Package ‘ggstatsplot’

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**Type** Package

**Title** 'ggplot2' Based Plots with Statistical Details

**Version** 0.0.10

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**Description** Extension of 'ggplot2', 'ggstatsplot' creates 
graphics with details from statistical tests included in the plots themselves. It is targeted primarily at behavioral sciences community to provide a one-line code to generate information-rich plots for statistical analysis of continuous (violin plots, scatterplots, histograms, dot plots, dot-and-whisker plots) or categorical (pie and bar charts) data. Currently, it supports only the most common types of statistical tests: parametric, nonparametric, robust, and bayesian versions of t-test/anova, correlation analyses, contingency table analysis, and regression analyses.

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**BugReports** https://github.com/IndrajeetPatil/ggstatsplot/issues

**Depends** R (>= 3.5.0)

**Imports** BayesFactor (>= 0.9.12-4.2), boot (>= 1.3-20), broomExtra, cowplot (>= 0.9.4), crayon (>= 1.3.4), dplyr (>= 0.8.0.1), ellipsis (>= 0.1.0), ez (>= 4.4-0), ggcorrplot (>= 0.1.2), ggExtra (>= 0.8), ggplot2 (>= 3.1.0), ggrepel (>= 0.8.0), ggsignif (>= 0.5.0), glue (>= 1.3.0), grid, groupedstats (>= 0.0.5), jmv (>= 0.9.6), magrittr (>= 1.5), metafor (>= 2.0-0), methods, paletteer (>= 0.2.1), psych (>= 1.8.12), purrr (>= 0.3.2), purrrlyr (>= 0.0.5), rcompanion (>= 2.1.1), rlang (>= 0.3.1), scales (>= 1.0.0), sjstats (>= 0.17.3), stats, stringr (>= 1.3.1), tibble (>= 2.1.1), tidyr (>= 0.8.3), utils, WRS2 (>= 0.10-0)

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**ggstatsplot-package**

**ggstatsplot**: 'ggplot2' Based Plots with Statistical Details

**Description**

ggstatsplot is an extension of ggplot2 package for creating graphics with details from statistical tests included in the plots themselves and targeted primarily at behavioral sciences community to provide a one-line code to produce information-rich plots. In a typical exploratory data analysis workflow, data visualization and statistical modelling are two different phases: visualization informs modelling, and modelling in its turn can suggest a different visualization method, and so on and so forth. The central idea of ggsstatsplot is simple: combine these two phases into one in the form of graphics with statistical details, which makes data exploration simpler and faster. Currently, it supports only the most common types of statistical tests (parametric, nonparametric, bayesian, and robust versions of t-test/anova, correlation, regression, and contingency tables analyses).

**Details**

ggstatsplot

The main functions are-

- `ggbetweenstats` function to produce information-rich comparison plot between different groups or conditions with ggplot2 and details from the statistical tests in the subtitle.
- **ggscatterstats** function to produce ggplot2 scatterplots along with a marginal histograms/boxplots/density plots from ggExtra and details from the statistical tests in the subtitle.
- **ggpiestats** function to produce pie chart with details from the statistical tests in the subtitle.
- **ggbarstats** function to produce stacked bar chart with details from the statistical tests in the subtitle.
- **gghistostats** function to produce histogram for a single variable with results from one sample test displayed in the subtitle.
- **ggedgeplotstats** function to produce Cleveland-style dot plots/charts for a single variable with labels and results from one sample test displayed in the subtitle.
- **ggecorrmat** function to visualize the correlation matrix.
- **ggcoeffstats** function to visualize results from regression analyses.
- **combine_plots** helper function to combine multiple ggstatsplot plots using cowplot::plot_grid() with a combination of title, caption, and annotation label.
- **theme_ggstatsplot** default theme used for this package.

For more documentation, see the dedicated [Website](https://indrajeetpatil.github.io/ggstatsplot/).

**Author(s)**

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**See Also**

**Useful links:**

- [https://indrajeetpatil.github.io/ggstatsplot/](https://indrajeetpatil.github.io/ggstatsplot/)
- [https://github.com/IndrajeetPatil/ggstatsplot](https://github.com/IndrajeetPatil/ggstatsplot)

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**bartlett_message**

*Display homogeneity of variance test as a message*

**Description**

A note to the user about the validity of assumptions for the default linear model.

**Usage**

```r
bartlett_message(data, x, y, lab = NULL, k = 2, output = "message", ...)
```
Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A
matrix or tables will not be accepted.
x The grouping variable from the dataframe data.
y The response (a.k.a. outcome or dependent) variable from the dataframe data.
lab A character describing label for the variable. If NULL, variable name will be
used.
k Number of digits after decimal point (should be an integer) (Default: k = 2).
output What output is desired: "message" (default) or "stats" (or "tidy") objects.
... Additional arguments (ignored).

Value

A list of class "htest" containing the following components:

statistic Bartlett’s K-squared test statistic.
parameter the degrees of freedom of the approximate chi-squared distribution of the test
statistic.
p.value the p-value of the test.
method the character string "Bartlett test of homogeneity of variances".
data.name a character string giving the names of the data.

Author(s)

Indrajeet Patil

See Also

ggbetweenstats

Other helper_messages: effsize_ci_message, ggcormat_matrix_message, grouped_message,
normality_message, pairwise_p, palette_message

Examples

# getting message
ggstatsplot::bartlett_message(  
data = iris,
  x = Species,
  y = Sepal.Length,
  lab = "Iris Species"
)

# getting results from the test
ggstatsplot::bartlett_message(  
data = mtcars,
  x = am,
bf_caption_maker

Prepare caption with bayes factor in favor of null

Description

Convenience function to write a caption message with bayes factors in favor of the null hypothesis.

Usage

bf_caption_maker(bf.df, k = 2, caption = NULL, ...)

Arguments

- **bf.df**: A dataframe containing two columns `log_e_bf01` and `bf.prior`. If dataframe contains more than two rows, only the first row will be used.
- **k**: Number of digits after decimal point (should be an integer) (Default: k = 2).
- **caption**: Text to display as caption (will be displayed on top of the bayes factor caption/message).
- **...**: Additional arguments (ignored).

Examples

```r
set.seed(123)

# dataframe containing results
bf_results <-
  bf_extractor(BayesFactor::correlationBF(
    x = iris$Sepal.Length,
    y = iris$Petal.Length
  )) %>%
  dplyr::mutate(.data = ., bf.prior = 0.707)

# creating caption
ggstatsplot::bf_caption_maker(
  bf.df = bf_results,
  k = 3,
  caption = "Note: Iris dataset"
)
```
bf_contingency_tab

Bayesian contingency table analysis.

Description

Bayesian contingency table analysis.

Usage

bf_contingency_tab(data, main, condition, sampling.plan = "indepMulti",
                   fixed.margin = "rows", prior.concentration = 1, caption = NULL,
                   output = "caption", k = 2, ...)

Arguments

data  A dataframe (or a tibble) from which variables specified are to be taken. A
       matrix or tables will not be accepted.
main  The variable to use as the rows in the contingency table.
condition  The variable to use as the columns in the contingency table.
sampling.plan  Character describing the sampling plan. Possible options are "indepMulti"
                (independent multinomial; default), "poisson", "jointMulti" (joint multino-
                mial), "hypergeom" (hypergeometric). For more, see ?BayesFactor::contingencyTableBF().
fixed.margin  For the independent multinomial sampling plan, which margin is fixed ("rows"
               or "cols"). Defaults to "rows".
prior.concentration  Specifies the prior concentration parameter, set to 1 by default. It indexes the ex-
                     pected deviation from the null hypothesis under the alternative, and corresponds
                     to Gunel and Dickey’s (1974) "a" parameter.
caption  The text for the plot caption.
output  Can either be "caption" (which will contain text for evidence in favor of null)
         or "results" (which will return the dataframe with results).
k  Number of digits after decimal point (should be an integer) (Default: k = 2).
...  further arguments to be passed to or from methods.

Author(s)

Indrajeet Patil

See Also

bf_corr_test, bf_oneway_anova, bf_two_sample_ttest
Bayesian correlation test.

**Description**

Bayesian correlation test.

**Usage**

```r
bf_corr_test(data, x, y, bf.prior = 0.707, caption = NULL, output = "caption", k = 2, ...)```

**Arguments**

- `data` A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
- `x` second continuous variable
- `y` first continuous variable
- `bf.prior` A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
- `caption` The text for the plot caption.
- `output` Can either be "caption" (which will contain text for evidence in favor of null) or "results" (which will return the dataframe with results).
- `k` Number of digits after decimal point (should be an integer) (Default: \(k = 2\)).
- `...` further arguments to be passed to or from methods.
bf_extractor

Author(s)
Indrajeet Patil

See Also
bf_contingency_tab, bf_oneway_anova, bf_two_sample_ttest

Examples

# for reproducibility
set.seed(123)

# to get caption (default)
bf_corr_test(
  data = anscombe,
  x = x1,
  y = y4,
  bf.prior = 1
)

# to see results
bf_corr_test(
  data = anscombe,
  x = x1,
  y = y4,
  bf.prior = 0.8,
  output = "results"
)

bf_extractor

Convenience function to extract bayes factors from BayesFactor model object.

Description

Convenience function to extract bayes factors from BayesFactor model object.

Usage

bf_extractor(bf.object, ...)

Arguments

bf.object An object from BayesFactor package test results.
... Currently ignored.
Examples

```r
# getting only bayes factors
ggstatsplot::bf_extractor(
  BayesFactor::anovaBF(Sepal.Length ~ Species, 
  data = iris, 
  progress = FALSE
)
)
```

\[ \text{bf\_oneway\_anova} \]

Bayesian one-way analysis of variance.

Description

Bayesian one-way analysis of variance.

Usage

```r
bf_oneway_anova(data, x, y, bf.prior = 0.707, caption = NULL, 
  output = "caption", k = 2, ...)
```

Arguments

data a data frame containing data for all factors in the formula

x The grouping variable from the dataframe data.

y The response (a.k.a. outcome or dependent) variable from the dataframe data.

bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.

caption The text for the plot caption.

output Can either be "caption" (which will contain text for evidence in favor of null) or "results" (which will return the dataframe with results).

k Number of digits after decimal point (should be an integer) (Default: \( k = 2 \)).

... Additional arguments.

Author(s)

Indrajeet Patil

See Also

- `bf_contingency_tab`
- `bf_corr_test`
- `bf_two_sample_ttest`
bf_one_sample_ttest

Examples

# to get caption (default)
bf_oneway_anova(
    data = iris,
    x = Species,
    y = Sepal.Length,
    bf.prior = 0.8
)

# to get results dataframe
bf_oneway_anova(
    data = iris,
    x = Species,
    y = Sepal.Length,
    bf.prior = 0.8,
    output = "results"
)

bf_one_sample_ttest  Bayesian one-sample t-test.

Description

Bayesian one-sample t-test.

Usage

bf_one_sample_ttest(data = NULL, x, test.value = 0, bf.prior = 0.707,
                     caption = NULL, output = "caption", k = 2, ...)

Arguments

data  for use with formula, a data frame containing all the data
x     a vector of observations for the first (or only) group
test.value  A number specifying the value of the null hypothesis (Default: 0).
bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
caption The text for the plot caption.
output  Can either be "caption" (which will contain text for evidence in favor of null) or "results" (which will return the dataframe with results).
k      Number of digits after decimal point (should be an integer) (Default: k = 2).
...    further arguments to be passed to or from methods.

Author(s)

Indrajeet Patil
**bf_two_sample_ttest**

Bayesian two-samples *t* -test.

**Description**

Bayesian two-samples *t* -test.

**Usage**

`bf_two_sample_ttest(data, x, y, paired = FALSE, bf.prior = 0.707, caption = NULL, output = "caption", k = 2, ...)`

**Arguments**

- **data**: for use with formula, a data frame containing all the data
- **x**: a vector of observations for the first (or only) group
- **y**: a vector of observations for the second group (or condition, for paired)
- **paired**: if TRUE, observations are paired
- **bf.prior**: A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
- **caption**: The text for the plot caption.
- **output**: Can either be "caption" (which will contain text for evidence in favor of null) or "results" (which will return the dataframe with results).
Number of digits after decimal point (should be an integer) (Default: \( k = 2 \)).

Further arguments to be passed to or from methods.

**Author(s)**

Indrajeet Patil

**See Also**

`bf_contingency_tab, bf_corr_test, bf_oneway_anova`

**Examples**

```r
# for reproducibility
set.seed(123)

# to get caption (default)
bf_two_sample_ttest(
  data = mtcars,
  x = am,
  y = wt,
  paired = FALSE,
  bf.prior = 0.880
)

# to see results
bf_two_sample_ttest(
  data = mtcars,
  x = am,
  y = wt,
  paired = FALSE,
  output = "results"
)

# for paired sample test
bf_two_sample_ttest(
  data = dplyr::filter(
    ggstatsplot::intent_morality,
    condition %in% c("accidental", "attempted"),
    harm == "Poisoning"
  ),
  x = condition,
  y = rating,
  paired = TRUE,
  output = "results"
)
**combine_plots**

*Combining and arranging multiple plots in a grid*

**Description**

Wrapper around `plot_grid` that will return a plotgrid along with a combination of title, caption, and annotation label.

**Usage**

```r
combine_plots(..., title.text = NULL, title.color = "black",
              title.size = 16, title.vjust = 0.5, title.hjust = 0.5,
              title.fontface = "bold", caption.text = NULL,
              caption.color = "black", caption.size = 10, caption.vjust = 0.5,
              caption.hjust = 0.5, caption.fontface = "plain", sub.text = NULL,
              sub.color = "black", sub.size = 12, sub.vjust = 0.5,
              sub.hjust = 0.5, sub.fontface = "plain", sub.x = 0.5,
              sub.y = 0.5, sub.vpadding = grid::unit(1, "lines"), sub.angle = 0,
              sub.lineheight = 0.9, title.rel.heights = c(0.1, 1.2),
              caption.rel.heights = c(1.2, 0.1), title.caption.rel.heights = c(0.1,
              1.2, 0.1))
```

**Arguments**

- `...`: Arguments passed on to `cowplot::plot_grid`.
- `plotlist` (optional) List of plots to display. Alternatively, the plots can be provided individually as the first n arguments of the function `plot_grid` (see examples).
- `align` (optional) Specifies whether graphs in the grid should be horizontally ("h") or vertically ("v") aligned. Options are "none" (default), "hv" (align in both directions), "h", and "v".
- `axis` (optional) Specifies whether graphs should be aligned by the left ("l"), right ("r"), top ("t"), or bottom ("b") margins. Options are "none" (default), or a string of any combination of l, r, t, and b in any order (e.g. "tlbr" or "rlbt" for aligning all margins). Must be specified if any of the graphs are complex (e.g. faceted) and alignment is specified and desired. See `align_plots()` for details.
- `nrow` (optional) Number of rows in the plot grid.
- `ncol` (optional) Number of columns in the plot grid.
- `rel_widths` (optional) Numerical vector of relative columns widths. For example, in a two-column grid, `rel_widths = c(2, 1)` would make the first column twice as wide as the second column.
- `rel_heights` (optional) Numerical vector of relative columns heights. Works just as `rel_widths` does, but for rows rather than columns.
**labels** (optional) List of labels to be added to the plots. You can also set `labels="AUTO"` to auto-generate upper-case labels or `labels="auto"` to auto-generate lower-case labels.

**label.size** (optional) Numerical value indicating the label size. Default is 14.

**label.fontfamily** (optional) Font family of the plot labels. If not provided, is taken from the current theme.

**label.fontface** (optional) Font face of the plot labels. Default is "bold".

**label.colour** (optional) Color of the plot labels. If not provided, is taken from the current theme.

**label.x** (optional) Single value or vector of x positions for plot labels, relative to each subplot. Defaults to 0 for all labels. (Each label is placed all the way to the left of each plot.)

**label.y** (optional) Single value or vector of y positions for plot labels, relative to each subplot. Defaults to 1 for all labels. (Each label is placed all the way to the top of each plot.)

**hjust** Adjusts the horizontal position of each label. More negative values move the label further to the right on the plot canvas. Can be a single value (applied to all labels) or a vector of values (one for each label). Default is -0.5.

**vjust** Adjusts the vertical position of each label. More positive values move the label further down on the plot canvas. Can be a single value (applied to all labels) or a vector of values (one for each label). Default is 1.5.

**scale** Individual number or vector of numbers greater than 0. Enables you to scale the size of all or select plots. Usually it’s preferable to set margins instead of using `scale`, but `scale` can sometimes be more powerful.

**cols** Deprecated. Use `ncol`.

**rows** Deprecated. Use `nrow`.

**title.text** String or plotmath expression to be drawn as title for the combined plot.

**title.color** Text color for title.

**title.size** Point size of title text.

**title.vjust** Vertical justification for title. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.

**title.hjust** Horizontal justification for title. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.

**title.fontface** The font face ("plain", "bold" (default), "italic", "bold.italic") for title.

**caption.text** String or plotmath expression to be drawn as the caption for the combined plot.

**caption.color** Text color for caption.

**caption.size** Point size of title text.

**caption.vjust** Vertical justification for caption. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.

**caption.hjust** Horizontal justification for caption. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.
caption.fontface
caption The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.

sub.text
The label with which the combined plot should be annotated. Can be a plotmath expression.

sub.color
Text color for annotation label (Default: "black").

sub.size
Point size of annotation text (Default: 12).

sub.vjust
Vertical justification for annotation label (Default: 0.5).

sub.hjust
Horizontal justification for annotation label (Default: 0.5).

sub.fontface
The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.

sub.x
The x position of annotation label (Default: 0.5).

sub.y
The y position of annotation label (Default: 0.5).

sub.vpadding
Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the y and vjust parameters, this can be changed (Default: grid::unit(1, "lines")).

sub.angle
Angle at which annotation label is to be drawn (Default: 0).

sub.lineheight
Line height of annotation label.

title.rel.heights
Numerical vector of relative columns heights while combining (title, plot).

caption.rel.heights
Numerical vector of relative columns heights while combining (plot, caption).

title.caption.rel.heights
Numerical vector of relative columns heights while combining (title, plot, caption).

Value
Combined plot with title and/or caption and/or annotation label

Author(s)
Indrajeet Patil

References
https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/combine_plots.html

Examples
# loading the necessary libraries
library(ggplot2)

# preparing the first plot
p1 <-
ggbarstats

Bar (column) charts with statistical tests

Description

Bar charts for categorical data with statistical details included in the plot as a subtitle.

Usage

```r
ggbarstats(data, main, condition = NULL, counts = NULL, ratio = NULL, paired = FALSE, labels.legend = NULL, results.subtitle = TRUE, stat.title = NULL, sample.size.label = TRUE, label.separator = " ", label.text.size = 4, label.fill.color = "white", label.fill.alpha = 1, bar.outline.color = "black", bf.message = FALSE, sampling.plan = "jointMulti", fixed.margin = "rows", prior.concentration = 1, title = NULL, subtitle = NULL, caption = NULL, legend.position = "right", x.axis.orientation = NULL, conf.level = 0.95, nboot = 100, simulate.p.value = FALSE, B = 2000, legend.title = NULL, xlab = NULL, ylab = "Percent", k = 2, perc.k = 0, data.label = "percentage", bar.proptest = TRUE, ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE)
```
package = "RColorBrewer", palette = "Dark2", direction = 1,
ggplot.component = NULL, messages = TRUE)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
main The variable to use as the rows in the contingency table.
condition The variable to use as the columns in the contingency table.
counts A string naming a variable in data containing counts, or NULL if each row represents a single observation (Default).
ratio A vector of numbers: the expected proportions for the proportion test. Default is NULL, which means if there are two levels ratio = c(1,1), etc.
paired Logical indicating whether data came from a within-subjects design study (Default: FALSE). If TRUE, McNemar test subtitle will be returned. If FALSE, Pearson's chi-square test will be returned.
labels.legenda A character vector with custom labels for levels of the main variable displayed in the legend.
results.subtitle Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.
stat.title Title for the effect being investigated with the chi-square test. The default is NULL, i.e. no title will be added to describe the effect being shown. An example of a stat.title argument will be something like "main x condition" or "interaction".
sample.size.label Logical that decides whether sample size information should be displayed for each level of the grouping variable condition (Default: TRUE).
label.separator If "both" counts and proportion information is to be displayed in a label, this argument decides whether these two pieces of information are going to be on the same line ("\r") or on separate lines ("\n").
label.text.size Numeric that decides text size for slice/bar labels (Default: 4).
label.fill.color Character that specifies fill color for slice/bar labels (Default: white).
label.fill.alpha Numeric that specifies fill color transparency or "alpha" for slice/bar labels (Default: 1 range 0 to 1).
bar.outline.color Character specifying color for bars (default: "black").
bf.message Logical that decides whether to display a caption with results from bayes factor test in favor of the null hypothesis (default: FALSE).
sampling.plan Character describing the sampling plan. Possible options are "indepMulti" (independent multinomial; default), "poisson", "jointMulti" (joint multinomial), "hypergeom" (hypergeometric). For more, see ?BayesFactor::contingencyTableBF().
fixed.margin  For the independent multinomial sampling plan, which margin is fixed ("rows" or "cols"). Defaults to "rows".

caption  The text for the plot caption.

prior.concentration  Specifies the prior concentration parameter, set to 1 by default. It indexes the expected deviation from the null hypothesis under the alternative, and corresponds to Gunel and Dickey’s (1974) “a” parameter.

title  The text for the plot title.

subtitle  The text for the plot subtitle. Will work only if results.subtitle = FALSE.

legend.position  The position of the legend "none", "left", "right", "bottom", "top" (Default: "right").

x.axis.orientation  The orientation of the x axis labels one of "slant" or "vertical" to change from the default horizontal orientation (Default: NULL which is horizontal).

conf.level  Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

nboot  Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

simulate.p.value  a logical indicating whether to compute p-values by Monte Carlo simulation.

B  an integer specifying the number of replicates used in the Monte Carlo test.

legend.title  Title text for the legend.

xlab  Custom text for the x axis label (Default: NULL, which will cause the x axis label to be the main variable).

ylab  Custom text for the y axis label (Default: "percent").

k  Number of digits after decimal point (should be an integer) (Default: k = 2).

perc.k  Numeric that decides number of decimal places for percentage labels (Default: 0).

data.label  Character decides what information needs to be displayed on the label in each pie slice. Possible options are "percentage" (default), "counts", "both".

bar.prop.test  Decides whether proportion test for main variable is to be carried out for each level of condition (Default: TRUE).

ggtheme  A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggrthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer  Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

package  Name of package from which the palette is desired as string or symbol.

palette  If a character string (e.g., "Set1"), will use that named palette. If a number, will index into the list of palettes of appropriate type. Default palette is "Dark2".
direction

Either 1 or -1. If -1 the palette will be reversed.

`ggplot.component`

A ggplot component to be added to the plot prepared by `ggstatsplot`. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.

`messages`

Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

**Value**

Unlike a number of statistical softwares, `ggstatsplot` doesn’t provide the option for Yates’ correction for the Pearson’s chi-squared statistic. This is due to compelling amount of Monte-Carlo simulation research which suggests that the Yates’ correction is overly conservative, even in small sample sizes. As such it is recommended that it should not ever be applied in practice (Camilli & Hopkins, 1978, 1979; Feinberg, 1980; Larntz, 1978; Thompson, 1988).

**Author(s)**

Chuck Powell, Indrajeet Patil

**Examples**

```r
# for reproducibility
set.seed(123)

# simple function call with the defaults (with condition)
`ggstatsplot::ggbarstats`
  (data = datasets::mtcars,
   main = vs,
   condition = cyl,
   bf.message = TRUE,
   nboot = 10,
   labels.legend = c("0 = V-shaped", "1 = straight"),
   legend.title = "Engine"
  )

# Not run:
# simple function call with the defaults (with count data)
library(jmv)

`ggstatsplot::ggbarstats`
  (data = as.data.frame(HairEyeColor),
   main = Eye,
   condition = Hair,
   counts = Freq
  )

# End(Not run)
```
**ggbetweenstats**  
*Box/Violin plots for group or condition comparisons in between-subjects designs.*

**Description**

A combination of box and violin plots along with jittered data points for between-subjects designs with statistical details included in the plot as a subtitle.

**Usage**

```r
ggbetweenstats(data, x, y, plot.type = "boxviolin",  
type = "parametric", pairwise.comparisons = FALSE,  
pairwise.annotation = "asterisk", pairwise.display = "significant",  
p.adjust.method = "holm", effsize.type = "unbiased",  
partial = TRUE, effsize.noncentral = TRUE, bf.prior = 0.707,  
bf.message = FALSE, results.subtitle = TRUE, xlab = NULL,  
ylab = "null", caption = NULL, title = NULL, subtitle = NULL,  
sample.size.label = TRUE, k = 2, var.equal = FALSE,  
conf.level = 0.95, nboot = 100, tr = 0.1,  
axes.range.restrict = FALSE, mean.label.size = 3,  
mean.label.fontface = "bold", mean.label.color = "black",  
notch = FALSE, notchwidth = 0.5, linetype = "solid",  
outlier.tagging = FALSE, outlier.shape = 19, outlier.label = NULL,  
outlier.label.color = "black", outlier.color = "black",  
outlier.coef = 1.5, mean.plotting = TRUE, mean.ci = FALSE,  
mean.size = 5, mean.color = "darkred", point.jitter.width = NULL,  
point.jitter.height = 0, point.dodge.width = 0.6,  
ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE,  
package = "RColorBrewer", palette = "Dark2", direction = 1,  
ggplot.component = NULL, messages = TRUE)
```

**Arguments**

- **data**  
  A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.

- **x**  
  The grouping variable from the dataframe data.

- **y**  
  The response (a.k.a. outcome or dependent) variable from the dataframe data.

- **plot.type**  
  Character describing the type of plot. Currently supported plots are "box" (for pure boxplots), "violin" (for pure violin plots), and "boxviolin" (for a combination of box and violin plots; default).

- **type**  
  Type of statistic expected ("parametric" or "nonparametric" or "robust" or "bayes"). Corresponding abbreviations are also accepted: "p" (for parametric), "np" (nonparametric), "r" (robust), or "bf" resp.
pairwise.comparisons
Logical that decides whether pairwise comparisons are to be displayed. **Only significant comparisons** will be shown by default. (default: FALSE). To change this behavior, select appropriate option with pairwise.display argument.

pairwise.annotation
Character that decides the annotations to use for pairwise comparisons. Either "p.value" or "asterisk" (default).

pairwise.display
Decides which pairwise comparisons to display. Available options are "significant" (abbreviation accepted: "s") or "non-significant" (abbreviation accepted: "ns") or "everything"/"all". The default is "significant". You can use this argument to make sure that your plot is not uber-cluttered when you have multiple groups being compared and scores of pairwise comparisons being displayed.

p.adjust.method
Adjustment method for $p$-values for multiple comparisons. Possible methods are: "holm" (default), "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none".

effsize.type
Type of effect size needed for parametric tests. The argument can be "biased" ("d" for Cohen's $d$ for **t-test**; "partial_eta" for partial eta-squared for **anova**) or "unbiased" ("g" Hedge's $g$ for **t-test**; "partial_omega" for partial omega-squared for **anova**).

partial
Logical that decides if partial eta-squared or omega-squared are returned (Default: TRUE). If FALSE, eta-squared or omega-squared will be returned. Valid only for objects of class `lm`, `aov`, `anova`, or `aovlist`.

effsize.noncentral
Logical indicating whether to use non-central $t$-distributions for computing the confidence interval for Cohen's $d$ or Hedge's $g$ (Default: TRUE).

bf.prior
A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.

bf.message
Logical that decides whether to display Bayes Factor in favor of the null hypothesis for **parametric test** (Default: FALSE).

results.subtitle
Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.

xlab, ylab
Labels for x and y axis variables. If NULL (default), variable names for x and y will be used.

caption
The text for the plot caption.

title
The text for the plot title.

subtitle
The text for the plot subtitle. Will work only if results.subtitle = FALSE.

sample.size.label
Logical that decides whether sample size information should be displayed for each level of the grouping variable x (Default: TRUE).

k
Number of digits after decimal point (should be an integer) (Default: k = 2).
var.equal  a logical variable indicating whether to treat the variances in the samples as equal. If TRUE, then a simple F test for the equality of means in a one-way analysis of variance is performed. If FALSE, an approximate method of Welch (1951) is used, which generalizes the commonly known 2-sample Welch test to the case of arbitrarily many samples.

conf.level  Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

nboot  Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

tr  Trim level for the mean when carrying out robust tests. If you get error stating "Standard error cannot be computed because of Winsorized variance of 0 (e.g., due to ties). Try to decrease the trimming level.", try to play around with the value of tr, which is by default set to 0.1. Lowering the value might help.

axes.range.restrict  Logical that decides whether to restrict the axes values ranges to min and max values of the axes variables (Default: FALSE), only relevant for functions where axes variables are of numeric type.

mean.label.size, mean.label.fontface, mean.label.color  Aesthetics for the label displaying mean. Defaults: 3, "bold", "black", respectively.

notch  A logical. If FALSE (default), a standard box plot will be displayed. If TRUE, a notched box plot will be used. Notches are used to compare groups; if the notches of two boxes do not overlap, this suggests that the medians are significantly different. In a notched box plot, the notches extend $1.58 \times \text{IQR} / \sqrt{n}$. This gives a roughly 95% confidence interval for comparing medians. IQR: Inter-Quartile Range.

notchwidth  For a notched box plot, width of the notch relative to the body (default 0.5).

linetype  Character strings ("blank", "solid", "dashed", "dotted", "dotdash", "longdash", and "twodash") specifying the type of line to draw box plots (Default: "solid"). Alternatively, the numbers 0 to 6 can be used (0 for "blank", 1 for "solid", etc.).

outlier.tagging  Decides whether outliers should be tagged (Default: FALSE).

outlier.shape  Hiding the outliers can be achieved by setting outlier.shape = NA. Importantly, this does not remove the outliers, it only hides them, so the range calculated for the y-axis will be the same with outliers shown and outliers hidden.

outlier.label  Label to put on the outliers that have been tagged.

outlier.label.color  Color for the label to to put on the outliers that have been tagged (Default: "black").

outlier.color  Default aesthetics for outliers (Default: "black").

outlier.coef  Coefficient for outlier detection using Tukey’s method. With Tukey’s method, outliers are below (1st Quartile) or above (3rd Quartile) outlier.coef times the Inter-Quartile Range (IQR) (Default: 1.5).

mean.plotting  Logical that decides whether mean is to be highlighted and its value to be displayed (Default: TRUE).
mean.ci Logical that decides whether 95 is to be displayed (Default: FALSE).
mean.size Point size for the data point corresponding to mean (Default: 5).
mean.color Color for the data point corresponding to mean (Default: "darkred").
point.jitter.width Numeric specifying the degree of jitter in x direction. Defaults to 40% of the resolution of the data.
point.jitter.height Numeric specifying the degree of jitter in y direction. Defaults to 0.1.
point.dodge.width Numeric specifying the amount to dodge in the x direction. Defaults to 0.60.
ggtheme A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).
ggstatsplot.layer Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).
package Name of package from which the palette is desired as string or symbol.
palette If a character string (e.g., "Set1"), will use that named palette. If a number, will index into the list of palettes of appropriate type. Default palette is "Dark2".
direction Either 1 or -1. If -1 the palette will be reversed.
ggplot.component A ggplot component to be added to the plot prepared by ggstatsplot. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.
messages Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Details

For parametric tests, Welch’s ANOVA/t-test are used as a default (i.e., var.equal = FALSE). References:

• ANOVA: Delacre, Leys, Mora, & Lakens, PsyArXiv, 2018

If robust tests are selected, following tests are used is .

• ANOVA: one-way ANOVA on trimmed means (see ?WRS2::t1way)
• t-test: Yuen’s test for trimmed means (see ?WRS2::yuen)

Variant of this function ggwithinstats is currently in progress. You can still use this function just to prepare the plot for exploratory data analysis, but the statistical details displayed in the subtitle will be incorrect. You can remove them by adding + ggplot2::labs(subtitle = NULL).
Author(s)

Indrajeet Patil

References

https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggbetweenstats.html

See Also

grouped_ggbetweenstats, pairwise_p

Examples

# to get reproducible results from bootstrapping
set.seed(123)

# simple function call with the defaults
ggstatsplot::ggbetweenstats(
  data = mtcars,
  x = am,
  y = mpg,
  title = "Fuel efficiency by type of car transmission",
  caption = "Transmission (0 = automatic, 1 = manual)",
  bf.message = TRUE
)

## Not run:
# more detailed function call
ggstatsplot::ggbetweenstats(
  data = datasets::morley,
  x = Expt,
  y = Speed,
  plot.type = "box",
  conf.level = 0.99,
  xlab = "The experiment number",
  ylab = "Speed-of-light measurement",
  pairwise.comparisons = TRUE,
  pairwise.annotation = "p.value",
  p.adjust.method = "fdr",
  outlier.tagging = TRUE,
  outlier.label = Run,
  nboot = 10,
  ggtheme = ggplot2::theme_grey(),
  ggbetweenstats.layer = FALSE,
  bf.message = TRUE
)

## End(Not run)
Model coefficients for fitted models with the model summary as a caption.

Description

Model coefficients for fitted models with the model summary as a caption.

Usage

ggcoefstats(x, output = "plot", statistic = NULL, scales = NULL, conf.method = "Wald", conf.type = "Wald", component = "survival", p.kr = TRUE, p.adjust.method = "none", coefficient.type = c("beta", "location", "coefficient"), by.class = FALSE, effsize = "eta", partial = TRUE, nboot = 500, meta.analytic.effect = FALSE, point.color = "blue", point.size = 3, point.shape = 16, conf.int = TRUE, conf.level = 0.95, se.type = "nid", k = 2, k.caption.summary = 0, exclude.intercept = TRUE, exponentiate = FALSE, errorbar.color = "black", errorbar.height = 0, errorbar.linetype = "solid", errorbar.size = 0.5, vline = TRUE, vline.color = "black", vline.linetype = "dashed", vline.size = 1, sort = "none", xlab = "regression coefficient", ylab = "term", title = NULL, subtitle = NULL, stats.labels = TRUE, caption = NULL, caption.summary = TRUE, stats.label.size = 3, stats.label.fontface = "bold", stats.label.color = NULL, label.r = 0.15, label.size = 0.25, label.box.padding = 1, label.label.padding = 0.25, label.point.padding = 0.5, label.segment.color = "grey50", label.segment.size = 0.5, label.segment.alpha = NULL, label.min.segment.length = 0.5, label.force = 1, label.max.iter = 2000, label.nudge.x = 0, label.nudge.y = 0, label.xlim = c(NA, NA), label.ylim = c(NA, NA), label.direction = "y", package = "RColorBrewer", palette = "Dark2", direction = 1, ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, messages = FALSE, ...)

Arguments

x A model object to be tidied with broom::tidy, or a tidy data frame containing results. If a data frame is to be plotted, it must contain columns named term (names of predictors), or estimate (corresponding estimates of coefficients or other quantities of interest). Other optional columns are conf.low and conf.high (for confidence intervals); p.value. It is important that all term names should be unique.

output Character describing the expected output from this function: "plot" (visualization of regression coefficients) or "tidy" (tidy dataframe of results from
ggcoefstats

broom::tidy) or "glance" (object from broom::glance) or "augment" (object from broom::augment).

statistic Which statistic is to be displayed (either "t" or "f" or "z") in the label. This is especially important if the x argument in ggcoefstats is a dataframe in which case the function wouldn’t know what kind of model it is dealing with.
scales scales on which to report the variables: for random effects, the choices are "sd-cor" (standard deviations and correlations: the default if scales is NULL) or "vcov" (variances and covariances). NA means no transformation, appropriate e.g. for fixed effects.

conf.method Character describing method for computing confidence intervals (for more, see ?lme4::confint.merMod and ?broom.mixed::tidy.brmsfit). This argument has different defaults depending on the model object. For the merMod class model objects (lmer, glmer, nlmer, etc.), the default is " Wald" (other options are: "profile", "boot"). For MCMC or brms fit model objects (Stan, JAGS, etc.), the default is "quantile", while the only other options is "HPDinterval".

conf.type Whether to use "profile" or " Wald" confidence intervals, passed to the type argument of ordinal::confint.clm(). Defaults to "profile".

component Character specifying whether to tidy the survival or the longitudinal component of the model. Must be either "survival" or "longitudinal". Defaults to "survival".

p.kr Logical, if TRUE, the computation of p-values for lmer is based on conditional F-tests with Kenward-Roger approximation for the df. For details, see ?sjstats::p_value.

p.adjust.method Adjustment method for p-values for multiple comparisons. Possible methods are: "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none". Default is no correction ("none"). This argument is relevant for multiplicity correction for multiway ANOVA designs (see, Cramer et al., 2015).

coefficient.type Relevant only for ordinal regression models (clm, clmm, "svyolr", and polr), this argument decides which parameters are display in the plot. Available parameters are: parameter that measures the intercept, i.e. the log-odds distance between response values ("alpha"); effects on the location ("beta"); or effects on the scale ("zeta"). For clm and clmm models, by default, only "beta" (a vector of regression parameters) parameters will be show. Other options are "alpha" (a vector of threshold parameters) or "both". For polr models, by default, only "coefficient" will be shown. Other option is to show "zeta" parameters. Note that, from broom 0.7.0 onward, coefficients will be renamed and "intercept" type coefficients will correspond to "alpha" parameters, "location" type coefficients will correspond to "beta" parameters, and "scale" type coefficients will correspond to "zeta" parameters.

by.class A logical indicating whether or not to show performance measures broken down by class. Defaults to FALSE. When by.class = FALSE only returns a tibble with accuracy and kappa statistics. Mostly relevant for an object of class "confusionMatrix".

effsize Character describing the effect size to be displayed: "eta" (default) or "omega". This argument is relevant only for models objects of class aov, anova, and aovlist.
**partial**
Logical that decides if partial eta-squared or omega-squared are returned (Default: TRUE). If FALSE, eta-squared or omega-squared will be returned. Valid only for objects of class aov, anova, or aovlist.

**nboot**
Number of bootstrap samples for confidence intervals for partial eta-squared and omega-squared (Default: 500). This argument is relevant only for models objects of class aov, anova, and aovlist.

**meta.analytic.effect**
Logical that decides whether subtitle for meta-analysis via linear (mixed-effects) models - as implemented in the metafor package - is to be displayed (default: FALSE). If TRUE, input to argument subtitle will be ignored. This will be mostly relevant if a data frame with estimates and their standard errors is entered as input to x argument.

**point.color**
Character describing color for the point (Default: "blue").

**point.size**
Numeric specifying size for the point (Default: 3).

**point.shape**
Numeric specifying shape to draw the points (Default: 16 (a dot)).

**conf.int**
Logical. Decides whether to display confidence intervals as error bars (Default: TRUE).

**conf.level**
Numeric deciding level of confidence intervals (Default: 0.95). For MCMC model objects (Stan, JAGS, etc.), this will be probability level for CI.

**se.type**
Character specifying the method used to compute standard standard errors for quantile regression (Default: "nid"). To see all available methods, see quantreg::summary.rq().

**k**
Number of decimal places expected for results displayed in labels (Default: k = 2).

**k.caption.summary**
Number of decimal places expected for results displayed in captions (Default: k.caption.summary = 0).

**exclude.intercept**
Logical that decides whether the intercept should be excluded from the plot (Default: TRUE).

**exponentiate**
If TRUE, the x-axis will be logarithmic (Default: FALSE).

**errorbar.color**
Character deciding color of the error bars (Default: "black").

**errorbar.height**
Numeric specifying the height of the error bars (Default: 0).

**errorbar.linetype**
Line type of the error bars (Default: "solid").

**errorbar.size**
Numeric specifying the size of the error bars (Default: 0.5).

**vline**
Decides whether to display a vertical line (Default: "TRUE").

**vline.color**
Character specifying color of the vertical line (Default: "black").

**vline.linetype**
Character specifying line type of the vertical line (Default: "dashed").

**vline.size**
Numeric specifying the size of the vertical line (Default: 1).

**sort**
If "none" (default) do not sort, "ascending" sort by increasing coefficient value, or "descending" sort by decreasing coefficient value.
xlab  Label for x axis variable (Default: "estimate").
ylab  Label for y axis variable (Default: "term").
title The text for the plot title.
subtitle The text for the plot subtitle. The input to this argument will be ignored if meta.analytic.effect is set to TRUE.
stats.labels Logical. Decides whether the statistic and p-values for each coefficient are to be attached to each dot as a text label using ggrepel (Default: TRUE).
caption The text for the plot caption.
caption.summary Logical. Decides whether the model summary should be displayed as a caption to the plot (Default: TRUE). Color of the line segment. Defaults to the same color as the text.
stats.label.size, stats.label.fontface, stats.label.color Aesthetics for the labels. Defaults: 3, "bold", NULL, resp. If stats.label.color is NULL, colors will be chosen from the specified package (Default: "RColorBrewer") and palette (Default: "Dark2").
label.r, Radius of rounded corners, as unit or number. Defaults to 0.15. (Default unit is lines).
label.size Size of label border, in mm. Defaults to 0.25.
label.box.padding Amount of padding around bounding box, as number. Defaults to 1. (Default unit is lines).
label.label.padding Amount of padding around label, as number. Defaults to 0.25. (Default unit is lines).
label.point.padding Amount of padding around labeled point, as number. Defaults to 0. (Default unit is lines).
label.segment.color Color of the line segment (Default: "grey50").
label.segment.size Width of line segment connecting the data point to the text label, in mm. Defaults to 0.5.
label.segment.alpha Transparency of the line segment. Defaults to the same transparency as the text.
label.min.segment.length Skip drawing segments shorter than this. Defaults to 0.5. (Default unit is lines).
label.force Force of repulsion between overlapping text labels. Defaults to 1.
label.max.iter Maximum number of iterations to try to resolve overlaps. Defaults to 2000.
label.nudge.x, label.nudge.y Horizontal and vertical adjustments to nudge the starting position of each text label. Defaults to 0.
label.xlim, label ylim Limits for the x and y axes. Text labels will be constrained to these limits. By default, text labels are constrained to the entire plot area. Defaults to c(NA, NA).
label.direction
Character ("both", "x", or "y") – direction in which to adjust position of labels (Default: "y").

package
Name of package from which the palette is desired as string or symbol.

palette
Name of palette as string or symbol.

direction
Either 1 or -1. If -1 the palette will be reversed.

ggtheme
A function, ggplot2 theme name. Default value is ggplot2::theme_bw().
Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer
Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

messages
Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Value
Plot with the regression coefficients’ point estimates as dots with confidence interval whiskers.

Author(s)
Indrajeet Patil

References
https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggcoefstats.html

Examples

# for reproducibility
set.seed(123)

# ----------------------- with model object -----------------------------------

# model object
mod <- lm(formula = mpg ~ cyl * am, data = mtcars)

# to get a plot
ggstatsplot::ggcoefstats(x = mod, output = "plot")

# to get a tidy dataframe
ggstatsplot::ggcoefstats(x = mod, output = "tidy")

# to get a glance summary
ggstatsplot::ggcoefstats(x = mod, output = "glance")

# to get augmented dataframe
ggcoefstats

ggstatsplot::ggcoefstats(x = mod, output = "augment")

# -------------- with custom dataframe -----------------------------

# creating a dataframe
df <-
  structure(
    list(
      term = structure(  
        c(3L, 4L, 1L, 2L, 5L),  
        .Label = c(  
          "Africa",  
          "Americas", "Asia", "Europe", "Oceania"
        ),
        class = "factor"
      ),
      estimate = c(  
        0.382047603321706,  
        0.78078311514665,  
        0.425607573765058,  
        0.55836541235078,  
        0.956473848429961
      ),
      std.error = c(  
        0.0465576338644502,  
        0.033021819731529,  
        0.0362834986178494,  
        0.0480571500648261,  
        0.062215818388157
      ),
      statistic = c(  
        8.20590677555356,  
        23.6446030308067,  
        11.730058415607,  
        11.6187818146078,  
        15.3734833553524
      ),
      conf.low = c(  
        0.290515146096969,  
        0.715841986960399,  
        0.354354575031406,  
        0.46379116008131,  
        0.827446138277154
      ),
      conf.high = c(  
        0.473580060546444,  
        0.845724236068931,  
        0.496860572498711,  
        0.652939922388847,  
        1.08550155858277
      ),
      p.value = c(  
        3.28679518728519e-15,
      )
    ),
    class = "structure"
  )
```r
4.04778497135963e-75,
7.5975330804449e-29,
5.45155840151592e-26,
2.99171217913312e-13
),
df.residual = c(394L, 358L, 622L, 298L, 22L)
),
row.names = c(NA, -5L),
class = c("tbl_df",
"tbl", "data.frame"
)
)

# plotting the dataframe
ggstatsplot::ggcoefstats(
x = df,
statistic = "t",
meta.analytic.effect = TRUE
)

# ---------------- getting model summary ------------------------------

# model
library(lme4)
lmm1 <- lme4::lmer(
  formula = Reaction ~ Days + (Days | Subject),
data = sleepstudy
)

# dataframe with model summary
ggstatsplot::ggcoefstats(x = lmm1, output = "glance")

# ---------------- getting augmented dataframe ----------------------------

# setup
set.seed(123)
library(survival)

# fit
cfit <-
  survival::coxph(formula = Surv(time, status) ~ age + sex, data = lung)

# augmented dataframe
ggstatsplot::ggcoefstats(
x = cfit,
data = lung,
output = "augment",
type.predict = "risk"
)
```
ggcorrmat

Visualization of a correlalogram (or correlation matrix)

Description

Visualization of a correlalogram (or correlation matrix)

Usage

```r
ggcorrmat(data, cor.vars = NULL, cor.vars.names = NULL,
output = "plot", matrix.type = "full", method = "square",
corr.method = "pearson", type = NULL, exact = FALSE,
continuity = TRUE, beta = 0.1, digits = 2, k = NULL,
sig.level = 0.05, p.adjust.method = "none", hc.order = FALSE,
hc.method = "complete", lab = TRUE, package = "RColorBrewer",
palette = "Dark2", direction = 1, colors = c("#E69F00", "white",
"#0070CF"), outline.color = "black", ggtheme = ggplot2::theme_bw(),
.ggstatsplot.layer = TRUE, title = NULL, subtitle = NULL,
caption = NULL, caption.default = TRUE, lab.col = "black",
lab.size = 5, insig = "pch", pch = 4, pch.col = "black",
pch.cex = 11, tl.cex = 12, tl.col = "black", tl.srt = 45,
axis.text.x.margin.l = 0, axis.text.x.margin.t = 0,
axis.text.x.margin.r = 0, axis.text.x.margin.b = 0,
messages = TRUE)
```

Arguments

data Dataframe from which variables specified are preferentially to be taken.
cor.vars List of variables for which the correlation matrix is to be computed and visualized. If NULL (default), all numeric variables from data will be used.
cor.vars.names Optional list of names to be used for cor.vars. The names should be entered in the same order.
output Character that decides expected output from this function: "plot" (for visualization matrix) or "correlations" (or "corr" or "r"; for correlation matrix) or "p-values" (or "p.values" or "p"; for a matrix of p-values) or "ci" (for a tibble with confidence intervals for unique correlation pairs; not available for robust correlation) or "n" (or "sample.size" for a tibble with sample sizes for each correlation pair).
matrix.type Character, "full" (default), "upper" or "lower", display full matrix, lower triangular or upper triangular matrix.
method Character argument that decides the visualization method of correlation matrix to be used. Allowed values are "square" (default), "circle"
corr.method, type A character string indicating which correlation coefficient is to be computed ("pearson" (default) or "kendall" or "spearman"). "robust" can also be entered but only if output argument is set to either "correlations" or "p-values".
The robust correlation used is percentage bend correlation (see `?WRS2::pb1()`. Abbreviations will also work: "p" (for parametric/Pearson's r), "np" (nonparametric/Spearman's rho), "r" (robust).

**exact**
A logical indicating whether an exact p-value should be computed. Used for Kendall's tau and Spearman's rho. For more details, see `?stats::cor.test`.

**continuity**
A logical. If TRUE, a continuity correction is used for Kendall's tau and Spearman's rho when not computed exactly (Default: TRUE).

**beta**
A numeric bending constant for robust correlation coefficient (Default: 0.1).

**digits, k**
Decides the number of decimal digits to be displayed (Default: 2).

**sig.level**
Significance level (Default: 0.05). If the p-value in p-value matrix is bigger than sig.level, then the corresponding correlation coefficient is regarded as insignificant and flagged as such in the plot. This argument is relevant only when output = "plot".

**p.adjust.method**
What adjustment for multiple tests should be used? ("holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"). See `stats::p.adjust` for details about why to use "holm" rather than "bonferroni"). Default is "none". If adjusted p-values are displayed in the visualization of correlation matrix, the adjusted p-values will be used for the upper triangle, while unadjusted p-values will be used for the lower triangle of the matrix.

**hc.order**
Logical value. If TRUE, correlation matrix will be hc.ordered using hclust function (Default is FALSE).

**hc.method**
The agglomeration method to be used in hclust (see ?hclust).

**lab**
Logical value. If TRUE, correlation coefficient values will be displayed in the plot.

**package**
Name of package from which the palette is desired as string or symbol.

**palette**
Name of palette as string or symbol.

**direction**
Either 1 or -1. If -1 the palette will be reversed.

**colors**
A vector of 3 colors for low, mid, and high correlation values. If set to NULL, manual specification of colors will be turned off and 3 colors from the specified palette from package will be selected.

**outline.color**
The outline color of square or circle. Default value is "gray".

**ggtheme**
A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

**ggstatsplot.layer**
Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

**title**
The text for the plot title.

**subtitle**
The text for the plot subtitle.

**caption**
The text for the plot caption. If not specified (if it is NULL, i.e.), a default caption will be shown.
caption.default Logical decides whether the default caption should be shown.
lab.col Color to be used for the correlation coefficient labels (applicable only when lab = TRUE).
lab.size Size to be used for the correlation coefficient labels (applicable only when lab = TRUE).
insig Character used to show specialized insignificant correlation coefficients ("pch" (default) or "blank"). If "blank", the corresponding glyphs will be removed; if "pch" is used, characters (see ?pch for details) will be added on the corresponding glyphs.
pch Decides the glyphs (read point shapes) to be used for insignificant correlation coefficients (only valid when insig = "pch"). Default value is pch = 4.
pch.col, pch.cex The color and the cex (size) of pch (only valid when insig = "pch"). Defaults are pch.col = "#F0E442" and pch.cex = 10.

       tl.cex, tl.col, tl.srt The size, the color, and the string rotation of text label (variable names, i.e.).

       axis.text.x.margin.t, axis.text.x.margin.r, axis.text.x.margin.b, axis.text.x.margin.l
Margins between x-axis and the variable name texts (t: top, r: right, b: bottom, l: left), especially useful in case the names are slanted, i.e. when the tl.srt is between 45 and 75 (Defaults: 0, 0, 0, 0, resp.).

messages Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Value
Correlation matrix plot or correlation coefficient matrix or matrix of p-values.

Author(s)
Indrajeet Patil

References
https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggcorrmat.html

See Also
ggcorrmat ggscatterstats grouped_ggcorrmat ggscatterstats

Examples

# for reproducibility
set.seed(123)

# if 'cor.vars' not specified, all numeric variables used
ggstatsplot::ggcorrmat(data = iris)
```
# to get the correlalogram
# note that the function will run even if the vector with variable names is
# not of same length as the number of variables
ggstatsplot::ggcorrmat(
  data = ggplot2::msleep,
  cor.vars = sleep_total:bodywt,
  cor.vars.names = c("total sleep", "REM sleep")
) + # further modification using `ggplot2``
  ggplot2::scale_y_discrete(position = "right")

# to get the correlation matrix
# setting output = "p-values" (or "p") will return the p-value matrix
ggstatsplot::ggcorrmat(
  data = ggplot2::msleep,
  cor.vars = sleep_total:bodywt,
  cor.method = "r",
  p.adjust.method = "bonferroni",
  output = "p"
)

# setting `output = "ci"` will return the confidence intervals for unique
# correlation pairs
ggstatsplot::ggcorrmat(
  data = ggplot2::msleep,
  cor.vars = sleep_total:bodywt,
  p.adjust.method = "BH",
  output = "ci"
)

# modifying elements of the correlation matrix by changing function defaults
ggstatsplot::ggcorrmat(
  data = datasets::iris,
  cor.vars = c(Sepal.Length, Sepal.Width, Petal.Length, Petal.Width),
  sig.level = 0.01,
  g_theme = ggplot2::theme_bw(),
  hc.order = TRUE,
  matrix.type = "lower",
  outline.col = "white",
  title = "Dataset: Iris"
)
```

**ggdotplotstats**  
*Dot plot/chart for labeled numeric data.*
**Description**

A dot chart with statistical details from one-sample test included in the plot as a subtitle.

**Usage**

```r
ggdotplotstats(data, x, y, xlab = NULL, ylab = NULL, title = NULL, subtitle = NULL, caption = NULL, type = "parametric", test.value = 0, bf.prior = 0.707, bf.message = FALSE, robust.estimator = "onestep", conf.level = 0.95, nboot = 100, k = 2, results.subtitle = TRUE, ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, point.color = "black", point.size = 3, point.shape = 16, centrality.para = "mean", centrality.color = "blue", centrality.size = 1, centrality.linetype = "dashed", centrality.line.labeller = TRUE, centrality.k = 2, test.value.line = FALSE, test.value.color = "black", test.value.size = 1, test.value.linetype = "dashed", test.line.labeller = TRUE, test.k = 0, ggplot.component = NULL, messages = TRUE)
```

**Arguments**

- `data` A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will **not** be accepted.
- `x` A numeric variable.
- `y` Label or grouping variable.
- `xlab` Labels for x and y axis variables. If NULL (default), variable names for x and y will be used.
- `ylab` Label for y axis variable.
- `title` The text for the plot title.
- `subtitle` The text for the plot subtitle. Will work only if `results.subtitle = FALSE`.
- `caption` The text for the plot caption.
- `type` Type of statistic expected ("parametric" or "nonparametric" or "robust" or "bayes"). Corresponding abbreviations are also accepted: "p" (for parametric), "np" (nonparametric), "r" (robust), or "bf" (Bayesian).
- `test.value` A number specifying the value of the null hypothesis (Default: 0).
- `bf.prior` A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
- `bf.message` Logical that decides whether to display Bayes Factor in favor of the null hypothesis for **parametric test** (Default: FALSE).
- `robust.estimator` If `test = "robust"` robust estimator to be used ("onestep" (Default), "mom", or "median"). For more, see `?WRS2::onesampb`.
- `conf.level` Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).
nboot Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

k Number of digits after decimal point (should be an integer) (Default: k = 2).

results.subtitle Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.

ggtheme A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

point.color Character describing color for the point (Default: "black").

point.size Numeric specifying size for the point (Default: 3).

point.shape Numeric specifying shape to draw the points (Default: 16 (a dot)).

centrality.para Decides which measure of central tendency ("mean" or "median") is to be displayed as a vertical line.

centrality.color Decides color for the vertical line for centrality parameter (Default: "blue").

centrality.size Decides size for the vertical line for centrality parameter (Default: 1.2).

centrality.linetype Decides linetype for the vertical line for centrality parameter (Default: "dashed").

centrality.line.labeller A logical that decides whether line labels should be displayed for the centrality.para line (Default: TRUE).

centrality.k Integer denoting the number of decimal places expected for centrality parameter label. (Default: 2).

test.value.line Decides whether test value is to be displayed as a vertical line (Default: FALSE).

test.value.color Decides color for the vertical line denoting test value (Default: "black").

test.value.size Decides size for the vertical line for test value (Default: 1.2).

test.value.linetype Decides linetype for the vertical line for test value (Default: "dashed").

test.line.labeller A logical that decides whether line labels should be displayed for test.value line (Default: TRUE).

test.k Integer denoting the number of decimal places expected for test.value label. (Default: 0).
**ggplot.component**

A `ggplot` component to be added to the plot prepared by `ggstatsplot`. This argument is primarily helpful for grouped variant of the current function. Default is `NULL`. The argument should be entered as a function. If the given function has an argument `axes.range.restrict` and if it has been set to `TRUE`, the added `ggplot` component might not work as expected.

**messages**

Decides whether messages references, notes, and warnings are to be displayed (Default: `TRUE`).

**Author(s)**

Indrajeet Patil

**Examples**

```r
# for reproducibility
set.seed(123)

# plot
ggdotplotstats(
  data = ggplot2::mpg,
  x = cty,
  y = manufacturer,
  conf.level = 0.99,
  test.value = 15,
  test.value.line = TRUE,
  test.line.labeller = TRUE,
  test.value.color = "red",
  centrality.para = "median",
  centrality.k = 0,
  title = "Fuel economy data",
  xlab = "city miles per gallon",
  bf.message = TRUE,
  caption = substitute(
    paste(italic("Source"), ": EPA dataset on http://fueleconomy.gov")
  )
)
```

---

**gghistostats**  

*Histogram for distribution of a numeric variable*

**Description**

Histogram with statistical details from one-sample test included in the plot as a subtitle.
Usage

gghistostats(data = NULL, x, binwidth = NULL, bar.measure = "count", xlab = NULL, title = NULL, subtitle = NULL, caption = NULL, type = "parametric", test.value = 0, bf.prior = 0.707, bf.message = FALSE, robust.estimator = "onestep", effsize.type = "g", effsize.noncentral = TRUE, conf.level = 0.95, nboot = 100, k = 2, ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, fill.gradient = FALSE, low.color = "#0072B2", high.color = "#D55E00", bar.fill = "grey50", results.subtitle = TRUE, centrality.type = "mean", centrality.color = "blue", centrality.size = 1, centrality.k = 2, test.value.line = FALSE, test.value.color = "black", test.value.size = 1, test.value.linetype = "dashed", test.line.labeller = TRUE, test.k = 0, normal.curve = FALSE, normal.curve.color = "black", normal.curve.linetype = "solid", normal.curve.size = 1, ggplot.component = NULL, messages = TRUE)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.

x A numeric variable.

binwidth The width of the histogram bins. Can be specified as a numeric value, or a function that calculates width from x. The default is to use the max(x) - min(x) / sqrt(N). You should always check this value and explore multiple widths to find the best to illustrate the stories in your data.

bar.measure Character describing what value needs to be represented as height in the bar chart. This can either be "count", which shows number of points in bin, or "density", which density of points in bin, scaled to integrate to 1, or "proportion", which shows relative frequencies of observations in each bin, or "mix", which shows both count and proportion in the same plot.

xlab Labels for x and y axis variables. If NULL (default), variable names for x and y will be used.

title The text for the plot title.

subtitle The text for the plot subtitle. Will work only if results.subtitle = FALSE.

caption The text for the plot caption.

type Type of statistic expected ("parametric" or "nonparametric" or "robust" or "bayes"). Corresponding abbreviations are also accepted: "p" (for parametric), "np" (nonparametric), "r" (robust), or "bf" resp.

test.value A number specifying the value of the null hypothesis (Default: 0).

bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
bf.message Logical that decides whether to display Bayes Factor in favor of the null hypothesis for parametric test (Default: FALSE).

robust.estimator If test = "robust" robust estimator to be used ("onestep" (Default), "mom", or "median"). For more, see ?WRS2::onesampb.

effsize.type Type of effect size needed for parametric tests. The argument can be "biased" ("d" for Cohen’s d) or "unbiased" ("g" Hedge’s g for t-test). The default is

effsize.noncentral Logical indicating whether to use non-central t-distributions for computing the confidence interval for Cohen’s d or Hedge’s g (Default: TRUE).

conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

nboot Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

k Number of digits after decimal point (should be an integer) (Default: k = 2).

ggtheme A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

fill.gradient Logical decides whether color fill gradient is to be displayed (Default: FALSE). If FALSE, the legend and the color gradient will also be removed. The default is set to FALSE because the gradient provides redundant information in light of y-axis labels.

low.color, high.color Colors for low and high ends of the gradient. Defaults are colorblind-friendly.

bar.fill If fill.gradient = FALSE, then bar.fill decides which color will uniformly fill all the bars in the histogram (Default: "grey50").

results.subtitle Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.

centrality.para Decides which measure of central tendency ("mean" or "median") is to be displayed as a vertical line.

centrality.color Decides color for the vertical line for centrality parameter (Default: "blue").

centrality.size Decides size for the vertical line for centrality parameter (Default: 1.2).

centrality.linetype Decides linetype for the vertical line for centrality parameter (Default: "dashed").

centrality.line.labeller A logical that decides whether line labels should be displayed for the centrality.para line (Default: TRUE).
centrality.k  Integer denoting the number of decimal places expected for centrality parameter label. (Default: 2).

test.value.line  Decides whether test value is to be displayed as a vertical line (Default: FALSE).

test.value.color  Decides color for the vertical line denoting test value (Default: "black").

test.value.size  Decides size for the vertical line for test value (Default: 1.2).

test.value.linetype  Decides linetype for the vertical line for test value (Default: "dashed").

test.line.labeller  A logical that decides whether line labels should be displayed for test.value line (Default: TRUE).

test.k  Integer denoting the number of decimal places expected for test.value label. (Default: 0).

normal.curve  Logical decides whether to super-impose a normal curve using stats::dnorm(mean(x), sd(x)). Default is FALSE.

normal.curve.color, normal.curve.linetype, normal.curve.size  If normal.curve = TRUE, then these arguments can be used to modify color (Default: "black"), size (default: 1.0), linetype (default: "solid").

ggplot.component  A ggplot component to be added to the plot prepared by ggstatsplot. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.

messages  Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Author(s)
Indrajeet Patil

References
https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/gghistostats.html

See Also
grouped_gghistostats

Examples

# most basic function call with the defaults
# this is the **only** function where data argument can be `NULL`
ggstatsplot::gghistostats(
  x = ToothGrowth$len,
ggpiestats

Pie charts with statistical tests

Description

Pie charts for categorical data with statistical details included in the plot as a subtitle.

Usage

```r
ggpiestats(data, main, condition = NULL, counts = NULL, ratio = NULL,
  paired = FALSE, results.subtitle = TRUE, factor.levels = NULL,
  stat.title = NULL, sample.size.label = TRUE,
  label.separator = "\n", label.text.size = 4,
  label.fill.color = "white", label.fill.alpha = 1,
  bf.message = FALSE, sampling.plan = "indepMulti",
  fixed.margin = "rows", prior.concentration = 1, title = NULL,
  subtitle = NULL, caption = NULL, conf.level = 0.95, nboot = 100,
  simulate.p.value = FALSE, B = 2000, legend.title = NULL,
  facet.wrap.name = NULL, k = 2, perc.k = 0,
  slice.label = "percentage", facet.proptest = TRUE,
  ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE,
  package = "RColorBrewer", palette = "Dark2", direction = 1,
  ggplot.component = NULL, messages = TRUE)
```

Arguments

- **data**: A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
- **main**: The variable to use as the rows in the contingency table.
condition: The variable to use as the columns in the contingency table.
counts: A string naming a variable in data containing counts, or NULL if each row represents a single observation (Default).
ratio: A vector of numbers: the expected proportions for the proportion test. Default is NULL, which means if there are two levels ratio = c(1,1), etc.
paired: Logical indicating whether data came from a within-subjects design study (Default: FALSE). If TRUE, McNemar test subtitle will be returned. If FALSE, Pearson’s chi-square test will be returned.
results.subtitle: Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.
factor.levels: A character vector with labels for factor levels of main variable.
stat.title: Title for the effect being investigated with the chi-square test. The default is NULL, i.e. no title will be added to describe the effect being shown. An example of a stat.title argument will be something like “main x condition” or “interaction”.
sample.size.label: Logical that decides whether sample size information should be displayed for each level of the grouping variable condition (Default: TRUE).
label.separator: If “both” counts and proportion information is to be displayed in a label, this argument decides whether these two pieces of information are going to be on the same line (” ”) or on separate lines (” \n”).
label.text.size: Numeric that decides text size for slice/bar labels (Default: 4).
label.fill.color: Character that specifies fill color for slice/bar labels (Default: white).
label.fill.alpha: Numeric that specifies fill color transparency or “alpha” for slice/bar labels (Default: 1 range 0 to 1).
bf.message: Logical that decides whether to display a caption with results from bayes factor test in favor of the null hypothesis (default: FALSE).
sampling.plan: Character describing the sampling plan. Possible options are ”indepMulti” (independent multinomial; default), ”poisson”, ”jointMulti” (joint multinomial), ”hypergeom” (hypergeometric). For more, see ?BayesFactor::contingencyTableBF().
fixed.margin: For the independent multinomial sampling plan, which margin is fixed ("rows" or "cols"). Defaults to "rows".
prior.concentration: Specifies the prior concentration parameter, set to 1 by default. It indexes the expected deviation from the null hypothesis under the alternative, and corresponds to Gunel and Dickey’s (1974) ”a” parameter.
title: The text for the plot title.
subtitle: The text for the plot subtitle. Will work only if results.subtitle = FALSE.
caption: The text for the plot caption.
Unlike a number of statistical softwares, ggpiestats doesn’t provide the option for Yates’ correction for the Pearson’s chi-squared statistic. This is due to compelling amount of Monte-Carlo simulation research which suggests that the Yates’ correction is overly conservative, even in small sample sizes. As such it is recommended that it should not ever be applied in practice (Camilli & Hopkins, 1978, 1979; Feinberg, 1980; Larntz, 1978; Thompson, 1988).
Author(s)

Indrajeet Patil

References

https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggpiestats.html

Examples

# for reproducibility
set.seed(123)

# simple function call with the defaults (without condition)

ggstatsplot::ggpiestats(
data = ggplot2::msleep,
  main = vore,
  perc.k = 1,
  k = 2
)

# simple function call with the defaults (with condition)

ggstatsplot::ggpiestats(
  data = datasets::mtcars,
  main = vs,
  condition = cyl,
  bf.message = TRUE,
  nboot = 10,
  factor.levels = c("0 = V-shaped", "1 = straight"),
  legend.title = "Engine"
)

# simple function call with the defaults (without condition; with count data)
library(jmv)

ggstatsplot::ggpiestats(
  data = as.data.frame(HairEyeColor),
  main = Eye,
  counts = Freq
)

---

**ggplot_converter**

Transform object of any other class to an object of class `ggplot`.

**Description**

Transform object of any other class to an object of class `ggplot`.
Usage

\texttt{ggplot_converter(plot)}

Arguments

\texttt{plot} \quad A plot that needs to be converted to object of class \texttt{ggplot}.

Examples

library(ggplot2)

# creating a plot that is not of class 'ggplot'
p <- ggExtra::ggMarginal(ggplot(mtcars, aes(wt, mpg)) + geom_point())

# checking class of object
class(p)

# checking class of converted plot
p_converted <- ggstatsplot::ggplot_converter(p)
class(p_converted)

---

\texttt{ggscatterstats} \quad \textit{Scatterplot with marginal distributions}

Description

Scatterplots from \texttt{ggplot2} combined with marginal histograms/boxplots/density plots with statistical details added as a subtitle.

Usage

\texttt{ggscatterstats(data, x, y, type = \texttt{"pearson"}, conf.level = 0.95,}
\texttt{ bf.prior = 0.707, bf.message = FALSE, label.var = NULL,}
\texttt{ label.expression = NULL, xlab = NULL, ylab = NULL, method = \texttt{"lm"},}
\texttt{ method.args = list(), formula = y \sim x, point.color = \texttt{"black"},}
\texttt{ point.size = 3, point.alpha = 0.4, point.width.jitter = 0,}
\texttt{ point.height.jitter = 0, line.size = 1.5, line.color = \texttt{"blue"},}
\texttt{ marginal = TRUE, marginal.type = \texttt{"histogram"}, marginal.size = 5,}
\texttt{ margins = c("both", "x", "y"), package = \texttt{\"wesanderson\"},}
\texttt{ palette = \texttt{\"Royal1\"}, direction = 1, xfill = \texttt{\"#009E73\"},}
\texttt{ yfill = \texttt{\"#D55E00\"}, xalpha = 1, yalpha = 1, xsize = 0.7,}
\texttt{ ysize = 0.7, centrality.param = NULL, results.subtitle = TRUE,}
\texttt{ title = NULL, subtitle = NULL, caption = NULL, nbboot = 100,}
\texttt{ beta = 0.1, k = 2, axes.range.restrict = FALSE,}
\texttt{ gghtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE,}
\texttt{ ggplot.component = NULL, messages = TRUE)}
Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A
matrix or tables will not be accepted.

x The column in data containing the explanatory variable to be plotted on the x
axis. Can be entered either as a character string (e.g., "x") or as a bare expression
(e.g. x).

y The column in data containing the response (outcome) variable to be plotted on
the y axis. Can be entered either as a character string (e.g., "y") or as a bare
expression (e.g. y).

type Type of association between paired samples required ("parametric": Pearson's
product moment correlation coefficient" or "nonparametric": Spearman's rho" or
"robust": percentage bend correlation coefficient" or "bayes": Bayes Factor for
Pearson's r"). Corresponding abbreviations are also accepted:
"p" (for parametric/pearson's), "np" (nonparametric/spearman), "r" (robust),
"bf" (for bayes factor), resp.

cnf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper
confidence intervals (0.95).

bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculat-
ing Bayes factors.

bf.message Logical that decides whether to display Bayes Factor in favor of the null
hypothesis for parametric test (Default: FALSE).

label.var Variable to use for points labels. Can be entered either as a character string (e.g.,
"var1") or as a bare expression (e.g. var1).

label.expression An expression evaluating to a logical vector that determines the subset of data
points to label. This argument can be entered either as a character string (e.g.,
"y < 4 & z < 20") or as a bare expression (e.g., y < 4 & z < 20).

xlab Labels for x and y axis variables. If NULL (default), variable names for x and y
will be used.

ylab Labels for x and y axis variables. If NULL (default), variable names for x and y
will be used.

method Smoothing method (function) to use, accepts either a character vector, e.g. "auto",
"lm", "glm", "gam", "loess" or a function, e.g. MASS::rlm or mgcv::gam,
base::lm, or base::loess.

For method = "auto" the smoothing method is chosen based on the size of the
largest group (across all panels). loess() is used for less than 1,000 observa-
tions; otherwise mgcv::gam() is used with formula = y ~ s(x, bs = "cs").
Somewhat anecdotally, loess gives a better appearance, but is O(N^2) in mem-
ory, so does not work for larger datasets.

If you have fewer than 1,000 observations but want to use the same gam() model
that method = "auto" would use, then set method = "gam", formula = y ~ s(x, bs = "cs").

method.args List of additional arguments passed on to the modelling function defined by
method.

formula Formula to use in smoothing function, eg. y ~ x, y ~ poly(x, 2), y ~ log(x)
point.color, point.size, point.alpha
  Aesthetics specifying geom point (defaults: point.color = "black", point.size = 3, point.alpha = 0.6).
point.width.jitter, point.height.jitter
  Degree of jitter in x and y direction, respectively. Defaults to 0 (0 data).
line.size
  Size for the regression line.
line.color
  Color for the regression line.
marginal
  Decides whether ggExtra::ggMarginal() plots will be displayed; the default is TRUE.
marginal.type
  Type of marginal distribution to be plotted on the axes ("histogram", "boxplot", "density", "violin", "densigram").
marginal.size
  Integer describing the relative size of the marginal plots compared to the main plot. A size of 5 means that the main plot is 5x wider and 5x taller than the marginal plots.
margins
  Character describing along which margins to show the plots. Any of the following arguments are accepted: "both", "x", "y".
package
  Name of package from which the palette is desired as string or symbol.
palette
  Name of palette as string or symbol.
direction
  Either 1 or -1. If -1 the palette will be reversed.
xfill, yfill
  Character describing color fill for x and y axes marginal distributions (default: "#009E73" (for x) and "#D55E00" (for y)). If set to NULL, manual specification of colors will be turned off and 2 colors from the specified palette from package will be selected.
xalpha, yalpha
  Numeric deciding transparency levels for the marginal distributions. Any numbers from 0 (transparent) to 1 (opaque). The default is 1 for both axes.
xsize, ysize
  Size for the marginal distribution boundaries (Default: 0.7).
centrality.param
  Decides which measure of central tendency ("mean" or "median") is to be displayed as vertical (for x) and horizontal (for y) lines.
results.subtitle
  Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.
title
  The text for the plot title.
subtitle
  The text for the plot subtitle. Will work only if results.subtitle = FALSE.
caption
  The text for the plot caption.
nboot
  Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).
beta
  Bending constant (Default: 0.1). For more, see ?WRS2::pbcor.
k
  Number of digits after decimal point (should be an integer) (Default: k = 2).
axes.range.restrict
  Logical that decides whether to restrict the axes values ranges to min and max values of the axes variables (Default: FALSE), only relevant for functions where axes variables are of numeric type.
ggtheme

A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer

Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

ggplot.component

A ggplot component to be added to the plot prepared by ggstatsplot. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.

messages

Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Note

- marginal.type = "densigram" will work only with the development version of ggExtra that you can download from GitHub: devtools::install_github("daattali/ggExtra")
- The plot uses ggrepel::geom_label_repel to attempt to keep labels from over-lapping to the largest degree possible. As a consequence plot times will slow down massively (and the plot file will grow in size) if you have a lot of labels that overlap.

Author(s)

Indrajeet Patil, Chuck Powell

References

https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggscatterstats.html

See Also

grouped_ggscatterstats, ggcorrmat, grouped_ggcorrmat

Examples

# to get reproducible results from bootstrapping
set.seed(123)

# creating dataframe
mtcars_new <- mtcars %>%
  tibble::rownames_to_column(., var = "car") %>%
  tibble::as_tibble(x = .)

# simple function call with the defaults
ggstatsplot::ggscatterstats(
  data = mtcars_new,
grouped_ggbarstats  

Description

Helper function for ggstatsplot::ggbarstats to apply this function across multiple levels of a given factor and combining the resulting plots using ggstatsplot::combine_plots.

Usage

grouped_ggbarstats(data, main, condition, counts = NULL, grouping.var, title.prefix = NULL, ratio = NULL, paired = FALSE, results.subtitle = TRUE, labels.legend = NULL, stat.title = NULL, sample.size.label = TRUE, label.separator = "\n", label.text.size = 4, label.fill.color = "white", label.fill.alpha = 1, bar.outline.color = "black", bf.message = FALSE, sampling.plan = "jointMulti", fixed.margin = "rows", prior.concentration = 1, subtitle = NULL, caption = NULL, legend.position = "right", x.axis.orientation = NULL, conf.level = 0.95, nboot = 100, simulate.p.value = FALSE, B = 2000, legend.title = NULL, xlab = NULL, ylab = "Percent", k = 2, perc.k = 0, data.label = "percentage", bar.proptest = TRUE, gggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, package = "RColorBrewer", palette = "Dark2", direction = 1, ggplot.component = NULL, messages = TRUE, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
main The variable to use as the rows in the contingency table.
condition The variable to use as the columns in the contingency table.
counts A string naming a variable in data containing counts, or NULL if each row represents a single observation (Default).
grouping.var A single grouping variable (can be entered either as a bare name x or as a string "x").
ggbarstats

**title.prefix**  Character string specifying the prefix text for the fixed plot title (name of each factor level) (Default: NULL). If NULL, the variable name entered for grouping.var will be used.

**ratio**  A vector of numbers: the expected proportions for the proportion test. Default is NULL, which means if there are two levels ratio = c(1,1), etc.

**paired**  Logical indicating whether data came from a within-subjects design study (Default: FALSE). If TRUE, McNemar test subtitle will be returned. If FALSE, Pearson's chi-square test will be returned.

**results.subtitle**  Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.

**labels.legend**  A character vector with custom labels for levels of the main variable displayed in the legend.

**stat.title**  Title for the effect being investigated with the chi-square test. The default is NULL, i.e. no title will be added to describe the effect being shown. An example of a stat.title argument will be something like "main x condition" or "interaction".

**sample.size.label**  Logical that decides whether sample size information should be displayed for each level of the grouping variable condition (Default: TRUE).

**label.separator**  If "both" counts and proportion information is to be displayed in a label, this argument decides whether these two pieces of information are going to be on the same line (" ") or on separate lines ("\n").

**label.text.size**  Numeric that decides text size for slice/bar labels (Default: 4).

**label.fill.color**  Character that specifies fill color for slice/bar labels (Default: white).

**label.fill.alpha**  Numeric that specifies fill color transparency or "alpha" for slice/bar labels (Default: 1 range 0 to 1).

**bar.outline.color**  Character specifying color for bars (default: "black").

**bf.message**  Logical that decides whether to display a caption with results from bayes factor test in favor of the null hypothesis (default: FALSE).

**sampling.plan**  Character describing the sampling plan. Possible options are "indepMulti" (independent multinomial; default), "poisson", "jointMulti" (joint multinomial), "hypergeom" (hypergeometric). For more, see ?BayesFactor::contingencyTableBF().

**fixed.margin**  For the independent multinomial sampling plan, which margin is fixed ("rows" or "cols"). Defaults to "rows".

**prior.concentration**  Specifies the prior concentration parameter, set to 1 by default. It indexes the expected deviation from the null hypothesis under the alternative, and corresponds to Gunel and Dickey's (1974) "a" parameter.

**subtitle**  The text for the plot subtitle. Will work only if results.subtitle = FALSE.
grouped_ggbarstats

caption The text for the plot caption.

legend.position The position of the legend "none", "left", "right", "bottom", "top" (Default: "right").

x.axis.orientation The orientation of the x axis labels one of "slant" or "vertical" to change from the default horizontal orientation (Default: NULL which is horizontal).

conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

nboot Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

simulate.p.value a logical indicating whether to compute p-values by Monte Carlo simulation.

B an integer specifying the number of replicates used in the Monte Carlo test.

legend.title Title text for the legend.

xlab Custom text for the x axis label (Default: NULL, which will cause the x axis label to be the main variable).

ylab Custom text for the y axis label (Default: "percent").

k Number of digits after decimal point (should be an integer) (Default: k = 2).

perc.k Numeric that decides number of decimal places for percentage labels (Default: 0).

data.label Character decides what information needs to be displayed on the label in each pie slice. Possible options are "percentage" (default), "counts", "both".

bar.prop.test Decides whether proportion test for main variable is to be carried out for each level of condition (Default: TRUE).

ggtheme A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

package Name of package from which the palette is desired as string or symbol.

palette If a character string (e.g., "Set1"), will use that named palette. If a number, will index into the list of palettes of appropriate type. Default palette is "Dark2".

direction Either 1 or -1. If -1 the palette will be reversed.

ggplot.component A ggplot component to be added to the plot prepared by gggstatsplot. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.
messages Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Arguments passed on to combine_plots

title.text String or plotmath expression to be drawn as title for the combined plot.
title.color Text color for title.
title.size Point size of title text.
title.vjust Vertical justification for title. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.
title.hjust Horizontal justification for title. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.
title.fontface The font face ("plain", "bold" (default), "italic", "bold.italic") for title.
caption.text String or plotmath expression to be drawn as the caption for the combined plot.
caption.color Text color for caption.
caption.size Point size of title text.
caption.vjust Vertical justification for caption. Default = 0.5 (centered on y).
   0 = baseline at y, 1 = ascender at y.
caption.hjust Horizontal justification for caption. Default = 0.5 (centered on x).
   0 = flush-left at x, 1 = flush-right.
caption.fontface The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.
sub.text The label with which the combined plot should be annotated. Can be a plotmath expression.
sub.color Text color for annotation label (Default: "black").
sub.size Point size of annotation text (Default: 12).
sub.x The x position of annotation label (Default: 0.5).
sub.y The y position of annotation label (Default: 0.5).
sub.hjust Horizontal justification for annotation label (Default: 0.5).
sub.vjust Vertical justification for annotation label (Default: 0.5).
sub.vpadding Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the y and vjust parameters, this can be changed (Default: grid::unitHQL BlinesB).
sub.fontface The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.
sub.angle Angle at which annotation label is to be drawn (Default: 0).
sub.lineheight Line height of annotation label.
title.caption.rel.heights Numerical vector of relative columns heights while combining (title, plot, caption).
title.rel.heights Numerical vector of relative columns heights while combining (title, plot).
caption.rel.heights Numerical vector of relative columns heights while combining (plot, caption).
Unlike a number of statistical softwares, ggstatsplot doesn’t provide the option for Yates’ correction for the Pearson’s chi-squared statistic. This is due to compelling amount of Monte-Carlo simulation research which suggests that the Yates’ correction is overly conservative, even in small sample sizes. As such it is recommended that it should not ever be applied in practice (Camilli & Hopkins, 1978, 1979; Feinberg, 1980; Larntz, 1978; Thompson, 1988).

**Author(s)**

Indrajeet Patil, Chuck Powell

**See Also**

ggbarstats

**Examples**

```r
## Not run:
# with condition and with count data
library(jmv)

ggstatsplot::grouped_ggbarstats(
  data = as.data.frame(HairEyeColor),
  main = Hair,
  condition = Eye,
  counts = Freq,
  grouping.var = Sex
)

# the following will take slightly more amount of time
# for reproducibility
set.seed(123)

# let's create a smaller dataframe
diamonds_short <- ggplot2::diamonds %>%
  dplyr::filter(.data = ., cut %in% c("Very Good", "Ideal")) %>%
  dplyr::filter(.data = ., clarity %in% c("SI1", "SI2", "VS1", "VS2")) %>%
  dplyr::sample_frac(tbl = ., size = 0.05)

# plot
ggstatsplot::grouped_ggbarstats(
  data = diamonds_short,
  main = color,
  condition = clarity,
  grouping.var = cut,
  bf.message = TRUE,
  sampling.plan = "poisson",
  title.prefix = "Quality",
  data.label = "both",
  messages = FALSE,
)```
grouped_ggbetweenstats

Violin plots for group or condition comparisons in between-subjects designs repeated across all levels of a grouping variable.

Description

A combined plot of comparison plot created for levels of a grouping variable.

Usage

```r
grouped_ggbetweenstats(data, x, y, grouping.var, title.prefix = NULL, plot.type = "boxviolin", type = "parametric", pairwise.comparisons = FALSE, pairwise.annotation = "asterisk", pairwise.display = "significant", p.adjust.method = "holm", effsize.type = "unbiased", partial = TRUE, effsize.noncentral = TRUE, bf.prior = 0.707, bf.message = FALSE, results.subtitle = TRUE, xlab = NULL, ylab = NULL, subtitle = NULL, caption = NULL, sample.size.label = TRUE, k = 2, var.equal = FALSE, conf.level = 0.95, nboot = 100, tr = 0.1, axes.range.restrict = FALSE, mean.label.size = 3, mean.label.fontface = "bold", mean.label.color = "black", notch = FALSE, notchwidth = 0.5, linetype = "solid", outlier.tagging = FALSE, outlier.label = NULL, outlier.label.color = "black", outlier.color = "black", outlier.shape = 19, outlier.coef = 1.5, mean.plotting = TRUE, mean.ci = FALSE, mean.size = 5, mean.color = "darkred", point.jitter.width = NULL, point.jitter.height = 0, point.dodge.width = 0.6, ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, package = "RColorBrewer", palette = "Dark2", direction = 1, ggplot.component = NULL, messages = TRUE, ...)
```

Arguments

- `data` A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
- `x` The grouping variable from the dataframe data.
- `y` The response (a.k.a. outcome or dependent) variable from the dataframe data.
- `grouping.var` A single grouping variable (can be entered either as a bare name x or as a string "x").
title.prefix Character string specifying the prefix text for the fixed plot title (name of each factor level) (Default: NULL). If NULL, the variable name entered for grouping, var will be used.

plot.type Character describing the type of plot. Currently supported plots are "box" (for pure boxplots), "violin" (for pure violin plots), and "boxviolin" (for a combination of box and violin plots; default).

type Type of statistic expected ("parametric" or "nonparametric" or "robust" or "bayes"). Corresponding abbreviations are also accepted: "p" (for parametric), "np" (nonparametric), "r" (robust), or "bf" resp.

pairwise.comparisons Logical that decides whether pairwise comparisons are to be displayed. Only significant comparisons will be shown by default. (default: FALSE). To change this behavior, select appropriate option with pairwise.display argument.

pairwise.annotation Character that decides the annotations to use for pairwise comparisons. Either "p.value" or "asterisk" (default).

pairwise.display Decides which pairwise comparisons to display. Available options are "significant" (abbreviation accepted: "s") or "non-significant" (abbreviation accepted: "ns") or "everything"/"all". The default is "significant". You can use this argument to make sure that your plot is not uber-cluttered when you have multiple groups being compared and scores of pairwise comparisons being displayed.

p.adjust.method Adjustment method for p-values for multiple comparisons. Possible methods are: "holm" (default), "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none".

effsize.type Type of effect size needed for parametric tests. The argument can be "biased" ("d" for Cohen's d for t-test; "partial_eta" for partial eta-squared for anova) or "unbiased" ("g" Hedge's g for t-test; "partial_omega" for partial omega-squared for anova).

partial Logical that decides if partial eta-squared or omega-squared are returned (Default: TRUE). If FALSE, eta-squared or omega-squared will be returned. Valid only for objects of class lm, aov, anova, or aovlist.

effsize.noncentral Logical indicating whether to use non-central t-distributions for computing the confidence interval for Cohen's d or Hedge's g (Default: TRUE).

bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.

bf.message Logical that decides whether to display Bayes Factor in favor of the null hypothesis for parametric test (Default: FALSE).

results.subtitle Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.

xlab Labels for x and y axis variables. If NULL (default), variable names for x and y will be used.
**ylab**

Labels for x and y axis variables. If NULL (default), variable names for x and y will be used.

**subtitle**

The text for the plot subtitle. Will work only if results.subtitle = FALSE.

**caption**

The text for the plot caption.

**sample.size.label**

Logical that decides whether sample size information should be displayed for each level of the grouping variable x (Default: TRUE).

**k**

Number of digits after decimal point (should be an integer) (Default: k = 2).

**var.equal**

A logical variable indicating whether to treat the variances in the samples as equal. If TRUE, then a simple F test for the equality of means in a one-way analysis of variance is performed. If FALSE, an approximate method of Welch (1951) is used, which generalizes the commonly known 2-sample Welch test to the case of arbitrarily many samples.

**conf.level**

Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

**nboot**

Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

**tr**

Trim level for the mean when carrying out robust tests. If you get error stating "Standard error cannot be computed because of Winsorized variance of 0 (e.g., due to ties). Try to decrease the trimming level.", try to play around with the value of tr, which is by default set to 0.1. Lowering the value might help.

**axes.range.restrict**

Logical that decides whether to restrict the axes values ranges to min and max values of the axes variables (Default: FALSE), only relevant for functions where axes variables are of numeric type.

**mean.label.size**

Aesthetics for the label displaying mean. Defaults: 3, "bold", "black", respectively.

**mean.label.fontface**

Aesthetics for the label displaying mean. Defaults: 3, "bold", "black", respectively.

**mean.label.color**

Aesthetics for the label displaying mean. Defaults: 3, "bold", "black", respectively.

**notch**

A logical. If FALSE (default), a standard box plot will be displayed. If TRUE, a notched box plot will be used. Notches are used to compare groups; if the notches of two boxes do not overlap, this suggests that the medians are significantly different. In a notched box plot, the notches extend $1.58 \times \text{IQR} / \sqrt{n}$. This gives a roughly 95% confidence interval for comparing medians. IQR: Inter-Quartile Range.

**notchwidth**

For a notched box plot, width of the notch relative to the body (default 0.5).

**linetype**

Character strings ("blank", "solid", "dashed", "dotted", "dotdash", "longdash", and "twodash") specifying the type of line to draw box plots (Default: "solid"). Alternatively, the numbers 0 to 6 can be used (0 for "blank", 1 for "solid", etc.).
outlier.tagging  
Decides whether outliers should be tagged (Default: FALSE).

outlier.label  
Label to put on the outliers that have been tagged.

outlier.label.color  
Color for the label to put on the outliers that have been tagged (Default: "black").

outlier.color  
Default aesthetics for outliers (Default: "black").

outlier.shape  
Hiding the outliers can be achieved by setting outlier.shape = NA. Importantly, this does not remove the outliers, it only hides them, so the range calculated for the y-axis will be the same with outliers shown and outliers hidden.

outlier.coef  
Coefficient for outlier detection using Tukey's method. With Tukey's method, outliers are below (1st Quartile) or above (3rd Quartile) outlier.coef times the Inter-Quartile Range (IQR) (Default: 1.5).

mean.plotting  
Logical that decides whether mean is to be highlighted and its value to be displayed (Default: TRUE).

mean.ci  
Logical that decides whether 95 is to be displayed (Default: FALSE).

mean.size  
Point size for the data point corresponding to mean (Default: 5).

mean.color  
Color for the data point corresponding to mean (Default: "darkred").

point.jitter.width  
Numeric specifying the degree of jitter in x direction. Defaults to 40% of the resolution of the data.

point.jitter.height  
Numeric specifying the degree of jitter in y direction. Defaults to 0.1.

point.dodge.width  
Numeric specifying the amount to dodge in the x direction. Defaults to 0.60.

ggtheme  
A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer  
Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

package  
Name of package from which the palette is desired as string or symbol.

palette  
If a character string (e.g., "Set1"), will use that named palette. If a number, will index into the list of palettes of appropriate type. Default palette is "Dark2".

direction  
Either 1 or -1. If -1 the palette will be reversed.

ggplot.component  
A ggplot component to be added to the plot prepared by ggstatsplot. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.

messages  
Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).
Arguments passed on to `combine_plots`:

- **title.text**: String or plotmath expression to be drawn as title for the combined plot.
- **title.color**: Text color for title.
- **title.size**: Point size of title text.
- **title.vjust**: Vertical justification for title. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.
- **title.hjust**: Horizontal justification for title. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.
- **title.fontface**: The font face ("plain", "bold" (default), "italic", "bold.italic") for title.
- **caption.text**: String or plotmath expression to be drawn as the caption for the combined plot.
- **caption.color**: Text color for caption.
- **caption.size**: Point size of title text.
- **caption.vjust**: Vertical justification for caption. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.
- **caption.hjust**: Horizontal justification for caption. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.
- **caption.fontface**: The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.
- **sub.text**: The label with which the combined plot should be annotated. Can be a plotmath expression.
- **sub.color**: Text color for annotation label (Default: "black").
- **sub.size**: Point size of annotation text (Default: 12).
- **sub.x**: The x position of annotation label (Default: 0.5).
- **sub.y**: The y position of annotation label (Default: 0.5).
- **sub.hjust**: Horizontal justification for annotation label (Default: 0.5).
- **sub.vjust**: Vertical justification for annotation label (Default: 0.5).
- **sub.vpadding**: Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the y and vjust parameters, this can be changed (Default: grid::unitHQL BlinesBI).
- **sub.fontface**: The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.
- **sub.angle**: Angle at which annotation label is to be drawn (Default: 0).
- **sub.lineheight**: Line height of annotation label.
- **title.caption.rel.heights**: Numerical vector of relative columns heights while combining (title, plot, caption).
- **title.rel.heights**: Numerical vector of relative columns heights while combining (title, plot).
- **caption.rel.heights**: Numerical vector of relative columns heights while combining (plot, caption).
**grouped_ggbetweenstats**

**Details**

For parametric tests, Welch’s ANOVA/t-test are used as a default (i.e., `var.equal = FALSE`).

References:

- ANOVA: Delacre, Leys, Mora, & Lakens, *PsyArXiv*, 2018

If robust tests are selected, following tests are used is.

- ANOVA: one-way ANOVA on trimmed means (see `?WRS2::t1way`)
- *t*-test: Yuen’s test for trimmed means (see `?WRS2::yuen`)

Variant of this function `ggbetweenstats` is currently in progress. You can still use this function just to prepare the plot for exploratory data analysis, but the statistical details displayed in the subtitle will be incorrect. You can remove them by adding `ggplot2::labs(subtitle = NULL)`.

**Author(s)**

Indrajeet Patil, Chuck Powell

**References**

[https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggbetweenstats.html](https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggbetweenstats.html)

**See Also**

- `ggbetweenstats`

**Examples**

```r
# to get reproducible results from bootstrapping
set.seed(123)

# the most basic function call
ggstatsplot::grouped_ggbetweenstats(
  data = dplyr::filter(ggplot2::mpg, drv != "4"),
  x = year,
  y = hwy,
  grouping.var = drv,
  conf.level = 0.99,
  bf.message = TRUE
)

## Not run:
# modifying individual plots using `ggplot.component` argument
ggstatsplot::grouped_ggbetweenstats(
  data = dplyr::filter(
    ggstatsplot::movies_long,
    genre %in% c("Action", "Comedy"),
    mpaa %in% c("R", "PG")
  ),
)```
grouped_ggcorrmat

Visualization of a correlalogram (or correlation matrix) for all levels of a grouping variable

Description
Helper function for ggstatsplot::ggcorrmat to apply this function across multiple levels of a given factor and combining the resulting plots using ggstatsplot::combine_plots.

Usage

```r
grouped_ggcorrmat(data, cor.vars = NULL, cor.vars.names = NULL, grouping.var = mpaa, results.subtitle = FALSE, ggplot.component = ggplot2::scale_y_continuous(breaks = seq(1, 9, 1)), messages = FALSE)
```

Arguments

data Dataframe from which variables specified are preferentially to be taken.
cor.vars List of variables for which the correlation matrix is to be computed and visualized. If NULL (default), all numeric variables from data will be used.
cor.vars.names Optional list of names to be used for cor.vars. The names should be entered in the same order.
grouping.var A single grouping variable (can be entered either as a bare name x or as a string “x”).
title.prefix  Character string specifying the prefix text for the fixed plot title (name of each factor level) (Default: NULL). If NULL, the variable name entered for grouping.var will be used.

output  Character that decides expected output from this function: "plot" (for visualization matrix) or "correlations" (or "corr" or "r"; for correlation matrix) or "p-values" (or "p.values" or "p"; for a matrix of p-values) or "ci" (for a tibble with confidence intervals for unique correlation pairs) not available for robust correlation) or "n" (or "sample.size" for a tibble with sample sizes for each correlation pair).

matrix.type  Character, "full" (default), "upper" or "lower", display full matrix, lower triangular or upper triangular matrix.

method  Character argument that decides the visualization method of correlation matrix to be used. Allowed values are "square" (default), "circle"

corr.method  A character string indicating which correlation coefficient is to be computed ("pearson" (default) or "kendall" or "spearman"). "robust" can also be entered but only if output argument is set to either "correlations" or "p-values". The robust correlation used is percentage bend correlation (see ?WRS2::pbcor). Abbreviations will also work: "p" (for parametric/Pearson's r), "np" (nonparametric/Spearman's rho), "r" (robust).

type  A character string indicating which correlation coefficient is to be computed ("pearson" (default) or "kendall" or "spearman"). "robust" can also be entered but only if output argument is set to either "correlations" or "p-values". The robust correlation used is percentage bend correlation (see ?WRS2::pbcor). Abbreviations will also work: "p" (for parametric/Pearson's r), "np" (nonparametric/Spearman's rho), "r" (robust).

exact  A logical indicating whether an exact p-value should be computed. Used for Kendall's tau and Spearman's rho. For more details, see ?stats::cor.test.

continuity  A logical. If TRUE, a continuity correction is used for Kendall's tau and Spearman's rho when not computed exactly (Default: TRUE).

beta  A numeric bending constant for robust correlation coefficient (Default: .1).

digits  Decides the number of decimal digits to be displayed (Default: 2).

k  Decides the number of decimal digits to be displayed (Default: 2).

sig.level  Significance level (Default: .05). If the p-value in p-value matrix is bigger than sig.level, then the corresponding correlation coefficient is regarded as insignificant and flagged as such in the plot. This argument is relevant only when output = "plot".

p.adjust.method  What adjustment for multiple tests should be used? ("holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"). See stats::p.adjust for details about why to use "holm" rather than "bonferroni"). Default is "none". If adjusted p-values are displayed in the visualization of correlation matrix, the adjusted p-values will be used for the upper triangle, while unadjusted p-values will be used for the lower triangle of the matrix.

hc.order  Logical value. If TRUE, correlation matrix will be hc.ordered using hclust function (Default is FALSE).
The agglomeration method to be used in `hclust` (see `?hclust`).

Logical value. If TRUE, correlation coefficient values will be displayed in the plot.

Name of package from which the palette is desired as string or symbol.

Name of palette as string or symbol.

Either 1 or -1. If -1 the palette will be reversed.

A vector of 3 colors for low, mid, and high correlation values. If set to NULL, manual specification of colors will be turned off and 3 colors from the specified palette from package will be selected.

The outline color of square or circle. Default value is "gray".

A function, `ggplot2` theme name. Default value is `ggplot2::theme_bw()`. Any of the `ggplot2` themes, or themes from extension packages are allowed (e.g., `ggthemes::theme_fivethirtyeight()`, `hrbrthemes::theme_ipsum_ps()`, etc.).

Logical that decides whether `theme_ggstatsplot` theme elements are to be displayed along with the selected `ggtheme` (Default: TRUE).

The text for the plot subtitle.

The text for the plot caption. If not specified (if it is NULL, i.e.), a default caption will be shown.

Logical decides whether the default caption should be shown.

Color to be used for the correlation coefficient labels (applicable only when `lab = TRUE`).

Size to be used for the correlation coefficient labels (applicable only when `lab = TRUE`).

Character used to show specialized insignificant correlation coefficients ("pch" (default) or "blank"). If "blank", the corresponding glyphs will be removed; if "pch" is used, characters (see `?pch` for details) will be added on the corresponding glyphs.

Decides the glyphs (read point shapes) to be used for insignificant correlation coefficients (only valid when `insig = "pch"`). Default value is `pch = 4`.

The color and the cex (size) of `pch` (only valid when `insig = "pch"`). Defaults are `pch.col = "#F0E442"` and `pch.cex = 10`.

The color and the cex (size) of `pch` (only valid when `insig = "pch"`). Defaults are `pch.col = "#F0E442"` and `pch.cex = 10`.

The size, the color, and the string rotation of text label (variable names, i.e.).

The size, the color, and the string rotation of text label (variable names, i.e.).

Margins between x-axis and the variable name texts (t: top, r: right, b: bottom, l: left), especially useful in case the names are slanted, i.e. when the `tl.srt` is between 45 and 75 (Defaults: 0, 0, 0, 0, resp.).
Margins between x-axis and the variable name texts (t: top, r: right, b: bottom, l: left), especially useful in case the names are slanted, i.e. when the tl.srt is between 45 and 75 (Defaults: 0, 0, 0, 0, resp.).

Margins between x-axis and the variable name texts (t: top, r: right, b: bottom, l: left), especially useful in case the names are slanted, i.e. when the tl.srt is between 45 and 75 (Defaults: 0, 0, 0, 0, resp.).

Margins between x-axis and the variable name texts (t: top, r: right, b: bottom, l: left), especially useful in case the names are slanted, i.e. when the tl.srt is between 45 and 75 (Defaults: 0, 0, 0, 0, resp.).

Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Arguments passed on to combine_plots

title.text String or plotmath expression to be drawn as title for the combined plot.

title.color Text color for title.

title.size Point size of title text.

title.vjust Vertical justification for title. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.

title.hjust Horizontal justification for title. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.

title.fontface The font face ("plain", "bold" (default), "italic", "bold.italic") for title.

caption.text String or plotmath expression to be drawn as the caption for the combined plot.

caption.color Text color for caption.

caption.size Point size of title text.

caption.vjust Vertical justification for caption. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.

caption.hjust Horizontal justification for caption. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.

caption.fontface The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.

The label with which the combined plot should be annotated. Can be a plotmath expression.

Text color for annotation label (Default: "black").

Point size of annotation text (Default: 12).

The x position of annotation label (Default: 0.5).

The y position of annotation label (Default: 0.5).

Horizontal justification for annotation label (Default: 0.5).

Vertical justification for annotation label (Default: 0.5).
**sub.vpadding** Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the `y` and `vjust` parameters, this can be changed (Default: `grid::unit(1, "lines")`).

**sub.fontface** The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.

**sub.angle** Angle at which annotation label is to be drawn (Default: `0`).

**sub.lineheight** Line height of annotation label.

**title.caption.rel.heights** Numerical vector of relative columns heights while combining (title, plot, caption).

**title.rel.heights** Numerical vector of relative columns heights while combining (title, plot).

**caption.rel.heights** Numerical vector of relative columns heights while combining (plot, caption).

**Value**

Correlation matrix plot or correlation coefficient matrix or matrix of p-values.

**Author(s)**

Indrajeet Patil, Chuck Powell

**References**

https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggcorrmat.html

**See Also**

`ggcorrmat`, `ggscatterstats`, `grouped_ggscatterstats`

**Examples**

```r
# for reproducibility
set.seed(123)

# for plot
# (without specifying needed variables; all numeric variables will be used)
ggstatsplot::grouped_ggcorrmat(
  data = ggplot2::msleep,
  grouping.var = vore
)

# for getting plot
ggstatsplot::grouped_ggcorrmat(
  data = ggplot2::msleep,
  grouping.var = vore,
  cor.vars = sleep_total:bodywt,
  corr.method = "r",
)```
grouped_ggdotplotstats

Grouped histograms for distribution of a labelled numeric variable

Description

Helper function for ggstatsplot::ggdotplotstats to apply this function across multiple levels of a given factor and combining the resulting plots using ggstatsplot::combine_plots.

Usage

grouped_ggdotplotstats(data, x, y, grouping.var, title.prefix = NULL, xlab = NULL, ylab = NULL, subtitle = NULL, caption = NULL, type = "parametric", test.value = 0, bf.prior = 0.707, bf.message = FALSE, robust.estimator = "onestep", conf.level = 0.95, nboot = 100, k = 2, ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, point.color = "black", point.size = 3, point.shape = 16, results.subtitle = TRUE, centrality.par = "mean", centrality.color = "blue", centrality.size = 1, centrality.linetype = "dashed", centrality.line.labeller = TRUE, centrality.k = 2, test.value.line = FALSE, test.value.color = "black", test.value.size = 1,
grouped_ggdotplotstats

test.value.linetype = "dashed", test.line.labeller = TRUE,
test.k = 0, ggplot.component = NULL, messages = TRUE, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A
matrix or tables will not be accepted.
x A numeric variable.
y Label or grouping variable.
grouping.var A single grouping variable (can be entered either as a bare name x or as a string
"x").
title.prefix Character string specifying the prefix text for the fixed plot title (name of each
factor level) (Default: NULL). If NULL, the variable name entered for grouping.var will be used.
xlab Labels for x and y axis variables. If NULL (default), variable names for x and y
will be used.
ylab Label for y axis variable.
subtitle The text for the plot subtitle. Will work only if results.subtitle = FALSE.
caption The text for the plot caption.
type Type of statistic expected ("parametric" or "nonparametric" or "robust" or
"bayes"). Corresponding abbreviations are also accepted: "p" (for parametric),
"np" (nonparametric), "r" (robust), or "bf" resp.
test.value A number specifying the value of the null hypothesis (Default: 0).
bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating
Bayes factors.
bf.message Logical that decides whether to display Bayes Factor in favor of the null hypothesis for parametric test (Default: FALSE).
robust.estimator If test = "robust" robust estimator to be used ("onestep" (Default), "mom", or
"median"). For more, see ?WRS2::onesampb.
conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper
confidence intervals (0.95).
nboot Number of bootstrap samples for computing confidence interval for the effect
size (Default: 100).
k Number of digits after decimal point (should be an integer) (Default: k = 2).
ggtheme A function, ggplot2 theme name. Default value is ggplot2::theme_bw().
Any of the ggplot2 themes, or themes from extension packages are allowed
(e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(),
etc.).

ggstatsplot.layer Logical that decides whether theme_ggtestatsplot theme elements are to be
displayed along with the selected ggtheme (Default: TRUE).
point.color Character describing color for the point (Default: "black").
point.size Numeric specifying size for the point (Default: 3).
point.shape Numeric specifying shape to draw the points (Default: 16 (a dot)).
results.subtitle

Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.
centrality.param

Decides which measure of central tendency ("mean" or "median") is to be displayed as a vertical line.
centrality.color

Decides color for the vertical line for centrality parameter (Default: "blue").
centrality.size

Decides size for the vertical line for centrality parameter (Default: 1.2).
centrality.linetype

Decides linetype for the vertical line for centrality parameter (Default: "dashed").
centrality.line.labeller

A logical that decides whether line labels should be displayed for the centrality.param line (Default: TRUE).
centrality.k

Integer denoting the number of decimal places expected for centrality parameter label. (Default: 2).
test.value.line

Decides whether test value is to be displayed as a vertical line (Default: FALSE).
test.value.color

Decides color for the vertical line denoting test value (Default: "black").
test.value.size

Decides size for the vertical line for test value (Default: 1.2).
test.value.linetype

Decides linetype for the vertical line for test value (Default: "dashed").
test.line.labeller

A logical that decides whether line labels should be displayed for test.value line (Default: TRUE).
test.k

Integer denoting the number of decimal places expected for test.value label. (Default: 0).
ggplot.component

A ggplot component to be added to the plot prepared by ggstatsplot. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.
messages

Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Arguments passed on to combine_plots

title.text String or plotmath expression to be drawn as title for the combined plot.
title.color Text color for title.
**title.size**  Point size of title text.
**title.vjust**  Vertical justification for title. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.
**title.hjust**  Horizontal justification for title. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.
**title.fontface**  The font face ("plain", "bold" (default), "italic", "bold.italic") for title.
**caption.text**  String or plotmath expression to be drawn as the caption for the combined plot.
**caption.color**  Text color for caption.
**caption.size**  Point size of title text.
**caption.vjust**  Vertical justification for caption. Default = 0.5 (centered on y). 0 = baseline at y, 1 = ascender at y.
**caption.hjust**  Horizontal justification for caption. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.
**caption.fontface**  The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.
**sub.text**  The label with which the combined plot should be annotated. Can be a plotmath expression.
**sub.color**  Text color for annotation label (Default: "black").
**sub.size**  Point size of annotation text (Default: 12).
**sub.x**  The x position of annotation label (Default: 0.5).
**sub.y**  The y position of annotation label (Default: 0.5).
**sub.hjust**  Horizontal justification for annotation label (Default: 0.5).
**sub.vjust**  Vertical justification for annotation label (Default: 0.5).
**sub.vpadding**  Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the y and vjust parameters, this can be changed (Default: grid::unitHQL BlinesBI).
**sub.fontface**  The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.
**sub.angle**  Angle at which annotation label is to be drawn (Default: 0).
**sub.lineheight**  Line height of annotation label.
**title.caption.rel.heights**  Numerical vector of relative columns heights while combining (title, plot, caption).
**title.rel.heights**  Numerical vector of relative columns heights while combining (title, plot).
**caption.rel.heights**  Numerical vector of relative columns heights while combining (plot, caption).

**Author(s)**

Indrajeet Patil
grouped_gghistostats

See Also
ggdotplotstats

Examples

```r
# for reproducibility
set.seed(123)

# removing factor level with very few no. of observations
df <- dplyr::filter(.data = ggplot2::mpg, cyl %in% c("4", "6", "8"))

# plot
ggstatsplot::grouped_ggdotplotstats(  
data = df,
  x = "cty",
  y = "manufacturer",
  grouping.var = "cyl",
  test.value = 15.5,
  title.prefix = "cylinder count",
  ggpplot.component = ggplot2::scale_x_continuous(    
    sec.axis = ggplot2::dup_axis(),
    limits = c(12, 24),
    breaks = seq(12, 24, 2)
  ),
  messages = FALSE
)
```

---

**grouped_gghistostats**  
*Grouped histograms for distribution of a numeric variable*

**Description**

Helper function for ggstatsplot::gghistostats to apply this function across multiple levels of a given factor and combining the resulting plots using ggstatsplot::combine_plots.

**Usage**

```r
grouped_gghistostats(data, x, grouping.var, title.prefix = NULL,  
  binwidth = NULL, bar.measure = "count", xlab = NULL,  
  subtitle = NULL, caption = NULL, type = "parametric",  
  test.value = 0, bf.prior = 0.707, bf.message = FALSE,  
  robust.estimator = "onestep", effsize.type = "g",  
  effsize.noncentral = TRUE, conf.level = 0.95, nboot = 100, k = 2,  
  ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE,  
  fill.gradient = FALSE, low.color = "#0072B2",  
  high.color = "#D55E00", bar.fill = "grey50",  
  results.subtitle = TRUE, centrality.para = "mean",
```
centrality.color = "blue", centrality.size = 1,
centrality.linetype = "dashed", centrality.line.labeller = TRUE,
centrality.k = 2, test.value.line = FALSE,
test.value.color = "black", test.value.size = 1,
test.value.linetype = "dashed", test.line.labeller = TRUE,
test.k = 0, normal.curve = FALSE, normal.curve.color = "black",
normal.curve.linetype = "solid", normal.curve.size = 1,
ggplot.component = NULL, messages = TRUE, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A
matrix or tables will not be accepted.
x A numeric variable.
grouping.var A single grouping variable (can be entered either as a bare name x or as a string
"x").
title.prefix Character string specifying the prefix text for the fixed plot title (name of each
factor level) (Default: NULL). If NULL, the variable name entered for grouping.var
will be used.
binwidth The width of the histogram bins. Can be specified as a numeric value, or a func-
tion that calculates width from x. The default is to use the max(x) - min(x) / sqrt(N).
You should always check this value and explore multiple widths to find the best
to illustrate the stories in your data.
bar.measure Character describing what value needs to be represented as height in the bar
chart. This can either be "count", which shows number of points in bin, or
"density", which density of points in bin, scaled to integrate to 1, or "proportion",
which shows relative frequencies of observations in each bin, or "mix", which
shows both count and proportion in the same plot.
xlab Labels for x and y axis variables. If NULL (default), variable names for x and y
will be used.
subtitle The text for the plot subtitle. Will work only if results.subtitle = FALSE.
caption The text for the plot caption.
type Type of statistic expected ("parametric" or "nonparametric" or "robust" or
"bayes"). Corresponding abbreviations are also accepted: "p" (for parametric),
"np" (nonparametric), "r" (robust), or "bf" resp.
test.value A number specifying the value of the null hypothesis (Default: 0).
bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating
Bayes factors.
bf.message Logical that decides whether to display Bayes Factor in favor of the null hypo-
thesis for parametric test (Default: FALSE).
robust.estimator If test = "robust" robust estimator to be used ("onestep" (Default), "mom", or
"median"). For more, see ?WRS2::onesampb.
effsize.type Type of effect size needed for parametric tests. The argument can be "biased"
("d" for Cohen’s d) or "unbiased" ("g" Hedge’s g for t-test). The default is
effsize.noncentral Logical indicating whether to use non-central \( t \)-distributions for computing the confidence interval for Cohen’s \( d \) or Hedge’s \( g \) (Default: TRUE).

conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

nboot Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

k Number of digits after decimal point (should be an integer) (Default: \( k = 2 \)).

ggtheme A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

fill.gradient Logical decides whether color fill gradient is to be displayed (Default: FALSE). If FALSE, the legend and the color gradient will also be removed. The default is set to FALSE because the gradient provides redundant information in light of y-axis labels.

low.color Colors for low and high ends of the gradient. Defaults are colorblind-friendly.

high.color Colors for low and high ends of the gradient. Defaults are colorblind-friendly.

bar.fill If fill.gradient = FALSE, then bar.fill decides which color will uniformly fill all the bars in the histogram (Default: "grey50").

results.subtitle Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.

centrality.para Decides which measure of central tendency ("mean" or "median") is to be displayed as a vertical line.

centrality.color Decides color for the vertical line for centrality parameter (Default: "blue").

centrality.size Decides size for the vertical line for centrality parameter (Default: 1.2).

centrality.linetype Decides linetype for the vertical line for centrality parameter (Default: "dashed").

centrality.line.labeller A logical that decides whether line labels should be displayed for the centrality.para line (Default: TRUE).

centrality.k Integer denoting the number of decimal places expected for centrality parameter label. (Default: 2).

test.value.line Decides whether test value is to be displayed as a vertical line (Default: FALSE).

test.value.color Decides color for the vertical line denoting test value (Default: "black").
test.value.size
Decides size for the vertical line for test value (Default: 1.2).

test.value.linetype
Decides linetype for the vertical line for test value (Default: "dashed").

test.line.labeller
A logical that decides whether line labels should be displayed for test.value line
(Default: TRUE).

test.k
Integer denoting the number of decimal places expected for test.value label.
(Default: 0).

normal.curve
Logical decides whether to super-impose a normal curve using stats::dnorm(mean(x), sd(x)).
Default is FALSE.

normal.curve.color
If normal.curve = TRUE, then these arguments can be used to modify color
(Default: "black"), size (default: 1.0), linetype (default: "solid").

normal.curve.linetype
If normal.curve = TRUE, then these arguments can be used to modify color
(Default: "black"), size (default: 1.0), linetype (default: "solid").

normal.curve.size
If normal.curve = TRUE, then these arguments can be used to modify color
(Default: "black"), size (default: 1.0), linetype (default: "solid").

 ggplot.component
A ggplot component to be added to the plot prepared by ggstatsplot. This
argument is primarily helpful for grouped_ variant of the current function. De-
fault is NULL. The argument should be entered as a function. If the given function
has an argument axes.range.restrict and if it has been set to TRUE, the added
ggplot component might not work as expected.

messages
Decides whether messages references, notes, and warnings are to be displayed
(Default: TRUE).

Arguments passed on to combine_plots

title.text String or plotmath expression to be drawn as title for the combined
plot.

title.color Text color for title.

title.size Point size of title text.

title.vjust Vertical justification for title. Default = 0.5 (centered on y). 0 =
baseline at y, 1 = ascender at y.

title.hjust Horizontal justification for title. Default = 0.5 (centered on x). 0 =
flush-left at x, 1 = flush-right.

title.fontface The font face ("plain", "bold" (default), "italic", "bold.italic")
for title.

caption.text String or plotmath expression to be drawn as the caption for the
combined plot.

caption.color Text color for caption.

caption.size Point size of title text.

caption.vjust Vertical justification for caption. Default = 0.5 (centered on y).
0 = baseline at y, 1 = ascender at y.
caption.hjust  Horizontal justification for caption. Default = 0.5 (centered on x). 0 = flush-left at x, 1 = flush-right.
caption.fontface  The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.
sub.text  The label with which the combined plot should be annotated. Can be a plotmath expression.
sub.color  Text color for annotation label (Default: "black").
sub.size  Point size of annotation text (Default: 12).
sub.x  The x position of annotation label (Default: 0.5).
sub.y  The y position of annotation label (Default: 0.5).
sub.hjust  Horizontal justification for annotation label (Default: 0.5).
sub.vjust  Vertical justification for annotation label (Default: 0.5).
sub.vpadding  Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the y and vjust parameters, this can be changed (Default: grid::unit(1, "lines")).
sub.fontface  The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.
sub.angle  Angle at which annotation label is to be drawn (Default: 0).
sub.lineheight  Line height of annotation label.
title.caption.rel.heights  Numerical vector of relative columns heights while combining (title, plot, caption).
title.rel.heights  Numerical vector of relative columns heights while combining (title, plot).
caption.rel.heights  Numerical vector of relative columns heights while combining (plot, caption).

Author(s)
Indrajeet Patil, Chuck Powell

References
https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/gghistostats.html

See Also
gghistostats

Examples

ggstatsplot::grouped_gghistostats(
data = iris,
x = Sepal.Length,
test.value = 5,
bf.message = TRUE,
grouping.var = Species,
grouped_ggpiestats

Grouped pie charts with statistical tests

Description

Helper function for ggstatsplot::ggpiestats to apply this function across multiple levels of a given factor and combining the resulting plots using ggstatsplot::combine_plots.

Usage

grouped_ggpiestats(data, main, condition = NULL, counts = NULL, grouping.var = NULL, title.prefix = NULL, ratio = NULL, paired = FALSE, results.subtitle = TRUE, factor.levels = NULL, stat.title = NULL, sample.size.label = TRUE, label.separator = "\n", label.text.size = 4, label.fill.color = "white", label.fill.alpha = 1, bf.message = FALSE, sampling.plan = "indepmulti", fixed.margin = "rows", prior.concentration = 1, subtitle = NULL, caption = NULL, conf.level = 0.95, nboot = 100, simulate.p.value = FALSE, B = 2000, legend.title = NULL, facet.wrap.name = NULL, k = 2, perc.k = 0, slice.label = "percentage", facet.proptest = TRUE, ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, package = "RColorBrewer", palette = "Dark2", direction = 1, ggplot.component = NULL, messages = TRUE, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
main The variable to use as the rows in the contingency table.
condition The variable to use as the columns in the contingency table.
counts A string naming a variable in data containing counts, or NULL if each row represents a single observation (Default).

grouping.var A single grouping variable (can be entered either as a bare name x or as a string "x").
title.prefix Character string specifying the prefix text for the fixed plot title (name of each factor level) (Default: NULL). If NULL, the variable name entered for grouping.var will be used.
ratio A vector of numbers: the expected proportions for the proportion test. Default is NULL, which means if there are two levels ratio = c(1,1), etc.

paired Logical indicating whether data came from a within-subjects design study (Default: FALSE). If TRUE, McNemar test subtitle will be returned. If FALSE, Pearson's chi-square test will be returned.

results.subtitle Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.

factor.levels A character vector with labels for factor levels of main variable.

stat.title Title for the effect being investigated with the chi-square test. The default is NULL, i.e. no title will be added to describe the effect being shown. An example of a stat.title argument will be something like "main x condition" or "interaction".

sample.size.label Logical that decides whether sample size information should be displayed for each level of the grouping variable condition (Default: TRUE).

label.separator If "both" counts and proportion information is to be displayed in a label, this argument decides whether these two pieces of information are going to be on the same line (" ") or on separate lines ("\n").

label.text.size Numeric that decides text size for slice/bar labels (Default: 4).

label.fill.color Character that specifies fill color for slice/bar labels (Default: white).

label.fill.alpha Numeric that specifies fill color transparency or "alpha" for slice/bar labels (Default: 1 range 0 to 1).

bf.message Logical that decides whether to display a caption with results from bayes factor test in favor of the null hypothesis (default: FALSE).

sampling.plan Character describing the sampling plan. Possible options are "indepMulti" (independent multinomial; default), "poisson", "jointMulti" (joint multinomial), "hypergeom" (hypergeometric). For more, see ?BayesFactor::contingencyTableBF().

fixed.margin For the independent multinomial sampling plan, which margin is fixed ("rows" or "cols"). Defaults to "rows".

prior.concentration Specifies the prior concentration parameter, set to 1 by default. It indexes the expected deviation from the null hypothesis under the alternative, and corresponds to Gunel and Dickey's (1974) "a" parameter.

subtitle The text for the plot subtitle. Will work only if results.subtitle = FALSE.

caption The text for the plot caption.

conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

nboot Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).
simulate.p.value
    a logical indicating whether to compute p-values by Monte Carlo simulation.

B
    an integer specifying the number of replicates used in the Monte Carlo test.

legend.title
    Title text for the legend.

dataset.wrap.name
    The text for the dataset wrap variable label.

k
    Number of digits after decimal point (should be an integer) (Default: k = 2).

perc.k
    Numeric that decides number of decimal places for percentage labels (Default: 0).

slice.label
    Character decides what information needs to be displayed on the label in each
    pie slice. Possible options are "percentage" (default), "counts", "both".

dataset.proptest
    Decides whether proportion test for main variable is to be carried out for each
    level of condition (Default: TRUE).

ggtheme
    A function, ggplot2 theme name. Default value is ggplot2::theme_bw().
    Any of the ggplot2 themes, or themes from extension packages are allowed
    (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(),
    etc.).

ggstatsplot.layer
    Logical that decides whether theme_ggstatsplot theme elements are to be
    displayed along with the selected ggtheme (Default: TRUE).

package
    Name of package from which the palette is desired as string or symbol.

palette
    If a character string (e.g., "Set1"), will use that named palette. If a number, will
    index into the list of palettes of appropriate type. Default palette is "Dark2".

direction
    Either 1 or -1. If -1 the palette will be reversed.

ggplot.component
    A ggplot component to be added to the plot prepared by ggstatsplot. This
    argument is primarily helpful for grouped_ variant of the current function. De-
    fault is NULL. The argument should be entered as a function. If the given function
    has an argument axes.range.restrict and if it has been set to TRUE, the added
    ggplot component might not work as expected.

messages
    Decides whether messages references, notes, and warnings are to be displayed
    (Default: TRUE).

... Arguments passed on to combine_plots

title.text
    String or plotmath expression to be drawn as title for the combined
    plot.

title.color
    Text color for title.

title.size
    Point size of title text.

title.vjust
    Vertical justification for title. Default = 0.5 (centered on y). 0 =
    baseline at y, 1 = ascender at y.

title.hjust
    Horizontal justification for title. Default = 0.5 (centered on x). 0 =
    flush-left at x, 1 = flush-right.

title.fontface
    The font face ("plain", "bold" (default), "italic", "bold.italic")
    for title.
caption.text String or plotmath expression to be drawn as the caption for the combined plot.
caption.color Text color for caption.
caption.size Point size of title text.
caption.vjust Vertical justification for caption. Default = 0.5 (centered on y).
  \[ \theta = \text{baseline at } y, \quad 1 = \text{ascender at } y. \]
caption.hjust Horizontal justification for caption. Default = 0.5 (centered on x).
  \[ \theta = \text{flush-left at } x, \quad 1 = \text{flush-right}. \]
caption.fontface The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.
sub.text The label with which the combined plot should be annotated. Can be a plotmath expression.
sub.color Text color for annotation label (Default: "black").
sub.size Point size of annotation text (Default: 12).
sub.x The x position of annotation label (Default: 0.5).
sub.y The y position of annotation label (Default: 0.5).
sub.hjust Horizontal justification for annotation label (Default: 0.5).
sub.vjust Vertical justification for annotation label (Default: 0.5).
sub.vpadding Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the y and vjust parameters, this can be changed (Default: grid::unitHQL BlinesBI).
sub.fontface The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.
sub.angle Angle at which annotation label is to be drawn (Default: 0).
sub.lineheight Line height of annotation label.
title.caption.rel.heights Numerical vector of relative columns heights while combining (title, plot, caption).
title.rel.heights Numerical vector of relative columns heights while combining (title, plot).
caption.rel.heights Numerical vector of relative columns heights while combining (plot, caption).

Value

Unlike a number of statistical softwares, ggstatsplot doesn’t provide the option for Yates’ correction for the Pearson’s chi-squared statistic. This is due to compelling amount of Monte-Carlo simulation research which suggests that the Yates’ correction is overly conservative, even in small sample sizes. As such it is recommended that it should not ever be applied in practice (Camilli & Hopkins, 1978, 1979; Feinberg, 1980; Larntz, 1978; Thompson, 1988).

Author(s)

Indrajeet Patil, Chuck Powell
References

https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggpiestats.html

See Also

ggpiestats

Examples

```r
# grouped one-sample proportion tests
ggstatsplot::grouped_ggpiestats(
data = mtcars,
grouping.var = am,
main = cyl
)

# without condition and with count data
library(jmv)
ggstatsplot::grouped_ggpiestats(
data = as.data.frame(HairEyeColor),
main = Hair,
counts = Freq,
grouping.var = Sex
)

# the following will take slightly more amount of time
## Not run:
# for reproducibility
set.seed(123)

diamonds_short <- ggplot2::diamonds %>%
dplyr::filter(data = ., cut %in% c("Fair", "Very Good", "Ideal")) %>%
dplyr::sample_frac(tbl = ., size = 0.10)

# plot
ggstatsplot::grouped_ggpiestats(
data = diamonds_short,
main = color,
condition = clarity,
grouping.var = cut,
bf.message = TRUE,
sampling.plan = "poisson",
title.prefix = "Quality",
slice.label = "both",
messages = FALSE,
perc.k = 1,
nrow = 3
)
```
grouped_ggscatterstats

Scatterplot with marginal distributions for all levels of a grouping variable

Description

Grouped scatterplots from ggplot2 combined with marginal histograms/boxplots/density plots with statistical details added as a subtitle.

Usage

grouped_ggscatterstats(data, x, y, type = "pearson", conf.level = 0.95, 
bf.prior = 0.707, bf.message = FALSE, label.var = NULL, 
label.expression = NULL, grouping.var, title.prefix = NULL, 
xlab = NULL, ylab = NULL, method = "lm", method.args = list(), 
formula = y ~ x, point.color = "black", point.size = 3, 
point.alpha = 0.4, line.size = 1.5, point.width.jitter = 0, 
point.height.jitter = 0, line.color = "blue", marginal = TRUE, 
marginal.type = "histogram", marginal.size = 5, margins = c("both", 
"x", "y"), package = "wesanderson", palette = "Royal1", 
direction = 1, xfill = "#009E73", yfill = "#D55E00", xalpha = 1, 
yalpha = 1, xsize = 0.7, ysize = 0.7, centrality.para = NULL, 
results.subtitle = TRUE, caption = NULL, subtitle = NULL, 
nboot = 100, beta = 0.1, k = 2, axes.range.restrict = FALSE, 
ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE, 
ggplot.component = NULL, messages = TRUE, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.

x The column in data containing the explanatory variable to be plotted on the x axis. Can be entered either as a character string (e.g., "x") or as a bare expression (e.g., x).

y The column in data containing the response (outcome) variable to be plotted on the y axis. Can be entered either as a character string (e.g., "y") or as a bare expression (e.g., y).

type Type of association between paired samples required ("parametric": Pearson's product moment correlation coefficient or "nonparametric": Spearman's rho or "robust": percentage bend correlation coefficient or "bayes": Bayes Factor for Pearson's r'). Corresponding abbreviations are also accepted: "p" (for parametric/pearson's), "np" (nonparametric/spearman), "r" (robust), "bf" (for bayes factor), resp.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>conf.level</td>
<td>Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).</td>
</tr>
<tr>
<td>bf.prior</td>
<td>A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.</td>
</tr>
<tr>
<td>bf.message</td>
<td>Logical that decides whether to display Bayes Factor in favor of the null hypothesis for parametric test (Default: FALSE).</td>
</tr>
<tr>
<td>label.var</td>
<td>Variable to use for points labels. Can be entered either as a character string (e.g., &quot;var1&quot;) or as a bare expression (e.g., var1).</td>
</tr>
<tr>
<td>label.expression</td>
<td>An expression evaluating to a logical vector that determines the subset of data points to label. This argument can be entered either as a character string (e.g., &quot;y &lt; 4 &amp; z &lt; 20&quot;) or as a bare expression (e.g., y &lt; 4 &amp; z &lt; 20).</td>
</tr>
<tr>
<td>grouping.var</td>
<td>A single grouping variable (can be entered either as a bare name x or as a string &quot;x&quot;).</td>
</tr>
<tr>
<td>title.prefix</td>
<td>Character string specifying the prefix text for the fixed plot title (name of each factor level) (Default: NULL). If NULL, the variable name entered for grouping.var will be used.</td>
</tr>
<tr>
<td>xlab</td>
<td>Labels for x and y axis variables. If NULL (default), variable names for x and y will be used.</td>
</tr>
<tr>
<td>ylab</td>
<td>Labels for x and y axis variables. If NULL (default), variable names for x and y will be used.</td>
</tr>
<tr>
<td>method</td>
<td>Smoothing method (function) to use, accepts either a character vector, e.g. &quot;auto&quot;, &quot;lm&quot;, &quot;glm&quot;, &quot;gam&quot;, &quot;loess&quot; or a function, e.g. MASS::rlm or mgcv::gam, base::lm, or base::loess.</td>
</tr>
<tr>
<td>method.args</td>
<td>List of additional arguments passed on to the modelling function defined by method.</td>
</tr>
<tr>
<td>formula</td>
<td>Formula to use in smoothing function, e.g. y ~ x, y ~ poly(x, 2), y ~ log(x)</td>
</tr>
<tr>
<td>point.color</td>
<td>Aesthetics specifying geom point (defaults: point.color = &quot;black&quot;, point.size = 3, point.alpha = 1)</td>
</tr>
<tr>
<td>point.size</td>
<td>Aesthetics specifying geom point (defaults: point.color = &quot;black&quot;, point.size = 3, point.alpha = 1)</td>
</tr>
<tr>
<td>point.alpha</td>
<td>Aesthetics specifying geom point (defaults: point.color = &quot;black&quot;, point.size = 3, point.alpha = 1)</td>
</tr>
<tr>
<td>line.size</td>
<td>Size for the regression line.</td>
</tr>
<tr>
<td>point.width.jitter</td>
<td>Degree of jitter in x and y direction, respectively. Defaults to 0 (0 data).</td>
</tr>
<tr>
<td>point.height.jitter</td>
<td>Degree of jitter in x and y direction, respectively. Defaults to 0 (0 data).</td>
</tr>
<tr>
<td>line.color</td>
<td>Color for the regression line.</td>
</tr>
</tbody>
</table>
marginal
Decides whether ggExtra::ggMarginal() plots will be displayed; the default is TRUE.
marginal.type
Type of marginal distribution to be plotted on the axes ("histogram", "boxplot", "density", "violin", "densigram").
marginal.size
Integer describing the relative size of the marginal plots compared to the main plot. A size of 5 means that the main plot is 5x wider and 5x taller than the marginal plots.
margins
Character describing along which margins to show the plots. Any of the following arguments are accepted: "both", "x", "y".
package
Name of package from which the palette is desired as string or symbol.
palette
Name of palette as string or symbol.
direction
Either Q or MQ. If MQ the palette will be reversed.
xfill
Character describing color fill for x and y axes marginal distributions (default: "#000E73" (for x) and "#D55E00" (for y)). If set to NULL, manual specification of colors will be turned off and 2 colors from the specified palette from package will be selected.
yfill
Character describing color fill for x and y axes marginal distributions (default: "#000E73" (for x) and "#D55E00" (for y)). If set to NULL, manual specification of colors will be turned off and 2 colors from the specified palette from package will be selected.
xalpha
Numeric deciding transparency levels for the marginal distributions. Any numbers from 0 (transparent) to 1 (opaque). The default is 1 for both axes.
yalpha
Numeric deciding transparency levels for the marginal distributions. Any numbers from 0 (transparent) to 1 (opaque). The default is 1 for both axes.
xsize
Size for the marginal distribution boundaries (Default: 0.7).
ysize
Size for the marginal distribution boundaries (Default: 0.7).
centrality.par
Decides which measure of central tendency ("mean" or "median") is to be displayed as vertical (for x) and horizontal (for y) lines.
results.subtitle
Decides whether the results of statistical tests are to be displayed as a subtitle (Default: TRUE). If set to FALSE, only the plot will be returned.
caption
The text for the plot caption.
subtitle
The text for the plot subtitle. Will work only if results.subtitle = FALSE.
nboot
Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).
beta
Bending constant (Default: 0.1). For more, see ?WRS2::pbcor.
k
Number of digits after decimal point (should be an integer) (Default: k = 2).
axes.range.restrict
Logical that decides whether to restrict the axes values ranges to min and max values of the axes variables (Default: FALSE), only relevant for functions where axes variables are of numeric type.
grouped_ggscatterstats

**ggtheme**
A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

**ggstatsplot.layer**
Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

**ggplot.component**
A ggplot component to be added to the plot prepared by ggstatsplot. This argument is primarily helpful for grouped_ variant of the current function. Default is NULL. The argument should be entered as a function. If the given function has an argument axes.range.restrict and if it has been set to TRUE, the added ggplot component might not work as expected.

**messages**
Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

... Arguments passed on to combine_plots

**title.text** String or plotmath expression to be drawn as title for the combined plot.

**title.color** Text color for title.

**title.size** Point size of title text.

**title.vjust** Vertical justification for title. Default = 0.5 (centered on y). \(0 = \) baseline at y, \(1 = \) ascender at y.

**title.hjust** Horizontal justification for title. Default = 0.5 (centered on x). \(0 = \) flush-left at x, \(1 = \) flush-right.

**title.fontface** The font face ("plain", "bold" (default), "italic", "bold.italic") for title.

**caption.text** String or plotmath expression to be drawn as the caption for the combined plot.

**caption.color** Text color for caption.

**caption.size** Point size of title text.

**caption.vjust** Vertical justification for caption. Default = 0.5 (centered on y). \(0 = \) baseline at y, \(1 = \) ascender at y.

**caption.hjust** Horizontal justification for caption. Default = 0.5 (centered on x). \(0 = \) flush-left at x, \(1 = \) flush-right.

**caption.fontface** The font face ("plain" (default), "bold", "italic", "bold.italic") for caption.

**sub.text** The label with which the combined plot should be annotated. Can be a plotmath expression.

**sub.color** Text color for annotation label (Default: "black").

**sub.size** Point size of annotation text (Default: 12).

**sub.x** The x position of annotation label (Default: 0.5).

**sub.y** The y position of annotation label (Default: 0.5).

**sub.hjust** Horizontal justification for annotation label (Default: 0.5).

**sub.vjust** Vertical justification for annotation label (Default: 0.5).
sub.vpadding Vertical padding. The total vertical space added to the label, given in grid units. By default, this is added equally above and below the label. However, by changing the y and vjust parameters, this can be changed (Default: grid::unit(1, "lines")).

sub.fontface The font face ("plain" (default), "bold", "italic", "bold.italic") for the annotation label.

sub.angle Angle at which annotation label is to be drawn (Default: 0).

sub.lineheight Line height of annotation label.

title.caption.rel.heights Numerical vector of relative columns heights while combining (title, plot, caption).

title.rel.heights Numerical vector of relative columns heights while combining (title, plot).

caption.rel.heights Numerical vector of relative columns heights while combining (plot, caption).

Author(s)
Indrajeet Patil, Chuck Powell

References
https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/ggscatterstats.html

See Also
ggscatterstats, ggcorrmat, grouped_ggcorrmat

Examples

```r
# Not run:
# to ensure reproducibility
set.seed(123)

# basic function call
ggstatsplot::grouped_ggscatterstats(
data = dplyr::filter(
  ggstatsplot::movies_long,
genre == "Comedy" |
genre == "Drama"
),
x = length,
y = rating,
method = "lm",
formula = y ~ x + I(x^3),
grouping.var = genre
)

# using labeling
# (also show how to modify basic plot from within function call)
```
**intent_morality**

Moral judgments about third-party moral behavior.

**Description**

Moral judgments about third-party moral behavior.

**Usage**

```r
intent_morality
```
Format

A data frame with 4016 rows and 8 variables

- id. Participant id.
- item. Which story/vignette participants read for a given condition.
- harm. What kind of harm was involved in the item.
- belief. What kind of belief the actor had (neutral or negative/harmful).
- outcome. What kind of outcome the actor caused (neutral or negative/harmful).
- condition. Type of harm, composed of belief and outcome.
- question. Type of moral judgment asked (wrongness or punishment).
- rating. Moral judgment rating on a scale of 1 to 7.

Details

This dataset contains data from a recent study about how people judge behavior of others when they unintentionally or intentionally cause harm to others.

Participants responded to four different vignettes that contains four different types of conditions-

- accidental harm. neutral belief, harmful/negative outcome
- intentional harm. harmful/negative belief, harmful/negative outcome
- attempted harm. harmful/negative belief, neutral outcome
- neutral harm. neutral belief, neutral outcome

Additionally, participants saw one of the four variants for each of the four items. Each of the item had a different type of harm.

Source

https://www.nature.com/articles/s41598-017-05299-9

Examples

dim(intent_morality)
head(intent_morality)
dplyr::glimpse(intent_morality)
Edgar Anderson's Iris Data in long format.

**Description**

Edgar Anderson’s Iris Data in long format.

**Usage**

`iris_long`

**Format**

A data frame with 600 rows and 5 variables

- id. Dummy identity number for each flower (150 flowers in total).
- Species. The species are *Iris setosa*, *versicolor*, and *virginica*.
- attribute. What attribute is being measured ("Sepal" or "Petal").
- measure. What aspect of the attribute is being measured ("Length" or "Width").
- value. Value of the measurement.

**Details**

This famous (Fisher’s or Anderson’s) iris data set gives the measurements in centimeters of the variables sepal length and width and petal length and width, respectively, for 50 flowers from each of 3 species of iris. The species are *Iris setosa*, *versicolor*, and *virginica*.

This is a modified dataset from datasets package.

**Source**


**Examples**

```r
dim(iris_long)
head(iris_long)
dplyr::glimpse(iris_long)
```
movies_long

$\text{movies_long}$

Movie information and user ratings from IMDB.com (long format).

Description

Movie information and user ratings from IMDB.com (long format).

Usage

movies_long

Format

A data frame with 1,579 rows and 8 variables

- title. Title of the movie.
- year. Year of release.
- budget. Total budget (if known) in US dollars
- length. Length in minutes.
- rating. Average IMDB user rating.
- votes. Number of IMDB users who rated this movie.
- mpaa. MPAA rating.
- genre. Different genres of movies (action, animation, comedy, drama, documentary, romance, short).

Details

Modified dataset from ggplot2movies package.


Movies were are identical to those selected for inclusion in movies_wide but this dataset has been constructed such that every movie appears in one and only one genre category.

Source

https://CRAN.R-project.org/package=ggplot2movies

Examples

dim(movies_long)
head(movies_long)
dplyr::glimpse(movies_long)
movies_wide

Movie information and user ratings from IMDB.com (wide format).

Description

Movie information and user ratings from IMDB.com (wide format).

Usage

movies_wide

Format

A data frame with 1,579 rows and 13 variables

- title. Title of the movie.
- year. Year of release.
- budget. Total budget in millions of US dollars
- length. Length in minutes.
- rating. Average IMDB user rating.
- votes. Number of IMDB users who rated this movie.
- mpaa. MPAA rating.
- action, animation, comedy, drama, documentary, romance, short. Binary variables representing if movie was classified as belonging to that genre.
- NumGenre. The number of different genres a film was classified in as an integer between one and four

Details

Modified dataset from ggplot2movies package.


Movies were selected for inclusion if they had a known length and had been rated by at least one imdb user. Small categories such as documentaries and NC-17 movies were removed.

Source

https://CRAN.R-project.org/package=ggplot2movies

Examples

dim(movies_wide)
head(movies_wide)
dplyr::glimpse(movies_wide)
normality_message

Display normality test result as a message.

Description

A note to the user about the validity of assumptions for the default linear model.

Usage

normality_message(x, lab = NULL, k = 2, output = "message", ...)

Arguments

x  A numeric vector.
lab A character describing label for the variable. If NULL, a generic "x" label will be used.
k  Number of digits after decimal point (should be an integer) (Default: k = 2).
output What output is desired: "message" (default) or "stats" (or "tidy") objects.
...  Additional arguments (ignored).

Value

A list with class "htest" containing the following components:

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.
method    the character string "Shapiro-Wilk normality test".
data.name  a character string giving the name(s) of the data.

Author(s)

Indrajeet Patil

See Also

ggbetweenstats

Other helper_messages: bartlett_message, effsize_ci_message, ggcorrmat_matrix_message, grouped_message, pairwise_p, palette_message
Examples

```r
# message
cnormality_message(
  x = anscombe$x1,
  lab = "x1",
  k = 3
)

# statistical test object
ggstatsplot::normality_message(
  x = anscombe$x2,
  output = "tidy"
)
```

---

**outlier_df**  
*Adding a column to dataframe describing outlier status.*

**Description**

This function is mostly helpful for internal operations of some of the functions in this package.

**Usage**

```r
outlier_df(data, x, y, outlier.label, outlier.coef = 1.5, ...)
```

**Arguments**

- **data**: A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will **not** be accepted.
- **x**: The grouping variable from the dataframe data.
- **y**: The response (a.k.a. outcome or dependent) variable from the dataframe data.
- **outlier.label**: Label to put on the outliers that have been tagged.
- **outlier.coef**: Coefficient for outlier detection using Tukey’s method. With Tukey’s method, outliers are below (1st Quartile) or above (3rd Quartile) outlier.coef times the Inter-Quartile Range (IQR) (Default: 1.5).
- **...**: Additional arguments.

**Author(s)**

Indrajeet Patil
pairwise_p

Examples

# adding column for outlier and a label for that outlier
ggstatsplot::outlier_df(
  data = morley,
  x = Expt,
  y = Speed,
  outlier.label = Run,
  outlier.coef = 2
)  
dplyr::arrange(outlier)

pairwise_p  

Pairwise comparison tests

Description

Calculate pairwise comparisons between group levels with corrections for multiple testing.

Usage

pairwise_p(data, x, y, type = "parametric", tr = 0.1, paired = FALSE,
  var.equal = FALSE, p.adjust.method = "holm", k = 2,
  messages = TRUE, ...)

Arguments

data  
  A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.

x  
  The grouping variable from the dataframe data.

y  
  The response (a.k.a. outcome or dependent) variable from the dataframe data.

type  
  Type of statistic expected ("parametric" or "nonparametric" or "robust" or "bayes"). Corresponding abbreviations are also accepted: "p" (for parametric), "np" (nonparametric), "r" (robust), or "bf" resp.

tr  
  Trim level for the mean when carrying out robust tests. If you get error stating "Standard error cannot be computed because of Winsorized variance of 0 (e.g., due to ties). Try to decrease the trimming level.", try to play around with the value of tr, which is by default set to 0.1. Lowering the value might help.

paired  
  a logical indicating whether you want a paired t-test.

var.equal  
  a logical variable indicating whether to treat the variances in the samples as equal. If TRUE, then a simple F test for the equality of means in a one-way analysis of variance is performed. If FALSE, an approximate method of Welch (1951) is used, which generalizes the commonly known 2-sample Welch test to the case of arbitrarily many samples.
p.adjust.method
Adjustment method for \( p \)-values for multiple comparisons. Possible methods are: "holm" (default), "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none".

k
Number of digits after decimal point (should be an integer) (Default: \( k = 2 \)).

messages
Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

Additional arguments.

Author(s)
Indrajeet Patil

See Also
ggbetweenstats, grouped_ggbetweenstats

Other helper_messages: bartlett_message, effsize_ci_message, ggcormat_matrix_message, grouped_message, normality_message, palette_message

Examples

# time consuming, so not run on `CRAN` machines
## Not run:
# show all columns in a tibble
options(tibble.width = Inf)

# for reproducibility
set.seed(123)

#---------------------- between-subjects design --------------------------

# parametric
# if `\var.equal = TRUE`, then Student's \( t \)-test will be run
ggstatsplot::pairwise_p(
  data = ggplot2::msleep,
  x = vore,
  y = brainwt,
  type = "p",
  var.equal = TRUE,
  paired = FALSE,
  p.adjust.method = "bonferroni"
)

# if `\var.equal = FALSE`, then Games-Howell test will be run
ggstatsplot::pairwise_p(
  data = ggplot2::msleep,
  x = vore,
  y = brainwt,
  type = "p",
  var.equal = FALSE,

```r
# non-parametric
ggstatsplot::pairwise_p(  
  data = ggplot2::msleep,  
  x = vore,  
  y = brainwt,  
  type = "np",  
  paired = FALSE,  
  p.adjust.method = "none"
)

# robust  
ggstatsplot::pairwise_p(  
  data = ggplot2::msleep,  
  x = vore,  
  y = brainwt,  
  type = "r",  
  paired = FALSE,  
  p.adjust.method = "fdr"
)

## End(Not run)

# converting to long format  
bugs_long <- bugs %>%  
tibble::as_tibble(.) %>%  
tidyrr::gather(., key, value, LDF:HDHF)

# parametric  
ggstatsplot::pairwise_p(  
  data = bugs_long,  
  x = key,  
  y = value,  
  type = "p",  
  paired = TRUE,  
  p.adjust.method = "BH"
)

# non-parametric  
ggstatsplot::pairwise_p(  
  data = bugs_long,  
  x = key,  
  y = value,  
  type = "np",  
  paired = TRUE,
```

```
subtitle_anova_bayes

Making text subtitle for the between-subject one-way anova designs.

Description

Making text subtitle for the between-subject one-way anova designs.

Usage

subtitle_anova_bayes(data, x, y, effsize.type = \"unbiased\", partial = TRUE, var.equal = FALSE, bf.prior = 0.707, paired = FALSE, k = 2, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.

x The grouping variable from the dataframe data.

y The response (a.k.a. outcome or dependent) variable from the dataframe data.

effsize.type Type of effect size needed for parametric tests. The argument can be \"biased\" (\"d\" for Cohen’s $d$ for t-test; \"partial_eta\" for partial eta-squared for anova) or \"unbiased\" (\"g\" Hedge’s $g$ for t-test; \"partial_omega\" for partial omega-squared for anova).

partial Logical that decides if partial eta-squared or omega-squared are returned (Default: TRUE). If FALSE, eta-squared or omega-squared will be returned. Valid only for objects of class lm, aov, anova, or aovlist.

var.equal a logical variable indicating whether to treat the variances in the samples as equal. If TRUE, then a simple F test for the equality of means in a one-way analysis of variance is performed. If FALSE, an approximate method of Welch (1951) is used, which generalizes the commonly known 2-sample Welch test to the case of arbitrarily many samples.

bf.prior A number between 0.5 and 2 (default \0.707\), the prior width to use in calculating Bayes factors.
subtitle_anova_parametric

Making text subtitle for the between-subject anova designs.

Description

Making text subtitle for the between-subject anova designs.

Usage

subtitle_anova_parametric(data, x, y, effsize.type = "unbiased", partial = TRUE, conf.level = 0.95, nboot = 100, var.equal = FALSE, k = 2, messages = TRUE, ...)

Examples

```r
# Not run:
## with defaults
subtitle_anova_bayes(
  data = ggplot2::msleep,
  x = vore,
  y = sleep_rem,
  k = 2,
  bf.prior = 0.8
)

# modifying the defaults
subtitle_anova_bayes(
  data = ggplot2::msleep,
  x = vore,
  y = sleep_rem,
  effsize.type = "partial_eta",
  var.equal = TRUE
)

## End(Not run)
```
Arguments

data
A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.

x
The grouping variable from the dataframe data.

y
The response (a.k.a. outcome or dependent) variable from the dataframe data.

effsize.type
Type of effect size needed for parametric tests. The argument can be "biased" ("d" for Cohen’s d for t-test; "partial_eta" for partial eta-squared for anova) or "unbiased" ("g" for Hedge’s g for t-test; "partial_omega" for partial omega-squared for anova).

partial
Logical that decides if partial eta-squared or omega-squared are returned (Default: TRUE). If FALSE, eta-squared or omega-squared will be returned. Valid only for objects of class lm, aov, anova, or aovlist.

conf.level
Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

nboot
Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

var.equal
a logical variable indicating whether to treat the variances in the samples as equal. If TRUE, then a simple F test for the equality of means in a one-way analysis of variance is performed. If FALSE, an approximate method of Welch (1951) is used, which generalizes the commonly known 2-sample Welch test to the case of arbitrarily many samples.

k
Number of digits after decimal point (should be an integer) (Default: k = 2).

messages
Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

... Additional arguments.

Author(s)

Indrajeet Patil

Examples

# with defaults
subtitle_anova_parametric(
  data = ggplot2::msleep,
  x = vore,
  y = sleep_rem,
  k = 3
)

# modifying the defaults
subtitle_anova_parametric(
  data = ggplot2::msleep,
  x = vore,
  y = sleep_rem,
  effsize.type = "biased",
  partial = FALSE,
Making text subtitle for the robust ANOVA (between-subjects designs).

Description

Making text subtitle for the robust ANOVA (between-subjects designs).

Usage

subtitle_anova_robust(data, x, y, tr = 0.1, nboot = 100,
conf.level = 0.95, conf.type = "norm", messages = TRUE, k = 2,
...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A
matrix or tables will not be accepted.
x The grouping variable from the dataframe data.
y The response (a.k.a. outcome or dependent) variable from the dataframe data.
tr Trim level for the mean when carrying out robust tests. If you get error stating
"Standard error cannot be computed because of Winsorized variance of 0 (e.g.,
due to ties). Try to decrease the trimming level." , try to play around with the
value of tr , which is by default set to 0.1. Lowering the value might help.
nboot Number of bootstrap samples for computing confidence interval for the effect
size (Default: 100).
conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper
confidence intervals (0.95).
conf.type A vector of character strings representing the type of intervals required. The
value should be any subset of the values "norm", "basic", "perc", "bca". For
more, see ?boot::boot.ci.
messages Decides whether messages references, notes, and warnings are to be displayed
( Default: TRUE).
k Number of digits after decimal point (should be an integer) (Default: k = 2).
... Additional arguments.

Author(s)

Indrajeet Patil
Examples

```r
# examples not executed due to time constraints
## Not run:
# for reproducibility
set.seed(123)

# going with the defaults
subtitle_anova_robust(
  data = ggplot2::midwest,
  x = state,
  y = percbelowpoverty,
  nboot = 10
)

# changing defaults
subtitle_anova_robust(
  data = ggplot2::midwest,
  x = state,
  y = percollege,
  tr = 0.2,
  nboot = 10
)

## End(Not run)
```

Usage

```r
subtitle_contingency_tab(data, main, condition, counts = NULL, 
nboot = 100, paired = FALSE, stat.title = NULL, 
conf.level = 0.95, conf.type = "norm", simulate.p.value = FALSE, 
B = 2000, bias.correct = FALSE, k = 2, messages = TRUE, ...)
```

Arguments

- `data`: A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will **not** be accepted.
main
The variable to use as the rows in the contingency table.

condition
The variable to use as the columns in the contingency table.

counts
A string naming a variable in data containing counts, or NULL if each row represents a single observation (Default).

nboot
Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

paired
Logical indicating whether data came from a within-subjects design study (Default: FALSE). If TRUE, McNemar test subtitle will be returned. If FALSE, Pearson’s chi-square test will be returned.

stat.title
Title for the effect being investigated with the chi-square test. The default is NULL, i.e. no title will be added to describe the effect being shown. An example of a stat.title argument will be something like "main x condition" or "interaction".

conf.level
Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

conf.type
A vector of character strings representing the type of intervals required. The value should be any subset of the values "norm", "basic", "perc", "bca". For more, see ?boot::boot.ci.

simulate.p.value
a logical indicating whether to compute p-values by Monte Carlo simulation.

B
an integer specifying the number of replicates used in the Monte Carlo test.

bias.correct
If TRUE, a bias correction will be applied to Cramer’s V.

k
Number of digits after decimal point (should be an integer) (Default: k = 2).

messages
Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

...
Additional arguments (currently ignored).

Author(s)
Indrajeet Patil

See Also

ggpiestats

Examples

# without counts data
subtitle_contingency_tab(
  data = mtcars,
  main = am,
  condition = cyl,
  nboot = 15
)
library(jmv)

as.data.frame(HairEyeColor) %>%
dplyr::filter(.data ==., Sex == "Male") %>%
subtitle_contingency_tab(
  data = .,
  main = Hair,
  condition = Sex,
  counts = Freq
)

subtitle_friedman_nonparametric

Making text subtitle for the Friedman Rank Sum Test (nonparametric ANOVA) (within-subjects designs).

Description

Making text subtitle for the Friedman Rank Sum Test (nonparametric ANOVA) (within-subjects designs).

Usage

subtitle_friedman_nonparametric(data, x, y, messages = TRUE, k = 2, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
x The grouping variable from the dataframe data.
y The response (a.k.a. outcome or dependent) variable from the dataframe data.
messages Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).
k Number of digits after decimal point (should be an integer) (Default: k = 2).
... Additional arguments (ignored).

Author(s)

Indrajeet Patil
subtitle_ggscatterstats

Examples

```r
# setup
set.seed(123)
library(ggstatsplot)
library(jmv)
data("bugs", package = "jmv")

# converting to long format
data_bugs <- bugs %>%
  tibble::as_tibble(.) %>%
  tidyr::gather(., key, value, LDLF:HDHF)

# creating the subtitle
ggstatsplot::subtitle_friedman_nonparametric(
  data = data_bugs,
  x = key,
  y = value,
  k = 2
)
```

subtitle_ggscatterstats

*Making text subtitle for the correlation test.*

Description

Making text subtitle for the correlation test.

Usage

`subtitle_ggscatterstats(data, x, y, nboot = 100, beta = 0.1,` `type = "pearson", bf.prior = 0.707, conf.level = 0.95,` `conf.type = "norm", messages = TRUE, k = 2, ...)`

Arguments

- `data` A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
- `x` A vector containing the explanatory variable.
- `y` The response - a vector of length the number of rows of `x`.
- `nboot` Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).
- `beta` bending constant (Default: 0.1). For more, see `?WRS2::pbcor`.
- `type` Type of association between paired samples required ("parametric": Pearson’s product moment correlation coefficient" or "nonparametric": Spearman’s rho" or "robust": percentage bend correlation coefficient" or "bayes":
Bayes Factor for Pearson’s $r$). Corresponding abbreviations are also accepted: "p" (for parametric/pearson’s), "np" (nonparametric/spearman), "r" (robust), "bf" (for bayes factor), resp.

bf.prior  A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.

conf.level  Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

conf.type  A vector of character strings representing the type of intervals required. The value should be any subset of the values "norm", "basic", "perc", "bca". For more, see ?boot::boot.ci.

messages  Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

k  Number of digits after decimal point (should be an integer) (Default: k = 2).

...  further arguments to be passed to or from methods.

Author(s)

Indrajeet Patil

Examples

# without changing defaults
subtitle_ggscatterstats(
  data = ggplot2::midwest,
  x = area,
  y = percblack
)

# changing defaults
subtitle_ggscatterstats(
  data = ggplot2::midwest,
  x = area,
  y = percblack,
  nboot = 25,
  beta = 0.2,
  type = "r",
  k = 1
)
**Description**

Making text subtitle for the Kruskal-Wallis test (nonparametric ANOVA) (between-subjects designs).

**Usage**

```r
subtitle_kw_nonparametric(data, x, y, messages = TRUE, k = 2, nboot = 100, conf.level = 0.95, conf.type = "norm", ...)
```

**Arguments**

- `data`: A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will **not** be accepted.
- `x`: The grouping variable from the dataframe `data`.
- `y`: The response (a.k.a. outcome or dependent) variable from the dataframe `data`.
- `messages`: Decides whether messages references, notes, and warnings are to be displayed (Default: `TRUE`).
- `k`: Number of digits after decimal point (should be an integer) (Default: `k = 2`).
- `nboot`: Number of bootstrap samples for computing confidence interval for the effect size (Default: `100`).
- `conf.level`: Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).
- `conf.type`: A vector of character strings representing the type of intervals required. The value should be any subset of the values "norm", "basic", "perc", "bca". For more, see `?boot::boot.ci`.
- `...`: Additional arguments (ignored).

**Author(s)**

Indrajeet Patil

**Examples**

```r
subtitle_kw_nonparametric(
  data = ggplot2::msleep,
  x = vore,
  y = sleep_rem
)
```
Making text subtitle for the Mann-Whitney U-test (between-subjects designs).

Usage

subtitle_mann_nonparametric(data, x, y, paired = FALSE, k = 2,
    conf.level = 0.95, conf.type = "norm", nboot = 100,
    messages = TRUE, ...)

subtitle_t_nonparametric(data, x, y, paired = FALSE, k = 2,
    conf.level = 0.95, conf.type = "norm", nboot = 100,
    messages = TRUE, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A
    matrix or tables will not be accepted.

x The grouping variable from the dataframe data.

y The response (a.k.a. outcome or dependent) variable from the dataframe data.

paired a logical indicating whether you want a paired t-test.

k Number of digits after decimal point (should be an integer) (Default: k = 2).

conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper
    confidence intervals (0.95).

conf.type A vector of character strings representing the type of intervals required. The
    value should be any subset of the values "norm", "basic", "perc", "bca". For
    more, see ?boot::boot.ci.

nboot Number of bootstrap samples for computing confidence interval for the effect
    size (Default: 100).

messages Decides whether messages references, notes, and warnings are to be displayed
    (Default: TRUE).

... Additional arguments.

Details

Two-sample Wilcoxon test, also known as Mann-Whitney test, is carried out.

For the two independent samples case, the Mann-Whitney U-test is calculated and W is reported
from stats::wilcox.test. For the paired samples case the Wilcoxon signed rank test is run and V is
reported.
Since there is no single commonly accepted method for reporting effect size for these tests we are computing and reporting $r$ (computed as $Z/\sqrt{N}$) along with the confidence intervals associated with the estimate.

*Note:* The `stats::wilcox.test` function does not follow the same convention as `stats::t.test`. The sign of the $V$ test statistic will always be positive since it is the sum of the positive signed ranks. Therefore $V$ will vary in magnitude but not significance based solely on the order of the grouping variable. Consider manually reordering your factor levels if appropriate as shown in the second example below.

**Author(s)**

Indrajeet Patil, Chuck Powell

**Examples**

```r
## Not run: set.seed(123)

# ------------------ between-subjects design -------------------
# simple function call
ggstatsplot::subtitle_mann_nonparametric(
  data = sleep,
  x = group,
  y = extra
)

# creating a smaller dataset
msleep_short <- dplyr::filter(
  .data = ggplot2::msleep,
  vore %in% c("carni", "herbi")
)

# modifying few things
ggstatsplot::subtitle_mann_nonparametric(
  data = msleep_short,
  x = vore,
  y = sleep_rem,
  nboot = 200,
  conf.level = 0.99,
  conf.type = "bca"
)

# The order of the grouping factor matters when computing *V*
# Changing default alphabeical order manually
msleep_short$vore <- factor(msleep_short$vore,      
  levels = c("herbi", "carni")
)

# note the change in the reported *V* value but the identical 
# value for *p* and the reversed effect size

ggstatsplot::subtitle_mann_nonparametric(
  data = msleep_short,
  x = vore,
  y = sleep_rem,
  nboot = 200,
  conf.level = 0.99,
  conf.type = "bca"
)
```
subtitle_meta_ggcoefstats

Prepare subtitle with meta-analysis results

Description
Making text subtitle for meta-analysis via linear (mixed-effects) models as implemented in the metafor package.

Usage
subtitle_meta_ggcoefstats(data, k = 2, messages = TRUE,
output = "subtitle", caption = NULL, ...)

Arguments
data A dataframe. It must contain columns named estimate (corresponding estimates of coefficients or other quantities of interest) and std.error (the standard error of the regression term).
k Number of digits after decimal point (should be an integer) (Default: k = 2).
messages Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).
output Character describing the desired output. If "subtitle", a formatted subtitle with summary effect and statistical details will be returned, and if "caption", expression containing details from model summary will be returned. The other option is to return "tidy" data frame with coefficients or "glance" dataframe with model summaries.
caption The text for the plot caption.
... Additional arguments (ignored).
Author(s)

Indrajeet Patil

Examples

# let's create a dataframe
df_results <-
structure(
  .Data = list(estimate = c(
    0.38204760321706, 0.78078311514665,
    0.425607573765058, 0.558365541235078, 0.956473848429961
  ),
  std.error = c(
    0.0465576338644502,
    0.0330218199731529, 0.0362834986178494, 0.0480571500648261, 0.062215818388157
  ),
  t.value = c(
    8.2059677855356, 23.6444603038067, 11.7300588415607,
    11.6187818146078, 15.3734833553524
  ),
  conf.low = c(
    0.29051514606969,
    0.715841986960399, 0.354354575031406, 0.46379116008131, 0.827446138277154
  ),
  conf.high = c(
    0.473580060546444, 0.845724236068931, 0.496860572498711,
    0.652939922388847, 1.08550155858277
  ),
  p.value.x = c(
    3.28679518728519e-15,
    4.04778497135963e-75, 7.59757330804449e-29, 5.451555840151592e-26,
    2.99171217913312e-13
  ),
  df.residual = c(
    394L, 358L, 622L, 298L,
    22L
  ),
  row.names = c(NA, -5L),
  class = c("tbl_df", "tbl", "data.frame")
)

# making subtitle
ggstatsplot::subtitle_meta_ggcoefstats(
  data = df_results,
  k = 3,
  messages = FALSE
)

# getting tidy data frame with coefficients
ggstatsplot::subtitle_meta_ggcoefstats(
  data = df_results,
  messages = FALSE,
  output = "tidy"
)

# making caption
ggstatsplot::subtitle_meta_ggcoefstats(
  data = df_results,
k = 2,
messages = FALSE,
output = "caption"
)

# getting dataframe with model summary
ggstatsplot::subtitle_meta_ggcoefstats(
data = df_results,
messages = FALSE,
output = "glance"
)

subtitle_onesample_proptest

Making text subtitle for Proportion Test (N Outcomes)

Description

This is going to be a chi-squared Goodness of fit test.

Usage

subtitle_onesample_proptest(data, main, counts = NULL, ratio = NULL,
legend.title = NULL, k = 2, ...)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A
matrix or tables will not be accepted.

main The variable to use as the rows in the contingency table.

counts A string naming a variable in data containing counts, or NULL if each row represents a single observation (Default).

ratio A vector of numbers: the expected proportions for the proportion test. Default
is NULL, which means if there are two levels ratio = c(1,1), etc.

legend.title Title text for the legend.

k Number of digits after decimal point (should be an integer) (Default: k = 2).

... Additional arguments (currently ignored).

Author(s)

Indrajeet Patil
subtitle_template

Examples

# with counts
library(jmv)

subtitle_onenesample_proptest(
  data = as.data.frame(HairEyeColor),
  main = Eye,
  counts = Freq
)

# in case no variation, only sample size will be shown
subtitle_onenesample_proptest(
  data = cbind.data.frame(x = rep("a", 10)),
  main = x
)

subtitle_template  Template for subtitles with statistical details for tests with a single parameter (e.g., t, chi-squared, etc.)

Description

Template for subtitles with statistical details for tests with a single parameter (e.g., t, chi-squared, etc.)

Usage

subtitle_template(no.parameters, stat.title = NULL, statistic.text,
  statistic, parameter = NULL, parameter2 = NULL, p.value,
  effsize.text, effsize.estimate, effsize.LL, effsize.UL, n,
  conf.level = 0.95, k = 3L, k.parameter = 0L)

Arguments

no.parameters  An integer that specifies that the number of parameters for the statistical test. Can be 0 for non-parametric tests, 1 for tests based on t-statistic or chi-squared statistic, 2 for tests based on F-statistic.

stat.title  A character describing the test being run, which will be added as a prefix in the subtitle. The default is NULL. An example of a stat.title argument will be something like "Student's t-test: ".

statistic.text  A character that specifies the relevant test statistic. For example, for tests with t-statistic, statistic.text = "t". If you want to use plotmath, you will have to quote the argument (e.g., quote(italic("t"))).

statistic  The numeric value of a statistic.

parameter  The numeric value of a parameter being modeled (often degrees of freedom for the test). Default is NULL to accommodate non-parametric tests.
parameter2 Relevant only if the statistic in question has two degrees of freedom (default: NULL).

p.value The two-sided p-value associated with the observed statistic.

effsize.text A character that specifies the relevant effect size. For example, for Cohen’s d statistic, effsize.text = "d". If you want to use plotmath, you will have to quote the argument (e.g., quote(italic("d"))).

effsize.estimate, effsize.LL, effsize.UL The estimated value of the effect size, its lower bound, and its upper.

n An integer specifying the sample size used for the test.

conf.level Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

k Number of decimal places to display (default: 3).

k.parameter Number of decimal places to display for the parameter (default: 0).

Author(s)
Indrajeet Patil

Examples

```r
set.seed(123)

# subtitle for *t*-statistic with Cohen's *d* as effect size
ggstatsplot::subtitle_template(
  no.parameters = 1L,
  statistic.text = quote(italic("t")),
  statistic = 5.494,
  parameter = 29.234,
  p.value = 0.00001,
  effsize.text = quote(italic("d")),
  effsize.estimate = -1.980,
  effsize.LL = -2.873,
  effsize.UL = -1.088,
  n = 32L,
  conf.level = 0.95,
  k = 3L,
  k.parameter = 3L
)
```

subtitle_t_bayes Making text subtitle for the bayesian t-test.

Description
Making text subtitle for the bayesian t-test.
Usage
subtitle_t_bayes(data, x, y, bf.prior = 0.707, paired = FALSE, k = 2, ...)

Arguments
data A dataframe (or a tibble) from which variables specified are to be taken. A
dataframe or table will not be accepted.
x The grouping variable from the dataframe data.
y The response (a.k.a. outcome or dependent) variable from the dataframe data.
bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculat-
ing Bayes factors.
paired a logical indicating whether you want a paired t-test.
k Number of digits after decimal point (should be an integer) (Default: k = 2).
... Additional arguments.

Author(s)
Indrajeet Patil

Examples

# for reproducibility
set.seed(123)

# between-subjects design
subtitle_t_bayes(
data = mtcars,
x = am,
y = wt,
paired = FALSE
)

# within-subjects design
subtitle_t_bayes(
data = dplyr::filter(
  ggstatsplot::intent_morality,
  condition %in% c("accidental", "attempted"),
harm == "Poisoning"
),
x = condition,
y = rating,
paired = TRUE
)
Making text subtitle for one sample t-test and its nonparametric and robust equivalents.

### Usage

```r
subtitle_t_onesample(data, x, type = "parametric", test.value = 0,
  bf.prior = 0.707, robust.estimator = "onestep", effsize.type = "g",
  effsize.noncentral = TRUE, conf.level = 0.95, conf.type = "norm",
  nboot = 100, k = 2, messages = TRUE, ...)
```

### Arguments

- **data**: A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will **not** be accepted.
- **x**: A numeric variable.
- **type**: Type of statistic expected ("parametric" or "nonparametric" or "robust" or "bayes"). Corresponding abbreviations are also accepted: "p" (for parametric), "np" (nonparametric), "r" (robust), or "bf" resp.
- **test.value**: A number specifying the value of the null hypothesis (Default: 0).
- **bf.prior**: A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
- **robust.estimator**: If test = "robust" robust estimator to be used ("onestep" (Default), "mom", or "median"). For more, see ?WRS2::onesampb.
- **effsize.type**: Type of effect size needed for parametric tests. The argument can be "biased" ("d" for Cohen's d) or "unbiased" ("g" Hedge’s g for t-test). The default is
- **effsize.noncentral**: Logical indicating whether to use non-central t-distributions for computing the confidence interval for Cohen’s d or Hedge’s g (Default: TRUE).
- **conf.level**: Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).
- **conf.type**: A vector of character strings representing the type of intervals required. The value should be any subset of the values "norm", "basic", "perc", "bca". For more, see ?boot::boot.ci.
- **nboot**: Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).
- **k**: Number of digits after decimal point (should be an integer) (Default: k = 2).
- **messages**: Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).
- **...**: Additional arguments.
Author(s)
Indrajeet Patil

See Also
gghistostats

Examples

```r
# for reproducibility
set.seed(123)

ggstatsplot::subtitle_t_oneway(
  data = iris,
  x = Sepal.Length,
  test.value = 5,
  type = "r"
)
```

subtitle_t_parametric  Making text subtitle for the t-test (between-/within-subjects designs).

Description
Making text subtitle for the t-test (between-/within-subjects designs).

Usage
```r
subtitle_t_parametric(data, x, y, paired = FALSE, effsize.type = "g",
                      effsize.noncentral = TRUE, conf.level = 0.95, var.equal = FALSE,
                      k = 2, ...)
```

Arguments
data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
x The grouping variable from the dataframe data.
y The response (a.k.a. outcome or dependent) variable from the dataframe data.
paired a logical indicating whether you want a paired t-test.
effsize.type Type of effect size needed for parametric tests. The argument can be "biased" ("d" for Cohen’s $d$ for t-test; "partial_eta" for partial eta-squared for anova) or "unbiased" ("g" Hedge’s $g$ for t-test; "partial_omega" for partial omega-squared for anova).
effsize.noncentral Logical indicating whether to use non-central $t$-distributions for computing the confidence interval for Cohen’s $d$ or Hedge’s $g$ (Default: TRUE).
conf.level
Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

var.equal
a logical variable indicating whether to treat the variances in the samples as equal. If TRUE, then a simple F test for the equality of means in a one-way analysis of variance is performed. If FALSE, an approximate method of Welch (1951) is used, which generalizes the commonly known 2-sample Welch test to the case of arbitrarily many samples.

k
Number of digits after decimal point (should be an integer) (Default: k = 2).

Details
Cohen’s $d$ is calculated in the traditional fashion as the difference between means or mean minus mu divided by the estimated standardized deviation. By default Hedge’s correction is applied $(N-3)/(N-2.25)$ to produce $g$. For independent samples $t$-test, there are two possibilities implemented. If the $t$-test did not make a homogeneity of variance assumption, (the Welch test), the variance term will mirror the Welch test, otherwise a pooled and weighted estimate is used. If a paired samples $t$-test was requested, then effect size desired is based on the standard deviation of the differences.

The computation of the confidence intervals defaults to a use of non-central Student-$t$ distributions (effsize.noncentral = TRUE); otherwise a central distribution is used.

When computing confidence intervals the variance of the effect size $d$ or $g$ is computed using the conversion formula reported in Cooper et al. (2009)

- $((n1+n2)/(n1*n2) + .5*d^2/df) * ((n1+n2)/df)$ (independent samples)
- $sqrt(((1/n) + (d^2/n)) * 2 * (1 - r))$ (paired case)

Author(s)
Indrajeet Patil, Chuck Powell

See Also
subtitle_t_parametric

Examples

```r
# creating a smaller dataset
msleep_short <- dplyr::filter(
  .data = ggplot2::msleep,
  vore %in% c("carni", "herbi")
)

# with defaults
subtitle_t_parametric(
  data = msleep_short,
  x = vore,
  y = sleep_rem
)
```
# changing defaults
subtitle_t_parametric(
    data = msleep_short,
    x = vore,
    y = sleep_rem,
    var.equal = TRUE,
    k = 2,
    effsize.type = "d"
)

subtitle_t_robust  
Making text subtitle for the robust t-test (between- and within-subjects designs).

Description

Making text subtitle for the robust t-test (between- and within-subjects designs).

Usage

subtitle_t_robust(data, x, y, tr = 0.1, paired = FALSE, nboot = 100,
conf.level = 0.95, conf.type = "norm", k = 2, messages = TRUE,
...)

Arguments

data  
A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.

x  
The grouping variable from the dataframe.

y  
The response (a.k.a. outcome or dependent) variable from the dataframe.

tr  
Trim level for the mean when carrying out robust tests. If you get error stating "Standard error cannot be computed because of Winsorized variance of 0 (e.g., due to ties). Try to decrease the trimming level.", try to play around with the value of tr, which is by default set to 0.1. Lowering the value might help.

paired  
a logical indicating whether you want a paired t-test.

nboot  
Number of bootstrap samples for computing confidence interval for the effect size (Default: 100).

conf.level  
Scalar between 0 and 1. If unspecified, the defaults return 95% lower and upper confidence intervals (0.95).

conf.type  
A vector of character strings representing the type of intervals required. The value should be any subset of the values "norm", "basic", "perc", "bca". For more, see ?boot::boot.ci.

k  
Number of digits after decimal point (should be an integer) (Default: k = 2).

messages  
Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).

...  
Additional arguments.
theme_corrmat

Default theme used for correlation matrix

Description
Default theme used for correlation matrix

Usage
theme_corrmat()

Value
A ggplot2 object with the theme_ggstatsplot overlaid.
theme_ggstatsplot

Author(s)
Indrajeet Patil

Description
Common theme used across all plots generated in ggstatsplot and assumed by the author to be aesthetically pleasing to the user/reader.

Usage
theme_ggstatsplot(ggtheme = ggplot2::theme_bw(),
                  ggstatsplot.layer = TRUE)

theme_mprl(ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE)

Arguments
ggtheme A function, ggplot2 theme name. Default value is ggplot2::theme_bw(). Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., ggthemes::theme_fivethirtyeight(), hrbrthemes::theme_ipsum_ps(), etc.).

ggstatsplot.layer Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

Value
A ggplot2 object with the theme_ggstatsplot theme.

Author(s)
Indrajeet Patil

References
https://indrajeetpatil.github.io/ggstatsplot/articles/web_only/theme_ggstatsplot.html
theme_pie

*Default theme used for pie chart*

---

**Description**

Default theme used for pie chart

**Usage**

theme_pie(ggtheme = ggplot2::theme_bw(), ggstatsplot.layer = TRUE)

**Arguments**

- `ggtheme`: A function, ggplot2 theme name. Default value is `ggplot2::theme_bw()`. Any of the ggplot2 themes, or themes from extension packages are allowed (e.g., `ggthemes::theme_fivethirtyeight()`, `hrbrthemes::theme_ipsum_ps()`, etc.).
- `ggstatsplot.layer`: Logical that decides whether theme_ggstatsplot theme elements are to be displayed along with the selected ggtheme (Default: TRUE).

**Value**

A ggplot2 object with the theme_ggstatsplot theme.

**Author(s)**

Indrajeet Patil

---

**Titanic_full**

*Titanic dataset.*

---

**Description**

Titanic dataset.

**Usage**

Titanic_full
Format
A data frame with 2201 rows and 5 variables
• id. Dummy identity number for each person.
• Class. 1st, 2nd, 3rd, Crew.
• Sex. Male, Female.
• Age. Child, Adult.
• Survived. No, Yes.

Details
This data set provides information on the fate of passengers on the fatal maiden voyage of the ocean liner 'Titanic', summarized according to economic status (class), sex, age and survival.
This is a modified dataset from datasets package.

Source

Examples
```
dim(Titanic_full)
head(Titanic_full)
dplyr::glimpse(Titanic_full)
```

Description
Virtual reality moral dilemmas.

Usage
```
VR_dilemma
```

Format
A data frame with 68 rows and 4 variables
• id. Dummy identity number for each participant.
• order. The order in which the participants completed the two sessions: "text_first" (0) or "text_second" (1).
• modality. Describes how the moral dilemmas were presented to the participants: either in text format ("text") or in Virtual Reality ("vr").
• score. Proportion of "utilitarian" decisions. In other words, of the 4 decisions, how many affirmative were responses. Range: 0 (all utilitarian) - 1 (none utilitarian).
Details

Dataset from a study where participants completed identical moral dilemmas in two different sessions held on separate days: in one session, they read text description of the scenario, while in another session they completed the same scenarios in Virtual Reality (videos: https://www.youtube.com/watch?v=ebdUJHhhYs8). The study investigated if there was a discrepancy between how people judged the same scenarios while reading them in text versus experiencing them in virtual reality.

Source

https://psyarxiv.com/ry3ap/

Examples

dim(VR_dilemma)
head(VR_dilemma)
dplyr::glimpse(VR_dilemma)
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