable(x = data, ...)</code> .

Value

Results depend on `format_to`:

- 'Raw': A list with two elements called 'statistics_result' and 'tests_result', that contain all results of the descriptive statistics and the hypothesis tests. This format useful, when extracting a specific result unformatted (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 combinations 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 printing.
- `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'.

```

atable_options	<i>Set or get options</i>
----------------	---------------------------

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.
- `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_hstest.numeric`: Either NULL or a function. Default is NULL. If a function, then it will replace `atable::two_sample_hstest.numeric` when `atable` is called. The function must mimic `two_sample_hstest`: see the help there.
- `two_sample_hstest.factor`: Analog to argument `two_sample_hstest.numeric`
- `two_sample_hstest.ordered`: Analog to argument `two_sample_hstest.numeric`
- `multi_sample_hstest.numeric`: Either NULL or a function. Default is NULL. If a function, then it will replace `atable::multi_sample_hstest.numeric` when `atable` is called. The function must mimic `multi_sample_hstest`: see the help there.
- `multi_sample_hstest.factor`: Analog to argument `multi_sample_hstest.numeric`
- `multi_sample_hstest.ordered`: Analog to argument `multi_sample_hstest.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.hstest`: Either NULL or a function. Default is NULL. If a function, then it will replace `format_tests.hstest`. 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.

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	<i>Checks the output of function statistics</i>
------------------	-------------------------------------------------

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	<i>Checks the output of functions two_sample_hstest and multi_sample_hstest</i>
-------------	-----------------------------------------------------------------------------------------------------------------

Description

Checks the output of function [two_sample_hstest](#) and [multi_sample_hstest](#).

Usage

```
check_tests(x)
```

Arguments

x Result of function [two_sample_hstest](#) or [multi_sample_hstest](#).

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.

format_statistics	<i>Format statistics</i>
-------------------	--------------------------

Description

The results of function `statistics` must be formatted 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

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

Details

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

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 chosen 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_hstest](#) and [multi_sample_hstest](#) must be formatted before printing. `format_tests` does this.

Usage

```
format_tests(x, ...)

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

## S3 method for class 'hstest_with_effect_size'
format_tests(x,
  format_tests.hstest_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 <code>format_tests</code> : 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 formatted.

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.

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. That's 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_hstest *Calculates multi sample hypothesis tests*

Description

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

Usage

```
multi_sample_hstest(value, group, ...)

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

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

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

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

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

Arguments

value	An atomic vector.
group	A factor, same length as value.
...	Passed to methods.
multi_sample_hstest.factor	Analog to argument two_sample_hstest.numeric
multi_sample_hstest.ordered	Analog to argument two_sample_hstest.numeric
multi_sample_hstest.numeric	Either NULL or a function. Default is NULL. If a function, then it will replace <code>atable:::multi_sample_hstest.numeric</code> . The function must mimic multi_sample_hstest.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_hstest` 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 'hstest'. 'hstest'-objects are a suitable output for function `two_sample_hstest`. 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_hstest` again.
- factor: Calls `chisq.test`.
- character: Casts value to factor and then calls method `multi_sample_hstest` again.
- ordered: Calls `kruskal.test`.
- numeric: Calls `multi_sample_hstest`'s method on `ordered(value)`.

`replace_consecutive` *Replaces consecutive elements*

Description

If $x[i+1]=x[i]$ then $x[i+1]$ is replaced by $x[i]$ for $i=1, \dots, \text{length}(x)-1$.

Usage

```
replace_consecutive(x, by = "")
```

Arguments

`x` A character or factor.
`by` A character with length 1.

Details

The `=` is defined by function `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)
```

replace_NA	<i>Replaces NA</i>
------------	--------------------

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

<code>x</code>	An object.
<code>...</code>	Passed to methods.
<code>replacement</code>	A character of length 1. Default value is defined in <code>atable_options('replace_NA_by')</code> , 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	<i>Calculates descriptive statistics</i>
------------	------------------------------------------

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 <code>atable:::statistics.numeric</code> . The function must mimic <code>statistics</code> : arguments 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.statistics_numeric`. 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 modified 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 weights 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 section 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_hstest	<i>Two sample hypothesis tests and effect size</i>
-------------------	----------------------------------------------------

Description

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

Usage

```
two_sample_hstest(value, group, ...)

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

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



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

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

## S3 method for class 'ordered'
two_sample_hstest(value, group,
  two_sample_hstest.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_hstest.factor	Analog to argument two_sample_hstest.numeric
two_sample_hstest.numeric	Either NULL or a function. Default is NULL. If a function, then it will replace <code>atable:::two_sample_hstest.numeric</code> . The function must mimic <code>two_sample_hstest.numeric</code> : arguments are value, group and the ellipsis Result is a named list with length > 0 with unique names.
two_sample_hstest.ordered	Analog to argument two_sample_hstest.numeric

Details

Results are passed to function `format_tests` for the final table. So the results of `two_sample_hstest` 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_hstest` is essentially a wrapper to standardize the arguments of various hypothesis test functions.

As `two_sample_hstest` 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 'hstest'. 'hstest'-objects are a suitable output for function `two_sample_hstest`. 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_hstest` 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_hstest` 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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