

# Package ‘dlookr’

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**Type** Package

**Title** Tools for Data Diagnosis, Exploration, Transformation

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**Description** A collection of tools that support data diagnosis, exploration, and transformation. Data diagnostics provides information and visualization of missing values and outliers and unique and negative values to help you understand the distribution and quality of your data. Data exploration provides information and visualization of the descriptive statistics of univariate variables, normality tests and outliers, correlation of two variables, and relationship between target variable and predictor. Data transformation supports binning for categorizing continuous variables, imputates missing values and outliers, resolving skewness. And it creates automated reports that support these three tasks.

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<https://choonghyunryu.github.io/dlookr/>

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dlookr-package	<i>dlookr: Tools for Data Diagnosis, Exploration, Transformation</i>
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### **Description**

dlookr provides data diagnosis, data exploration and transformation of variables during data analysis.

### **Details**

It has three main goals:

- When data is acquired, it is possible to judge whether data is erroneous or to select a variable to be corrected or removed through data diagnosis.
- Understand the distribution of data in the EDA process. It can also understand the relationship between target variables and predictor variables for the prediction model.
- Imputes missing value and outlier to standardization and resolving skewness. And, To convert a continuous variable to a categorical variable, bin the continuous variables.

To learn more about dlookr, start with the vignettes: `'browseVignettes(package = "dlookr")'`

### **Author(s)**

**Maintainer:** Choonghyun Ryu <choonghyun.ryu@gmail.com>

**See Also**

Useful links:

- <https://github.com/choonghyunryu/dlookr/>
- <https://choonghyunryu.github.io/dlookr/>
- Report bugs at <https://github.com/choonghyunryu/dlookr/issues>

---

binning

*Binning the Numeric Data*

---

**Description**

The `binning()` converts a numeric variable to a categorization variable.

**Usage**

```
binning(  
  x,  
  nbins,  
  type = c("quantile", "equal", "pretty", "kmeans", "bclust"),  
  ordered = TRUE,  
  labels = NULL,  
  approxy.lab = TRUE  
)
```

**Arguments**

<code>x</code>	numeric. numeric vector for binning.
<code>nbins</code>	integer. number of intervals(bins). required. if missing, <code>nclass.Sturges</code> is used.
<code>type</code>	character. binning method. Choose from "quantile", "equal", "pretty", "kmeans" and "bclust". The "quantile" sets breaks with quantiles of the same interval. The "equal" sets breaks at the same interval. The "pretty" chooses a number of breaks not necessarily equal to <code>nbins</code> using <code>base::pretty</code> function. The "kmeans" uses <code>stats::kmeans</code> function to generate the breaks. The "bclust" uses <code>e1071::bclust</code> function to generate the breaks using bagged clustering. "kmeans" and "bclust" was implemented by <code>classInt::classIntervals()</code> function.
<code>ordered</code>	logical. whether to build an ordered factor or not.
<code>labels</code>	character. the label names to use for each of the bins.
<code>approxy.lab</code>	logical. If TRUE, large number breaks are approximated to pretty numbers. If FALSE, the original breaks obtained by type are used.

**Details**

This function is useful when used with the `mutate/transmute` function of the `dplyr` package.

See `vignette("transformation")` for an introduction to these concepts.

**Value**

An object of bins class. Attributes of bins class is as follows.

- class : "bins"
- type : binning type, "quantile", "equal", "pretty", "kmeans", "bclust".
- breaks : breaks for binning. the number of intervals into which x is to be cut.
- levels : levels of binned value.
- raw : raw data, numeric vector corresponding to x argument.

**See Also**

[binning\\_by](#), [print.bins](#), [summary.bins](#), [plot.bins](#).

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA

# Binning the platelets variable. default type argument is "quantile"
bin <- binning(heartfailure2$platelets)
# Print bins class object
bin

# Summarise bins class object
summary(bin)

# Plot bins class object
plot(bin)

# Using labels argument
bin <- binning(heartfailure2$platelets, nbins = 4,
              labels = c("LQ1", "UQ1", "LQ3", "UQ3"))
bin

# Using another type argument
bin <- binning(heartfailure2$platelets, nbins = 5, type = "equal")
bin
bin <- binning(heartfailure2$platelets, nbins = 5, type = "pretty")
bin
bin <- binning(heartfailure2$platelets, nbins = 5, type = "kmeans")
bin
bin <- binning(heartfailure2$platelets, nbins = 5, type = "bclust")
bin

x <- sample(1:1000, size = 50) * 12345679
bin <- binning(x)
bin
bin <- binning(x, approxy.lab = FALSE)
bin
```

```

# extract binned results
extract(bin)

# -----
# Using pipes & dplyr
# -----
library(dplyr)

# Compare binned frequency by death_event
heartfailure2 %>%
  mutate(platelets_bin = binning(heartfailure2$platelets) %>%
    extract()) %>%
  group_by(death_event, platelets_bin) %>%
  summarise(freq = n()) %>%
  arrange(desc(freq)) %>%
  head(10)

# Compare binned frequency by death_event using Viz
heartfailure2 %>%
  mutate(platelets_bin = binning(heartfailure2$platelets) %>%
    extract()) %>%
  target_by(death_event) %>%
  relate(platelets_bin) %>%
  plot()

```

---

binning\_by

*Optimal Binning for Scoring Modeling*


---

## Description

The `binning_by()` finding intervals for numerical variable using optimal binning. Optimal binning categorizes a numeric characteristic into bins for ulterior usage in scoring modeling.

## Usage

```
binning_by(.data, y, x, p = 0.05, ordered = TRUE, labels = NULL)
```

## Arguments

<code>.data</code>	a data frame.
<code>y</code>	character. name of binary response variable(0, 1). The variable must contain only the integers 0 and 1 as element. However, in the case of factor having two levels, it is performed while type conversion is performed in the calculation process.
<code>x</code>	character. name of continuous characteristic variable. At least 5 different values. and Inf is not allowed.

p	numeric. percentage of records per bin. Default 5% (0.05). This parameter only accepts values greater than 0.00 (0%) and lower than 0.50 (50%).
ordered	logical. whether to build an ordered factor or not.
labels	character. the label names to use for each of the bins.

### Details

This function is useful when used with the mutate/transmute function of the dplyr package. And this function is implemented using `smbinning()` function of `smbinning` package.

### Value

an object of "optimal\_bins" class. Attributes of "optimal\_bins" class is as follows.

- class : "optimal\_bins".
- type : binning type, "optimal".
- breaks : numeric. the number of intervals into which x is to be cut.
- levels : character. levels of binned value.
- raw : numeric. raw data, x argument value.
- ivtable : data.frame. information value table.
- iv : numeric. information value.
- target : integer. binary response variable.

### attributes of "optimal\_bins" class

Attributes of the "optimal\_bins" class that is as follows.

- class : "optimal\_bins".
- levels : character. factor or ordered factor levels
- type : character. binning method
- breaks : numeric. breaks for binning
- raw : numeric. before the binned the raw data
- ivtable : data.frame. information value table
- iv : numeric. information value
- target : integer. binary response variable

See vignette("transformation") for an introduction to these concepts.

### See Also

[binning](#), [plot.optimal\\_bins](#).

## Examples

```
library(dplyr)

# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "creatinine"] <- NA

# optimal binning using character
bin <- binning_by(heartfailure2, "death_event", "creatinine")

# optimal binning using name
bin <- binning_by(heartfailure2, death_event, creatinine)
bin

# performance table
attr(bin, "performance")

# summary optimal_bins class
summary(bin)

# visualize all information for optimal_bins class
plot(bin)

# visualize WoE information for optimal_bins class
plot(bin, type = "WoE")

# visualize all information without typographic
plot(bin, typographic = FALSE)

# extract binned results
extract(bin) %>%
  head(20)
```

---

binning\_rgr

*Binning by recursive information gain ratio maximization*

---

## Description

The `binning_rgr()` finding intervals for numerical variable using recursive information gain ratio maximization.

## Usage

```
binning_rgr(.data, y, x, min_perc_bins = 0.1, max_n_bins = 5, ordered = TRUE)
```

**Arguments**

<code>.data</code>	a data frame.
<code>y</code>	character. name of binary response variable. The variable must character of factor.
<code>x</code>	character. name of continuous characteristic variable. At least 5 different values. and Inf is not allowed.
<code>min_perc_bins</code>	numeric. minimum percetange of rows for each split or segment (controls the sample size), 0.1 (or 10 percent) as default.
<code>max_n_bins</code>	integer. maximum number of bins or segments to split the input variable, 5 bins as default.
<code>ordered</code>	logical. whether to build an ordered factor or not.

**Details**

This function can be usefully used when developing a model that predicts `y`.

**Value**

an object of "infogain\_bins" class. Attributes of "infogain\_bins" class is as follows.

- `class` : "infogain\_bins".
- `type` : binning type, "infogain".
- `breaks` : numeric. the number of intervals into which `x` is to be cut.
- `levels` : character. levels of binned value.
- `raw` : numeric. raw data, `x` argument value.
- `target` : integer. binary response variable.
- `x_var` : character. name of `x` variable.
- `y_var` : character. name of `y` variable.

**See Also**

[binning](#), [binning\\_by](#), [plot.infogain\\_bins](#).

**Examples**

```
library(dplyr)

# binning by recursive information gain ratio maximization using character
bin <- binning_rgr(heartfailure, "death_event", "creatinine")

# binning by recursive information gain ratio maximization using name
bin <- binning_rgr(heartfailure, death_event, creatinine)
bin

# summary optimal_bins class
```

```

summary(bin)

# visualize all information for optimal_bins class
plot(bin)

# visualize WoE information for optimal_bins class
plot(bin, type = "cross")

# visualize all information without typographic
plot(bin, type = "cross", typographic = FALSE)

# extract binned results
extract(bin) %>%
  head(20)

```

---

compare_category	<i>Compare categorical variables</i>
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---

## Description

The `compare_category()` compute information to examine the relationship between categorical variables.

## Usage

```

compare_category(.data, ...)

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

```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

## Details

It is important to understand the relationship between categorical variables in EDA. `compare_category()` compares relations by pair combination of all categorical variables. and return `compare_category` class that based list object.

**Value**

An object of the class as compare based list. The information to examine the relationship between categorical variables is as follows each components.

- `var1` : factor. The level of the first variable to compare. 'var1' is the name of the first variable to be compared.
- `var2` : factor. The level of the second variable to compare. 'var2' is the name of the second variable to be compared.
- `n` : integer. frequency by var1 and var2.
- `rate` : double. relative frequency.
- `first_rate` : double. relative frequency in first variable.
- `second_rate` : double. relative frequency in second variable.

**Attributes of return object**

Attributes of `compare_category` class is as follows.

- `variables` : character. List of variables selected for comparison.
- `combination` : matrix. It consists of pairs of variables to compare.

**See Also**

[summary.compare\\_category](#), [print.compare\\_category](#), [plot.compare\\_category](#).

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

library(dplyr)

# Compare the all categorical variables
all_var <- compare_category(heartfailure2)

# Print compare_numeric class objects
all_var

# Compare the categorical variables that case of joint the death_event variable
all_var %>%
  "["(grep("death_event", names(all_var)))

# Compare the two categorical variables
two_var <- compare_category(heartfailure2, smoking, death_event)

# Print compare_category class objects
two_var
```

```
# Filtering the case of smoking included NA
two_var %>%
  "[["(1) %>%
  filter(!is.na(smoking))

# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)

# Summary by returned objects
stat

# component of table
stat$table

# component of chi-square test
stat$chisq

# component of chi-square test
summary(all_var, "chisq")

# component of chi-square test (first, third case)
summary(all_var, "chisq", pos = c(1, 3))

# component of relative frequency table
summary(all_var, "relative")

# component of table without missing values
summary(all_var, "table", na.rm = TRUE)

# component of table include marginal value
margin <- summary(all_var, "table", marginal = TRUE)
margin

# component of chi-square test
summary(two_var, method = "chisq")

# verbose is FALSE
summary(all_var, "chisq", verbose = FALSE)

#' # Using pipes & dplyr -----
# If you want to use dplyr, set verbose to FALSE
summary(all_var, "chisq", verbose = FALSE) %>%
  filter(p.value < 0.26)

# Extract component from list by index
summary(all_var, "table", na.rm = TRUE, verbose = FALSE) %>%
  "[["(1)

# Extract component from list by name
summary(all_var, "table", na.rm = TRUE, verbose = FALSE) %>%
  "[["("smoking vs death_event")

# plot all pair of variables
```

```

plot(all_var)

# plot a pair of variables
plot(two_var)

# plot all pair of variables by prompt
plot(all_var, prompt = TRUE)

# plot a pair of variables
plot(two_var, las = 1)

```

---

compare_numeric	<i>Compare numerical variables</i>
-----------------	------------------------------------

---

### Description

The `compare_numeric()` compute information to examine the relationship between numerical variables.

### Usage

```

compare_numeric(.data, ...)

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

```

### Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

### Details

It is important to understand the relationship between numerical variables in EDA. `compare_numeric()` compares relations by pair combination of all numerical variables. and return `compare_numeric` class that based list object.

### Value

An object of the class as `compare` based list. The information to examine the relationship between numerical variables is as follows each components. - correlation component : Pearson's correlation coefficient.

- var1 : factor. The level of the first variable to compare. 'var1' is the name of the first variable to be compared.
  - var2 : factor. The level of the second variable to compare. 'var2' is the name of the second variable to be compared.
  - coef\_corr : double. Pearson's correlation coefficient.
- linear component : linear model summaries
- var1 : factor. The level of the first variable to compare. 'var1' is the name of the first variable to be compared.
  - var2 : factor. The level of the second variable to compare. 'var2' is the name of the second variable to be compared.
  - r.squared : double. The percent of variance explained by the model.
  - adj.r.squared : double. r.squared adjusted based on the degrees of freedom.
  - sigma : double. The square root of the estimated residual variance.
  - statistic : double. F-statistic.
  - p.value : double. p-value from the F test, describing whether the full regression is significant.
  - df : integer degrees of freedom.
  - logLik : double. the log-likelihood of data under the model.
  - AIC : double. the Akaike Information Criterion.
  - BIC : double. the Bayesian Information Criterion.
  - deviance : double. deviance.
  - df.residual : integer residual degrees of freedom.

### Attributes of return object

Attributes of compare\_numeric class is as follows.

- raw : a data.frame or a `tbl_df`. Data containing variables to be compared. Save it for visualization with `plot.compare_numeric()`.
- variables : character. List of variables selected for comparison.
- combination : matrix. It consists of pairs of variables to compare.

### See Also

[correlate](#), [summary.compare\\_numeric](#), [print.compare\\_numeric](#), [plot.compare\\_numeric](#).

### Examples

```
# Generate data for the example
heartfailure2 <- heartfailure[, c("platelets", "creatinine", "sodium")]

library(dplyr)
# Compare the all numerical variables
all_var <- compare_numeric(heartfailure2)
```

```
# Print compare_numeric class object
all_var

# Compare the correlation that case of joint the sodium variable
all_var %>%
  "$"(correlation) %>%
  filter(var1 == "sodium" | var2 == "sodium") %>%
  arrange(desc(abs(coef_corr)))

# Compare the correlation that case of abs(coef_corr) > 0.1
all_var %>%
  "$"(correlation) %>%
  filter(abs(coef_corr) > 0.1)

# Compare the linear model that case of joint the sodium variable
all_var %>%
  "$"(linear) %>%
  filter(var1 == "sodium" | var2 == "sodium") %>%
  arrange(desc(r.squared))

# Compare the two numerical variables
two_var <- compare_numeric(heartfailure2, sodium, creatinine)

# Print compare_numeric class objects
two_var

# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)

# Just correlation
summary(all_var, method = "correlation")

# Just correlation condition by r > 0.1
summary(all_var, method = "correlation", thres_corr = 0.1)

# linear model summaries condition by R^2 > 0.05
summary(all_var, thres_rs = 0.05)

# verbose is FALSE
summary(all_var, verbose = FALSE)

# plot all pair of variables
plot(all_var)

# plot a pair of variables
plot(two_var)

# plot all pair of variables by prompt
plot(all_var, prompt = TRUE)

# plot a pair of variables not focuses on typographic elements
plot(two_var, typographic = FALSE)
```

---

correlate	<i>Compute the correlation coefficient between two variable</i>
-----------	---

---

### Description

The `correlate()` compute the correlation coefficient for numerical or categorical data.

### Usage

```
correlate(.data, ...)  
  
## S3 method for class 'data.frame'  
correlate(  
  .data,  
  ...,  
  method = c("pearson", "kendall", "spearman", "cramer", "theil")  
)  
  
## S3 method for class 'grouped_df'  
correlate(  
  .data,  
  ...,  
  method = c("pearson", "kendall", "spearman", "cramer", "theil")  
)  
  
## S3 method for class 'tbl_dbi'  
correlate(  
  .data,  
  ...,  
  method = c("pearson", "kendall", "spearman", "cramer", "theil"),  
  in_database = FALSE,  
  collect_size = Inf  
)
```

### Arguments

<code>.data</code>	a <code>data.frame</code> or a <a href="#">grouped_df</a> or a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>correlate()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing. See <code>vignette("EDA")</code> for an introduction to these concepts.

method	a character string indicating which correlation coefficient (or covariance) is to be computed. One of "pearson" (default), "kendall", or "spearman": can be abbreviated. For numerical variables, one of "pearson" (default), "kendall", or "spearman": can be used as an abbreviation. For categorical variables, "cramer" and "theil" can be used. "cramer" computes Cramer's V statistic, "theil" computes Theil's U statistic.
in_database	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in_database = TRUE.
collect_size	a integer. The number of data samples from the DBMS to R. Applies only if in_database = FALSE.

### Details

This function is useful when used with the `group_by()` function of the `dplyr` package. If you want to compute by level of the categorical data you are interested in, rather than the whole observation, you can use `grouped_df` as the `group_by()` function. This function is computed `stats::cor()` function by use = "pairwise.complete.obs" option for numerical variable. And support categorical variable with theil's U correlation coefficient and Cramer's V correlation coefficient.

### Correlation coefficient information

It returns `data.frame` with the following variables.:

- var1 : names of numerical variable
- var2 : name of the corresponding numeric variable
- coef\_corr : Correlation coefficient

When `method = "cramer"`, `data.frame` with the following variables is returned.

- var1 : names of numerical variable
- var2 : name of the corresponding numeric variable
- chisq : the value the chi-squared test statistic
- df : the degrees of freedom of the approximate chi-squared distribution of the test statistic
- pval : the p-value for the test
- coef\_corr : theil's U correlation coefficient (Uncertainty Coefficient).

### See Also

[cor](#), [summary.correlate](#), [plot.correlate](#).

### Examples

```
# Correlation coefficients of all numerical variables
tab_corr <- correlate(heartfailure)
tab_corr
```

```

mat_corr <- summary(tab_corr)
mat_corr

plot(tab_corr)

# Select the variable to compute
correlate(heartfailure, "creatinine", "sodium")

# Non-parametric correlation coefficient by kendall method
correlate(heartfailure, creatinine, method = "kendall")

# theil's U correlation coefficient (Uncertainty Coefficient)
tab_corr <- correlate(heartfailure, anaemia, hblood_pressure, method = "theil")
tab_corr

summary(tab_corr)
plot(tab_corr)

# Using dplyr::grouped_dt
library(dplyr)

gdata <- group_by(heartfailure, smoking, death_event)
correlate(gdata)

# Using pipes -----
# Correlation coefficients of all numerical variables
heartfailure %>%
  correlate()

# Non-parametric correlation coefficient by spearman method
heartfailure %>%
  correlate(creatinine, sodium, method = "spearman")

# -----
# Correlation coefficient
# that eliminates redundant combination of variables
heartfailure %>%
  correlate() %>%
  filter(as.integer(var1) > as.integer(var2))

# Using pipes & dplyr -----
# Compute the correlation coefficient of 'creatinine' variable by 'smoking'
# and 'death_event' variables. And extract only those with absolute
# value of correlation coefficient is greater than 0.2
heartfailure %>%
  group_by(smoking, death_event) %>%
  correlate(creatinine) %>%
  filter(abs(coef_corr) >= 0.2)

# extract only those with 'smoking' variable level is "Yes",
# and compute the correlation coefficient of 'Sales' variable
# by 'hblood_pressure' and 'death_event' variables.
# And the correlation coefficient is negative and smaller than 0.5

```

```

heartfailure %>%
  filter(smoking == "Yes") %>%
  group_by(hblood_pressure, death_event) %>%
  correlate(creatinine) %>%
  filter(coef_corr < 0) %>%
  filter(abs(coef_corr) > 0.5)

library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Correlation coefficients of all numerical variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  correlate()

# Using pipes & dplyr -----
# Compute the correlation coefficient of creatinine variable by 'hblood_pressure'
# and 'death_event' variables.
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  group_by(hblood_pressure, death_event) %>%
  correlate(creatinine)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

---

cramer

*Cramer's V statistic*


---

### Description

Computes the Cramer's V statistic and Chisquare p value between two categorical variables in data.frame.

### Usage

```
cramer(dfm, x, y)
```

**Arguments**

dfm	data.frame. probability distributions.
x	character. name of categorical or discrete variable.
y	character. name of another categorical or discrete variable.

**Value**

data.frame. It has the following variables.:

- var1 : character. first variable name.
- var2 : character. second variable name.
- chisq : numeric. Chisquare statistic.
- df : integer. degree of freedom.
- pval : numeric. p value of Chisquare test.
- coef\_corr : numeric. Cramer's V statistic.

**See Also**

[theil](#).

**Examples**

```
cramer(mtcars, "gear", "carb")
```

---

describe	<i>Compute descriptive statistic</i>
----------	--------------------------------------

---

**Description**

The describe() compute descriptive statistic of numeric variable for exploratory data analysis.

**Usage**

```
describe(.data, ...)

## S3 method for class 'data.frame'
describe(.data, ..., statistics = NULL, quantiles = NULL)

## S3 method for class 'grouped_df'
describe(
  .data,
  ...,
  statistics = NULL,
  quantiles = NULL,
  all.combinations = FALSE
)
```

**Arguments**

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> or a <code>grouped_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>describe()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing. See <code>vignette("EDA")</code> for an introduction to these concepts.
<code>statistics</code>	character. the name of the descriptive statistic to calculate. The defaults is <code>c("mean", "sd", "se_mean", "IQR", "skewness", "kurtosis", "quantiles")</code>
<code>quantiles</code>	numeric. list of quantiles to calculate. The values of elements must be between 0 and 1. and to calculate quantiles, you must include "quantiles" in the <code>statistics</code> argument value. The default is <code>c(0, .01, .05, 0.1, 0.2, 0.25, 0.3, 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.9, 0.95, 0.99, 1)</code> .
<code>all.combinations</code>	logical. When used with <code>group_by()</code> , this argument expresses all combinations of group combinations. If the argument value is <code>TRUE</code> , cases that do not exist as actual data are also included in the output.

**Details**

This function is useful when used with the `group_by` function of the `dplyr` package. If you want to calculate the statistic by level of the categorical data you are interested in, rather than the whole statistic, you can use `grouped_df` as the `group_by()` function.

From version 0.5.5, the 'variable' column in the "descriptive statistic information" tibble object has been changed to 'described\_variables'. This is because there are cases where 'variable' is included in the variable name of the data. There is probably no case where 'described\_variables' is included in the variable name of the data.

**Value**

An object of the same class as `.data`.

**Descriptive statistic information**

The information derived from the numerical data `describe` is as follows.

- `n` : number of observations excluding missing values
- `na` : number of missing values
- `mean` : arithmetic average
- `sd` : standard deviation
- `se_mean` : standard error mean.  $sd/\sqrt{n}$
- `IQR` : interquartile range (Q3-Q1)
- `skewness` : skewness

- kurtosis : kurtosis
- p25 : Q1. 25% percentile
- p50 : median. 50% percentile
- p75 : Q3. 75% percentile
- p01, p05, p10, p20, p30 : 1%, 5%, 20%, 30% percentiles
- p40, p60, p70, p80 : 40%, 60%, 70%, 80% percentiles
- p90, p95, p99, p100 : 90%, 95%, 99%, 100% percentiles

### See Also

[describe.tbl\\_dbi](#), [diagnose\\_numeric.data.frame](#).

### Examples

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "sodium"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

# Describe descriptive statistics of numerical variables
describe(heartfailure2)

# Select the variable to describe
describe(heartfailure2, sodium, platelets, statistics = c("mean", "sd", "quantiles"))
describe(heartfailure2, -sodium, -platelets)
describe(heartfailure2, 5, statistics = c("mean", "sd", "quantiles"), quantiles = c(0.01, 0.1))

# Using dplyr::grouped_dt
library(dplyr)

gdata <- group_by(heartfailure2, hblood_pressure, death_event)
describe(gdata, "creatinine")

# Using pipes -----
# Positive values select variables
heartfailure2 %>%
  describe(platelets, sodium, creatinine)

# Negative values to drop variables
heartfailure2 %>%
  describe(-platelets, -sodium, -creatinine)

# Using pipes & dplyr -----
# Find the statistic of all numerical variables by 'hblood_pressure' and 'death_event',
# and extract only those with 'hblood_pressure' variable level is "Yes".
heartfailure2 %>%
  group_by(hblood_pressure, death_event) %>%
  describe() %>%
  filter(hblood_pressure == "Yes")
```

```
# Using all.combinations = TRUE
heartfailure2 %>%
  filter(!hblood_pressure %in% "Yes" | !death_event %in% "Yes") %>%
  group_by(hblood_pressure, death_event) %>%
  describe(all.combinations = TRUE)

# extract only those with 'smoking' variable level is "Yes",
# and find 'creatinine' statistics by 'hblood_pressure' and 'death_event'
heartfailure2 %>%
  filter(smoking == "Yes") %>%
  group_by(hblood_pressure, death_event) %>%
  describe(creatinine)
```

---

describe.tbl_dbi	<i>Compute descriptive statistic</i>
------------------	--------------------------------------

---

### Description

The describe() compute descriptive statistic of numerical(INTEGER, NUMBER, etc.) column of the DBMS table through tbl\_dbi for exploratory data analysis.

### Usage

```
## S3 method for class 'tbl_dbi'
describe(
  .data,
  ...,
  statistics = NULL,
  quantiles = NULL,
  all.combinations = FALSE,
  in_database = FALSE,
  collect_size = Inf
)
```

### Arguments

.data	a tbl_dbi.
...	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, describe() will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
statistics	character. the name of the descriptive statistic to calculate. The defaults is c("mean", "sd", "se_mean", "IQR", "skewness", "kurtosis", "quantiles")

quantiles	numeric. list of quantiles to calculate. The values of elements must be between 0 and 1. and to calculate quantiles, you must include "quantiles" in the statistics argument value. The default is <code>c(0, .01, .05, 0.1, 0.2, 0.25, 0.3, 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.9, 0.95, 0.99, 1)</code> .
all.combinations	logical. When used with <code>group_by()</code> , this argument expresses all combinations of group combinations. If the argument value is TRUE, cases that do not exist as actual data are also included in the output.
in_database	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in <code>in_database = TRUE</code> .
collect_size	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> . See <code>vignette("EDA")</code> for an introduction to these concepts.

## Details

This function is useful when used with the `group_by` function of the `dplyr` package. If you want to calculate the statistic by level of the categorical data you are interested in, rather than the whole statistic, you can use `grouped_df` as the `group_by()` function.

From version 0.5.5, the 'variable' column in the "descriptive statistic information" tibble object has been changed to 'described\_variables'. This is because there are cases where 'variable' is included in the variable name of the data. There is probably no case where 'described\_variables' is included in the variable name of the data.

## Value

An object of the same class as `.data`.

## Descriptive statistic information

The information derived from the numerical data describe is as follows.

- `n` : number of observations excluding missing values
- `na` : number of missing values
- `mean` : arithmetic average
- `sd` : standard deviation
- `se_mean` : standard error mean.  $sd/\sqrt{n}$
- `IQR` : interquartile range (Q3-Q1)
- `skewness` : skewness
- `kurtosis` : kurtosis
- `p25` : Q1. 25% percentile
- `p50` : median. 50% percentile
- `p75` : Q3. 75% percentile
- `p01, p05, p10, p20, p30` : 1%, 5%, 20%, 30% percentiles
- `p40, p60, p70, p80` : 40%, 60%, 70%, 80% percentiles
- `p90, p95, p99, p100` : 90%, 95%, 99%, 100% percentiles

**See Also**

[describe.data.frame](#), [diagnose\\_numeric.tbl\\_dbi](#).

**Examples**

```
library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Positive values select variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  describe(platelets, creatinine, sodium)

con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  describe(platelets, creatinine, sodium,
    statistics = c("mean", "sd", "quantiles"), quantiles = 0.1)

# Negative values to drop variables, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  describe(-platelets, -creatinine, -sodium, collect_size = 200)

# Using pipes & dplyr -----
# Find the statistic of all numerical variables by 'smoking' and 'death_event',
# and extract only those with 'smoking' variable level is "Yes".
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  group_by(smoking, death_event) %>%
  describe() %>%
  filter(smoking == "Yes")

# Using all.combinations = TRUE
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  filter(!smoking %in% "Yes" | !death_event %in% "Yes") %>%
  group_by(smoking, death_event) %>%
  describe(all.combinations = TRUE) %>%
  filter(smoking == "Yes")

# extract only those with 'sex' variable level is "Male",
# and find 'sodium' statistics by 'smoking' and 'death_event'
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  filter(sex == "Male") %>%
```

```
group_by(smoking, death_event) %>%
  describe(sodium)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
```

---

diagnose

*Diagnose data quality of variables*

---

## Description

The `diagnose()` produces information for diagnosing the quality of the variables of `data.frame` or `tbl_df`.

## Usage

```
diagnose(.data, ...)
```

```
## S3 method for class 'data.frame'
diagnose(.data, ...)
```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

## Details

The scope of data quality diagnosis is information on missing values and unique value information. Data quality diagnosis can determine variables that require missing value processing. Also, the unique value information can determine the variable to be removed from the data analysis.

## Value

An object of `tbl_df`.

### Diagnostic information

The information derived from the data diagnosis is as follows.:

- variables : variable names
- types : data type of the variable or to select a variable to be corrected or removed through data diagnosis.
  - integer, numeric, factor, ordered, character, etc.
- missing\_count : number of missing values
- missing\_percent : percentage of missing values
- unique\_count : number of unique values
- unique\_rate : ratio of unique values.  $\text{unique\_count} / \text{number of observation}$

See vignette("diagonosis") for an introduction to these concepts.

### See Also

[diagnose.tbl\\_dbi](#), [diagnose\\_category.data.frame](#), [diagnose\\_numeric.data.frame](#).

### Examples

```
# Diagnosis of all variables
diagnose(jobchange)

# Select the variable to diagnose
diagnose(jobchange, gender, experience, training_hours)
diagnose(jobchange, -gender, -experience, -training_hours)
diagnose(jobchange, "gender", "experience", "training_hours")
diagnose(jobchange, 4, 9, 13)

# Using pipes -----
library(dplyr)

# Diagnosis of all variables
jobchange %>%
  diagnose()
# Positive values select variables
jobchange %>%
  diagnose(gender, experience, training_hours)
# Negative values to drop variables
jobchange %>%
  diagnose(-gender, -experience, -training_hours)
# Positions values select variables
jobchange %>%
  diagnose(4, 9, 13)
# Negative values to drop variables
jobchange %>%
  diagnose(-8, -9, -10)
```

```
# Using pipes & dplyr -----
# Diagnosis of missing variables
jobchange %>%
  diagnose() %>%
  filter(missing_count > 0)
```

---

diagnose.tbl\_dbi      *Diagnose data quality of variables in the DBMS*

---

## Description

The `diagnose()` produces information for diagnosing the quality of the column of the DBMS table through `tbl_dbi`.

## Usage

```
## S3 method for class 'tbl_dbi'
diagnose(.data, ..., in_database = TRUE, collect_size = Inf)
```

## Arguments

<code>.data</code>	a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>in_database</code>	a logical. Specifies whether to perform in-database operations. If <code>TRUE</code> , most operations are performed in the DBMS. if <code>FALSE</code> , table data is taken in R and operated in-memory.
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .

## Details

The scope of data quality diagnosis is information on missing values and unique value information. Data quality diagnosis can determine variables that require missing value processing. Also, the unique value information can determine the variable to be removed from the data analysis.

## Value

An object of `tbl_df`.

## Diagnostic information

The information derived from the data diagnosis is as follows.:

- variables : column names
- types : data type of the variable or to select a variable to be corrected or removed through data diagnosis.
  - integer, numeric, factor, ordered, character, etc.
- missing\_count : number of missing values
- missing\_percent : percentage of missing values
- unique\_count : number of unique values
- unique\_rate : ratio of unique values.  $\text{unique\_count} / \text{number of observation}$

See vignette("diagonosis") for an introduction to these concepts.

## See Also

[diagnose.data.frame](#), [diagnose\\_category.tbl\\_dbi](#), [diagnose\\_numeric.tbl\\_dbi](#).

## Examples

```
library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy jobchange to the DBMS with a table named TB_JOBCHANGE
copy_to(con_sqlite, jobchange, name = "TB_JOBCHANGE", overwrite = TRUE)

# Using pipes -----
# Diagnosis of all columns
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose()

# Positive values select columns
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose(gender, education_level, company_size)

# Negative values to drop columns
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose(-gender, -education_level, -company_size)

# Positions values select columns, and In-memory mode
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose(1, 3, 8, in_database = FALSE)
```

```

# Positions values select columns, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose(-8, -9, -10, in_database = FALSE, collect_size = 200)

# Using pipes & dplyr -----
# Diagnosis of missing variables
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose() %>%
  filter(missing_count > 0)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

---

diagnose\_category      *Diagnose data quality of categorical variables*

---

### Description

The `diagnose_category()` produces information for diagnosing the quality of the variables of `data.frame` or `tbl_df`.

### Usage

```

diagnose_category(.data, ...)

## S3 method for class 'data.frame'
diagnose_category(
  .data,
  ...,
  top = 10,
  type = c("rank", "n")[2],
  add_character = TRUE,
  add_date = TRUE
)

```

### Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose_category()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

top	an integer. Specifies the upper top rows or rank to extract. Default is 10.
type	a character string specifying how result are extracted. "rank" that extract top n ranks by decreasing frequency. In this case, if there are ties in rank, more rows than the number specified by the top argument are returned. Default is "n" extract only top n rows by decreasing frequency. If there are too many rows to be returned because there are too many ties, you can adjust the returned rows appropriately by using "n".
add_character	logical. Decide whether to include text variables in the diagnosis of categorical data. The default value is TRUE, which also includes character variables.
add_date	logical. Decide whether to include Date and POSIXct variables in the diagnosis of categorical data. The default value is TRUE, which also includes character variables.

### Details

The scope of the diagnosis is the occupancy status of the levels in categorical data. If a certain level of occupancy is close to 100 then the removal of this variable in the forecast model will have to be considered. Also, if the occupancy of all levels is close to 0 variable is likely to be an identifier.

### Value

an object of `tbl_df`.

### Categorical diagnostic information

The information derived from the categorical data diagnosis is as follows.

- variables : variable names
- levels: level names
- N : number of observation
- freq : number of observation at the levels
- ratio : percentage of observation at the levels
- rank : rank of occupancy ratio of levels

See vignette("diagonosis") for an introduction to these concepts.

### See Also

[diagnose\\_category.tbl\\_dbi](#), [diagnose.data.frame](#), [diagnose\\_numeric.data.frame](#), [diagnose\\_outlier.data.frame](#)

### Examples

```
# Diagnosis of categorical variables
diagnose_category(jobchange)

# Select the variable to diagnose
# diagnose_category(jobchange, education_level, company_type)
```

```

# diagnose_category(jobchange, -education_level, -company_type)
# diagnose_category(jobchange, "education_level", "company_type")
# diagnose_category(jobchange, 7)

# Using pipes -----
library(dplyr)

# Diagnosis of all categorical variables
jobchange %>%
  diagnose_category()

# Positive values select variables
jobchange %>%
  diagnose_category(company_type, job_chnge)

# Negative values to drop variables
jobchange %>%
  diagnose_category(-company_type, -job_chnge)

# Positions values select variables
jobchange %>%
  diagnose_category(7)

# Negative values to drop variables
jobchange %>%
  diagnose_category(-7)

# Top rank levels with top argument
jobchange %>%
  diagnose_category(top = 2)

# Using pipes & dplyr -----
# Extraction of level that is more than 60% of categorical data
jobchange %>%
  diagnose_category() %>%
  filter(ratio >= 60)

# All observations of enrollee_id have a rank of 1.
# Because it is a unique identifier. Therefore, if you select up to the top rank 3,
# all records are displayed. It will probably fill your screen.

# extract rows that less than equal rank 3
# default of type argument is "n"
jobchange %>%
  diagnose_category(enrollee_id, top = 3)

# extract rows that less than equal rank 3
jobchange %>%
  diagnose_category(enrollee_id, top = 3, type = "rank")

# extract only 3 rows
jobchange %>%
  diagnose_category(enrollee_id, top = 3, type = "n")

```

---

diagnose\_category.tbl\_dbi

*Diagnose data quality of categorical variables in the DBMS*


---

### Description

The `diagnose_category()` produces information for diagnosing the quality of the character (CHAR, VARCHAR, VARCHAR2, etc.) column of the DBMS table through `tbl_dbi`.

### Usage

```
## S3 method for class 'tbl_dbi'
diagnose_category(
  .data,
  ...,
  top = 10,
  type = c("rank", "n")[1],
  in_database = TRUE,
  collect_size = Inf
)
```

### Arguments

<code>.data</code>	a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose_category()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>top</code>	an integer. Specifies the upper top rank to extract. Default is 10.
<code>type</code>	a character string specifying how result are extracted. Default is "rank" that extract top n ranks by decreasing frequency. In this case, if there are ties in rank, more rows than the number specified by the <code>top</code> argument are returned. "n" extract top n rows by decreasing frequency. If there are too many rows to be returned because there are too many ties, you can adjust the returned rows appropriately by using "n".
<code>in_database</code>	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory.
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .

**Details**

The scope of the diagnosis is the occupancy status of the levels in categorical data. If a certain level of occupancy is close to 100 then the removal of this variable in the forecast model will have to be considered. Also, if the occupancy of all levels is close to 0 variable is likely to be an identifier.

**Value**

an object of tbl\_df.

**Categorical diagnostic information**

The information derived from the categorical data diagnosis is as follows.

- variables : variable names
- levels: level names
- N : number of observation
- freq : number of observation at the levels
- ratio : percentage of observation at the levels
- rank : rank of occupancy ratio of levels

See vignette("diagonosis") for an introduction to these concepts.

**See Also**

[diagnose\\_category.data.frame](#), [diagnose.tbl\\_dbi](#), [diagnose\\_category.tbl\\_dbi](#), [diagnose\\_numeric.tbl\\_dbi](#), [diagnose\\_outlier.tbl\\_dbi](#).

**Examples**

```
library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy jobchange to the DBMS with a table named TB_JOBCHANGE
copy_to(con_sqlite, jobchange, name = "TB_JOBCHANGE", overwrite = TRUE)

# Using pipes -----
# Diagnosis of all categorical variables
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose_category()

# Positive values select variables
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose_category(company_type, job_chnge)
```

```

# Negative values to drop variables, and In-memory mode
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose_category(-company_type, -job_chnge, in_database = FALSE)

# Positions values select variables, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose_category(7, in_database = FALSE, collect_size = 200)

# Negative values to drop variables
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose_category(-7)

# Top rank levels with top argument
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose_category(top = 2)

# Using pipes & dplyr -----
# Extraction of level that is more than 60% of categorical data
con_sqlite %>%
  tbl("TB_JOBCHANGE") %>%
  diagnose_category() %>%
  filter(ratio >= 60)

# Using type argument -----
dfm <- data.frame(alpabet = c(rep(letters[1:5], times = 5), "c"))

# copy dfm to the DBMS with a table named TB_EXAMPLE
copy_to(con_sqlite, dfm, name = "TB_EXAMPLE", overwrite = TRUE)

# extract rows that less than equal rank 10
# default of top argument is 10
con_sqlite %>%
  tbl("TB_EXAMPLE") %>%
  diagnose_category()

# extract rows that less than equal rank 2
con_sqlite %>%
  tbl("TB_EXAMPLE") %>%
  diagnose_category(top = 2, type = "rank")

# extract rows that less than equal rank 2
# default of type argument is "rank"
con_sqlite %>%
  tbl("TB_EXAMPLE") %>%
  diagnose_category(top = 2)

# extract only 2 rows
con_sqlite %>%
  tbl("TB_EXAMPLE") %>%

```

```
diagnose_category(top = 2, type = "n")

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
```

---

diagnose\_numeric      *Diagnose data quality of numerical variables*

---

### Description

The `diagnose_numeric()` produces information for diagnosing the quality of the numerical data.

### Usage

```
diagnose_numeric(.data, ...)

## S3 method for class 'data.frame'
diagnose_numeric(.data, ...)
```

### Arguments

`.data`      a `data.frame` or a `tbl_df`.

`...`      one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, `diagnose_numeric()` will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

### Details

The scope of the diagnosis is the calculate a statistic that can be used to understand the distribution of numerical data. `min`, `Q1`, `mean`, `median`, `Q3`, `max` can be used to estimate the distribution of data. If the number of zero or minus is large, it is necessary to suspect the error of the data. If the number of outliers is large, a strategy of eliminating or replacing outliers is needed.

### Value

an object of `tbl_df`.

### Numerical diagnostic information

The information derived from the numerical data diagnosis is as follows.

- `variables` : variable names
- `min` : minimum

- Q1 : 25 percentile
- mean : arithmetic average
- median : median. 50 percentile
- Q3 : 75 percentile
- max : maximum
- zero : count of zero values
- minus : count of minus values
- outlier : count of outliers

See vignette("diagnosis") for an introduction to these concepts.

### See Also

[diagnose\\_numeric.tbl\\_dbi](#), [diagnose.data.frame](#), [diagnose\\_category.data.frame](#), [diagnose\\_outlier.data.frame](#)

### Examples

```
# Diagnosis of numerical variables
diagnose_numeric(heartfailure)

# Select the variable to diagnose
diagnose_numeric(heartfailure, cpk_enzyme, sodium)
diagnose_numeric(heartfailure, -cpk_enzyme, -sodium)
diagnose_numeric(heartfailure, "cpk_enzyme", "sodium")
diagnose_numeric(heartfailure, 5)

# Using pipes -----
library(dplyr)

# Diagnosis of all numerical variables
heartfailure %>%
  diagnose_numeric()
# Positive values select variables
heartfailure %>%
  diagnose_numeric(cpk_enzyme, sodium)
# Negative values to drop variables
heartfailure %>%
  diagnose_numeric(-cpk_enzyme, -sodium)
# Positions values select variables
heartfailure %>%
  diagnose_numeric(5)
# Negative values to drop variables
heartfailure %>%
  diagnose_numeric(-1, -5)

# Using pipes & dplyr -----
# List of variables containing outliers
heartfailure %>%
  diagnose_numeric() %>%
```

```
filter(outlier > 0)
```

---

```
diagnose_numeric.tbl_dbi
```

*Diagnose data quality of numerical variables in the DBMS*

---

### Description

The `diagnose_numeric()` produces information for diagnosing the quality of the numerical (INTEGER, NUMBER, etc.) column of the DBMS table through `tbl_dbi`.

### Usage

```
## S3 method for class 'tbl_dbi'
diagnose_numeric(.data, ..., in_database = FALSE, collect_size = Inf)
```

### Arguments

<code>.data</code>	a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose_numeric()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>in_database</code>	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported <code>in_database = TRUE</code> .
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .

### Details

The scope of the diagnosis is the calculate a statistic that can be used to understand the distribution of numerical data. min, Q1, mean, median, Q3, max can be used to estimate the distribution of data. If the number of zero or minus is large, it is necessary to suspect the error of the data. If the number of outliers is large, a strategy of eliminating or replacing outliers is needed.

### Value

an object of `tbl_df`.

### Numerical diagnostic information

The information derived from the numerical data diagnosis is as follows.

- variables : variable names
- min : minimum
- Q1 : 25 percentile
- mean : arithmetic average
- median : median. 50 percentile
- Q3 : 75 percentile
- max : maximum
- zero : count of zero values
- minus : count of minus values
- outlier : count of outliers

See vignette("diagonosis") for an introduction to these concepts.

### See Also

[diagnose\\_numeric.data.frame](#), [diagnose.tbl\\_dbi](#), [diagnose\\_category.tbl\\_dbi](#), [diagnose\\_outlier.tbl\\_dbi](#).

### Examples

```
library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Diagnosis of all numerical variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_numeric()

# Positive values select variables, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_numeric(age, sodium, collect_size = 200)

# Negative values to drop variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_numeric(-age, -sodium)

# Positions values select variables
```

```

con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_numeric(5)

# Negative values to drop variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_numeric(-1, -5)

# Using pipes & dplyr -----
# List of variables containing outliers
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_numeric() %>%
  filter(outlier > 0)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

---

diagnose_outlier	<i>Diagnose outlier of numerical variables</i>
------------------	--

---

## Description

The `diagnose_outlier()` produces outlier information for diagnosing the quality of the numerical data.

## Usage

```

diagnose_outlier(.data, ...)

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

```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose_outlier()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

**Details**

The scope of the diagnosis is to provide outlier information. If the number of outliers is small and the difference between the averages including outliers and the averages not including them is large, it is necessary to eliminate or replace the outliers.

**Value**

an object of `tbl_df`.

**Outlier Diagnostic information**

The information derived from the numerical data diagnosis is as follows.

- `variables` : variable names
- `outliers_cnt` : number of outliers
- `outliers_ratio` : percent of outliers
- `outliers_mean` : arithmetic average of outliers
- `with_mean` : arithmetic average of with outliers
- `without_mean` : arithmetic average of without outliers

See vignette("diagnosis") for an introduction to these concepts.

**See Also**

[diagnose\\_outlier.tbl\\_dbi](#), [diagnose.data.frame](#), [diagnose\\_category.data.frame](#), [diagnose\\_numeric.data.frame](#)

**Examples**

```
# Diagnosis of numerical variables
diagnose_outlier(heartfailure)

# Select the variable to diagnose
diagnose_outlier(heartfailure, cpk_enzyme, sodium)
diagnose_outlier(heartfailure, -cpk_enzyme, -sodium)
diagnose_outlier(heartfailure, "cpk_enzyme", "sodium")
diagnose_outlier(heartfailure, 5)

# Using pipes -----
library(dplyr)

# Diagnosis of all numerical variables
heartfailure %>%
  diagnose_outlier()
# Positive values select variables
heartfailure %>%
  diagnose_outlier(cpk_enzyme, sodium)
# Negative values to drop variables
heartfailure %>%
```

```

    diagnose_outlier(-cpk_enzyme, -sodium)
# Positions values select variables
heartfailure %>%
  diagnose_outlier(5)
# Negative values to drop variables
heartfailure %>%
  diagnose_outlier(-1, -5)

# Using pipes & dplyr -----
# outlier_ratio is more than 1%
heartfailure %>%
  diagnose_outlier() %>%
  filter(outliers_ratio > 1)

```

---

diagnose\_outlier.tbl\_dbi

*Diagnose outlier of numerical variables in the DBMS*

---

## Description

The `diagnose_outlier()` produces outlier information for diagnosing the quality of the numerical (INTEGER, NUMBER, etc.) column of the DBMS table through `tbl_dbi`.

## Usage

```

## S3 method for class 'tbl_dbi'
diagnose_outlier(.data, ..., in_database = FALSE, collect_size = Inf)

```

## Arguments

<code>.data</code>	a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose_outlier()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>in_database</code>	Specifies whether to perform in-database operations. If <code>TRUE</code> , most operations are performed in the DBMS. if <code>FALSE</code> , table data is taken in R and operated in-memory. Not yet supported <code>in_database = TRUE</code> .
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .

**Details**

The scope of the diagnosis is to provide outlier information. If the number of outliers is small and the difference between the averages including outliers and the averages not including them is large, it is necessary to eliminate or replace the outliers.

**Value**

an object of `tbl_df`.

**Outlier Diagnostic information**

The information derived from the numerical data diagnosis is as follows.

- `variables` : variable names
- `outliers_cnt` : number of outliers
- `outliers_ratio` : percent of outliers
- `outliers_mean` : arithmetic average of outliers
- `with_mean` : arithmetic average of with outliers
- `without_mean` : arithmetic average of without outliers

See vignette("diagnosis") for an introduction to these concepts.

**See Also**

[diagnose\\_outlier.data.frame](#), [diagnose.tbl\\_dbi](#), [diagnose\\_category.tbl\\_dbi](#), [diagnose\\_numeric.tbl\\_dbi](#).

**Examples**

```
library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Diagnosis of all numerical variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_outlier()

# Positive values select variables, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_outlier(platelets, sodium, collect_size = 200)

# Negative values to drop variables
```

```

con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_outlier(-platelets, -sodium)

# Positions values select variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_outlier(5)

# Negative values to drop variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_outlier(-1, -5)

# Using pipes & dplyr -----
# outlier_ratio is more than 1%
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_outlier() %>%
  filter(outliers_ratio > 1)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

---

diagnose\_paged\_report *Reporting the information of data diagnosis*

---

## Description

The `diagnose_paged_report()` paged report the information for diagnosing the quality of the data.

## Usage

```

diagnose_paged_report(.data, ...)

## S3 method for class 'data.frame'
diagnose_paged_report(
  .data,
  output_format = c("pdf", "html"),
  output_file = NULL,
  output_dir = tempdir(),
  browse = TRUE,
  title = "Data Diagnosis Report",
  subtitle = deparse(substitute(.data)),
  author = "dlookr",
  abstract_title = "Report Overview",
  abstract = NULL,

```

```

title_color = "white",
subtitle_color = "gold",
thres_uniq_cat = 0.5,
thres_uniq_num = 5,
flag_content_zero = TRUE,
flag_content_minus = TRUE,
flag_content_missing = TRUE,
cover_img = NULL,
create_date = Sys.time(),
logo_img = NULL,
theme = c("orange", "blue"),
sample_percent = 100,
is_tbl_dbi = FALSE,
base_family = NULL,
...
)

```

### Arguments

<code>.data</code>	a data.frame or a <a href="#">tbl_df</a> .
<code>...</code>	arguments to be passed to <code>pagedown::chrome_print()</code> .
<code>output_format</code>	report output type. Choose either "pdf" and "html". "pdf" create pdf file by <code>rmarkdown::render()</code> and <code>pagedown::chrome_print()</code> . so, you needed Chrome web browser on computer. "html" create html file by <code>rmarkdown::render()</code> .
<code>output_file</code>	name of generated file. default is NULL.
<code>output_dir</code>	name of directory to generate report file. default is <code>tempdir()</code> .
<code>browse</code>	logical. choose whether to output the report results to the browser.
<code>title</code>	character. title of report. default is "Data Diagnosis Report".
<code>subtitle</code>	character. subtitle of report. default is name of data.
<code>author</code>	character. author of report. default is "dlookr".
<code>abstract_title</code>	character. abstract title of report. default is "Report Overview".
<code>abstract</code>	character. abstract of report.
<code>title_color</code>	character. color of title. default is "white".
<code>subtitle_color</code>	character. color of subtitle. default is "gold".
<code>thres_uniq_cat</code>	numeric. threshold to use for "Unique Values - Categorical Variables". default is 0.5.
<code>thres_uniq_num</code>	numeric. threshold to use for "Unique Values - Numerical Variables". default is 5.
<code>flag_content_zero</code>	logical. whether to output "Zero Values" information. the default value is TRUE, and the information is displayed.
<code>flag_content_minus</code>	logical. whether to output "Minus Values" information. the default value is TRUE, and the information is displayed.

flag_content_missing	logical. whether to output "Missing Value" information. the default value is TRUE, and the information is displayed.
cover_img	character. name of cover image.
create_date	Date or POSIXct, character. The date on which the report is generated. The default value is the result of Sys.time().
logo_img	character. name of logo image file on top right.
theme	character. name of theme for report. support "orange" and "blue". default is "orange".
sample_percent	numeric. Sample percent of data for performing Diagnosis. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
is_tbl_dbi	logical. whether .data is a tbl_dbi object.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

## Details

Generate generalized data diagnostic reports automatically. You can choose to output to pdf and html files. This is useful for diagnosing a data frame with a large number of variables than data with a small number of variables.

Create an PDF through the Chrome DevTools Protocol. If you want to create PDF, Google Chrome or Microsoft Edge (or Chromium on Linux) must be installed prior to using this function. If not installed, you must use `output_format = "html"`.

## Reported information

Reported from the data diagnosis is as follows.

- Overview
  - Data Structures
  - Job Informations
  - Warnings
  - Variables
- Missing Values
  - List of Missing Values
  - Visualization
- Unique Values
  - Categorical Variables
  - Numerical Variables
- Categorical Variable Diagnosis
  - Top Ranks
- Numerical Variable Diagnosis

- Distribution
  - \* Zero Values
  - \* Minus Values
- Outliers
  - \* List of Outliers
  - \* Individual Outliers

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### See Also

[diagnose\\_paged\\_report.tbl\\_dbi](#).

### Examples

```
if (FALSE) {
# create dataset
heartfailure2 <- dlookr::heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "sodium"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 2), "time"] <- 0
heartfailure2[sample(seq(NROW(heartfailure2)), 1), "creatinine"] <- -0.3

# create pdf file. file name is Diagnosis_Paged_Report.pdf
diagnose_paged_report(heartfailure2)

# create pdf file. file name is Diagn.pdf. and change cover image
cover <- file.path(system.file(package = "dlookr"), "report", "cover2.jpg")
diagnose_paged_report(heartfailure2, cover_img = cover, title_color = "gray",
  output_file = "Diagn.pdf")

# create pdf file. file name is ./Diagn.pdf and not browse
cover <- file.path(system.file(package = "dlookr"), "report", "cover3.jpg")
diagnose_paged_report(heartfailure2, output_dir = ".", cover_img = cover,
  flag_content_missing = FALSE, output_file = "Diagn.pdf", browse = FALSE)

# create pdf file. file name is Diagnosis_Paged_Report.html
diagnose_paged_report(heartfailure2, output_format = "html")
}
```

---

diagnose\_paged\_report.tbl\_dbi

*Reporting the information of data diagnosis for table of the DBMS*


---

## Description

The `diagnose_paged_report()` paged report the information for diagnosing the quality of the DBMS table through `tbl_dbi`.

## Usage

```
## S3 method for class 'tbl_dbi'
diagnose_paged_report(
  .data,
  output_format = c("pdf", "html")[1],
  output_file = NULL,
  output_dir = tempdir(),
  browse = TRUE,
  title = "Data Diagnosis Report",
  subtitle = deparse(substitute(.data)),
  author = "dlookr",
  abstract_title = "Report Overview",
  abstract = NULL,
  title_color = "white",
  subtitle_color = "gold",
  thres_uniq_cat = 0.5,
  thres_uniq_num = 5,
  flag_content_zero = TRUE,
  flag_content_minus = TRUE,
  flag_content_missing = TRUE,
  cover_img = NULL,
  create_date = Sys.time(),
  logo_img = NULL,
  theme = c("orange", "blue")[1],
  sample_percent = 100,
  in_database = FALSE,
  collect_size = Inf,
  as_factor = TRUE,
  ...
)
```

## Arguments

<code>.data</code>	a <code>tbl_dbi</code> .
<code>output_format</code>	report output type. Choose either "pdf" and "html". "pdf" create pdf file by <code>rmarkdown::render()</code> and <code>pagedown::chrome_print()</code> . so, you needed Chrome web browser on computer. "html" create html file by <code>rmarkdown::render()</code> .

<code>output_file</code>	name of generated file. default is NULL.
<code>output_dir</code>	name of directory to generate report file. default is <code>tempdir()</code> .
<code>browse</code>	logical. choose whether to output the report results to the browser.
<code>title</code>	character. title of report. default is "Data Diagnosis Report".
<code>subtitle</code>	character. subtitle of report. default is name of data.
<code>author</code>	character. author of report. default is "dlookr".
<code>abstract_title</code>	character. abstract title of report. default is "Report Overview".
<code>abstract</code>	character. abstract of report.
<code>title_color</code>	character. color of title. default is "white".
<code>subtitle_color</code>	character. color of title. default is "gold".
<code>thres_uniq_cat</code>	numeric. threshold to use for "Unique Values - Categorical Variables". default is 0.5.
<code>thres_uniq_num</code>	numeric. threshold to use for "Unique Values - Numerical Variables". default is 5.
<code>flag_content_zero</code>	logical. whether to output "Zero Values" information. the default value is TRUE, and the information is displayed.
<code>flag_content_minus</code>	logical. whether to output "Minus Values" information. the default value is TRUE, and the information is displayed.
<code>flag_content_missing</code>	logical. whether to output "Missing Value" information. the default value is TRUE, and the information is displayed.
<code>cover_img</code>	character. name of cover image.
<code>create_date</code>	Date or POSIXct, character. The date on which the report is generated. The default value is the result of <code>Sys.time()</code> .
<code>logo_img</code>	character. name of logo image on top right.
<code>theme</code>	character. name of theme for report. support "orange" and "blue". default is "orange".
<code>sample_percent</code>	numeric. Sample percent of data for performing Diagnosis. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
<code>in_database</code>	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in <code>in_database = TRUE</code> .
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .
<code>as_factor</code>	logical. whether to convert to factor when importing a character type variable from DBMS table into R.
<code>...</code>	arguments to be passed to <code>pagedown::chrome_print()</code> .

## Details

Generate generalized data diagnostic reports automatically. You can choose to output to pdf and html files. This is useful for diagnosing a data frame with a large number of variables than data with a small number of variables.

Create an PDF through the Chrome DevTools Protocol. If you want to create PDF, Google Chrome or Microsoft Edge (or Chromium on Linux) must be installed prior to using this function. If not installed, you must use `output_format = "html"`.

## Reported information

Reported from the data diagnosis is as follows.

- Overview
  - Data Structures
  - Job Informations
  - Warnings
  - Variables
- Missing Values
  - List of Missing Values
  - Visualization
- Unique Values
  - Categorical Variables
  - Numerical Variables
- Categorical Variable Diagnosis
  - Top Ranks
- Numerical Variable Diagnosis
  - Distribution
    - \* Zero Values
    - \* Minus Values
  - Outliers
    - \* List of Outliers
    - \* Individual Outliers

## See Also

[diagnose\\_paged\\_report.data.frame.](#)

## Examples

```
if (FALSE) {  
  library(dplyr)  
  
  # Generate data for the example  
  heartfailure2 <- heartfailure
```

```

heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure2 to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure2, name = "TB_HEARTFAILURE", overwrite = TRUE)

# reporting the diagnosis information -----
# create pdf file. file name is Diagnosis_Paged_Report.pdf
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_paged_report()

# create pdf file. file name is Diagn.pdf, and collect size is 250
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  diagnose_paged_report(collect_size = 250, output_file = "Diagn.pdf")

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
}

```

---

diagnose\_report

*Reporting the information of data diagnosis*


---

## Description

The `diagnose_report()` report the information for diagnosing the quality of the data.

## Usage

```

diagnose_report(.data, output_format, output_file, output_dir, ...)

## S3 method for class 'data.frame'
diagnose_report(
  .data,
  output_format = c("pdf", "html"),
  output_file = NULL,
  output_dir = tempdir(),
  font_family = NULL,
  browse = TRUE,
  ...
)

```

**Arguments**

.data	a data.frame or a <a href="#">tbl_df</a> .
output_format	report output type. Choose either "pdf" and "html". "pdf" create pdf file by knitr::knit(). "html" create html file by rmarkdown::render().
output_file	name of generated file. default is NULL.
output_dir	name of directory to generate report file. default is tempdir().
...	arguments to be passed to methods.
font_family	character. font family name for figure in pdf.
browse	logical. choose whether to output the report results to the browser.

**Details**

Generate generalized data diagnostic reports automatically. You can choose to output to pdf and html files. This is useful for diagnosing a data frame with a large number of variables than data with a small number of variables. For pdf output, Korean Gothic font must be installed in Korean operating system.

**Reported information**

Reported from the data diagnosis is as follows.

- Diagnose Data
  - Overview of Diagnosis
    - \* List of all variables quality
    - \* Diagnosis of missing data
    - \* Diagnosis of unique data(Text and Category)
    - \* Diagnosis of unique data(Numerical)
  - Detailed data diagnosis
    - \* Diagnosis of categorical variables
    - \* Diagnosis of numerical variables
    - \* List of numerical diagnosis (zero)
    - \* List of numerical diagnosis (minus)
- Diagnose Outliers
  - Overview of Diagnosis
    - \* Diagnosis of numerical variable outliers
    - \* Detailed outliers diagnosis

See vignette("diagonosis") for an introduction to these concepts.

**Examples**

```

if (FALSE) {
# reporting the diagnosis information -----
# create pdf file. file name is DataDiagnosis_Report.pdf
diagnose_report(heartfailure)

# create pdf file. file name is Diagn.pdf
diagnose_report(heartfailure, output_file = "Diagn.pdf")

# create pdf file. file name is ./Diagn.pdf and not browse
diagnose_report(heartfailure, output_dir = ".", output_file = "Diagn.pdf",
  browse = FALSE)

# create html file. file name is Diagnosis_Report.html
diagnose_report(heartfailure, output_format = "html")

# create html file. file name is Diagn.html
diagnose_report(heartfailure, output_format = "html", output_file = "Diagn.html")
}

```

---

diagnose\_report.tbl\_dbi

*Reporting the information of data diagnosis for table of the DBMS*

---

**Description**

The `diagnose_report()` report the information for diagnosing the quality of the DBMS table through `tbl_dbi`

**Usage**

```

## S3 method for class 'tbl_dbi'
diagnose_report(
  .data,
  output_format = c("pdf", "html"),
  output_file = NULL,
  output_dir = tempdir(),
  font_family = NULL,
  in_database = FALSE,
  collect_size = Inf,
  ...
)

```

**Arguments**

.data	a tbl_dbi.
output_format	report output type. Choose either "pdf" and "html". "pdf" create pdf file by knitr::knit(). "html" create html file by rmarkdown::render().
output_file	name of generated file. default is NULL.
output_dir	name of directory to generate report file. default is tempdir().
font_family	character. font family name for figure in pdf.
in_database	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in_database = TRUE.
collect_size	a integer. The number of data samples from the DBMS to R. Applies only if in_database = FALSE.
...	arguments to be passed to methods.

**Details**

Generate generalized data diagnostic reports automatically. You can choose to output to pdf and html files. This is useful for diagnosing a data frame with a large number of variables than data with a small number of variables. For pdf output, Korean Gothic font must be installed in Korean operating system.

**Reported information**

Reported from the data diagnosis is as follows.

- Diagnose Data
  - Overview of Diagnosis
    - \* List of all variables quality
    - \* Diagnosis of missing data
    - \* Diagnosis of unique data(Text and Category)
    - \* Diagnosis of unique data(Numerical)
  - Detailed data diagnosis
    - \* Diagnosis of categorical variables
    - \* Diagnosis of numerical variables
    - \* List of numerical diagnosis (zero)
    - \* List of numerical diagnosis (minus)
- Diagnose Outliers
  - Overview of Diagnosis
    - \* Diagnosis of numerical variable outliers
    - \* Detailed outliers diagnosis

See vignette("diagonosis") for an introduction to these concepts.

**See Also**

[diagnose\\_report.data.frame.](#)

**Examples**

```

if (FALSE) {
  library(dplyr)

  # Generate data for the example
  heartfailure2 <- heartfailure
  heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
  heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

  # connect DBMS
  con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

  # copy heartfailure2 to the DBMS with a table named TB_HEARTFAILURE
  copy_to(con_sqlite, heartfailure2, name = "TB_HEARTFAILURE", overwrite = TRUE)

  # reporting the diagnosis information -----
  # create pdf file. file name is DataDiagnosis_Report.pdf
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    diagnose_report()

  # create pdf file. file name is Diagn.pdf, and collect size is 350
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    diagnose_report(collect_size = 350, output_file = "Diagn.pdf")

  # create html file. file name is Diagnosis_Report.html
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    diagnose_report(output_format = "html")

  # create html file. file name is Diagn.html
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    diagnose_report(output_format = "html", output_file = "Diagn.html")

  # Disconnect DBMS
  DBI::dbDisconnect(con_sqlite)
}

```

**Description**

The `diagnose_sparsese()` checks for combinations of levels that do not appear as data among all combinations of levels of categorical variables.

**Usage**

```
diagnose_sparsese(.data, ...)

## S3 method for class 'data.frame'
diagnose_sparsese(
  .data,
  ...,
  type = c("all", "sparse")[2],
  add_character = FALSE,
  limit = 500
)
```

**Arguments**

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>diagnose_sparsese()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>type</code>	a character string specifying how result are extracted. "all" that returns a combination of all possible levels. At this time, the frequency of each case is also returned.. Default is "sparse" returns only sparse level combinations.
<code>add_character</code>	logical. Decide whether to include text variables in the diagnosis of categorical data. The default value is TRUE, which also includes character variables.
<code>limit</code>	integer. Conditions to check sparse levels. If the number of all possible combinations exceeds the limit, the calculation ends.

**Value**

an object of `data.frame`.

**Information of sparse levels**

The information derived from the sparse levels diagnosis is as follows.

- `variables` : level of categorical variables.
- `N` : number of observation. (optional)

## Examples

```
library(dplyr)

# Examples of too many combinations
diagnose_sparese(jobchange)

# Character type is also included in the combination variable
diagnose_sparese(jobchange, add_character = TRUE)

# Combination of two variables
jobchange %>%
  diagnose_sparese(education_level, major_discipline)

# Remove two categorical variables from combination
jobchange %>%
  diagnose_sparese(-city, -education_level)

diagnose_sparese(heartfailure)

# Adjust the threshold of limit to calculate
diagnose_sparese(heartfailure, limit = 50)

# List all combinations, including parese cases
diagnose_sparese(heartfailure, type = "all")

# collaboration with dplyr
heartfailure %>%
  diagnose_sparese(type = "all") %>%
  arrange(desc(n_case)) %>%
  mutate(percent = round(n_case / sum(n_case) * 100, 1))
```

---

diagnose\_web\_report *Reporting the information of data diagnosis with html*

---

## Description

The `diagnose_web_report()` report the information for diagnosing the quality of the data.

## Usage

```
diagnose_web_report(.data, ...)

## S3 method for class 'data.frame'
diagnose_web_report(
  .data,
  output_file = NULL,
```

```

output_dir = tempdir(),
browse = TRUE,
title = "Data Diagnosis",
subtitle = deparse(substitute(.data)),
author = "dlookr",
title_color = "gray",
thres_uniq_cat = 0.5,
thres_uniq_num = 5,
logo_img = NULL,
create_date = Sys.time(),
theme = c("orange", "blue"),
sample_percent = 100,
is_tbl_dbi = FALSE,
base_family = NULL,
...
)

```

### Arguments

<code>.data</code>	a data.frame or a <a href="#">tbl_df</a> .
<code>...</code>	arguments to be passed to methods.
<code>output_file</code>	name of generated file. default is NULL.
<code>output_dir</code>	name of directory to generate report file. default is tempdir().
<code>browse</code>	logical. choose whether to output the report results to the browser.
<code>title</code>	character. title of report. default is "Data Diagnosis Report".
<code>subtitle</code>	character. subtitle of report. default is name of data.
<code>author</code>	character. author of report. default is "dlookr".
<code>title_color</code>	character. color of title. default is "gray".
<code>thres_uniq_cat</code>	numeric. threshold to use for "Unique Values - Categorical Variables". default is 0.5.
<code>thres_uniq_num</code>	numeric. threshold to use for "Unique Values - Numerical Variables". default is 5.
<code>logo_img</code>	character. name of logo image file on top left.
<code>create_date</code>	Date or POSIXct, character. The date on which the report is generated. The default value is the result of Sys.time().
<code>theme</code>	character. name of theme for report. support "orange" and "blue". default is "orange".
<code>sample_percent</code>	numeric. Sample percent of data for performing Diagnosis. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
<code>is_tbl_dbi</code>	logical. whether .data is a tbl_dbi object.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

## Details

Generate generalized data diagnostic reports automatically. This is useful for diagnosing a data frame with a large number of variables than data with a small number of variables.

## Reported information

Reported from the data diagnosis is as follows.

- Overview
  - Data Structures
    - \* Data Structures
    - \* Data Types
    - \* Job Informations
  - Warnings
  - Variables
- Missing Values
  - List of Missing Values
  - Visualization
- Unique Values
  - Categorical Variables
  - Numerical Variables
- Outliers
- Samples
  - Duplicated
  - Heads
  - Tails

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## See Also

[diagnose\\_web\\_report.tbl\\_dbi](#).

## Examples

```
if (FALSE) {  
  # create dataset  
  heartfailure2 <- dlookr::heartfailure  
  heartfailure2[sample(seq(NROW(heartfailure2)), 20), "sodium"] <- NA  
  heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA  
  heartfailure2[sample(seq(NROW(heartfailure2)), 2), "time"] <- 0  
  heartfailure2[sample(seq(NROW(heartfailure2)), 1), "creatinine"] <- -0.3  
}
```

```

# create pdf file. file name is Diagnosis_Report.html
diagnose_web_report(heartfailure2)

# file name is Diagn.html. and change logo image
logo <- file.path(system.file(package = "dlookr"), "report", "R_logo_html.svg")
diagnose_web_report(heartfailure2, logo_img = logo, title_color = "black",
  output_file = "Diagn.html")

# file name is ./Diagn_heartfailure.html, "blue" theme and not browse
diagnose_web_report(heartfailure2, output_dir = ".", author = "Choonghyun Ryu",
  output_file = "Diagn_heartfailure.html", theme = "blue", browse = FALSE)
}

```

---

diagnose\_web\_report.tbl\_dbi

*Reporting the information of data diagnosis for table of the DBMS  
with html*

---

## Description

The `diagnose_web_report()` report the information for diagnosing the quality of the DBMS table through `tbl_dbi`

## Usage

```

## S3 method for class 'tbl_dbi'
diagnose_web_report(
  .data,
  output_file = NULL,
  output_dir = tempdir(),
  browse = TRUE,
  title = "Data Diagnosis",
  subtitle = deparse(substitute(.data)),
  author = "dlookr",
  title_color = "gray",
  thres_uniq_cat = 0.5,
  thres_uniq_num = 5,
  logo_img = NULL,
  create_date = Sys.time(),
  theme = c("orange", "blue")[1],
  sample_percent = 100,
  in_database = FALSE,
  collect_size = Inf,
  as_factor = TRUE,
  ...
)

```

**Arguments**

.data	a tbl_dbi.
output_file	name of generated file. default is NULL.
output_dir	name of directory to generate report file. default is tempdir().
browse	logical. choose whether to output the report results to the browser.
title	character. title of report. default is "Data Diagnosis Report".
subtitle	character. subtitle of report. default is name of data.
author	character. author of report. default is "dlookr".
title_color	character. color of title. default is "gray".
thres_uniq_cat	numeric. threshold to use for "Unique Values - Categorical Variables". default is 0.5.
thres_uniq_num	numeric. threshold to use for "Unique Values - Numerical Variables". default is 5.
logo_img	character. name of logo image on top right.
create_date	Date or POSIXct, character. The date on which the report is generated. The default value is the result of Sys.time().
theme	character. name of theme for report. support "orange" and "blue". default is "orange".
sample_percent	numeric. Sample percent of data for performing Diagnosis. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
in_database	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in_database = TRUE.
collect_size	a integer. The number of data samples from the DBMS to R. Applies only if in_database = FALSE.
as_factor	logical. whether to convert to factor when importing a character type variable from DBMS table into R.
...	arguments to be passed to methods.

**Details**

Generate generalized data diagnostic reports automatically. This is useful for diagnosing a data frame with a large number of variables than data with a small number of variables.

**Reported information**

Reported from the data diagnosis is as follows.

- Overview
  - Data Structures
    - \* Data Structures
    - \* Data Types

- \* Job Informations
  - Warnings
  - Variables
- Missing Values
  - Top Ranks
- Numerical Variable Diagnosis
  - List of Missing Values
  - Visualization
- Unique Values
  - Categorical Variables
  - Numerical Variables
- Outliers
- Samples
  - Duplicated
  - Heads
  - Tails

### See Also

[diagnose\\_web\\_report.data.frame.](#)

### Examples

```
if (FALSE) {
  library(dplyr)

  # Generate data for the example
  heartfailure2 <- heartfailure
  heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
  heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

  # connect DBMS
  con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

  # copy heartfailure2 to the DBMS with a table named TB_HEARTFAILURE
  copy_to(con_sqlite, heartfailure2, name = "TB_HEARTFAILURE", overwrite = TRUE)

  # reporting the diagnosis information -----
  # create pdf file. file name is Diagnosis_Report.html
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    diagnose_web_report()

  # create pdf file. file name is Diagn.html, and collect size is 250
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
```

```

diagnose_web_report(collect_size = 250, output_file = "Diagn.html")

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
}

```

---

dlookr\_orange\_paged    *Generate paged HTML document*

---

### Description

Generate paged HTML document

### Usage

```
dlookr_orange_paged(...)
```

```
dlookr_blue_paged(...)
```

### Arguments

...                    arguments to be passed to pagedown: [:html\\_paged](#).

### Value

document of markdown format.

### References

<https://pagedown.rbind.io>

---

dlookr\_templ\_html    *dlookr HTML template Loads additional style and template file*

---

### Description

dlookr HTML template

Loads additional style and template file

### Usage

```
dlookr_templ_html(toc = TRUE, ...)
```

**Arguments**

toc                   should a table of contents be displayed?  
...                   additional arguments provided to html\_document

**Value**

An R Markdown output format.

**References**

[https://raw.githubusercontent.com/dr-harper/example-rmd-templates/master/R/my\\_html\\_format.R](https://raw.githubusercontent.com/dr-harper/example-rmd-templates/master/R/my_html_format.R)

---

eda\_paged\_report           *Reporting the information of EDA*

---

**Description**

The `eda_paged_report()` paged report the information for EDA.

**Usage**

```
eda_paged_report(.data, ...)  
  
## S3 method for class 'data.frame'  
eda_paged_report(  
  .data,  
  target = NULL,  
  output_format = c("pdf", "html"),  
  output_file = NULL,  
  output_dir = tempdir(),  
  browse = TRUE,  
  title = "EDA Report",  
  subtitle = deparse(substitute(.data)),  
  author = "dlookr",  
  abstract_title = "Report Overview",  
  abstract = NULL,  
  title_color = "black",  
  subtitle_color = "blue",  
  cover_img = NULL,  
  create_date = Sys.time(),  
  logo_img = NULL,  
  theme = c("orange", "blue"),  
  sample_percent = 100,  
  is_tbl_dbi = FALSE,  
  base_family = NULL,  
  ...  
)
```

**Arguments**

<code>.data</code>	a data.frame or a <code>tbl_df</code> .
<code>...</code>	arguments to be passed to <code>pagedown::chrome_print()</code> .
<code>target</code>	character. target variable.
<code>output_format</code>	report output type. Choose either "pdf" and "html". "pdf" create pdf file by <code>rmarkdown::render()</code> and <code>pagedown::chrome_print()</code> . so, you needed Chrome web browser on computer. "html" create html file by <code>rmarkdown::render()</code> .
<code>output_file</code>	name of generated file. default is NULL.
<code>output_dir</code>	name of directory to generate report file. default is <code>tempdir()</code> .
<code>browse</code>	logical. choose whether to output the report results to the browser.
<code>title</code>	character. title of report. default is "Data Diagnosis Report".
<code>subtitle</code>	character. subtitle of report. default is name of data.
<code>author</code>	character. author of report. default is "dlookr".
<code>abstract_title</code>	character. abstract title of report. default is "Report Overview".
<code>abstract</code>	character. abstract of report.
<code>title_color</code>	character. color of title. default is "black".
<code>subtitle_color</code>	character. color of subtitle. default is "blue".
<code>cover_img</code>	character. name of cover image.
<code>create_date</code>	Date or POSIXct, character. The date on which the report is generated. The default value is the result of <code>Sys.time()</code> .
<code>logo_img</code>	character. name of logo image file on top right.
<code>theme</code>	character. name of theme for report. support "orange" and "blue". default is "orange".
<code>sample_percent</code>	numeric. Sample percent of data for performing Diagnosis. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
<code>is_tbl_dbi</code>	logical. whether <code>.data</code> is a <code>tbl_dbi</code> object.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)

**Details**

Generate generalized EDA report automatically. You can choose to output to pdf and html files. This feature is useful for EDA of data with many variables, rather than data with fewer variables.

Create an PDF through the Chrome DevTools Protocol. If you want to create PDF, Google Chrome or Microsoft Edge (or Chromium on Linux) must be installed prior to using this function. If not installed, you must use `output_format = "html"`.

## Reported information

The EDA process will report the following information:

- Overview
  - Data Structures
  - Job Informations
- Univariate Analysis
  - Descriptive Statistics
    - \* Numerical Variables
    - \* Categorical Variables
  - Normality Test
- Bivariate Analysis
  - Compare Numerical Variables
  - Compare Categorical Variables
- Multivariate Analysis
  - Correlation Analysis
    - \* Correlation Coefficient Matrix
    - \* Correlation Plot
- Target based Analysis
  - Grouped Numerical Variables
  - Grouped Categorical Variables
  - Grouped Correlation

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## See Also

[eda\\_paged\\_report.tbl\\_dbi](#).

## Examples

```
if (FALSE) {  
  # create the dataset  
  heartfailure2 <- dlookr::heartfailure  
  heartfailure2[sample(seq(NROW(heartfailure2)), 20), "sodium"] <- NA  
  heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA  
  
  # create pdf file. file name is EDA_Paged_Report.pdf  
  eda_paged_report(heartfailure2, sample_percent = 80)  
  
  # create pdf file. file name is EDA.pdf. and change cover image  
  cover <- file.path(system.file(package = "dlookr"), "report", "cover1.jpg")  
  eda_paged_report(heartfailure2, cover_img = cover, title_color = "gray",
```

```

output_file = "EDA.pdf")

# create pdf file. file name is ./EDA.pdf and not browse
cover <- file.path(system.file(package = "dlookr"), "report", "cover3.jpg")
eda_paged_report(heartfailure2, output_dir = ".", cover_img = cover,
  flag_content_missing = FALSE, output_file = "EDA.pdf", browse = FALSE)

# create pdf file. file name is EDA_Paged_Report.html
eda_paged_report(heartfailure2, target = "death_event", output_format = "html")
}

```

---

eda\_paged\_report.tbl\_dbi

*Reporting the information of EDA for table of the DBMS*

---

## Description

The `eda_paged_report()` paged report the information for EDA of the DBMS table through `tbl_dbi`

## Usage

```

## S3 method for class 'tbl_dbi'
eda_paged_report(
  .data,
  target = NULL,
  output_format = c("pdf", "html")[1],
  output_file = NULL,
  output_dir = tempdir(),
  browse = TRUE,
  title = "EDA Report",
  subtitle = deparse(substitute(.data)),
  author = "dlookr",
  abstract_title = "Report Overview",
  abstract = NULL,
  title_color = "black",
  subtitle_color = "blue",
  cover_img = NULL,
  create_date = Sys.time(),
  logo_img = NULL,
  theme = c("orange", "blue")[1],
  sample_percent = 100,
  in_database = FALSE,
  collect_size = Inf,
  as_factor = TRUE,
  ...
)

```

**Arguments**

.data	a tbl_dbi.
target	character. target variable.
output_format	report output type. Choose either "pdf" and "html". "pdf" create pdf file by rmarkdown::render() and pagedown::chrome_print(). so, you needed Chrome web browser on computer. "html" create html file by rmarkdown::render().
output_file	name of generated file. default is NULL.
output_dir	name of directory to generate report file. default is tempdir().
browse	logical. choose whether to output the report results to the browser.
title	character. title of report. default is "Data Diagnosis Report".
subtitle	character. subtitle of report. default is name of data.
author	character. author of report. default is "dlookr".
abstract_title	character. abstract title of report. default is "Report Overview".
abstract	character. abstract of report.
title_color	character. color of title. default is "black".
subtitle_color	character. color of title. default is "blue".
cover_img	character. name of cover image.
create_date	Date or POSIXct, character. The date on which the report is generated. The default value is the result of Sys.time().
logo_img	character. name of logo image on top right.
theme	character. name of theme for report. support "orange" and "blue". default is "orange".
sample_percent	numeric. Sample percent of data for performing EDA. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
in_database	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in_database = TRUE.
collect_size	a integer. The number of data samples from the DBMS to R. Applies only if in_database = FALSE.
as_factor	logical. whether to convert to factor when importing a character type variable from DBMS table into R.
...	arguments to be passed to pagedown::chrome_print().

**Details**

Generate generalized EDA report automatically. You can choose to output to pdf and html files. This feature is useful for EDA of data with many variables, rather than data with fewer variables.

Create an PDF through the Chrome DevTools Protocol. If you want to create PDF, Google Chrome or Microsoft Edge (or Chromium on Linux) must be installed prior to using this function. If not installed, you must use output\_format = "html".

**Reported information**

The EDA process will report the following information:

- Overview
  - Data Structures
  - Job Informations
- Univariate Analysis
  - Descriptive Statistics
    - \* Numerical Variables
    - \* Categorical Variables
  - Normality Test
- Bivariate Analysis
  - Compare Numerical Variables
  - Compare Categorical Variables
- Multivariate Analysis
  - Correlation Analysis
    - \* Correlation Coefficient Matrix
    - \* Correlation Plot
- Target based Analysis
  - Grouped Numerical Variables
  - Grouped Categorical Variables
  - Grouped Correlation

**See Also**

[eda\\_paged\\_report.data.frame.](#)

**Examples**

```
if (FALSE) {
library(dplyr)

# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure2 to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure2, name = "TB_HEARTFAILURE", overwrite = TRUE)

# reporting the diagnosis information -----
# create pdf file. file name is EDA_Paged_Report.pdf
```

```

con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_paged_report(target = "death_event")

# create pdf file. file name is EDA.pdf, and collect size is 250
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_paged_report(collect_size = 250, output_file = "EDA.pdf")

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
}

```

---

eda\_report

*Reporting the information of EDA*


---

## Description

The `eda_report()` report the information of exploratory data analysis for object inheriting from `data.frame`.

## Usage

```

eda_report(.data, ...)

## S3 method for class 'data.frame'
eda_report(
  .data,
  target = NULL,
  output_format = c("pdf", "html"),
  output_file = NULL,
  output_dir = tempdir(),
  font_family = NULL,
  browse = TRUE,
  ...
)

```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	arguments to be passed to methods.
<code>target</code>	target variable.
<code>output_format</code>	character. report output type. Choose either "pdf" and "html". "pdf" create pdf file by <code>knitr::knit()</code> . "html" create html file by <code>rmarkdown::render()</code> .
<code>output_file</code>	character. name of generated file. default is NULL.

output\_dir      character. name of directory to generate report file. default is tempdir().  
font\_family     character. font family name for figure in pdf.  
browse           logical. choose whether to output the report results to the browser.

### Details

Generate generalized EDA report automatically. You can choose to output as pdf and html files. This feature is useful for EDA of data with many variables, rather than data with fewer variables. For pdf output, Korean Gothic font must be installed in Korean operating system.

### Reported information

The EDA process will report the following information:

- Introduction
  - Information of Dataset
  - Information of Variables
  - About EDA Report
- Univariate Analysis
  - Descriptive Statistics
  - Normality Test of Numerical Variables
    - \* Statistics and Visualization of (Sample) Data
- Relationship Between Variables
  - Correlation Coefficient
    - \* Correlation Coefficient by Variable Combination
    - \* Correlation Plot of Numerical Variables
- Target based Analysis
  - Grouped Descriptive Statistics
    - \* Grouped Numerical Variables
    - \* Grouped Categorical Variables
  - Grouped Relationship Between Variables
    - \* Grouped Correlation Coefficient
    - \* Grouped Correlation Plot of Numerical Variables

See vignette("EDA") for an introduction to these concepts.

### Examples

```
if (FALSE) {
  library(dplyr)

  ## target variable is categorical variable -----
  # reporting the EDA information
  # create pdf file. file name is EDA_Report.pdf
  eda_report(heartfailure, death_event)
```

```

# create pdf file. file name is EDA_heartfailure.pdf
eda_report(heartfailure, "death_event", output_file = "EDA_heartfailure.pdf")

# create pdf file. file name is EDA_heartfailure.pdf and not browse
eda_report(heartfailure, "death_event", output_dir = ".",
  output_file = "EDA_heartfailure.pdf", browse = FALSE)

# create html file. file name is EDA_Report.html
eda_report(heartfailure, "death_event", output_format = "html")

# create html file. file name is EDA_heartfailure.html
eda_report(heartfailure, death_event, output_format = "html",
  output_file = "EDA_heartfailure.html")

## target variable is numerical variable -----
# reporting the EDA information
eda_report(heartfailure, sodium)

# create pdf file. file name is EDA2.pdf
eda_report(heartfailure, "sodium", output_file = "EDA2.pdf")

# create html file. file name is EDA_Report.html
eda_report(heartfailure, "sodium", output_format = "html")

# create html file. file name is EDA2.html
eda_report(heartfailure, sodium, output_format = "html", output_file = "EDA2.html")

## target variable is null
# reporting the EDA information
eda_report(heartfailure)

# create pdf file. file name is EDA2.pdf
eda_report(heartfailure, output_file = "EDA2.pdf")

# create html file. file name is EDA_Report.html
eda_report(heartfailure, output_format = "html")

# create html file. file name is EDA2.html
eda_report(heartfailure, output_format = "html", output_file = "EDA2.html")
}

```

---

eda\_report.tbl\_dbi

*Reporting the information of EDA for table of the DBMS*


---

### Description

The `eda_report()` report the information of Exploratory data analysis for object inheriting from the DBMS table through `tbl_dbi`

**Usage**

```
## S3 method for class 'tbl_dbi'
eda_report(
  .data,
  target = NULL,
  output_format = c("pdf", "html"),
  output_file = NULL,
  font_family = NULL,
  output_dir = tempdir(),
  in_database = FALSE,
  collect_size = Inf,
  ...
)
```

**Arguments**

.data	a tbl_dbi.
target	target variable.
output_format	report output type. Choose either "pdf" and "html". "pdf" create pdf file by knitr::knit(). "html" create html file by rmarkdown::render().
output_file	name of generated file. default is NULL.
font_family	character. font family name for figure in pdf.
output_dir	name of directory to generate report file. default is tempdir().
in_database	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in_database = TRUE.
collect_size	a integer. The number of data samples from the DBMS to R. Applies only if in_database = FALSE.
...	arguments to be passed to methods.

**Details**

Generate generalized data EDA reports automatically. You can choose to output to pdf and html files. This is useful for EDA a data frame with a large number of variables than data with a small number of variables. For pdf output, Korean Gothic font must be installed in Korean operating system.

**Reported information**

The EDA process will report the following information:

- Introduction
  - Information of Dataset
  - Information of Variables
  - About EDA Report
- Univariate Analysis

- Descriptive Statistics
- Normality Test of Numerical Variables
  - \* Statistics and Visualization of (Sample) Data
- Relationship Between Variables
  - Correlation Coefficient
    - \* Correlation Coefficient by Variable Combination
    - \* Correlation Plot of Numerical Variables
- Target based Analysis
  - Grouped Descriptive Statistics
    - \* Grouped Numerical Variables
    - \* Grouped Categorical Variables
  - Grouped Relationship Between Variables
    - \* Grouped Correlation Coefficient
    - \* Grouped Correlation Plot of Numerical Variables

See vignette("EDA") for an introduction to these concepts.

### See Also

[eda\\_report.data.frame.](#)

### Examples

```
if (FALSE) {
  library(dplyr)

  # Generate data for the example
  heartfailure2 <- heartfailure
  heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
  heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

  # connect DBMS
  con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

  # copy heartfailure2 to the DBMS with a table named TB_HEARTFAILURE
  copy_to(con_sqlite, heartfailure2, name = "TB_HEARTFAILURE", overwrite = TRUE)

  ## target variable is categorical variable
  # reporting the EDA information
  # create pdf file. file name is EDA_Report.pdf
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    eda_report(death_event)

  # create pdf file. file name is EDA_TB_HEARTFAILURE.pdf
  con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    eda_report("death_event", output_file = "EDA_TB_HEARTFAILURE.pdf")
}
```

```
# create html file. file name is EDA_Report.html
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report("death_event", output_format = "html")

# create html file. file name is EDA_TB_HEARTFAILURE.html
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report(death_event, output_format = "html", output_file = "EDA_TB_HEARTFAILURE.html")

## target variable is numerical variable
# reporting the EDA information, and collect size is 250
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report(sodium, collect_size = 250)

# create pdf file. file name is EDA2.pdf
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report("sodium", output_file = "EDA2.pdf")

# create html file. file name is EDA_Report.html
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report("sodium", output_format = "html")

# create html file. file name is EDA2.html
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report(sodium, output_format = "html", output_file = "EDA2.html")

## target variable is null
# reporting the EDA information
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report()

# create pdf file. file name is EDA2.pdf
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report(output_file = "EDA2.pdf")

# create html file. file name is EDA_Report.html
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report(output_format = "html")

# create html file. file name is EDA2.html
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_report(output_format = "html", output_file = "EDA2.html")
```

```
# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
}
```

---

eda\_web\_report

*Reporting the information of EDA with html*

---

## Description

The `eda_web_report()` report the information of exploratory data analysis for object inheriting from `data.frame`.

## Usage

```
eda_web_report(.data, ...)
```

```
## S3 method for class 'data.frame'
eda_web_report(
  .data,
  target = NULL,
  output_file = NULL,
  output_dir = tempdir(),
  browse = TRUE,
  title = "EDA",
  subtitle = deparse(substitute(.data)),
  author = "dlookr",
  title_color = "gray",
  logo_img = NULL,
  create_date = Sys.time(),
  theme = c("orange", "blue"),
  sample_percent = 100,
  is_tbl_dbi = FALSE,
  base_family = NULL,
  ...
)
```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <a href="#">tbl_df</a> .
<code>...</code>	arguments to be passed to methods.
<code>target</code>	character. target variable.
<code>output_file</code>	name of generated file. default is <code>NULL</code> .
<code>output_dir</code>	name of directory to generate report file. default is <code>tempdir()</code> .
<code>browse</code>	logical. choose whether to output the report results to the browser.

title	character. title of report. default is "EDA".
subtitle	character. subtitle of report. default is name of data.
author	character. author of report. default is "dlookr".
title_color	character. color of title. default is "gray".
logo_img	character. name of logo image file on top left.
create_date	Date or POSIXct, character. The date on which the report is generated. The default value is the result of Sys.time().
theme	character. name of theme for report. support "orange" and "blue". default is "orange".
sample_percent	numeric. Sample percent of data for performing EDA. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
is_tbl_dbi	logical. whether .data is a tbl_dbi object.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

## Details

Generate generalized EDA report automatically. This feature is useful for EDA of data with many variables, rather than data with fewer variables.

## Reported information

Reported from the EDA is as follows.

- Overview
  - Data Structures
  - Data Types
  - Job Informations
- Univariate Analysis
  - Descriptive Statistics
  - Normality Test
- Bivariate Analysis
  - Compare Numerical Variables
  - Compare Categorical Variables
- Multivariate Analysis
  - Correlation Analysis
    - \* Correlation Matrix
    - \* Correlation Plot
- Target based Analysis
  - Grouped Numerical Variables
  - Grouped Categorical Variables

### – Grouped Correlation

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### See Also

[eda\\_web\\_report.tbl\\_dbi](#).

### Examples

```
if (FALSE) {
# create the dataset
heartfailure2 <- dlookr::heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "sodium"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

# create html file. file name is EDA_Report.html
eda_web_report(heartfailure2)

# file name is EDA.html. and change logo image
logo <- file.path(system.file(package = "dlookr"), "report", "R_logo_html.svg")
eda_web_report(heartfailure2, logo_img = logo, title_color = "black",
  output_file = "EDA.html")

# file name is ./EDA_heartfailure.html, "blue" theme and not browse
eda_web_report(heartfailure2, target = "death_event", output_dir = ".",
  author = "Choonghyun Ryu", output_file = "EDA_heartfailure.html",
  theme = "blue", browse = FALSE)
}
```

---

eda\_web\_report.tbl\_dbi

*Reporting the information of EDA for table of the DBMS with html*

---

### Description

The `eda_web_report()` report the information of exploratory data analysis for the DBMS table through `tbl_dbi`

### Usage

```
## S3 method for class 'tbl_dbi'
eda_web_report(
  .data,
```

```

target = NULL,
output_file = NULL,
output_dir = tempdir(),
browse = TRUE,
title = "EDA",
subtitle = deparse(substitute(.data)),
author = "dlookr",
title_color = "gray",
logo_img = NULL,
create_date = Sys.time(),
theme = c("orange", "blue")[1],
sample_percent = 100,
in_database = FALSE,
collect_size = Inf,
as_factor = TRUE,
...
)

```

### Arguments

.data	a tbl_dbi.
target	character. target variable.
output_file	name of generated file. default is NULL.
output_dir	name of directory to generate report file. default is tempdir().
browse	logical. choose whether to output the report results to the browser.
title	character. title of report. default is "EDA Report".
subtitle	character. subtitle of report. default is name of data.
author	character. author of report. default is "dlookr".
title_color	character. color of title. default is "gray".
logo_img	character. name of logo image on top right.
create_date	Date or POSIXct, character. The date on which the report is generated. The default value is the result of Sys.time().
theme	character. name of theme for report. support "orange" and "blue". default is "orange".
sample_percent	numeric. Sample percent of data for performing EDA. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
in_database	Specifies whether to perform in-database operations. If TRUE, most operations are performed in the DBMS. if FALSE, table data is taken in R and operated in-memory. Not yet supported in_database = TRUE.
collect_size	a integer. The number of data samples from the DBMS to R. Applies only if in_database = FALSE.
as_factor	logical. whether to convert to factor when importing a character type variable from DBMS table into R.
...	arguments to be passed to methods.

## Details

Generate generalized EDA report automatically. This feature is useful for EDA of data with many variables, rather than data with fewer variables.

## Reported information

Reported from the EDA is as follows.

- Overview
  - Data Structures
  - Data Types
  - Job Informations
- Univariate Analysis
  - Descriptive Statistics
  - Normality Test
- Bivariate Analysis
  - Compare Numerical Variables
  - Compare Categorical Variables
- Multivariate Analysis
  - Correlation Analysis
    - \* Correlation Matrix
    - \* Correlation Plot
- Target based Analysis
  - Grouped Numerical Variables
  - Grouped Categorical Variables
  - Grouped Correlation

## See Also

[eda\\_web\\_report.data.frame.](#)

## Examples

```
if (FALSE) {  
  library(dplyr)  
  
  # Generate data for the example  
  heartfailure2 <- heartfailure  
  heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA  
  heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA  
  
  # connect DBMS  
  con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")  
  
  # copy heartfailure2 to the DBMS with a table named TB_HEARTFAILURE
```

```
copy_to(con_sqlite, heartfailure2, name = "TB_HEARTFAILURE", overwrite = TRUE)

# reporting the diagnosis information -----
# create pdf file. file name is EDA_Report.html
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_web_report(target = "death_event")

# create pdf file. file name is EDA.html, and collect size is 250
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  eda_web_report(collect_size = 250, output_file = "EDA.html")

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
}
```

---

entropy

*Calculate the entropy*

---

## Description

Calculate the Shannon's entropy.

## Usage

```
entropy(x)
```

## Arguments

x                    a numeric vector.

## Value

numeric. entropy

## Examples

```
set.seed(123)
x <- sample(1:10, 20, replace = TRUE)

entropy(x)
```

---

extract	<i>Extract bins from "bins"</i>
---------	---------------------------------

---

### Description

The `extract()` extract binned variable from "bins", "optimal\_bins" class object.

### Usage

```
extract(x)

## S3 method for class 'bins'
extract(x)
```

### Arguments

x a bins class or optimal\_bins class.

### Details

The "bins" and "optimal\_bins" class objects use the `summary()` and `plot()` functions to diagnose the performance of binned results. This function is used to extract the binned result if you are satisfied with the result.

### Value

factor.

### See Also

[binning](#), [binning\\_by](#).

### Examples

```
library(dplyr)

# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "creatinine"] <- NA

# optimal binning using binning_by()
bin <- binning_by(heartfailure2, "death_event", "creatinine")
bin

# extract binning result
extract(bin) %>%
  head(20)
```

---

`find_class`*Extract variable names or indices of a specific class*

---

**Description**

The `find_class()` extracts variable information having a certain class from an object inheriting `data.frame`.

**Usage**

```
find_class(  
  df,  
  type = c("numerical", "categorical", "categorical2", "date_categorical",  
           "date_categorical2"),  
  index = TRUE  
)
```

**Arguments**

<code>df</code>	a <code>data.frame</code> or objects inheriting from <code>data.frame</code>
<code>type</code>	character. Defines a group of classes to be searched. "numerical" searches for "numeric" and "integer" classes, "categorical" searches for "factor" and "ordered" classes. "categorical2" adds "character" class to "categorical". "date_categorical" adds result of "categorical2" and "Date", "POSIXct". "date_categorical2" adds result of "categorical" and "Date", "POSIXct".
<code>index</code>	logical. If TRUE is return numeric vector that is variables index. and if FALSE is return character vector that is variables name. default is TRUE.

**Value**

character vector or numeric vector. The meaning of vector according to data type is as follows.

- character vector : variables name
- numeric vector : variables index

**See Also**

[get\\_class](#).

**Examples**

```
## Not run:  
# data.frame  
find_class(iris, "numerical")  
find_class(iris, "numerical", index = FALSE)  
find_class(iris, "categorical")  
find_class(iris, "categorical", index = FALSE)
```

```
# tbl_df
find_class(ggplot2::diamonds, "numerical")
find_class(ggplot2::diamonds, "numerical", index = FALSE)
find_class(ggplot2::diamonds, "categorical")
find_class(ggplot2::diamonds, "categorical", index = FALSE)

# type is "categorical2"
iris2 <- data.frame(iris, char = "chars",
                    stringsAsFactors = FALSE)
find_class(iris2, "categorical", index = FALSE)
find_class(iris2, "categorical2", index = FALSE)

## End(Not run)
```

---

find\_na

*Finding variables including missing values*

---

## Description

Find the variable that contains the missing value in the object that inherits the `data.frame` or `data.frame`.

## Usage

```
find_na(.data, index = TRUE, rate = FALSE)
```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>index</code>	logical. When representing the information of a variable including missing values, specify whether or not the variable is represented by an index. Returns an index if TRUE or a variable names if FALSE.
<code>rate</code>	logical. If TRUE, returns the percentage of missing values in the individual variable.

## Value

Information on variables including missing values.

## See Also

[imutate\\_na](#), [find\\_outliers](#).

**Examples**

```
## Not run:
find_na(jobchange)

find_na(jobchange, index = FALSE)

find_na(jobchange, rate = TRUE)

## using dplyr -----
library(dplyr)

# Perform simple data quality diagnosis of variables with missing values.
jobchange %>%
  select(find_na(.)) %>%
  diagnose()

## End(Not run)
```

---

find_outliers	<i>Finding variables including outliers</i>
---------------	---

---

**Description**

Find the numerical variable that contains outliers in the object that inherits the data.frame or data.frame.

**Usage**

```
find_outliers(.data, index = TRUE, rate = FALSE)
```

**Arguments**

.data	a data.frame or a <a href="#">tbl_df</a> .
index	logical. When representing the information of a variable including outliers, specify whether or not the variable is represented by an index. Returns an index if TRUE or a variable names if FALSE.
rate	logical. If TRUE, returns the percentage of outliers in the individual variable.

**Value**

Information on variables including outliers.

**See Also**

[find\\_na](#), [impute\\_outlier](#).

**Examples**

```
## Not run:
find_outliers(heartfailure)

find_outliers(heartfailure, index = FALSE)

find_outliers(heartfailure, rate = TRUE)

## using dplyr -----
library(dplyr)

# Perform simple data quality diagnosis of variables with outliers.
heartfailure %>%
  select(find_outliers(.)) %>%
  diagnose()

## End(Not run)
```

---

find_skewness	<i>Finding skewed variables</i>
---------------	---------------------------------

---

**Description**

Find the numerical variable that skewed variable that inherits the data.frame or data.frame.

**Usage**

```
find_skewness(.data, index = TRUE, value = FALSE, thres = NULL)
```

**Arguments**

.data	a data.frame or a <a href="#">tbl_df</a> .
index	logical. When representing the information of a skewed variable, specify whether or not the variable is represented by an index. Returns an index if TRUE or a variable names if FALSE.
value	logical. If TRUE, returns the skewness value in the individual variable.
thres	Returns a skewness threshold value that has an absolute skewness greater than thres. The default is NULL to ignore the threshold. but, If value = TRUE, default to 0.5.

**Value**

Information on variables including skewness.

**See Also**

[find\\_na](#), [find\\_outliers](#).

**Examples**

```
## Not run:
find_skewness(heartfailure)

find_skewness(heartfailure, index = FALSE)

find_skewness(heartfailure, thres = 0.1)

find_skewness(heartfailure, value = TRUE)

find_skewness(heartfailure, value = TRUE, thres = 0.1)

## using dplyr -----
library(dplyr)

# Perform simple data quality diagnosis of skewed variables
heartfailure %>%
  select(find_skewness(.)) %>%
  diagnose()

## End(Not run)
```

---

get\_class

*Extracting a class of variables*

---

**Description**

The `get_class()` gets class of variables in `data.frame` or `tbl_df`.

**Usage**

```
get_class(df)
```

**Arguments**

`df` a `data.frame` or objects inheriting from `data.frame`

**Value**

a `data.frame` Variables of `data.frame` is as follows.

- `variable` : variables name
- `class` : class of variables

**See Also**

[find\\_class](#).

**Examples**

```
## Not run:
# data.frame
get_class(iris)

# tbl_df
get_class(ggplot2::diamonds)

library(dplyr)
ggplot2::diamonds %>%
  get_class() %>%
  filter(class %in% c("integer", "numeric"))

## End(Not run)
```

---

get\_column\_info

*Describe column of table in the DBMS*

---

**Description**

The `get_column_info()` retrieves the column information of the DBMS table through the `tbl_bdi` object of `dplyr`.

**Usage**

```
get_column_info(df)
```

**Arguments**

`df` a `tbl_dbi`.

**Value**

An object of `data.frame`.

**Column information of the DBMS table**

- SQLite DBMS connected `RSQLite::SQLite()`:
  - name: column name
  - type: data type in R
- MySQL/MariaDB DBMS connected `RMySQL::MySQL()`:
  - name: column name
  - Sclass: data type in R
  - type: data type of column in the DBMS
  - length: data length in the DBMS
- Oracle DBMS connected `ROracle::dbConnect()`:

- name: column name
- Sclass: column type in R
- type: data type of column in the DBMS
- len: length of column(Char/VARCHAR/VARCHAR2 data type) in the DBMS
- precision: precision of column(NUMBER data type) in the DBMS
- scale: decimal places of column(NUMBER data type) in the DBMS
- nullOK: nullability

### Examples

```
library(dplyr)
# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  get_column_info

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
```

---

get\_os

*Finding Users Machine's OS*

---

### Description

Get the operating system that users machines.

### Usage

```
get_os()
```

### Value

OS names. "windows" or "osx" or "linux"

### Examples

```
get_os()
```

---

get_percentile	<i>Finding percentile</i>
----------------	---------------------------

---

### Description

Find the percentile of the value specified in numeric vector.

### Usage

```
get_percentile(x, value, from = 0, to = 1, eps = 1e-06)
```

### Arguments

x	numeric. a numeric vector.
value	numeric. a scalar to find percentile value from vector x.
from	numeric. Start interval in logic to find percentile value. default to 0.
to	numeric. End interval in logic to find percentile value. default to 1.
eps	numeric. Threshold value for calculating the approximate value in recursive calling logic to find the percentile value. (epsilon). default to 1e-06.

### Value

list. Components of list. is as follows.

- percentile : numeric. Percentile position of value. It has a value between [0, 100].
- is\_outlier : logical. Whether value is an outlier.

### Examples

```
## Not run:  
carat <- ggplot2::diamonds$carat  
  
quantile(carat)  
  
get_percentile(carat, value = 0.5)  
get_percentile(carat, value = median(diamonds$carat))  
get_percentile(carat, value = 1)  
get_percentile(carat, value = 7)  
  
## End(Not run)
```

---

get_transform	<i>Transform a numeric vector</i>
---------------	-----------------------------------

---

### Description

The `get_transform()` gets transformation of numeric variable.

### Usage

```
get_transform(  
  x,  
  method = c("log", "sqrt", "log+1", "log+a", "1/x", "x^2", "x^3", "Box-Cox",  
             "Yeo-Johnson")  
)
```

### Arguments

x	numeric. numeric for transform
method	character. transformation method of numeric variable

### Details

The supported transformation method is follow.:

- "log" : log transformation.  $\log(x)$
- "log+1" : log transformation.  $\log(x + 1)$ . Used for values that contain 0.
- "log+a" : log transformation.  $\log(x + 1 - \min(x))$ . Used for values that contain 0.
- "sqrt" : square root transformation.
- "1/x" :  $1 / x$  transformation
- "x^2" : x square transformation
- "x^3" : x^3 square transformation
- "Box-Cox" : Box-Box transformation
- "Yeo-Johnson" : Yeo-Johnson transformation

### Value

numeric. transformed numeric vector.

### See Also

[plot\\_normality.](#)

**Examples**

```
## Not run:
# log+a transform
get_transform(iris$Sepal.Length, "log+a")

if (requireNamespace("forecast", quietly = TRUE)) {
  # Box-Cox transform
  get_transform(iris$Sepal.Length, "Box-Cox")

  # Yeo-Johnson transform
  get_transform(iris$Sepal.Length, "Yeo-Johnson")
} else {
  cat("If you want to use this feature, you need to install the forecast package.\n")
}

## End(Not run)
```

---

heartfailure

*Heart Failure Data*


---

**Description**

A dataset containing the ages and other attributes of almost 300 cases.

**Usage**

```
data(heartfailure)
```

**Format**

A data frame with 299 rows and 13 variables. The variables are as follows:

**age** patient's age.

**anaemia** decrease of red blood cells or hemoglobin (boolean), Yes, No.

**cpk\_enzyme** level of the CPK(creatinine phosphokinase) enzyme in the blood (mcg/L).

**diabetes** if the patient has diabetes (boolean), Yes, No.

**ejection\_fraction** percentage of blood leaving the heart at each contraction (percentage).

**hblood\_pressure** high\_blood\_pressure. if the patient has hypertension (boolean), Yes, No.

**platelets** platelets in the blood (kiloplatelets/mL).

**creatinine** level of serum creatinine in the blood (mg/dL).

**sodium** level of serum sodium in the blood (mEq/L).

**sex** patient's sex (binary), Male, Female.

**smoking** if the patient smokes or not (boolean), Yes, No.

**time** follow-up period (days).

**death\_event** if the patient deceased during the follow-up period (boolean), Yes, No.

## Details

Heart failure is a common event caused by Cardiovascular diseases and this dataset contains 12 features that can be used to predict mortality by heart failure.

## Source

"Heart Failure Prediction" in Kaggle <<https://www.kaggle.com/andrewmvd/heart-failure-clinical-data>>, License : CC BY 4.0

## References

Davide Chicco, Giuseppe Jurman: Machine learning can predict survival of patients with heart failure from serum creatinine and ejection fraction alone. BMC Medical Informatics and Decision Making 20, 16 (2020). <<https://doi.org/10.1186/s12911-020-1023-5>>

---

import_google_font	<i>Import Google Fonts</i>
--------------------	----------------------------

---

## Description

Import google font to be used when drawing charts.

## Usage

```
import_google_font(family)
```

## Arguments

family	character. font family name
--------	-----------------------------

## Details

When attaching the dlookr package, use "Roboto Condensed" and "Noto Sans Korean" among Google fonts. And also loads "Liberation Sans Narrow" and "NanumSquare" included in the package for offline environment.

If you want to use anything other than the 4 fonts that are loaded with the dlookr package, load the desired Google fonts with `import_google_font()`.

dlookr recommends the following google fonts, both sans and condensed: "IBM Plex Sans Condensed", "Encode Sans Condensed", "Barlow Condensed", "Saira Condensed", "Titillium Web", "Oswald", "PT Sans Narrow"

Korean fonts: "Nanum Gothic", "Gothic A1"

---

impute_na	<i>Impute Missing Values</i>
-----------	------------------------------

---

**Description**

Missing values are imputed with some representative values and statistical methods.

**Usage**

```
impute_na(.data, xvar, yvar, method, seed, print_flag, no_attrs)
```

**Arguments**

.data	a data.frame or a <a href="#">tbl_df</a> .
xvar	variable name to replace missing value.
yvar	target variable.
method	method of missing values imputation.
seed	integer. the random seed used in mice. only used "mice" method.
print_flag	logical. If TRUE, mice will print running log on console. Use print_flag=FALSE for silent computation. Used only when method is "mice".
no_attrs	logical. If TRUE, return numerical variable or categorical variable. else If FALSE, imputation class.

**Details**

impute\_na() creates an imputation class. The ‘imputation’ class includes missing value position, imputed value, and method of missing value imputation, etc. The ‘imputation’ class compares the imputed value with the original value to help determine whether the imputed value is used in the analysis.

See vignette("transformation") for an introduction to these concepts.

**Value**

An object of imputation class. or numerical variable or categorical variable. if no\_attrs is FALSE then return imputation class, else no\_attrs is TRUE then return numerical vector or factor. Attributes of imputation class is as follows.

- var\_type : the data type of predictor to replace missing value.
- method : method of missing value imputation.
  - predictor is numerical variable.
    - \* "mean" : arithmetic mean.
    - \* "median" : median.
    - \* "mode" : mode.
    - \* "knn" : K-nearest neighbors.

- \* "rpart" : Recursive Partitioning and Regression Trees.
- \* "mice" : Multivariate Imputation by Chained Equations.
- predictor is categorical variable.
  - \* "mode" : mode.
  - \* "rpart" : Recursive Partitioning and Regression Trees.
  - \* "mice" : Multivariate Imputation by Chained Equations.
- na\_pos : position of missing value in predictor.
- seed : the random seed used in mice. only used "mice" method.
- type : "missing values". type of imputation.
- message : a message tells you if the result was successful.
- success : Whether the imputation was successful.

### See Also

[impute\\_outlier](#).

### Examples

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

# Replace the missing value of the platelets variable with median
impute_na(heartfailure2, platelets, method = "median")

# Replace the missing value of the platelets variable with rpart
# The target variable is death_event.
# impute_na(heartfailure2, platelets, death_event, method = "rpart")

# Replace the missing value of the smoking variable with mode
# impute_na(heartfailure2, smoking, method = "mode")

# Replace the missing value of the smoking variable with mice
# The target variable is death_event.
# impute_na(heartfailure2, smoking, death_event, method = "mice")

## using dplyr -----
library(dplyr)

# The mean before and after the imputation of the platelets variable
heartfailure2 %>%
  mutate(platelets_imp = impute_na(heartfailure2, platelets, death_event,
                                   method = "knn", no_attr = TRUE)) %>%
  group_by(death_event) %>%
  summarise(orig = mean(platelets, na.rm = TRUE),
            imputation = mean(platelets_imp))
```

```

# If the variable of interest is a numerical variable
platelets <- imputate_na(heartfailure2, platelets, death_event, method = "rpart")
platelets
summary(platelets)

# plot(platelets)

# If the variable of interest is a categorical variable
# smoking <- imputate_na(heartfailure2, smoking, death_event, method = "mice")
# smoking
# summary(smoking)

# plot(smoking)

```

---

imputate_outlier	<i>Impute Outliers</i>
------------------	------------------------

---

## Description

Outliers are imputed with some representative values and statistical methods.

## Usage

```
imputate_outlier(.data, xvar, method, no_attrs, cap_ntiles)
```

## Arguments

.data	a data.frame or a <a href="#">tbl_df</a> .
xvar	variable name to replace missing value.
method	method of missing values imputation.
no_attrs	logical. If TRUE, return numerical variable or categorical variable. else If FALSE, imputation class.
cap_ntiles	numeric. Only used when method is "capping". Specifies the value of percentiles replaced by the values of lower outliers and upper outliers. The default is <code>c(0.05, 0.95)</code> .

## Details

`imputate_outlier()` creates an imputation class. The ‘imputation’ class includes missing value position, imputed value, and method of missing value imputation, etc. The ‘imputation’ class compares the imputed value with the original value to help determine whether the imputed value is used in the analysis.

See `vignette("transformation")` for an introduction to these concepts.

**Value**

An object of imputation class. or numerical variable. if `no_attr` is `FALSE` then return imputation class, else `no_attr` is `TRUE` then return numerical vector. Attributes of imputation class is as follows.

- `method` : method of missing value imputation.
  - predictor is numerical variable
    - \* `"mean"` : arithmetic mean
    - \* `"median"` : median
    - \* `"mode"` : mode
    - \* `"capping"` : Impute the upper outliers with 95 percentile, and Impute the lower outliers with 5 percentile.
      - You can change this criterion with the `cap_ntiles` argument.
- `outlier_pos` : position of outliers in predictor.
- `outliers` : outliers. outliers corresponding to `outlier_pos`.
- `type` : `"outliers"`. type of imputation.

**See Also**

[imputate\\_na](#).

**Examples**

```
# Replace the outliers of the sodium variable with median.
imputate_outlier(heartfailure, sodium, method = "median")

# Replace the outliers of the sodium variable with capping.
imputate_outlier(heartfailure, sodium, method = "capping")
imputate_outlier(heartfailure, sodium, method = "capping",
                 cap_ntiles = c(0.1, 0.9))

## using dplyr -----
library(dplyr)

# The mean before and after the imputation of the sodium variable
heartfailure %>%
  mutate(sodium_imp = imputate_outlier(heartfailure, sodium,
                                       method = "capping", no_attr = TRUE)) %>%
  group_by(death_event) %>%
  summarise(orig = mean(sodium, na.rm = TRUE),
            imputation = mean(sodium_imp, na.rm = TRUE))

# If the variable of interest is a numerical variables
sodium <- imputate_outlier(heartfailure, sodium)
sodium
summary(sodium)

plot(sodium)
```

---

jobchange

*Job Change of Data Scientists*

---

### Description

A dataset containing the gender and other attributes of almost 20000 cases.

### Usage

```
data(jobchange)
```

### Format

A data frame with 19158 rows and 14 variables. The variables are as follows:

**enrollee\_id** unique ID for candidate

**city** city code.

**city\_dev\_index** development index of the city (scaled).

**gender** gender of candidate.

**relevent\_experience** relevant experience of candidate

**enrolled\_university** type of University course enrolled if any.

**education\_level** education level of candidate.

**major\_discipline** education major discipline of candidate.

**experience** candidate total experience in years.

**company\_size** number of employees in current employer's company.

**company\_type** type of current employer.

**last\_new\_job** difference in years between previous job and current job.

**training\_hours** training hours completed.

**job\_chnge** if looking for a job change (boolean), Yes, No.

### Details

This dataset designed to understand the factors that lead a person to leave current job for HR re-searches too.

### Source

"HR Analytics: Job Change of Data Scientists" in Kaggle <<https://www.kaggle.com/arashnic/hr-analytics-job-change-of-data-scientists>>, License : CC0(Public Domain)

---

`jsd`*Jensen-Shannon Divergence*

---

**Description**

Computes the Jensen-Shannon divergence between two probability distributions.

**Usage**

```
jsd(p, q, base = c("log", "log2", "log10"), margin = FALSE)
```

**Arguments**

<code>p</code>	numeric. probability distributions.
<code>q</code>	numeric. probability distributions.
<code>base</code>	character. log bases. "log", "log2", "log10". default is "log"
<code>margin</code>	logical. Choose whether to return individual values or totals. The default value is FALSE, which returns individual values.

**Value**

numeric. Jensen-Shannon divergence of probability distributions `p` and `q`.

**See Also**

[kld](#).

**Examples**

```
# Sample data for probability distributions p.
event <- c(115, 76, 61, 39, 55, 10, 1)
no_event <- c(3, 3, 7, 10, 28, 44, 117)

p <- event / sum(event)
q <- no_event / sum(no_event)

jsd(p, q)
jsd(p, q, base = "log2")
jsd(p, q, margin = TRUE)
```

---

kld *Kullback-Leibler Divergence*

---

**Description**

Computes the Kullback-Leibler divergence between two probability distributions.

**Usage**

```
kld(p, q, base = c("log", "log2", "log10"), margin = FALSE)
```

**Arguments**

p	numeric. probability distributions.
q	numeric. probability distributions.
base	character. log bases. "log", "log2", "log10". default is "log"
margin	logical. Choose whether to return individual values or totals. The default value is FALSE, which returns individual values.

**Value**

numeric. Kullback-Leibler divergence of probability distributions p and q.

**See Also**

[jsd](#).

**Examples**

```
# Sample data for probability distributions p.
event <- c(115, 76, 61, 39, 55, 10, 1)
no_event <- c(3, 3, 7, 10, 28, 44, 117)

p <- event / sum(event)
q <- no_event / sum(no_event)

kld(p, q)
kld(p, q, base = "log2")
kld(p, q, margin = TRUE)
```

---

kurtosis	<i>Kurtosis of the data</i>
----------	-----------------------------

---

**Description**

This function calculated kurtosis of given data.

**Usage**

```
kurtosis(x, na.rm = FALSE)
```

**Arguments**

x	a numeric vector.
na.rm	logical. Determine whether to remove missing values and calculate them. The default is TRUE.

**Value**

numeric. calculated kurtosis

**See Also**

[skewness](#).

**Examples**

```
set.seed(123)
kurtosis(rnorm(100))
```

---

normality	<i>Performs the Shapiro-Wilk test of normality</i>
-----------	--

---

**Description**

The normality() performs Shapiro-Wilk test of normality of numerical values.

**Usage**

```
normality(.data, ...)

## S3 method for class 'data.frame'
normality(.data, ..., sample = 5000)

## S3 method for class 'grouped_df'
normality(.data, ..., sample = 5000)
```

**Arguments**

<code>.data</code>	a data.frame or a <a href="#">tbl_df</a> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>normality()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>sample</code>	the number of samples to perform the test. See <code>vignette("EDA")</code> for an introduction to these concepts.

**Details**

This function is useful when used with the [group\\_by](#) function of the `dplyr` package. If you want to test by level of the categorical data you are interested in, rather than the whole observation, you can use `group_tf` as the `group_by` function. This function is computed [shapiro.test](#) function.

**Value**

An object of the same class as `.data`.

**Normality test information**

The information derived from the numerical data test is as follows.

- `statistic` : the value of the Shapiro-Wilk statistic.
- `p_value` : an approximate p-value for the test. This is said in Royston(1995) to be adequate for `p_value < 0.1`.
- `sample` : the number of samples to perform the test. The number of observations supported by the `stats::shapiro.test` function is 3 to 5000.

**See Also**

[normality.tbl\\_dbi](#), [diagnose\\_numeric.data.frame](#), [describe.data.frame](#), [plot\\_normality.data.frame](#).

**Examples**

```
# Normality test of numerical variables
normality(heartfailure)

# Select the variable to describe
normality(heartfailure, platelets, sodium)
normality(heartfailure, -platelets, -sodium)
normality(heartfailure, 1)
normality(heartfailure, platelets, sodium, sample = 200)

# death_eventing dplyr::grouped_dt
library(dplyr)
```

```

gdata <- group_by(heartfailure, smoking, death_event)
normality(gdata, "platelets")
normality(gdata, sample = 250)

# death_eventing pipes -----
# Normality test of all numerical variables
heartfailure %>%
  normality()

# # Positive values select variables
heartfailure %>%
  normality(platelets, sodium)

# Positions values select variables
heartfailure %>%
  normality(1)

# death_eventing pipes & dplyr -----
# Test all numerical variables by 'smoking' and 'death_event',
# and extract only those with 'smoking' variable level is "No".
heartfailure %>%
  group_by(smoking, death_event) %>%
  normality() %>%
  filter(smoking == "No")

# extract only those with 'sex' variable level is "Male",
# and test 'platelets' by 'smoking' and 'death_event'
heartfailure %>%
  filter(sex == "Male") %>%
  group_by(smoking, death_event) %>%
  normality(platelets)

# Test log(platelets) variables by 'smoking' and 'death_event',
# and extract only p.value greater than 0.01.
heartfailure %>%
  mutate(platelets_income = log(platelets)) %>%
  group_by(smoking, death_event) %>%
  normality(platelets_income) %>%
  filter(p_value > 0.01)

```

---

normality.tbl\_dbi

*Performs the Shapiro-Wilk test of normality*


---

### Description

The `normality()` performs Shapiro-Wilk test of normality of numerical(INTEGER, NUMBER, etc.) column of the DBMS table through `tbl_dbi`.

**Usage**

```
## S3 method for class 'tbl_dbi'
normality(.data, ..., sample = 5000, in_database = FALSE, collect_size = Inf)
```

**Arguments**

<code>.data</code>	a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>normality()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>sample</code>	the number of samples to perform the test.
<code>in_database</code>	Specifies whether to perform in-database operations. If <code>TRUE</code> , most operations are performed in the DBMS. if <code>FALSE</code> , table data is taken in R and operated in-memory. Not yet supported <code>in_database = TRUE</code> .
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> . See <code>vignette("EDA")</code> for an introduction to these concepts.

**Details**

This function is useful when used with the `group_by` function of the `dplyr` package. If you want to test by level of the categorical data you are interested in, rather than the whole observation, you can use `group_tf` as the `group_by` function. This function is computed `shapiro.test` function.

**Value**

An object of the same class as `.data`.

**Normality test information**

The information derived from the numerical data test is as follows.

- `statistic` : the value of the Shapiro-Wilk statistic.
- `p_value` : an approximate p-value for the test. This is said in Royston(1995) to be adequate for `p_value < 0.1`.
- `sample` : the numer of samples to perform the test. The number of observations supported by the `stats::shapiro.test` function is 3 to 5000.

**See Also**

`normality.data.frame`, `diagnose_numeric.tbl_dbi`, `describe.tbl_dbi`.

**Examples**

```

library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Normality test of all numerical variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  normality()

# Positive values select variables, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  normality(platelets, sodium, collect_size = 200)

# Positions values select variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  normality(1)

# Using pipes & dplyr -----
# Test all numerical variables by 'smoking' and 'death_event',
# and extract only those with 'smoking' variable level is "Yes".
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  group_by(smoking, death_event) %>%
  normality() %>%
  filter(smoking == "Yes")

# extract only those with 'sex' variable level is "Male",
# and test 'sodium' by 'smoking' and 'death_event'
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  filter(sex == "Male") %>%
  group_by(smoking, death_event) %>%
  normality(sodium)

# Test log(sodium) variables by 'smoking' and 'death_event',
# and extract only p.value greater than 0.01.

# SQLite extension functions for log
RSQLite::initExtension(con_sqlite)

con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  mutate(log_sodium = log(sodium)) %>%

```

```

group_by(smoking, death_event) %>%
normality(log_sodium) %>%
filter(p_value > 0.01)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

---

 overview

*Describe overview of data*


---

## Description

Inquire basic information to understand the data in general.

## Usage

```
overview(.data)
```

## Arguments

`.data` a `data.frame` or a `tbl_df`.

## Details

`overview()` creates an overview class. The ‘overview’ class includes general information such as the size of the data, the degree of missing values, and the data types of variables.

## Value

An object of overview class. The overview class contains `data.frame` and two attributes. `data.frame` has the following 3 variables.: `data.frame` is as follow.:

- `division` : division of information.
  - `size` : indicators of related to data capacity
  - `duplicated` : indicators of related to duplicated value
  - `missing` : indicators of related to missing value
  - `data_type` : indicators of related to data type
- `metrics` : name of metrics.
  - `observations` : number of observations (number of rows)
  - `variables` : number of variables (number of columns)
  - `values` : number of values (number of cells. rows \* columns)
  - `memory size` : an estimate of the memory that is being used to store an R object.
  - `duplicate observation`: number of duplicate cases(observations).
  - `complete observation` : number of complete cases(observations). i.e., have no missing values.

- missing observation : number of observations that has missing values.
  - missing variables : number of variables that has missing values.
  - missing values : number of values(cells) that has missing values.
  - numerics : number of variables that is data type is numeric.
  - integers : number of variables that is data type is integer.
  - factors : number of variables that is data type is factor.
  - characters : number of variables that is data type is character.
  - Dates : number of variables that is data type is Date.
  - POSIXcts : number of variables that is data type is POSIXct.
  - others : number of variables that is not above.
- value : value of metrics.

Attributes of overview class is as follows.:

- duplicated : the index of duplicated observations.
- na\_col : the data type of predictor to replace missing value.
- info\_class : data.frame. variable name and class name that describe the data type of variables.
  - data.frame has a two variables.
    - \* variable : variable names
    - \* class : data type

### See Also

[summary.overview](#), [plot.overview](#).

### Examples

```
ov <- overview(jobchange)
ov

summary(ov)

plot(ov)
```

### Description

The `performance_bin()` calculates metrics to evaluate the performance of binned variable for binomial classification model.

**Usage**

```
performance_bin(y, x, na.rm = FALSE)
```

**Arguments**

**y** character or numeric, integer, factor. a binary response variable (0, 1). The variable must contain only the integers 0 and 1 as element. However, in the case of factor/character having two levels, it is performed while type conversion is performed in the calculation process.

**x** integer or factor, character. At least 2 different values. and Inf is not allowed.

**na.rm** logical. a logical indicating whether missing values should be removed.

**Details**

This function is useful when used with the mutate/transmute function of the dplyr package.

**Value**

an object of "performance\_bin" class. vaue of data.frame is as follows.

- Bin : character. bins.
- CntRec : integer. frequency by bins.
- CntPos : integer. frequency of positive by bins.
- CntNeg : integer. frequency of negative by bins.
- CntCumPos : integer. cumulate frequency of positive by bins.
- CntCumNeg : integer. cumulate frequency of negative by bins.
- RatePos : integer. relative frequency of positive by bins.
- RateNeg : integer. relative frequency of negative by bins.
- RateCumPos : numeric. cumulate relative frequency of positive by bins.
- RateCumNeg : numeric. cumulate relative frequency of negative by bins.
- Odds : numeric. odd ratio.
- LnOdds : numeric. loged odd ratio.
- WoE : numeric. weight of evidence.
- IV : numeric. Jeffrey's Information Value.
- JSD : numeric. Jensen-Shannon Divergence.
- AUC : numeric. AUC. area under curve.

Attributes of "performance\_bin" class is as follows.

- names : character. variable name of data.frame with "Binning Table".
- class : character. name of class. "performance\_bin" "data.frame".
- row.names : character. row name of data.frame with "Binning Table".
- IV : numeric. Jeffrey's Information Value.

- JSD : numeric. Jensen-Shannon Divergence.
- KS : numeric. Kolmogorov-Smirnov Statistics.
- gini : numeric. Gini index.
- HHI : numeric. Herfindahl-Hirschman Index.
- HHI\_norm : numeric.normalized Herfindahl-Hirschman Index.
- Cramer\_V : numeric. Cramer's V Statistics.
- chisq\_test : data.frame. table of significance tests. name is as follows.
  - Bin A : character. first bins.
  - Bin B : character. second bins.
  - statistics : numeric. statistics of Chi-square test.
  - p\_value : numeric. p-value of Chi-square test.

### See Also

[summary.performance\\_bin](#), [plot.performance\\_bin](#), [binning\\_by](#).

### Examples

```
# Generate data for the example
heartfailure2 <- heartfailure

set.seed(123)
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "creatinine"] <- NA

# Change the target variable to 0(negative) and 1(positive).
heartfailure2$death_event_2 <- ifelse(heartfailure2$death_event %in% "Yes", 1, 0)

# Binnig from creatinine to platelets_bin.
breaks <- c(0, 1, 2, 10)
heartfailure2$creatinine_bin <- cut(heartfailure2$creatinine, breaks)

# Diagnose performance binned variable
perf <- performance_bin(heartfailure2$death_event_2, heartfailure2$creatinine_bin)
perf
summary(perf)

plot(perf)

# Diagnose performance binned variable without NA
perf <- performance_bin(heartfailure2$death_event_2, heartfailure2$creatinine_bin, na.rm = TRUE)
perf
summary(perf)

plot(perf)
```

---

`plot.bins`*Visualize Distribution for a "bins" object*

---

### Description

Visualize two plots on a single screen. The plot at the top is a histogram representing the frequency of the level. The plot at the bottom is a bar chart representing the frequency of the level.

### Usage

```
## S3 method for class 'bins'  
plot(x, typographic = TRUE, base_family = NULL, ...)
```

### Arguments

<code>x</code>	an object of class "bins", usually, a result of a call to <code>binning()</code> .
<code>typographic</code>	logical. Whether to apply focuses on typographic elements to <code>ggplot2</code> visualization. The default is <code>TRUE</code> . if <code>TRUE</code> provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)
<code>...</code>	arguments to be passed to methods, such as graphical parameters (see <code>par</code> ).

### Details

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### See Also

[binning](#), [print.bins](#), [summary.bins](#).

### Examples

```
# Generate data for the example  
  
heartfailure2 <- heartfailure  
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA  
  
# Binning the platelets variable. default type argument is "quantile"  
bin <- binning(heartfailure2$platelets, nbins = 5)  
plot(bin)  
  
# Using another type arguments  
bin <- binning(heartfailure2$platelets, nbins = 5, type = "equal")  
plot(bin)
```

```
bin <- binning(heartfailure2$platelets, nbins = 5, type = "pretty")
plot(bin)

bin <- binning(heartfailure2$platelets, nbins = 5, type = "kmeans")
plot(bin)

bin <- binning(heartfailure2$platelets, nbins = 5, type = "bclust")
plot(bin)
```

---

plot.compare\_category *Visualize Information for an "compare\_category" Object*

---

### Description

Visualize mosaics plot by attribute of compare\_category class.

### Usage

```
## S3 method for class 'compare_category'
plot(
  x,
  prompt = FALSE,
  na.rm = FALSE,
  typographic = TRUE,
  base_family = NULL,
  ...
)
```

### Arguments

x	an object of class "compare_category", usually, a result of a call to compare_category().
prompt	logical. The default value is FALSE. If there are multiple visualizations to be output, if this argument value is TRUE, a prompt is output each time.
na.rm	logical. Specifies whether to include NA when plotting mosaics plot. The default is FALSE, so plot NA.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par). However, it only support las parameter. las is numeric in 0,1; the style of axis labels. <ul style="list-style-type: none"> <li>• 0 : always parallel to the axis [default],</li> <li>• 1 : always horizontal to the axis,</li> </ul>

**Details**

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

**See Also**

[compare\\_category](#), [print.compare\\_category](#), [summary.compare\\_category](#).

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

library(dplyr)

# Compare the all categorical variables
all_var <- compare_category(heartfailure2)

# Print compare_numeric class objects
all_var

# Compare the two categorical variables
two_var <- compare_category(heartfailure2, smoking, death_event)

# Print compare_category class objects
two_var

# plot all pair of variables
# plot(all_var)

# plot a pair of variables
plot(two_var)

# plot all pair of variables by prompt
plot(all_var, prompt = TRUE)

# plot a pair of variables without NA
plot(two_var, na.rm = TRUE)

# plot a pair of variables
plot(two_var, las = 1)

# plot a pair of variables not focuses on typographic elements
plot(two_var, typographic = FALSE)
```

---

plot.compare\_numeric *Visualize Information for an "compare\_numeric" Object*

---

## Description

Visualize scatter plot included box plots by attribute of compare\_numeric class.

## Usage

```
## S3 method for class 'compare_numeric'
plot(x, prompt = FALSE, typographic = TRUE, base_family = NULL, ...)
```

## Arguments

x	an object of class "compare_numeric", usually, a result of a call to compare_numeric().
prompt	logical. The default value is FALSE. If there are multiple visualizations to be output, if this argument value is TRUE, a prompt is output each time.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par). However, it does not support.

## Details

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

## See Also

[compare\\_numeric](#), [print.compare\\_numeric](#), [summary.compare\\_numeric](#).

## Examples

```
# Generate data for the example
heartfailure2 <- heartfailure[, c("platelets", "creatinine", "sodium")]

library(dplyr)
# Compare the all numerical variables
all_var <- compare_numeric(heartfailure2)

# Print compare_numeric class object
all_var
```

```

# Compare the two numerical variables
two_var <- compare_numeric(heartfailure2, sodium, creatinine)

# Print compare_numeric class objects
two_var

# plot all pair of variables
plot(all_var)

# plot a pair of variables
plot(two_var)

# plot all pair of variables by prompt
plot(all_var, prompt = TRUE)

# plot a pair of variables not focuses on typographic elements
plot(two_var, typographic = FALSE)

```

---

plot.correlate

*Visualize Information for an "correlate" Object*


---

## Description

Visualize by attribute of 'correlate' class. The plot of correlation matrix is a tile plot.

## Usage

```

## S3 method for class 'correlate'
plot(x, typographic = TRUE, base_family = NULL, ...)

```

## Arguments

x	an object of class "correlate", usually, a result of a call to correlate().
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par).

## Details

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

**See Also**

[correlate](#), [summary.correlate](#).

**Examples**

```
library(dplyr)

# correlate type is generic =====
tab_corr <- correlate(iris)
tab_corr

# visualize correlate class
plot(tab_corr)

tab_corr <- iris %>%
  correlate(Sepal.Length, Petal.Length)
tab_corr

# visualize correlate class
plot(tab_corr)

# correlate type is group =====
# Draw a correlation matrix plot by category of Species.
tab_corr <- iris %>%
  group_by(Species) %>%
  correlate()

# plot correlate class
plot(tab_corr)

# S3 method for correlate class by 'tbl_dbi' =====
# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy iris to the DBMS with a table named TB_IRIS
copy_to(con_sqlite, iris, name = "TB_IRIS", overwrite = TRUE)

# correlation coefficients of all numerical variables
tab_corr <- con_sqlite %>%
  tbl("TB_IRIS") %>%
  correlate()

plot(tab_corr)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
```

---

plot.imputation	<i>Visualize Information for an "imputation" Object</i>
-----------------	---

---

## Description

Visualize two kinds of plot by attribute of 'imputation' class. The imputation of a numerical variable is a density plot, and the imputation of a categorical variable is a bar plot.

## Usage

```
## S3 method for class 'imputation'
plot(x, typographic = TRUE, base_family = NULL, ...)
```

## Arguments

x	an object of class "imputation", usually, a result of a call to <code>imputate_na()</code> or <code>imputate_outlier()</code> .
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see <code>par</code> ). only applies when the model argument is TRUE, and is used for ... of the <code>plot.lm()</code> function.

## Details

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## See Also

[imputate\\_na](#), [imputate\\_outlier](#), [summary.imputation](#).

## Examples

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

# Impute missing values -----
# If the variable of interest is a numerical variables
platelets <- imputate_na(heartfailure2, platelets, death_event, method = "rpart")
```

```

platelets
summary(platelets)

plot(platelets)

# If the variable of interest is a categorical variables
smoking <- imputate_na(heartfailure2, smoking, death_event, method = "mice")
smoking
summary(smoking)

plot(smoking)

# Impute outliers -----
# If the variable of interest is a numerical variable
platelets <- imputate_outlier(heartfailure2, platelets, method = "capping")
platelets
summary(platelets)

plot(platelets)

```

---

plot.infogain\_bins      *Visualize Distribution for an "infogain\_bins" Object*

---

## Description

It generates plots for understand distribution and distribution by target variable using infogain\_bins.

## Usage

```

## S3 method for class 'infogain_bins'
plot(x, type = c("bar", "cross"), typographic = TRUE, base_family = NULL, ...)

```

## Arguments

x	an object of class "infogain_bins", usually, a result of a call to binning_rgr().
type	character. options for visualization. Distribution("bar"), Relative Frequency by target ("cross").
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	further arguments to be passed from or to other methods.

**Details**

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

**See Also**

[binning\\_rgr](#), [summary.bins](#)

**Examples**

```
# binning by recursive information gain ratio maximization using character
bin <- binning_rgr(heartfailure, "death_event", "creatinine")

# binning by recursive information gain ratio maximization using name
bin <- binning_rgr(heartfailure, death_event, creatinine)
bin

# summary optimal_bins class
summary(bin)

# visualize all information for optimal_bins class
plot(bin)

# visualize WoE information for optimal_bins class
plot(bin, type = "cross")

# visualize all information without typographic
plot(bin, type = "cross", typographic = FALSE)
```

---

plot.optimal\_bins      *Visualize Distribution for an "optimal\_bins" Object*

---

**Description**

It generates plots for understand distribution, frequency, bad rate, and weight of evidence using `optimal_bins`.

See vignette("transformation") for an introduction to these concepts.

**Usage**

```
## S3 method for class 'optimal_bins'
plot(
  x,
  type = c("all", "dist", "freq", "posrate", "WoE"),
```

```

    typographic = TRUE,
    base_family = NULL,
    rotate_angle = 0,
    ...
  )

```

### Arguments

x	an object of class "optimal_bins", usually, a result of a call to <code>binning_by()</code> .
type	character. options for visualization. Distribution ("dist"), Relative Frequency ("freq"), Positive Rate ("posrate"), and Weight of Evidence ("WoE"). and default "all" draw all plot.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)
rotate_angle	integer. specifies the rotation angle of the x-axis label. This is useful when the x-axis labels are long and overlap. The default is 0 to not rotate the label.
...	further arguments to be passed from or to other methods.

### Details

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### See Also

[binning\\_by](#), [summary.optimal\\_bins](#)

### Examples

```

# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "creatinine"] <- NA

# optimal binning using binning_by()
bin <- binning_by(heartfailure2, "death_event", "creatinine")
bin

# summary optimal_bins class.
summary(bin)

# visualize all information for optimal_bins class
plot(bin)

# rotate the x-axis labels by 45 degrees so that they do not overlap.

```

```

plot(bin, rotate_angle = 45)

# visualize WoE information for optimal_bins class
plot(bin, type = "WoE")

# visualize all information with typographic
plot(bin)

```

---

plot.overview

*Visualize Information for an "overview" Object*


---

### Description

Visualize a plot by attribute of 'overview' class. Visualize the data type, number of observations, and number of missing values for each variable.

### Usage

```

## S3 method for class 'overview'
plot(
  x,
  order_type = c("none", "name", "type"),
  typographic = TRUE,
  base_family = NULL,
  ...
)

```

### Arguments

x	an object of class "overview", usually, a result of a call to overview().
order_type	character. method of order of bars(variables).
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	further arguments to be passed from or to other methods.

### Details

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

**See Also**

[overview](#), [summary.overview](#).

**Examples**

```
ov <- overview(jobchange)
ov

summary(ov)

plot(ov)

# sort by name of variables
plot(ov, order_type = "name")

# sort by data type of variables
plot(ov, order_type = "type")
```

---

plot.performance\_bin *Visualize Performance for an "performance\_bin" Object*

---

**Description**

It generates plots for understand frequency, WoE by bins using performance\_bin.

**Usage**

```
## S3 method for class 'performance_bin'
plot(x, typographic = TRUE, base_family = NULL, ...)
```

**Arguments**

x	an object of class "performance_bin", usually, a result of a call to performance_bin().
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	further arguments to be passed from or to other methods.

**Details**

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

**See Also**

[performance\\_bin](#), [summary.performance\\_bin](#), [binning\\_by](#), [plot.optimal\\_bins](#).

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure

set.seed(123)
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "creatinine"] <- NA

# Change the target variable to 0(negative) and 1(positive).
heartfailure2$death_event_2 <- ifelse(heartfailure2$death_event %in% "Yes", 1, 0)

# Binnig from creatinine to platelets_bin.
breaks <- c(0, 1, 2, 10)
heartfailure2$creatinine_bin <- cut(heartfailure2$creatinine, breaks)

# Diagnose performance binned variable
perf <- performance_bin(heartfailure2$death_event_2, heartfailure2$creatinine_bin)
perf
summary(perf)

plot(perf)

# Diagnose performance binned variable without NA
perf <- performance_bin(heartfailure2$death_event_2, heartfailure2$creatinine_bin, na.rm = TRUE)
perf
summary(perf)

plot(perf)
plot(perf, typographic = FALSE)
```

---

plot.pps

*Visualize Information for an "pps" Object*

---

**Description**

Visualize by attribute of 'pps' class. The plot of a PPS(Predictive Power Score) is a bar plot or tile plot by PPS.

**Usage**

```
## S3 method for class 'pps'
plot(x, typographic = TRUE, base_family = NULL, ...)
```

**Arguments**

x	an object of class "pps", usually, a result of a call to pps().
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par).

**Details**

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

**See Also**

[pps](#), [summary.pps](#).

**Examples**

```
library(dplyr)

# pps type is generic =====
pps_generic <- pps(iris)
pps_generic

# visualize pps class
plot(pps_generic)

# pps type is target_by =====
##-----
# If the target variable is a categorical variable
# Using dplyr
pps_cat <- iris %>%
  target_by(Species) %>%
  pps()

# plot pps class
plot(pps_cat)

##-----
# If the target variable is a numerical variable
# Using dplyr
pps_num <- iris %>%
  target_by(Petal.Length) %>%
  pps()

# plot pps class
```

```
plot(pps_num)
```

---

plot.relate

---

*Visualize Information for an "relate" Object*


---

## Description

Visualize four kinds of plot by attribute of relate class.

## Usage

```
## S3 method for class 'relate'
plot(
  x,
  model = FALSE,
  hex_thres = 1000,
  pal = c("#FFFFB2", "#FED976", "#FEB24C", "#FD8D3C", "#FC4E2A", "#E31A1C", "#B10026"),
  typographic = TRUE,
  base_family = NULL,
  ...
)
```

## Arguments

x	an object of class "relate", usually, a result of a call to relate().
model	logical. This argument selects whether to output the visualization result to the visualization of the object of the lm model to grasp the relationship between the numerical variables.
hex_thres	an integer. Use only when the target and predictor are numeric variables. Used when the number of observations is large. Specify the threshold of the observations to draw hexabin plots that are not scatterplots. The default value is 1000.
pal	Color palette to paint hexabin. Use only when the target and predictor are numeric variables. Applied only when the number of observations is greater than hex_thres.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par). only applies when the model argument is TRUE, and is used for ... of the plot.lm() function.

## Details

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## See Also

[relate](#), [print.relate](#).

## Examples

```
# If the target variable is a categorical variable
categ <- target_by(heartfailure, death_event)

# If the variable of interest is a numerical variable
cat_num <- relate(categ, sodium)
cat_num
summary(cat_num)

plot(cat_num)

# If the variable of interest is a categorical variable
cat_cat <- relate(categ, hblood_pressure)
cat_cat
summary(cat_cat)

plot(cat_cat)

##-----
# If the target variable is a numerical variable
num <- target_by(heartfailure, creatinine)

# If the variable of interest is a numerical variable
num_num <- relate(num, sodium)
num_num
summary(num_num)

plot(num_num)

# If the variable of interest is a categorical variable
num_cat <- relate(num, smoking)
num_cat
summary(num_cat)

plot(num_cat)

# Not allow typographic
plot(num_cat, typographic = FALSE)
```

---

plot.transform      *Visualize Information for an "transform" Object*

---

### Description

Visualize two kinds of plot by attribute of 'transform' class. The transformation of a numerical variable is a density plot.

### Usage

```
## S3 method for class 'transform'
plot(x, typographic = TRUE, base_family = NULL, ...)
```

### Arguments

x	an object of class "transform", usually, a result of a call to transform().
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par).

### Details

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

### See Also

[transform](#), [summary.transform](#).

### Examples

```
# Standardization -----
creatinine_minmax <- transform(heartfailure$creatinine, method = "minmax")
creatinine_minmax
summary(creatinine_minmax)

plot(creatinine_minmax)

# Resolving Skewness -----
creatinine_log <- transform(heartfailure$creatinine, method = "log")
creatinine_log
summary(creatinine_log)
```

```
plot(creatinine_log)

plot(creatinine_log, typographic = FALSE)
```

---

plot.univar\_category *Visualize Information for an "univar\_category" Object*

---

## Description

Visualize mosaics plot by attribute of univar\_category class.

## Usage

```
## S3 method for class 'univar_category'
plot(
  x,
  na.rm = TRUE,
  prompt = FALSE,
  typographic = TRUE,
  base_family = NULL,
  ...
)
```

## Arguments

x	an object of class "univar_category", usually, a result of a call to univar_category().
na.rm	logical. Specifies whether to include NA when plotting bar plot. The default is FALSE, so plot NA.
prompt	logical. The default value is FALSE. If there are multiple visualizations to be output, if this argument value is TRUE, a prompt is output each time.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. If TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par). However, it does not support all parameters.

## Details

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

**See Also**

[univar\\_category](#), [print.univar\\_category](#), [summary.univar\\_category](#).

**Examples**

```
library(dplyr)

# Calculates the all categorical variables
all_var <- univar_category(heartfailure)

# Print univar_category class object
all_var

smoking <- univar_category(heartfailure, smoking)

# Print univar_category class object
smoking

# plot all variables
plot(all_var)

# plot smoking
plot(smoking)
```

---

plot.univar\_numeric     *Visualize Information for an "univar\_numeric" Object*

---

**Description**

Visualize boxplots and histogram by attribute of univar\_numeric class.

**Usage**

```
## S3 method for class 'univar_numeric'
plot(
  x,
  indiv = FALSE,
  viz = c("hist", "boxplot"),
  stand = ifelse(rep(indiv, 4), c("none", "robust", "minmax", "zscore"), c("robust",
    "minmax", "zscore", "none")),
  prompt = FALSE,
  typographic = TRUE,
  base_family = NULL,
  ...
)
```

**Arguments**

x	an object of class "univar_numeric", usually, a result of a call to univar_numeric().
indiv	logical. Select whether to display information of all variables in one plot when there are multiple selected numeric variables. In case of FALSE, all variable information is displayed in one plot. If TRUE, the information of the individual variables is output to the individual plots. The default is FALSE. If only one variable is selected, TRUE is applied.
viz	character. Describe what to plot visualization. "hist" draws a histogram and "boxplot" draws a boxplot. The default is "hist".
stand	character. Describe how to standardize the original data. "robust" normalizes the raw data through transformation calculated by IQR and median. "minmax" normalizes the original data using minmax transformation. "zscore" standardizes the original data using z-Score transformation. "none" does not perform data transformation. The default is "none" if indiv is TRUE, and "robust" if FALSE.
prompt	logical. The default value is FALSE. If there are multiple visualizations to be output, if this argument value is TRUE, a prompt is output each time.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. If TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to methods, such as graphical parameters (see par). However, it does not support.

**Details**

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

**See Also**

[univar\\_numeric](#), [print.univar\\_numeric](#), [summary.univar\\_numeric](#).

**Examples**

```
# Calculates the all categorical variables
all_var <- univar_numeric(heartfailure)

# Print univar_numeric class object
all_var

# Calculates the platelets, sodium variable
univar_numeric(heartfailure, platelets, sodium)

# Summary the all case : Return a invisible copy of an object.
```

```
stat <- summary(all_var)

# Summary by returned object
stat

# one plot with all variables
plot(all_var)

# one plot with all normalized variables by Min-Max method
plot(all_var, stand = "minmax")

# one plot with all variables
plot(all_var, stand = "none")

# one plot with all robust standardized variables
plot(all_var, viz = "boxplot")

# one plot with all standardized variables by Z-score method
plot(all_var, viz = "boxplot", stand = "zscore")

# individual boxplot by variables
plot(all_var, indiv = TRUE, "boxplot")

# individual histogram by variables
plot(all_var, indiv = TRUE, "hist")

# individual histogram by robust standardized variable
plot(all_var, indiv = TRUE, "hist", stand = "robust")

# plot all variables by prompt
plot(all_var, indiv = TRUE, "hist", prompt = TRUE)
```

---

plot\_bar\_category      *Plot bar chart of categorical variables*

---

### **Description**

The `plot_bar_category()` to visualizes the distribution of categorical data by level or relationship to specific numerical data by level.

### **Usage**

```
plot_bar_category(.data, ...)

## S3 method for class 'data.frame'
plot_bar_category(
  .data,
  ...,
```

```

    top = 10,
    add_character = TRUE,
    title = "Frequency by levels of category",
    each = FALSE,
    typographic = TRUE,
    base_family = NULL
  )

## S3 method for class 'grouped_df'
plot_bar_category(
  .data,
  ...,
  top = 10,
  add_character = TRUE,
  title = "Frequency by levels of category",
  each = FALSE,
  typographic = TRUE,
  base_family = NULL
)

```

### Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> or a <code>grouped_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_bar_category()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>top</code>	an integer. Specifies the upper top rank to extract. Default is 10.
<code>add_character</code>	logical. Decide whether to include text variables in the diagnosis of categorical data. The default value is <code>TRUE</code> , which also includes character variables.
<code>title</code>	character. a main title for the plot.
<code>each</code>	logical. Specifies whether to draw multiple plots on one screen. The default is <code>FALSE</code> , which draws multiple plots on one screen.
<code>typographic</code>	logical. Whether to apply focuses on typographic elements to <code>ggplot2</code> visualization. The default is <code>TRUE</code> . if <code>TRUE</code> provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)

### Details

The distribution of categorical variables can be understood by comparing the frequency of each level. The frequency table helps with this. As a visualization method, a bar graph can help you understand the distribution of categorical data more easily than a frequency table.

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### Examples

```
# Generate data for the example

heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

set.seed(123)
heartfailure2$test <- sample(LETTERS[1:15], 299, replace = TRUE)
heartfailure2$test[1:30] <- NA

# Visualization of all numerical variables
plot_bar_category(heartfailure2)

# Select the variable to diagnose
plot_bar_category(heartfailure2, "test", "smoking")
plot_bar_category(heartfailure2, -test, -smoking)

# Visualize the each plots
plot_bar_category(heartfailure2, each = TRUE)

# Not allow typographic argument
plot_bar_category(heartfailure2, typographic = FALSE)

# Using pipes -----
library(dplyr)

# Plot of all categorical variables
heartfailure2 %>%
  plot_bar_category()

# Visualize just 7 levels of top frequency
heartfailure2 %>%
  plot_bar_category(top = 7)

# Visualize only factor, not character
heartfailure2 %>%
  plot_bar_category(add_character = FALSE)

# Using groupd_df -----
heartfailure2 %>%
  group_by(death_event) %>%
  plot_bar_category(top = 5)

heartfailure2 %>%
  group_by(death_event) %>%
  plot_bar_category(each = TRUE, top = 5)
```

---

plot\_box\_numeric      *Plot Box-Plot of numerical variables*

---

### Description

The `plot_box_numeric()` to visualizes the box plot of numeric data or relationship to specific categorical data.

### Usage

```
plot_box_numeric(.data, ...)

## S3 method for class 'data.frame'
plot_box_numeric(
  .data,
  ...,
  title = "Distribution by numerical variables",
  each = FALSE,
  typographic = TRUE,
  base_family = NULL
)

## S3 method for class 'grouped_df'
plot_box_numeric(
  .data,
  ...,
  title = "Distribution by numerical variables",
  each = FALSE,
  typographic = TRUE,
  base_family = NULL
)
```

### Arguments

<code>.data</code>	data.frame or a <code>tbl_df</code> or a <code>grouped_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_box_numeric()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>title</code>	character. a main title for the plot.
<code>each</code>	logical. Specifies whether to draw multiple plots on one screen. The default is <code>FALSE</code> , which draws multiple plots on one screen.

typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

## Details

The box plot helps determine whether the distribution of a numeric variable. `plot_box_numeric()` shows box plots of several numeric variables on one screen. This function can also display a box plot for each level of a specific categorical variable.

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## Examples

```
# Visualization of all numerical variables
plot_box_numeric(heartfailure)

# Select the variable to diagnose
plot_box_numeric(heartfailure, "age", "time")
plot_box_numeric(heartfailure, -age, -time)

# Visualize the each plots
plot_box_numeric(heartfailure, "age", "time", each = TRUE)

# Not allow the typographic elements
plot_box_numeric(heartfailure, typographic = FALSE)

# Using pipes -----
library(dplyr)

# Plot of all numerical variables
heartfailure %>%
  plot_box_numeric()

# Using groupd_df -----
heartfailure %>%
  group_by(smoking) %>%
  plot_box_numeric()

heartfailure %>%
  group_by(smoking) %>%
  plot_box_numeric(each = TRUE)
```

---

plot\_hist\_numeric      *Plot histogram of numerical variables*

---

## Description

The `plot_hist_numeric()` to visualizes the histogram of numeric data or relationship to specific categorical data.

## Usage

```
plot_hist_numeric(.data, ...)  
  
## S3 method for class 'data.frame'  
plot_hist_numeric(  
  .data,  
  ...,  
  title = "Distribution by numerical variables",  
  each = FALSE,  
  typographic = TRUE,  
  base_family = NULL  
)  
  
## S3 method for class 'grouped_df'  
plot_hist_numeric(  
  .data,  
  ...,  
  title = "Distribution by numerical variables",  
  each = FALSE,  
  typographic = TRUE,  
  base_family = NULL  
)
```

## Arguments

<code>.data</code>	data.frame or a <code>tbl_df</code> or a <code>grouped_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_hist_numeric()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>title</code>	character. a main title for the plot.
<code>each</code>	logical. Specifies whether to draw multiple plots on one screen. The default is <code>FALSE</code> , which draws multiple plots on one screen.

typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

## Details

The histogram helps determine whether the distribution of a numeric variable. `plot_hist_numeric()` shows box plots of several numeric variables on one screen. This function can also display a histogram for each level of a specific categorical variable. The bin-width is set to the Freedman-Diaconis rule ( $2 * IQR(x) / length(x)^{1/3}$ )

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## Examples

```
# Visualization of all numerical variables
plot_hist_numeric(heartfailure)

# Select the variable to diagnose
plot_hist_numeric(heartfailure, "age", "time")
plot_hist_numeric(heartfailure, -age, -time)

# Visualize the each plots
plot_hist_numeric(heartfailure, "age", "time", each = TRUE)

# Not allow the typographic elements
plot_hist_numeric(heartfailure, typographic = FALSE)

# Using pipes -----
library(dplyr)

# Plot of all numerical variables
heartfailure %>%
  plot_hist_numeric()

# Using groupd_df -----
heartfailure %>%
  group_by(smoking) %>%
  plot_hist_numeric()

heartfailure %>%
  group_by(smoking) %>%
  plot_hist_numeric(each = TRUE)
```

---

plot\_na\_hclust                      *Combination chart for missing value*

---

### Description

Visualize distribution of missing value by combination of variables.

### Usage

```
plot_na_hclust(
  x,
  main = NULL,
  col.left = "#009E73",
  col.right = "#56B4E9",
  typographic = TRUE,
  base_family = NULL
)
```

### Arguments

x	data frames, or objects to be coerced to one.
main	character. Main title.
col.left	character. The color of left legend that is frequency of NA. default is "#009E73".
col.right	character. The color of right legend that is percentage of NA. default is "#56B4E9".
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

### Details

Rows are variables containing missing values, and columns are observations. These data structures were grouped into similar groups by applying hclust. So, it was made possible to visually examine how the missing values are distributed for each combination of variables.

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

### Examples

```
# Generate data for the example
set.seed(123L)
jobchange2 <- jobchange[sample(nrow(jobchange), size = 1000), ]
```

```
# Visualize hcluster chart for variables with missing value.
plot_na_hclust(jobchange2)

# Change the main title.
plot_na_hclust(jobchange2, main = "Distribution of missing value")

# Non typographic elements
plot_na_hclust(jobchange2, typographic = FALSE)
```

---

plot\_na\_intersect      *Plot the combination variables that is include missing value*

---

## Description

Visualize the combinations of missing value across cases.

## Usage

```
plot_na_intersect(
  x,
  only_na = TRUE,
  n_intersacts = NULL,
  n_vars = NULL,
  main = NULL,
  typographic = TRUE,
  base_family = NULL
)
```

## Arguments

x	data frames, or objects to be coerced to one.
only_na	logical. The default value is FALSE. If TRUE, only variables containing missing values are selected for visualization. If FALSE, included complete case.
n_intersacts	integer. Specifies the number of combinations of variables including missing values. The combination of variables containing many missing values is chosen first.
n_vars	integer. Specifies the number of variables that contain missing values to be visualized. The default value is NULL, which visualizes variables containing all missing values. If this value is greater than the number of variables containing missing values, all variables containing missing values are visualized. Variables containing many missing values are chosen first.
main	character. Main title.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbrthemes package.

`base_family` character. The name of the base font family to use for the visualization. If not specified, the font defined in `dlookr` is applied. (See details)

### Details

The visualization consists of four parts. The bottom left, which is the most basic, visualizes the case of cross(intersection)-combination. The x-axis is the variable including the missing value, and the y-axis represents the case of a combination of variables. And on the marginal of the two axes, the frequency of the case is expressed as a bar graph. Finally, the visualization at the top right expresses the number of variables including missing values in the data set, and the number of observations including missing values and complete cases .

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### Examples

```
# Generate data for the example
set.seed(123L)
jobchange2 <- jobchange[sample(nrow(jobchange), size = 1000), ]

# Visualize the combination variables that is include missing value.
plot_na_intersect(jobchange2)

# Diagnose the data with missing_count using diagnose() function
library(dplyr)

jobchange2 %>%
  diagnose %>%
  arrange(desc(missing_count))

# Visualize the combination variables that is include missing value
plot_na_intersect(jobchange2)

# Visualize variables containing missing values and complete case
plot_na_intersect(jobchange2, only_na = FALSE)

# Using n_vars argument
plot_na_intersect(jobchange2, n_vars = 5)

# Using n_intersects argument
plot_na_intersect(jobchange2, only_na = FALSE, n_intersects = 7)

# Non typographic elements
plot_na_intersect(jobchange2, typographic = FALSE)
```

---

plot\_na\_pareto      *Pareto chart for missing value*

---

### Description

Visualize pareto chart for variables with missing value.

### Usage

```
plot_na_pareto(
  x,
  only_na = FALSE,
  relative = FALSE,
  main = NULL,
  col = "black",
  grade = list(Good = 0.05, OK = 0.1, NotBad = 0.2, Bad = 0.5, Remove = 1),
  plot = TRUE,
  typographic = TRUE,
  base_family = NULL
)
```

### Arguments

x	data frames, or objects to be coerced to one.
only_na	logical. The default value is FALSE. If TRUE, only variables containing missing values are selected for visualization. If FALSE, all variables are included.
relative	logical. If this argument is TRUE, it sets the unit of the left y-axis to relative frequency. In case of FALSE, set it to frequency.
main	character. Main title.
col	character. The color of line for display the cumulative percentage.
grade	list. Specifies the cut-off to set the grade of the variable according to the ratio of missing values. The default values are Good: [0, 0.05], OK: (0.05, 0.1], NotBad: (0.1, 0.2], Bad: (0.2, 0.5], Remove: (0.5, 1].
plot	logical. If this value is TRUE then visualize plot. else if FALSE, return aggregate information about missing values.
typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization. The default is TRUE. if TRUE provides a base theme that focuses on typographic elements using hrbthemes package.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

### Details

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

## Examples

```
# Generate data for the example
set.seed(123L)
jobchange2 <- jobchange[sample(nrow(jobchange), size = 1000), ]

# Diagnose the data with missing_count using diagnose() function
library(dplyr)

jobchange2 %>%
  diagnose %>%
  arrange(desc(missing_count))

# Visualize pareto chart for variables with missing value.
plot_na_pareto(jobchange2)

# Visualize pareto chart for variables with missing value.
plot_na_pareto(jobchange2, col = "blue")

# Visualize only variables containing missing values
plot_na_pareto(jobchange2, only_na = TRUE)

# Display the relative frequency
plot_na_pareto(jobchange2, relative = TRUE)

# Change the grade
plot_na_pareto(jobchange2, grade = list(High = 0.1, Middle = 0.6, Low = 1))

# Change the main title.
plot_na_pareto(jobchange2, relative = TRUE, only_na = TRUE,
               main = "Pareto Chart for jobchange")

# Return the aggregate information about missing values.
plot_na_pareto(jobchange2, only_na = TRUE, plot = FALSE)

# Non typographic elements
plot_na_pareto(jobchange2, typographic = FALSE)
```

---

plot\_normality

*Plot distribution information of numerical data*

---

## Description

The `plot_normality()` visualize distribution information for normality test of the numerical data.

**Usage**

```
plot_normality(.data, ...)

## S3 method for class 'data.frame'
plot_normality(
  .data,
  ...,
  left = c("log", "sqrt", "log+1", "log+a", "1/x", "x^2", "x^3", "Box-Cox",
           "Yeo-Johnson"),
  right = c("sqrt", "log", "log+1", "log+a", "1/x", "x^2", "x^3", "Box-Cox",
            "Yeo-Johnson"),
  col = "steelblue",
  typographic = TRUE,
  base_family = NULL
)

## S3 method for class 'grouped_df'
plot_normality(
  .data,
  ...,
  left = c("log", "sqrt", "log+1", "log+a", "1/x", "x^2", "x^3", "Box-Cox",
           "Yeo-Johnson"),
  right = c("sqrt", "log", "log+1", "log+a", "1/x", "x^2", "x^3", "Box-Cox",
            "Yeo-Johnson"),
  col = "steelblue",
  typographic = TRUE,
  base_family = NULL
)
```

**Arguments**

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_normality()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing. See <code>vignette("EDA")</code> for an introduction to these concepts.
<code>left</code>	character. Specifies the data transformation method to draw the histogram in the lower left corner. The default is "log".
<code>right</code>	character. Specifies the data transformation method to draw the histogram in the lower right corner. The default is "sqrt".
<code>col</code>	a color to be used to fill the bars. The default is "steelblue".
<code>typographic</code>	logical. Whether to apply focuses on typographic elements to <code>ggplot2</code> visualization. The default is <code>TRUE</code> . if <code>TRUE</code> provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.

`base_family` character. The name of the base font family to use for the visualization. If not specified, the font defined in `dlookr` is applied. (See details)

### Details

The scope of the visualization is to provide a distribution information. Since the plot is drawn for each variable, if you specify more than one variable in the `...` argument, the specified number of plots are drawn.

The argument values that `left` and `right` can have are as follows.:

- "log" : log transformation.  $\log(x)$
- "log+1" : log transformation.  $\log(x + 1)$ . Used for values that contain 0.
- "log+a" : log transformation.  $\log(x + 1 - \min(x))$ . Used for values that contain 0.
- "sqrt" : square root transformation.
- "1/x" :  $1 / x$  transformation
- "x^2" : x square transformation
- "x^3" : x^3 square transformation
- "Box-Cox" : Box-Box transformation
- "Yeo-Johnson" : Yeo-Johnson transformation

### Distribution information

The plot derived from the numerical data visualization is as follows.

- histogram by original data
- q-q plot by original data
- histogram by log transfer data
- histogram by square root transfer data

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### See Also

[plot\\_normality.tbl\\_dbi](#), [plot\\_outlier.data.frame](#).

### Examples

```
# Visualization of all numerical variables
heartfailure2 <- heartfailure[, c("creatinine", "platelets", "sodium", "sex", "smoking")]
plot_normality(heartfailure2)

# Select the variable to plot
plot_normality(heartfailure2, platelets, sodium)
plot_normality(heartfailure2, -platelets, -sodium, col = "gray")
```

```

plot_normality(heartfailure2, 1)

# Change the method of transformation
plot_normality(heartfailure2, platelets, right = "1/x")

if (requireNamespace("forecast", quietly = TRUE)) {
  plot_normality(heartfailure2, platelets, left = "Box-Cox", right = "Yeo-Johnson")
} else {
  cat("If you want to use this feature, you need to install the rpart package.\n")
}

# Non typographic elements
plot_normality(heartfailure2, platelets, typographic = FALSE)

# Using dplyr::grouped_df
library(dplyr)

gdata <- group_by(heartfailure2, sex, smoking)
plot_normality(gdata)
plot_normality(gdata, "creatinine")

# Using pipes -----
# Visualization of all numerical variables
heartfailure2 %>%
  plot_normality()

# Positive values select variables
heartfailure2 %>%
  plot_normality(platelets, sodium)

# Positions values select variables
heartfailure2 %>%
  plot_normality(1)

# Using pipes & dplyr -----
# Plot 'creatinine' variable by 'sex' and 'smoking'
heartfailure2 %>%
  group_by(sex, smoking) %>%
  plot_normality(creatinine)

# extract only those with 'sex' variable level is "Male",
# and plot 'platelets' by 'smoking'
if (requireNamespace("forecast", quietly = TRUE)) {
  heartfailure2 %>%
    filter(sex == "Male") %>%
    group_by(smoking) %>%
    plot_normality(platelets, right = "Box-Cox")
} else {
  cat("If you want to use this feature, you need to install the rpart package.\n")
}

```

---

plot\_normality.tbl\_dbi

*Plot distribution information of numerical data*


---

### Description

The `plot_normality()` visualize distribution information for normality test of the numerical (INTEGER, NUMBER, etc.) column of the DBMS table through `tbl_dbi`.

### Usage

```
## S3 method for class 'tbl_dbi'
plot_normality(
  .data,
  ...,
  in_database = FALSE,
  collect_size = Inf,
  left = c("log", "sqrt", "log+1", "1/x", "x^2", "x^3", "Box-Cox", "Yeo-Johnson"),
  right = c("sqrt", "log", "log+1", "1/x", "x^2", "x^3", "Box-Cox", "Yeo-Johnson"),
  col = "steelblue",
  typographic = TRUE,
  base_family = NULL
)
```

### Arguments

<code>.data</code>	a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_normality()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing. See <code>vignette("EDA")</code> for an introduction to these concepts.
<code>in_database</code>	Specifies whether to perform in-database operations. If <code>TRUE</code> , most operations are performed in the DBMS. if <code>FALSE</code> , table data is taken in R and operated in-memory. Not yet supported <code>in_database = TRUE</code> .
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .
<code>left</code>	character. Specifies the data transformation method to draw the histogram in the lower left corner. The default is "log".
<code>right</code>	character. Specifies the data transformation method to draw the histogram in the lower right corner. The default is "sqrt".
<code>col</code>	a color to be used to fill the bars. The default is "steelblue".

typographic	logical. Whether to apply focuses on typographic elements to ggplot2 visualization.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)

### Details

The scope of the visualization is the provide a distribution information. Since the plot is drawn for each variable, if you specify more than one variable in the ... argument, the specified number of plots are drawn.

The argument values that left and right can have are as follows.:

- "log" : log transformation.  $\log(x)$
- "log+1" : log transformation.  $\log(x + 1)$ . Used for values that contain 0.
- "sqrt" : square root transformation.
- "1/x" :  $1 / x$  transformation
- "x^2" : x square transformation
- "x^3" :  $x^3$  square transformation
- "Box-Cox" : Box-Box transformation
- "Yeo-Johnson" : Yeo-Johnson transformation

### Distribution information

The plot derived from the numerical data visualization is as follows.

- histogram by original data
- q-q plot by original data
- histogram by log transfer data
- histogram by square root transfer data

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### See Also

[plot\\_normality.data.frame](#), [plot\\_outlier.tbl\\_dbi](#).

### Examples

```
library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
```

```
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Visualization of all numerical variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_normality()

# Positive values select variables, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_normality(platelets, sodium, collect_size = 200)

# Positions values select variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_normality(1)

# Not allow the typographic elements
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_normality(1, typographic = FALSE)

# Using pipes & dplyr -----
# Plot 'sodium' variable by 'smoking' and 'death_event'
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  group_by(smoking, death_event) %>%
  plot_normality(sodium)

# Plot using left and right arguments
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  group_by(smoking, death_event) %>%
  plot_normality(sodium, left = "Box-Cox", right = "log")

# extract only those with 'smoking' variable level is "Yes",
# and plot 'sodium' by 'death_event'
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  filter(smoking == "Yes") %>%
  group_by(death_event) %>%
  plot_normality(sodium)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)
```

**Description**

The `plot_outlier()` visualize outlier information for diagnosing the quality of the numerical data.

**Usage**

```
plot_outlier(.data, ...)

## S3 method for class 'data.frame'
plot_outlier(
  .data,
  ...,
  col = "steelblue",
  typographic = TRUE,
  base_family = NULL
)
```

**Arguments**

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_outlier()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>col</code>	a color to be used to fill the bars. The default is "steelblue".
<code>typographic</code>	logical. Whether to apply focuses on typographic elements to <code>ggplot2</code> visualization.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details) The default is <code>TRUE</code> . if <code>TRUE</code> provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.

**Details**

The scope of the diagnosis is the provide a outlier information. Since the plot is drawn for each variable, if you specify more than one variable in the `...` argument, the specified number of plots are drawn.

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

**Outlier diagnostic information**

The plot derived from the numerical data diagnosis is as follows.

- With outliers box plot

- Without outliers box plot
- With outliers histogram
- Without outliers histogram

See vignette("diagonosis") for an introduction to these concepts.

### See Also

`plot_outlier.tbl_dbi, diagnose_outlier.data.frame.`

### Examples

```
# Visualization of all numerical variables
plot_outlier(heartfailure)

# Select the variable to diagnose
plot_outlier(heartfailure, cpk_enzyme, sodium)
plot_outlier(heartfailure, -cpk_enzyme, -sodium)
plot_outlier(heartfailure, "cpk_enzyme", "sodium")
plot_outlier(heartfailure, 7)

# Using the col argument
plot_outlier(heartfailure, cpk_enzyme, col = "gray")

# Not allow typographic argument
plot_outlier(heartfailure, cpk_enzyme, typographic = FALSE)

# Using pipes -----
library(dplyr)

# Visualization of all numerical variables
heartfailure %>%
  plot_outlier()

# Positive values select variables
heartfailure %>%
  plot_outlier(cpk_enzyme, sodium)

# Negative values to drop variables
heartfailure %>%
  plot_outlier(-cpk_enzyme, -sodium)

# Positions values select variables
heartfailure %>%
  plot_outlier(7)

# Negative values to drop variables
heartfailure %>%
  plot_outlier(-1, -5)

# Using pipes & dplyr -----
```

```
# Visualization of numerical variables with a ratio of
# outliers greater than 5%
heartfailure %>%
  plot_outlier(heartfailure %>%
    diagnose_outlier() %>%
    filter(outliers_ratio > 5) %>%
    select(variables) %>%
    pull())
```

---

```
plot_outlier.target_df
```

*Plot outlier information of target\_df*

---

## Description

The `plot_outlier()` visualize outlier information for diagnosing the quality of the numerical data with `target_df` class.

## Usage

```
## S3 method for class 'target_df'
plot_outlier(.data, ..., typographic = TRUE, base_family = NULL)
```

## Arguments

<code>.data</code>	a <code>target_df</code> . reference <code>target_by</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_outlier()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>typographic</code>	logical. Whether to apply focuses on typographic elements to <code>ggplot2</code> visualization.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details) The default is <code>TRUE</code> . if <code>TRUE</code> provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.

## Details

The scope of the diagnosis is the provide a outlier information. Since the plot is drawn for each variable, if you specify more than one variable in the `...` argument, the specified number of plots are drawn.

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

**Outlier diagnostic information**

The plot derived from the numerical data diagnosis is as follows.

- With outliers box plot by target variable
- Without outliers box plot by target variable
- With outliers density plot by target variable
- Without outliers density plot by target variable

**See Also**

[plot\\_outlier.data.frame.](#)

**Examples**

```
# the target variable is a categorical variable
categ <- target_by(heartfailure, death_event)

plot_outlier(categ, sodium)
# plot_outlier(categ, sodium, typographic = FALSE)

# death_eventing dplyr
library(dplyr)
heartfailure %>%
  target_by(death_event) %>%
  plot_outlier(sodium, cpk_enzyme)

# death_eventing DBMS tables -----
# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# If the target variable is a categorical variable
categ <- target_by(con_sqlite %>% tbl("TB_HEARTFAILURE"), death_event)

plot_outlier(categ, sodium)
```

---

plot\_outlier.tbl\_dbi *Plot outlier information of numerical data diagnosis in the DBMS*

---

**Description**

The `plot_outlier()` visualize outlier information for diagnosing the quality of the numerical(INTEGER, NUMBER, etc.) column of the DBMS table through `tbl_dbi`.

**Usage**

```
## S3 method for class 'tbl_dbi'
plot_outlier(
  .data,
  ...,
  col = "steelblue",
  in_database = FALSE,
  collect_size = Inf,
  typographic = TRUE,
  base_family = NULL
)
```

**Arguments**

<code>.data</code>	a <code>tbl_dbi</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_outlier()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>col</code>	a color to be used to fill the bars. The default is "lightblue".
<code>in_database</code>	Specifies whether to perform in-database operations. If <code>TRUE</code> , most operations are performed in the DBMS. if <code>FALSE</code> , table data is taken in R and operated in-memory. Not yet supported in <code>in_database = TRUE</code> .
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .
<code>typographic</code>	logical. Whether to apply focuses on typographic elements to <code>ggplot2</code> visualization. The default is <code>TRUE</code> . if <code>TRUE</code> provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)

**Details**

The scope of the diagnosis is the provide a outlier information. Since the plot is drawn for each variable, if you specify more than one variable in the `...` argument, the specified number of plots are drawn.

**Outlier diagnostic information**

The plot derived from the numerical data diagnosis is as follows.

- With outliers box plot
- Without outliers box plot
- With outliers histogram

- Without outliers histogram

See vignette("diagnosis") for an introduction to these concepts.

The base\_family is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with import\_google\_font().

## See Also

[plot\\_outlier.data.frame](#), [diagnose\\_outlier.tbl\\_dbi](#).

## Examples

```
library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Visualization of all numerical variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_outlier()

# Positive values select variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_outlier(platelets, sodium)

# Negative values to drop variables, and In-memory mode and collect size is 200
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_outlier(-platelets, -sodium, collect_size = 200)

# Positions values select variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_outlier(6)

# Negative values to drop variables
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_outlier(-1, -5)

# Not allow the typographic elements
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_outlier(-1, -5, typographic = FALSE)
```

```

# Using pipes & dplyr -----
# Visualization of numerical variables with a ratio of
# outliers greater than 1%
con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  plot_outlier(con_sqlite %>%
    tbl("TB_HEARTFAILURE") %>%
    diagnose_outlier() %>%
    filter(outliers_ratio > 1) %>%
    select(variables) %>%
    pull())

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

---

plot_qq_numeric	<i>Plot Q-Q plot of numerical variables</i>
-----------------	---

---

## Description

The `plot_qq_numeric()` to visualizes the Q-Q plot of numeric data or relationship to specific categorical data.

## Usage

```

plot_qq_numeric(.data, ...)

## S3 method for class 'data.frame'
plot_qq_numeric(
  .data,
  ...,
  col_point = "steelblue",
  col_line = "black",
  title = "Q-Q plot by numerical variables",
  each = FALSE,
  typographic = TRUE,
  base_family = NULL
)

## S3 method for class 'grouped_df'
plot_qq_numeric(
  .data,
  ...,
  col_point = "steelblue",
  col_line = "black",

```

```

title = "Q-Q plot by numerical variables",
each = FALSE,
typographic = TRUE,
base_family = NULL
)

```

### Arguments

<code>.data</code>	data.frame or a <code>tbl_df</code> or a <code>grouped_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>plot_qq_numeric()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>col_point</code>	character. a color of points in Q-Q plot.
<code>col_line</code>	character. a color of line in Q-Q plot.
<code>title</code>	character. a main title for the plot.
<code>each</code>	logical. Specifies whether to draw multiple plots on one screen. The default is <code>FALSE</code> , which draws multiple plots on one screen.
<code>typographic</code>	logical. Whether to apply focuses on typographic elements to <code>ggplot2</code> visualization. The default is <code>TRUE</code> . if <code>TRUE</code> provides a base theme that focuses on typographic elements using <code>hrbrthemes</code> package.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)

### Details

The The Q-Q plot helps determine whether the distribution of a numeric variable is normally distributed. `plot_qq_numeric()` shows Q-Q plots of several numeric variables on one screen. This function can also display a Q-Q plot for each level of a specific categorical variable.

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

### Examples

```

# Visualization of all numerical variables
plot_qq_numeric(heartfailure)

# Select the variable to diagnose
plot_qq_numeric(heartfailure, "age", "time")
plot_qq_numeric(heartfailure, -age, -time)

# Not allow the typographic elements
plot_qq_numeric(heartfailure, "age", typographic = FALSE)

```

```

# Using pipes -----
library(dplyr)

# Plot of all numerical variables
heartfailure %>%
  plot_qq_numeric()

# Using groupd_df -----
heartfailure %>%
  group_by(smoking) %>%
  plot_qq_numeric()

heartfailure %>%
  group_by(smoking) %>%
  plot_qq_numeric(each = TRUE)

```

---

pps

---

*Compute Predictive Power Score*


---

## Description

The `pps()` compute PPS(Predictive Power Score) for exploratory data analysis.

## Usage

```

pps(.data, ...)

## S3 method for class 'data.frame'
pps(.data, ..., cv_folds = 5, do_parallel = FALSE, n_cores = -1)

## S3 method for class 'target_df'
pps(.data, ..., cv_folds = 5, do_parallel = FALSE, n_cores = -1)

```

## Arguments

<code>.data</code>	a <code>target_df</code> or <code>data.frame</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. If the first expression is negative, <code>describe()</code> will automatically start with all variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.
<code>cv_folds</code>	integer. number of cross-validation folds.
<code>do_parallel</code>	logical. whether to perform score calls in parallel.
<code>n_cores</code>	integer. number of cores to use, defaults to maximum cores - 1.

## Details

The PPS is an asymmetric, data-type-agnostic score that can detect linear or non-linear relationships between two variables. The score ranges from 0 (no predictive power) to 1 (perfect predictive power).

## Value

An object of the class `pps`. Attributes of `pps` class is as follows.

- `type` : type of `pps`
- `target` : name of target variable
- `predictor` : name of predictor

## Information of Predictive Power Score

The information of PPS is as follows.

- `x` : the name of the predictor variable
- `y` : the name of the target variable
- `result_type` : text showing how to interpret the resulting score
- `pps` : the predictive power score
- `metric` : the evaluation metric used to compute the PPS
- `baseline_score` : the score of a naive model on the evaluation metric
- `model_score` : the score of the predictive model on the evaluation metric
- `cv_folds` : how many cross-validation folds were used
- `seed` : the seed that was set
- `algorithm` : text showing what algorithm was used
- `model_type` : text showing whether classification or regression was used

## References

- RIP correlation. Introducing the Predictive Power Score - by Florian Wetschoreck  
– <https://towardsdatascience.com/rip-correlation-introducing-the-predictive-power-score-3d90808b9598>

## See Also

[print.relate](#), [plot.relate](#).

## Examples

```
library(dplyr)

# pps type is generic =====
pps_generic <- pps(iris)
pps_generic
```

```

# summary pps class
mat <- summary(pps_generic)
mat

# visualize pps class
plot(pps_generic)

# pps type is target_by =====
##-----
# If the target variable is a categorical variable
categ <- target_by(iris, Species)

# compute all variables
pps_cat <- pps(categ)
pps_cat

# compute Petal.Length and Petal.Width variable
pps_cat <- pps(categ, Petal.Length, Petal.Width)
pps_cat

# Using dplyr
pps_cat <- iris %>%
  target_by(Species) %>%
  pps()

pps_cat

# Using parallel process
# pps_cat <- iris %>%
#   target_by(Species) %>%
#   pps(do_parallel = TRUE)
#
# pps_cat

# summary pps class
tab <- summary(pps_cat)
tab

# visualize pps class
plot(pps_cat)

##-----
# If the target variable is a numerical variable
num <- target_by(iris, Petal.Length)

pps_num <- pps(num)
pps_num

# summary pps class
tab <- summary(pps_num)
tab

```

```
# plot pps class
plot(pps_num)
```

---

print.relate	<i>Summarizing relate information</i>
--------------	---------------------------------------

---

### Description

print and summary method for "relate" class.

### Usage

```
## S3 method for class 'relate'
print(x, ...)
```

### Arguments

x                    an object of class "relate", usually, a result of a call to relate().  
 ...                  further arguments passed to or from other methods.

### Details

print.relate() tries to be smart about formatting four kinds of relate. summary.relate() tries to be smart about formatting four kinds of relate.

### See Also

[plot.relate](#).

### Examples

```
## Not run:
# If the target variable is a categorical variable
categ <- target_by(heartfailure, death_event)

# If the variable of interest is a categorical variable
cat_cat <- relate(categ, hblood_pressure)

# Print bins class object
cat_cat

summary(cat_cat)

## End(Not run)
```

```
# If the target variable is a categorical variable
categ <- target_by(heartfailure, death_event)

# If the variable of interest is a numerical variable
cat_num <- relate(categ, sodium)
cat_num
summary(cat_num)

plot(cat_num)

# If the variable of interest is a categorical variable
cat_cat <- relate(categ, hblood_pressure)
cat_cat
summary(cat_cat)

plot(cat_cat)

##-----
# If the target variable is a numerical variable
num <- target_by(heartfailure, creatinine)

# If the variable of interest is a numerical variable
num_num <- relate(num, sodium)
num_num
summary(num_num)

plot(num_num)

# If the variable of interest is a categorical variable
num_cat <- relate(num, smoking)
num_cat
summary(num_cat)

plot(num_cat)

# Not allow typographic
plot(num_cat, typographic = FALSE)
```

---

relate

*Relationship between target variable and variable of interest*

---

### **Description**

The relationship between the target variable and the variable of interest (predictor) is briefly analyzed.

**Usage**

```
relate(.data, predictor)

## S3 method for class 'target_df'
relate(.data, predictor)
```

**Arguments**

`.data` a `target_df`.  
`predictor` variable of interest. predictor.  
 See vignette("relate") for an introduction to these concepts.

**Details**

Returns the four types of results that correspond to the combination of the target variable and the data type of the variable of interest.

- target variable: categorical variable
  - predictor: categorical variable
    - \* contingency table
    - \* `c("xtabs", "table")` class
  - predictor: numerical variable
    - \* descriptive statistic for each levels and total observation.
- target variable: numerical variable
  - predictor: categorical variable
    - \* ANOVA test. "lm" class.
  - predictor: numerical variable
    - \* simple linear model. "lm" class.

**Value**

An object of the class `relate`. Attributes of `relate` class is as follows.

- `target` : name of target variable
- `predictor` : name of predictor
- `model` : levels of binned value.
- `raw` : `table_df` with two variables `target` and `predictor`.

**Descriptive statistic information**

The information derived from the numerical data describe is as follows.

- `mean` : arithmetic average
- `sd` : standard deviation
- `se_mean` : standrd error mean.  $sd/\sqrt{n}$

- IQR : interquartile range (Q3-Q1)
- skewness : skewness
- kurtosis : kurtosis
- p25 : Q1. 25% percentile
- p50 : median. 50% percentile
- p75 : Q3. 75% percentile
- p01, p05, p10, p20, p30 : 1%, 5%, 20%, 30% percentiles
- p40, p60, p70, p80 : 40%, 60%, 70%, 80% percentiles
- p90, p95, p99, p100 : 90%, 95%, 99%, 100% percentiles

**See Also**

[print.relate](#), [plot.relate](#).

**Examples**

```
# If the target variable is a categorical variable
categ <- target_by(heartfailure, death_event)

# If the variable of interest is a numerical variable
cat_num <- relate(categ, sodium)
cat_num
summary(cat_num)

plot(cat_num)

# If the variable of interest is a categorical variable
cat_cat <- relate(categ, hblood_pressure)
cat_cat
summary(cat_cat)

plot(cat_cat)

##-----
# If the target variable is a numerical variable
num <- target_by(heartfailure, creatinine)

# If the variable of interest is a numerical variable
num_num <- relate(num, sodium)
num_num
summary(num_num)

plot(num_num)

# If the variable of interest is a categorical variable
num_cat <- relate(num, smoking)
num_cat
summary(num_cat)
```

```
plot(num_cat)

# Not allow typographic
plot(num_cat, typographic = FALSE)
```

---

skewness	<i>Skewness of the data</i>
----------	-----------------------------

---

### Description

This function calculated skewness of given data.

### Usage

```
skewness(x, na.rm = TRUE)
```

### Arguments

x	a numeric vector.
na.rm	logical. Determine whether to remove missing values and calculate them. The default is TRUE.

### Value

numeric. calculated skewness.

### See Also

[kurtosis](#), [find\\_skewness](#).

### Examples

```
set.seed(123)
skewness(rnorm(100))
```

---

`summary.bins`*Summarizing Binned Variable*

---

## Description

summary method for "bins" and "optimal\_bins".

## Usage

```
## S3 method for class 'bins'  
summary(object, ...)
```

```
## S3 method for class 'bins'  
print(x, ...)
```

## Arguments

<code>object</code>	an object of "bins" and "optimal_bins", usually, a result of a call to <code>binning()</code> .
<code>...</code>	further arguments passed to or from other methods.
<code>x</code>	an object of class "bins" and "optimal_bins", usually, a result of a call to <code>binning()</code> .

## Details

`print.bins()` prints the information of "bins" and "optimal\_bins" objects nicely. This includes frequency of bins, binned type, and number of bins. `summary.bins()` returns `data.frame` including frequency and relative frequency for each levels(bins).

See vignette("transformation") for an introduction to these concepts.

## Value

The function `summary.bins()` computes and returns a `data.frame` of summary statistics of the binned given in object. Variables of data frame is as follows.

- `levels` : levels of factor.
- `freq` : frequency of levels.
- `rate` : relative frequency of levels. it is not percentage.

## See Also

[binning](#)

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA

# Binning the platelets variable. default type argument is "quantile"
bin <- binning(heartfailure2$platelets)

# Print bins class object
bin

# Summarize bins class object
summary(bin)
```

---

```
summary.compare_category
```

*Summarizing compare\_category information*

---

**Description**

print and summary method for "compare\_category" class.

**Usage**

```
## S3 method for class 'compare_category'
summary(
  object,
  method = c("all", "table", "relative", "chisq"),
  pos = NULL,
  na.rm = TRUE,
  marginal = FALSE,
  verbose = TRUE,
  ...
)

## S3 method for class 'compare_category'
print(x, ...)
```

**Arguments**

object	an object of class "compare_category", usually, a result of a call to compare_category().
method	character. Specifies the type of information to be aggregated. "table" create contingency table, "relative" create relative contingency table, and "chisq" create information of chi-square test. and "all" aggregates all information. The default is "all"

pos	integer. Specifies the pair of variables to be summarized by index. The default is NULL, which aggregates all variable pairs.
na.rm	logical. Specifies whether to include NA when counting the contingency tables or performing a chi-square test. The default is TRUE, where NA is removed and aggregated.
marginal	logical. Specifies whether to add marginal values to the contingency table. The default value is FALSE, so no marginal value is added.
verbose	logical. Specifies whether to output additional information during the calculation process. The default is to output information as TRUE. In this case, the function returns the value with invisible(). If FALSE, the value is returned by return().
...	further arguments passed to or from other methods.
x	an object of class "compare_category", usually, a result of a call to compare_category().

### Details

print.compare\_category() displays only the information compared between the variables included in compare\_category. The "type", "variables" and "combination" attributes are not displayed. When using summary.compare\_category(), it is advantageous to set the verbose argument to TRUE if the user is only viewing information from the console. It is also advantageous to specify FALSE if you want to manipulate the results.

### See Also

[plot.compare\\_category](#).

### Examples

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

library(dplyr)

# Compare the all categorical variables
all_var <- compare_category(heartfailure2)

# Print compare_category class objects
all_var

# Compare the two categorical variables
two_var <- compare_category(heartfailure2, smoking, death_event)

# Print compare_category class objects
two_var

# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)
```

```

# Summary by returned objects
stat

# component of table
stat$table

# component of chi-square test
stat$chisq

# component of chi-square test
summary(all_var, "chisq")

# component of chi-square test (first, third case)
summary(all_var, "chisq", pos = c(1, 3))

# component of relative frequency table
summary(all_var, "relative")

# component of table without missing values
summary(all_var, "table", na.rm = TRUE)

# component of table include marginal value
margin <- summary(all_var, "table", marginal = TRUE)
margin

# component of chi-square test
summary(two_var, method = "chisq")

# verbose is FALSE
summary(all_var, "chisq", verbose = FALSE)

#' # Using pipes & dplyr -----
# If you want to use dplyr, set verbose to FALSE
summary(all_var, "chisq", verbose = FALSE) %>%
  filter(p.value < 0.26)

# Extract component from list by index
summary(all_var, "table", na.rm = TRUE, verbose = FALSE) %>%
  "[["(1)

# Extract component from list by name
summary(all_var, "table", na.rm = TRUE, verbose = FALSE) %>%
  "[["("smoking vs death_event")

```

---

```
summary.compare_numeric
```

*Summarizing compare\_numeric information*

---

**Description**

print and summary method for "compare\_numeric" class.

**Usage**

```
## S3 method for class 'compare_numeric'
summary(
  object,
  method = c("all", "correlation", "linear"),
  thres_corr = 0.3,
  thres_rs = 0.1,
  verbose = TRUE,
  ...
)

## S3 method for class 'compare_numeric'
print(x, ...)
```

**Arguments**

object	an object of class "compare_numeric", usually, a result of a call to compare_numeric().
method	character. Select statistics to be aggregated. "correlation" calculates the Pearson's correlation coefficient, and "linear" returns the aggregation of the linear model. "all" returns both information. However, the difference between summary.compare_numeric() and compare_numeric() is that only cases that are greater than the specified threshold are returned. "correlation" returns only cases with a correlation coefficient greater than the thres_corr argument value. "linear" returns only cases with R <sup>2</sup> greater than the thres_rs argument.
thres_corr	numeric. This is the correlation coefficient threshold of the correlation coefficient information to be returned. The default is 0.3.
thres_rs	numeric. R <sup>2</sup> threshold of linear model summaries information to return. The default is 0.1.
verbose	logical. Specifies whether to output additional information during the calculation process. The default is to output information as TRUE. In this case, the function returns the value with invisible(). If FALSE, the value is returned by return().
...	further arguments passed to or from other methods.
x	an object of class "compare_numeric", usually, a result of a call to compare_numeric().

**Details**

print.compare\_numeric() displays only the information compared between the variables included in compare\_numeric. When using summary.compare\_numeric(), it is advantageous to set the verbose argument to TRUE if the user is only viewing information from the console. It is also advantageous to specify FALSE if you want to manipulate the results.

**Value**

An object of the class as compare based list. The information to examine the relationship between numerical variables is as follows each components. - correlation component : Pearson's correlation coefficient.

- var1 : factor. The level of the first variable to compare. 'var1' is the name of the first variable to be compared.
- var2 : factor. The level of the second variable to compare. 'var2' is the name of the second variable to be compared.
- coef\_corr : double. Pearson's correlation coefficient.

- linear component : linear model summaries

- var1 : factor. The level of the first variable to compare. 'var1' is the name of the first variable to be compared.
- var2 : factor. The level of the second variable to compare. 'var2' is the name of the second variable to be compared.
- r.squared : double. The percent of variance explained by the model.
- adj.r.squared : double. r.squared adjusted based on the degrees of freedom.
- sigma : double. The square root of the estimated residual variance.
- statistic : double. F-statistic.
- p.value : double. p-value from the F test, describing whether the full regression is significant.
- df : integer degrees of freedom.
- logLik : double. the log-likelihood of data under the model.
- AIC : double. the Akaike Information Criterion.
- BIC : double. the Bayesian Information Criterion.
- deviance : double. deviance.
- df.residual : integer residual degrees of freedom.

**See Also**

[plot.compare\\_numeric](#).

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure[, c("platelets", "creatinine", "sodium")]

library(dplyr)
# Compare the all numerical variables
all_var <- compare_numeric(heartfailure2)

# Print compare_numeric class object
all_var
```

```

# Compare the correlation that case of joint the sodium variable
all_var %>%
  "$"(correlation) %>%
  filter(var1 == "sodium" | var2 == "sodium") %>%
  arrange(desc(abs(coef_corr)))

# Compare the correlation that case of abs(coef_corr) > 0.1
all_var %>%
  "$"(correlation) %>%
  filter(abs(coef_corr) > 0.1)

# Compare the linear model that case of joint the sodium variable
all_var %>%
  "$"(linear) %>%
  filter(var1 == "sodium" | var2 == "sodium") %>%
  arrange(desc(r.squared))

# Compare the two numerical variables
two_var <- compare_numeric(heartfailure2, sodium, creatinine)

# Print compare_numeric class objects
two_var

# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)

# Just correlation
summary(all_var, method = "correlation")

# Just correlation condition by r > 0.1
summary(all_var, method = "correlation", thres_corr = 0.1)

# linear model summaries condition by R^2 > 0.05
summary(all_var, thres_rs = 0.05)

# verbose is FALSE
summary(all_var, verbose = FALSE)

```

---

summary.correlate      *Summarizing Correlation Coefficient*

---

## Description

summary method for "correlate" class.

## Usage

```
## S3 method for class 'correlate'
summary(object, ...)
```

**Arguments**

object            an object of class "correlate", usually, a result of a call to correlate().  
 ...              further arguments passed to or from other methods.

**Details**

summary.correlate compares the correlation coefficient by variables.

**See Also**

[correlate](#), [plot.correlate](#).

**Examples**

```
library(dplyr)

# Correlation type is "generic" =====
# Correlation coefficients of all numerical variables
corr_tab <- correlate(heartfailure)
corr_tab

# summary correlate class
mat <- summary(corr_tab)
mat

# Select the variable to compute
corr_tab <- correlate(heartfailure, creatinine, sodium)
corr_tab

# summary correlate class
mat <- summary(corr_tab)
mat

# Correlation type is "group" =====
##-----
# If the target variable is a categorical variable
# Using dplyr
corr_tab <- heartfailure %>%
  group_by(smoking, death_event) %>%
  correlate()

corr_tab

# summary correlate class
mat <- summary(corr_tab)
mat

corr_tab <- heartfailure %>%
  group_by(smoking, death_event) %>%
  correlate(creatinine) %>%
```

```

    filter(abs(coef_corr) >= 0.2)

corr_tab

# summary correlate class
mat <- summary(corr_tab)
mat

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# Using pipes -----
# Correlation coefficients of all numerical variables
corr_tab <- con_sqlite %>%
  tbl("TB_HEARTFAILURE") %>%
  correlate()

# summary correlate class
mat <- summary(corr_tab)
mat

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

---

summary.imputation      *Summarizing imputation information*

---

## Description

print and summary method for "imputation" class.

## Usage

```
## S3 method for class 'imputation'
summary(object, ...)
```

## Arguments

object            an object of class "imputation", usually, a result of a call to `imputate_na()` or `imputate_outlier()`.

...                further arguments passed to or from other methods.

## Details

`summary.imputation()` tries to be smart about formatting two kinds of imputation.

**See Also**

[impute\\_na](#), [impute\\_outlier](#), [summary.imputation](#).

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 20), "platelets"] <- NA
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "smoking"] <- NA

# Impute missing values -----
# If the variable of interest is a numerical variables
platelets <- impute_na(heartfailure2, platelets, death_event, method = "rpart")
platelets
summary(platelets)
plot(platelets)

# If the variable of interest is a categorical variables
smoking <- impute_na(heartfailure2, smoking, death_event, method = "mice")
smoking
summary(smoking)

plot(smoking)

# Impute outliers -----
# If the variable of interest is a numerical variable
platelets <- impute_outlier(heartfailure2, platelets, method = "capping")
platelets
summary(platelets)

plot(platelets)
```

---

summary.optimal\_bins *Summarizing Performance for Optimal Bins*

---

**Description**

summary method for "optimal\_bins". summary metrics to evaluate the performance of binomial classification model.

**Usage**

```
## S3 method for class 'optimal_bins'
summary(object, ...)
```

**Arguments**

object            an object of class "optimal\_bins", usually, a result of a call to binning\_by().  
...                further arguments to be passed from or to other methods.

**Details**

print() to print only binning table information of "optimal\_bins" objects. summary.performance\_bin() includes general metrics and result of significance tests life follows.:

- Binning Table : Metrics by bins.
  - CntRec, CntPos, CntNeg, RatePos, RateNeg, Odds, WoE, IV, JSD, AUC.
- General Metrics.
  - Gini index.
  - Jeffrey's Information Value.
  - Jensen-Shannon Divergence.
  - Kolmogorov-Smirnov Statistics.
  - Herfindahl-Hirschman Index.
  - normalized Herfindahl-Hirschman Index.
  - Cramer's V Statistics.
- Table of Significance Tests.

**Value**

NULL.

**See Also**

[binning\\_by](#), [plot.optimal\\_bins](#)

**Examples**

```
library(dplyr)

# Generate data for the example
heartfailure2 <- heartfailure
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "creatinine"] <- NA

# optimal binning
bin <- binning_by(heartfailure2, "death_event", "creatinine")
bin

# summary optimal_bins class
summary(bin)

# performance table
attr(bin, "performance")
```

```
# visualize all information for optimal_bins class
plot(bin)

# visualize WoE information for optimal_bins class
plot(bin, type = "WoE")

# visualize all information without typographic
plot(bin, typographic = FALSE)

# extract binned results
extract(bin) %>%
  head(20)
```

---

summary.overview

*Summarizing overview information*

---

## Description

print and summary method for "overview" class.

## Usage

```
## S3 method for class 'overview'
summary(object, html = FALSE, ...)
```

## Arguments

object	an object of class "overview", usually, a result of a call to overview().
html	logical. whether to send summary results to html. The default is FALSE, which prints to the R console.
...	further arguments passed to or from other methods.

## Details

summary.overview() tries to be smart about formatting 14 information of overview.

## See Also

[overview](#), [plot.overview](#).

## Examples

```
ov <- overview(jobchange)
ov

summary(ov)
```

---

summary.performance\_bin

*Summarizing Performance for Binned Variable*

---

## Description

summary method for "performance\_bin". summary metrics to evaluate the performance of binomial classification model.

## Usage

```
## S3 method for class 'performance_bin'
summary(object, ...)
```

## Arguments

object            an object of class "performance\_bin", usually, a result of a call to performance\_bin().  
...                further arguments to be passed from or to other methods.

## Details

print() to print only binning table information of "performance\_bin" objects. summary.performance\_bin() includes general metrics and result of significance tests life follows.:

- Binning Table : Metrics by bins.
  - CntRec, CntPos, CntNeg, RatePos, RateNeg, Odds, WoE, IV, JSD, AUC.
- General Metrics.
  - Gini index.
  - Jeffrey's Information Value.
  - Jensen-Shannon Divergence.
  - Kolmogorov-Smirnov Statistics.
  - Herfindahl-Hirschman Index.
  - normalized Herfindahl-Hirschman Index.
  - Cramer's V Statistics.
- Table of Significance Tests.

**Value**

NULL.

**See Also**

[performance\\_bin](#), [plot.performance\\_bin](#), [binning\\_by](#), [summary.optimal\\_bins](#).

**Examples**

```
# Generate data for the example
heartfailure2 <- heartfailure

set.seed(123)
heartfailure2[sample(seq(NROW(heartfailure2)), 5), "creatinine"] <- NA

# Change the target variable to 0(negative) and 1(positive).
heartfailure2$death_event_2 <- ifelse(heartfailure2$death_event %in% "Yes", 1, 0)

# Binnig from creatinine to platelets_bin.
breaks <- c(0, 1, 2, 10)
heartfailure2$creatinine_bin <- cut(heartfailure2$creatinine, breaks)

# Diagnose performance binned variable
perf <- performance_bin(heartfailure2$death_event_2, heartfailure2$creatinine_bin)
perf
summary(perf)

# plot(perf)

# Diagnose performance binned variable without NA
perf <- performance_bin(heartfailure2$death_event_2, heartfailure2$creatinine_bin, na.rm = TRUE)
perf
summary(perf)

plot(perf)
```

---

summary.pps

*Summarizing Predictive Power Score*

---

**Description**

print and summary method for "pps" class.

**Usage**

```
## S3 method for class 'pps'
summary(object, ...)
```

**Arguments**

object            an object of class "pps", usually, a result of a call to pps().  
 ...              further arguments passed to or from other methods.

**Details**

summary.pps compares the PPS by variables.

**See Also**

[pps](#), [plot.pps](#).

**Examples**

```
library(dplyr)

# pps type is generic =====
pps_generic <- pps(iris)
pps_generic

# summary pps class
mat <- summary(pps_generic)
mat

# pps type is target_by =====
##-----
# If the target variable is a categorical variable
# Using dplyr
pps_cat <- iris %>%
  target_by(Species) %>%
  pps()

pps_cat

# summary pps class
tab <- summary(pps_cat)
tab

##-----
# If the target variable is a numerical variable
num <- target_by(iris, Petal.Length)

pps_num <- pps(num)
pps_num

# summary pps class
tab <- summary(pps_num)
tab
```

summary.transform      *Summarizing transformation information*

---

## Description

print and summary method for "transform" class.

## Usage

```
## S3 method for class 'transform'  
summary(object, ...)
```

## Arguments

object            an object of class "transform", usually, a result of a call to transform().  
...               further arguments passed to or from other methods.

## Details

summary.transform compares the distribution of data before and after data transformation.

## See Also

[transform](#), [plot.transform](#).

## Examples

```
# Standardization -----  
creatinine_minmax <- transform(heartfailure$creatinine, method = "minmax")  
creatinine_minmax  
summary(creatinine_minmax)  
  
plot(creatinine_minmax)  
  
# Resolving Skewness -----  
creatinine_log <- transform(heartfailure$creatinine, method = "log")  
creatinine_log  
summary(creatinine_log)  
  
plot(creatinine_log)  
  
plot(creatinine_log, typographic = FALSE)
```

---

`summary.univar_category`*Summarizing univar\_category information*

---

## Description

print and summary method for "univar\_category" class.

## Usage

```
## S3 method for class 'univar_category'  
summary(object, na.rm = TRUE, ...)
```

```
## S3 method for class 'univar_category'  
print(x, ...)
```

## Arguments

<code>object</code>	an object of class "univar_category", usually, a result of a call to <code>univar_category()</code> .
<code>na.rm</code>	logical. Specifies whether to include NA when performing a chi-square test. The default is TRUE, where NA is removed and aggregated.
<code>...</code>	further arguments passed to or from other methods.
<code>x</code>	an object of class "univar_category", usually, a result of a call to <code>univar_category()</code> .

## Details

`print.univar_category()` displays only the information of variables included in `univar_category`. The "variables" attribute is not displayed.

## Value

An object of the class as individual variables based list. The information to examine the relationship between categorical variables is as follows each components.

- `variable` : factor. The level of the variable. 'variable' is the name of the variable.
- `statistic` : numeric. the value the chi-squared test statistic.
- `p.value` : numeric. the p-value for the test.
- `df` : integer. the degrees of freedom of the chi-squared test.

## See Also

[plot.univar\\_category](#).

**Examples**

```

library(dplyr)

# Calculates the all categorical variables
all_var <- univar_category(heartfailure)

# Print univar_category class object
all_var

# Calculates the only smoking variable
all_var %>%
  "["(names(all_var) %in% "smoking")

smoking <- univar_category(heartfailure, smoking)

# Print univar_category class object
smoking

# Filtering the case of smoking included NA
smoking %>%
  "["(1) %>%
  filter(!is.na(smoking))

# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)

# Summary by returned object
stat

```

---

```
summary.univar_numeric
```

*Summarizing univar\_numeric information*

---

**Description**

print and summary method for "univar\_numeric" class.

**Usage**

```

## S3 method for class 'univar_numeric'
summary(object, stand = c("robust", "minmax", "zscore"), ...)

## S3 method for class 'univar_numeric'
print(x, ...)

```

**Arguments**

object	an object of class "univar_numeric", usually, a result of a call to univar_numeric().
stand	character Describe how to standardize the original data. "robust" normalizes the raw data through transformation calculated by IQR and median. "minmax" normalizes the original data using minmax transformation. "zscore" standardizes the original data using z-Score transformation. The default is "robust".
...	further arguments passed to or from other methods.
x	an object of class "univar_numeric", usually, a result of a call to univar_numeric().

**Details**

print.univar\_numeric() displays only the information of variables included in univar\_numeric The "variables" attribute is not displayed.

**Value**

An object of the class as individual variables based list. The statistics returned by summary.univar\_numeric() are different from the statistics returned by univar\_numeric(). univar\_numeric() is the statistics for the original data, but summary.univar\_numeric() is the statistics for the standardized data. A component named "statistics" is a tibble object with the following statistics.:

- variable : factor. The level of the variable. 'variable' is the name of the variable.
- n : number of observations excluding missing values
- na : number of missing values
- mean : arithmetic average
- sd : standard deviation
- se\_mean : standard error mean.  $sd/\sqrt{n}$
- IQR : interquartile range (Q3-Q1)
- skewness : skewness
- kurtosis : kurtosis
- median : median. 50% percentile

**See Also**

[plot.univar\\_numeric.](#)

**Examples**

```
# Calculates the all categorical variables
all_var <- univar_numeric(heartfailure)

# Print univar_numeric class object
all_var

# Calculates the platelets, sodium variable
```

```

univar_numeric(heartfailure, platelets, sodium)

# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)

# Summary by returned object
stat

# Statistics of numerical variables normalized by Min-Max method
summary(all_var, stand = "minmax")

# Statistics of numerical variables standardized by Z-score method
summary(all_var, stand = "zscore")

```

---

target\_by

*Target by one variables*


---

## Description

In the data analysis, a `target_df` class is created to identify the relationship between the target variable and the other variable.

## Usage

```

target_by(.data, target, ...)

## S3 method for class 'data.frame'
target_by(.data, target, ...)

```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>target</code>	target variable.
<code>...</code>	arguments to be passed to methods.

## Details

Data analysis proceeds with the purpose of predicting target variables that correspond to the facts of interest, or examining associations and relationships with other variables of interest. Therefore, it is a major challenge for EDA to examine the relationship between the target variable and its corresponding variable. Based on the derived relationships, analysts create scenarios for data analysis.

`target_by()` inherits the `grouped_df` class and returns a `target_df` class containing information about the target variable and the variable.

See vignette("EDA") for an introduction to these concepts.

**Value**

an object of target\_df class. Attributes of target\_df class is as follows.

- type\_y : the data type of target variable.

**See Also**

[relate](#).

**Examples**

```
# If the target variable is a categorical variable
categ <- target_by(heartfailure, death_event)

# If the variable of interest is a numerical variable
cat_num <- relate(categ, sodium)
cat_num
summary(cat_num)

plot(cat_num)

# If the variable of interest is a categorical variable
cat_cat <- relate(categ, hblood_pressure)
cat_cat
summary(cat_cat)

plot(cat_cat)

##-----
# If the target variable is a numerical variable
num <- target_by(heartfailure, creatinine)

# If the variable of interest is a numerical variable
num_num <- relate(num, sodium)
num_num
summary(num_num)

plot(num_num)

# If the variable of interest is a categorical variable
num_cat <- relate(num, smoking)
num_cat
summary(num_cat)

plot(num_cat)

# Non typographic
plot(num_cat, typographic = FALSE)
```

---

target_by.tbl_dbi	<i>Target by one column in the DBMS</i>
-------------------	---

---

### Description

In the data analysis, a `target_df` class is created to identify the relationship between the target column and the other column of the DBMS table through `tbl_dbi`

### Usage

```
## S3 method for class 'tbl_dbi'
target_by(.data, target, in_database = FALSE, collect_size = Inf, ...)
```

### Arguments

<code>.data</code>	a <code>tbl_dbi</code> .
<code>target</code>	target variable.
<code>in_database</code>	Specifies whether to perform in-database operations. If <code>TRUE</code> , most operations are performed in the DBMS. if <code>FALSE</code> , table data is taken in R and operated in-memory. Not yet supported <code>in_database = TRUE</code> .
<code>collect_size</code>	a integer. The number of data samples from the DBMS to R. Applies only if <code>in_database = FALSE</code> .
<code>...</code>	arguments to be passed to methods.

### Details

Data analysis proceeds with the purpose of predicting target variables that correspond to the facts of interest, or examining associations and relationships with other variables of interest. Therefore, it is a major challenge for EDA to examine the relationship between the target variable and its corresponding variable. Based on the derived relationships, analysts create scenarios for data analysis.

`target_by()` inherits the `grouped_df` class and returns a `target_df` class containing information about the target variable and the variable.

See `vignette("EDA")` for an introduction to these concepts.

### Value

an object of `target_df` class. Attributes of `target_df` class is as follows.

- `type_y` : the data type of target variable.

### See Also

[target\\_by.data.frame](#), [relate](#).

**Examples**

```

library(dplyr)

# connect DBMS
con_sqlite <- DBI::dbConnect(RSQLite::SQLite(), ":memory:")

# copy heartfailure to the DBMS with a table named TB_HEARTFAILURE
copy_to(con_sqlite, heartfailure, name = "TB_HEARTFAILURE", overwrite = TRUE)

# If the target variable is a categorical variable
categ <- target_by(con_sqlite %>% tbl("TB_HEARTFAILURE") , death_event)

# If the variable of interest is a numerical variable
cat_num <- relate(categ, sodium)
cat_num
summary(cat_num)
plot(cat_num)

# If the variable of interest is a categorical column
cat_cat <- relate(categ, hblood_pressure)
cat_cat
summary(cat_cat)
plot(cat_cat)

##-----
# If the target variable is a categorical column,
# and In-memory mode and collect size is 200
num <- target_by(con_sqlite %>% tbl("TB_HEARTFAILURE"), death_event, collect_size = 250)

# If the variable of interest is a numerical column
num_num <- relate(num, creatinine)
num_num
summary(num_num)
plot(num_num)
plot(num_num, hex_thres = 200)

# If the variable of interest is a categorical column
num_cat <- relate(num, smoking)
num_cat
summary(num_cat)
plot(num_cat)

# Disconnect DBMS
DBI::dbDisconnect(con_sqlite)

```

**Description**

Computes the Theil's U statistic between two categorical variables in data.frame.

**Usage**

```
theil(dfm, x, y)
```

**Arguments**

dfm	data.frame. probability distributions.
x	character. name of categorical or discrete variable.
y	character. name of another categorical or discrete variable.

**Value**

data.frame. It has the following variables.:

- var1 : character. first variable name.
- var2 : character. second variable name.
- coef\_corr : numeric. Theil's U statistic.

**See Also**

[cramer](#).

**Examples**

```
theil(mtcars, "gear", "carb")
```

---

transform

*Data Transformations*

---

**Description**

Performs variable transformation for standardization and resolving skewness of numerical variables.

**Usage**

```
transform(  
  x,  
  method = c("zscore", "minmax", "log", "log+1", "sqrt", "1/x", "x^2", "x^3",  
            "Box-Cox", "Yeo-Johnson")  
)
```

**Arguments**

x                    numeric vector for transformation.  
 method              method of transformations.

**Details**

transform() creates an transform class. The 'transform' class includes original data, transformed data, and method of transformation.

See vignette("transformation") for an introduction to these concepts.

**Value**

An object of transform class. Attributes of transform class is as follows.

- method : method of transformation data.
  - Standardization
    - \* "zscore" : z-score transformation.  $(x - \mu) / \sigma$
    - \* "minmax" : minmax transformation.  $(x - \min) / (\max - \min)$
  - Resolving Skewness
    - \* "log" : log transformation.  $\log(x)$
    - \* "log+1" : log transformation.  $\log(x + 1)$ . Used for values that contain 0.
    - \* "sqrt" : square root transformation.
    - \* "1/x" :  $1 / x$  transformation
    - \* "x^2" : x square transformation
    - \* "x^3" : x^3 square transformation
    - \* "Box-Cox" : Box-Box transformation
    - \* "Yeo-Johnson" : Yeo-Johnson transformation

**See Also**

[summary.transform](#), [plot.transform](#).

**Examples**

```
# Standardization -----
creatinine_minmax <- transform(heartfailure$creatinine, method = "minmax")
creatinine_minmax
summary(creatinine_minmax)
plot(creatinine_minmax)

# Resolving Skewness -----
creatinine_log <- transform(heartfailure$creatinine, method = "log")
creatinine_log
summary(creatinine_log)

plot(creatinine_log)
```

```

plot(creatinine_log, typographic = FALSE)

# Using dplyr -----
library(dplyr)

heartfailure %>%
  mutate(creatinine_log = transform(creatinine, method = "log+1")) %>%
  lm(sodium ~ creatinine_log, data = .)

```

---

```
transformation_paged_report
```

*Reporting the information of transformation*

---

## Description

The `eda_paged_report()` paged report the information for data transformation.

## Usage

```

transformation_paged_report(
  .data,
  target = NULL,
  output_format = c("pdf", "html"),
  output_file = NULL,
  output_dir = tempdir(),
  browse = TRUE,
  title = "Transformation Report",
  subtitle = deparse(substitute(.data)),
  author = "dlookr",
  abstract_title = "Report Overview",
  abstract = NULL,
  title_color = "white",
  subtitle_color = "tomato1",
  cover_img = NULL,
  create_date = Sys.time(),
  logo_img = NULL,
  theme = c("orange", "blue"),
  sample_percent = 100,
  base_family = NULL,
  ...
)

```

## Arguments

<code>.data</code>	a data.frame or a <a href="#">tbl_df</a> .
<code>target</code>	character. target variable.

output_format	report output type. Choose either "pdf" and "html". "pdf" create pdf file by rmarkdown::render() and pagedown::chrome_print(). so, you needed Chrome web browser on computer. "html" create html file by rmarkdown::render().
output_file	name of generated file. default is NULL.
output_dir	name of directory to generate report file. default is tempdir().
browse	logical. choose whether to output the report results to the browser.
title	character. title of report. default is "Data Diagnosis Report".
subtitle	character. subtitle of report. default is name of data.
author	character. author of report. default is "dlookr".
abstract_title	character. abstract title of report. default is "Report Overview".
abstract	character. abstract of report.
title_color	character. color of title. default is "white".
subtitle_color	character. color of subtitle. default is "tomato1".
cover_img	character. name of cover image.
create_date	Date or POSIXct, character. The date on which the report is generated. The default value is the result of Sys.time().
logo_img	character. name of logo image file on top right.
theme	character. name of theme for report. support "orange" and "blue". default is "orange".
sample_percent	numeric. Sample percent of data for performing Diagnosis. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
base_family	character. The name of the base font family to use for the visualization. If not specified, the font defined in dlookr is applied. (See details)
...	arguments to be passed to pagedown::chrome_print().

## Details

Generate transformation reports automatically. You can choose to output to pdf and html files. This is useful for Binning a data frame with a large number of variables than data with a small number of variables.

Create an PDF through the Chrome DevTools Protocol. If you want to create PDF, Google Chrome or Microsoft Edge (or Chromium on Linux) must be installed prior to using this function. If not installed, you must use output\_format = "html".

## Reported information

The transformation process will report the following information:

- Overview
  - Data Structures
  - Job Informations
- Imputation

- Missing Values
- Outliers
- Resolving Skewness
- Binning
- Optimal Binning

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## Examples

```
if (FALSE) {
# create pdf file. file name is Transformation_Paged_Report.pdf
transformation_paged_report(heartfailure, sample_percent = 80)

# create pdf file. file name is Transformation_heartfailure. and change cover image
cover <- file.path(system.file(package = "dlookr"), "report", "cover2.jpg")
transformation_paged_report(heartfailure, cover_img = cover, title_color = "gray",
  output_file = "Transformation_heartfailure")

# create pdf file. file name is ./Transformation.pdf and not browse
cover <- file.path(system.file(package = "dlookr"), "report", "cover1.jpg")
transformation_paged_report(heartfailure, output_dir = ".", cover_img = cover,
  flag_content_missing = FALSE, output_file = "Transformation.pdf", browse = FALSE)

# create pdf file. file name is Transformation_Paged_Report.html
transformation_paged_report(heartfailure, target = "death_event", output_format = "html")
}
```

---

transformation\_report *Reporting the information of transformation*

---

## Description

The `transformation_report()` report the information of transform numerical variables for object inheriting from `data.frame`.

## Usage

```
transformation_report(
  .data,
  target = NULL,
  output_format = c("pdf", "html"),
  output_file = NULL,
```

```

    output_dir = tempdir(),
    font_family = NULL,
    browse = TRUE
  )

```

### Arguments

.data	a data.frame or a <a href="#">tbl_df</a> .
target	target variable. If the target variable is not specified, the method of using the target variable information is not performed when the missing value is imputed. and Optimal binning is not performed if the target variable is not a binary class.
output_format	report output type. Choose either "pdf" and "html". "pdf" create pdf file by knitr::knit(). "html" create html file by rmarkdown::render().
output_file	name of generated file. default is NULL.
output_dir	name of directory to generate report file. default is tempdir().
font_family	character. font family name for figure in pdf.
browse	logical. choose whether to output the report results to the browser.

### Details

Generate transformation reports automatically. You can choose to output to pdf and html files. This is useful for Binning a data frame with a large number of variables than data with a small number of variables. For pdf output, Korean Gothic font must be installed in Korean operating system.

### Reported information

The transformation process will report the following information:

- Imputation
  - Missing Values
    - \* \* Variable names including missing value
  - Outliers
    - \* \* Variable names including outliers
- Resolving Skewness
  - Skewed variables information
    - \* \* Variable names with an absolute value of skewness greater than or equal to 0.5
- Binning
  - Numerical Variables for Binning
  - Binning
    - \* Numeric variable names
  - Optimal Binning
    - \* Numeric variable names

See vignette("transformation") for an introduction to these concepts.

**Examples**

```

if (FALSE) {
# reporting the Binning information -----
# create pdf file. file name is Transformation_Report.pdf & No target variable
transformation_report(heartfailure)

# create pdf file. file name is Transformation_Report.pdf
transformation_report(heartfailure, death_event)

# create pdf file. file name is Transformation_heartfailure.pdf
transformation_report(heartfailure, "death_event",
                      output_file = "Transformation_heartfailure.pdf")

# create html file. file name is Transformation_Report.html
transformation_report(heartfailure, "death_event", output_format = "html")

# create html file. file name is Transformation_heartfailure.html
transformation_report(heartfailure, death_event, output_format = "html",
                      output_file = "Transformation_heartfailure.html")
}

```

---

```
transformation_web_report
```

*Reporting the information of transformation with html*

---

**Description**

The `transformation_web_report()` report the information of transform numerical variables for object inheriting from `data.frame`.

**Usage**

```

transformation_web_report(
  .data,
  target = NULL,
  output_file = NULL,
  output_dir = tempdir(),
  browse = TRUE,
  title = "Transformation",
  subtitle = deparse(substitute(.data)),
  author = "dlookr",
  title_color = "gray",
  logo_img = NULL,
  create_date = Sys.time(),
  theme = c("orange", "blue"),

```

```

    sample_percent = 100,
    base_family = NULL,
    ...
)

```

### Arguments

<code>.data</code>	a data.frame or a <code>tbl_df</code> .
<code>target</code>	character. target variable.
<code>output_file</code>	name of generated file. default is NULL.
<code>output_dir</code>	name of directory to generate report file. default is <code>tempdir()</code> .
<code>browse</code>	logical. choose whether to output the report results to the browser.
<code>title</code>	character. title of report. default is "EDA Report".
<code>subtitle</code>	character. subtitle of report. default is name of data.
<code>author</code>	character. author of report. default is "dlookr".
<code>title_color</code>	character. color of title. default is "gray".
<code>logo_img</code>	character. name of logo image file on top left.
<code>create_date</code>	Date or POSIXct, character. The date on which the report is generated. The default value is the result of <code>Sys.time()</code> .
<code>theme</code>	character. name of theme for report. support "orange" and "blue". default is "orange".
<code>sample_percent</code>	numeric. Sample percent of data for performing EDA. It has a value between (0, 100]. 100 means all data, and 5 means 5% of sample data. This is useful for data with a large number of observations.
<code>base_family</code>	character. The name of the base font family to use for the visualization. If not specified, the font defined in <code>dlookr</code> is applied. (See details)
<code>...</code>	arguments to be passed to methods.

### Details

Generate transformation reports automatically. This is useful for Binning a data frame with a large number of variables than data with a small number of variables.

### Reported information

The transformation process will report the following information:

- Overview
  - Data Structures
  - Data Types
  - Job Informations
- Imputation
  - Missing Values
  - Outliers

- Resolving Skewness
- Binning
- Optimal Binning

The `base_family` is selected from "Roboto Condensed", "Liberation Sans Narrow", "NanumSquare", "Noto Sans Korean". If you want to use a different font, use it after loading the Google font with `import_google_font()`.

## Examples

```
if (FALSE) {
# create html file. file name is Transformation_Report.html
transformation_web_report(heartfailure)

# file name is Transformation.html. and change logo image
logo <- file.path(system.file(package = "dlookr"), "report", "R_logo_html.svg")
transformation_web_report(heartfailure, logo_img = logo, title_color = "black",
  output_file = "Transformation.html")

# file name is ./Transformation.html, "blue" theme and not browse
transformation_web_report(heartfailure, output_dir = ".", target = "death_event",
  author = "Choonghyun Ryu", output_file = "Transformation.html",
  theme = "blue", browse = FALSE)
}
```

---

univar\_category

*Statistic of univariate categorical variables*

---

## Description

The `univar_category()` calculates statistic of categorical variables that is frequency table

## Usage

```
univar_category(.data, ...)

## S3 method for class 'data.frame'
univar_category(.data, ...)
```

## Arguments

<code>.data</code>	a data.frame or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

## Details

`univar_category()` calculates the frequency table of categorical variables. If a specific variable name is not specified, frequency tables for all categorical variables included in the data are calculated. The `univar_category` class returned by `univar_category()` is useful because it can draw chisquare tests and bar plots as well as frequency tables of individual variables. and return `univar_category` class that based list object.

## Value

An object of the class as individual variables based list. The information to examine the relationship between categorical variables is as follows each components.

- `variable` : factor. The level of the variable. 'variable' is the name of the variable.
- `n` : integer. frequency by variable.
- `rate` : double. relative frequency.

## Attributes of return object

Attributes of `compare_category` class is as follows.

- `variables` : character. List of variables selected for calculate frequency.

## See Also

[summary.univar\\_category](#), [print.univar\\_category](#), [plot.univar\\_category](#).

## Examples

```
library(dplyr)

# Calculates the all categorical variables
all_var <- univar_category(heartfailure)

# Print univar_category class object
all_var

# Calculates the only smoking variable
all_var %>%
  "["(names(all_var) %in% "smoking")

smoking <- univar_category(heartfailure, smoking)

# Print univar_category class object
smoking

# Filtering the case of smoking included NA
smoking %>%
  "[["(1) %>%
  filter(!is.na(smoking))
```

```
# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)

# Summary by returned object
stat

# plot all variables
plot(all_var)

# plot smoking
plot(smoking)

# plot all variables by prompt
plot(all_var, prompt = TRUE)
```

---

univar_numeric	<i>Statistic of univariate numerical variables</i>
----------------	--

---

## Description

The `univar_numeric()` calculates statistic of numerical variables that is frequency table

## Usage

```
univar_numeric(.data, ...)
```

```
## S3 method for class 'data.frame'
univar_numeric(.data, ...)
```

## Arguments

<code>.data</code>	a <code>data.frame</code> or a <code>tbl_df</code> .
<code>...</code>	one or more unquoted expressions separated by commas. You can treat variable names like they are positions. Positive values select variables; negative values to drop variables. These arguments are automatically quoted and evaluated in a context where column names represent column positions. They support unquoting and splicing.

## Details

`univar_numeric()` calculates the popular statistics of numerical variables. If a specific variable name is not specified, statistics for all categorical numerical included in the data are calculated. The statistics obtained by `univar_numeric()` are part of those obtained by `describe()`. Therefore, it is recommended to use `describe()` to simply calculate statistics. However, if you want to visualize the distribution of individual variables, you should use `univar_numeric()`.

**Value**

An object of the class as individual variables based list. A component named "statistics" is a tibble object with the following statistics.:

- variable : factor. The level of the variable. 'variable' is the name of the variable.
- n : number of observations excluding missing values
- na : number of missing values
- mean : arithmetic average
- sd : standard deviation
- se\_mean : standrd error mean.  $sd/\sqrt{n}$
- IQR : interquartile range (Q3-Q1)
- skewness : skewness
- kurtosis : kurtosis
- median : median. 50% percentile

**Attributes of return object**

Attributes of compare\_category class is as follows.

- raw : a data.frame or a `tbl_df`. Data containing variables to be compared. Save it for visualization with `plot.univar_numeric()`.
- variables : character. List of variables selected for calculate statistics.

**See Also**

[summary.univar\\_numeric](#), [print.univar\\_numeric](#), [plot.univar\\_numeric](#).

**Examples**

```
# Calculates the all categorical variables
all_var <- univar_numeric(heartfailure)

# Print univar_numeric class object
all_var

# Calculates the platelets, sodium variable
univar_numeric(heartfailure, platelets, sodium)

# Summary the all case : Return a invisible copy of an object.
stat <- summary(all_var)

# Summary by returned object
stat

# Statistics of numerical variables normalized by Min-Max method
summary(all_var, stand = "minmax")
```

```
# Statistics of numerical variables standardized by Z-score method
summary(all_var, stand = "zscore")

# one plot with all variables
plot(all_var)

# one plot with all normalized variables by Min-Max method
plot(all_var, stand = "minmax")

# one plot with all variables
plot(all_var, stand = "none")

# one plot with all robust standardized variables
plot(all_var, viz = "boxplot")

# one plot with all standardized variables by Z-score method
plot(all_var, viz = "boxplot", stand = "zscore")

# individual boxplot by variables
plot(all_var, indiv = TRUE, "boxplot")

# individual histogram by variables
plot(all_var, indiv = TRUE, "hist")

# individual histogram by robust standardized variable
plot(all_var, indiv = TRUE, "hist", stand = "robust")

# plot all variables by prompt
plot(all_var, indiv = TRUE, "hist", prompt = TRUE)
```

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