# Package 'coveffectsplot'

January 18, 2024

**Title** Produce Forest Plots to Visualize Covariate Effects

**Version** 1.0.5

**Description** Produce forest plots to visualize covariate effects using either the command line or an interactive 'Shiny' application.

**URL** https://smouksassi.github.io/coveffectsplot/, https://github.com/smouksassi/coveffectsplot

**BugReports** https://github.com/smouksassi/coveffectsplot/issues

**Depends** R (>= 4.0.0), data.table (>= 1.9.8)

**Imports** colourpicker, egg, grid, ggplot2 (>= 3.3.2), shiny, stats, utils

**Suggests** markdown, dplyr, tidyr, shinyjs, shinymeta, table1, clipr, formatR, MASS, knitr, rmarkdown, mrgsolve, GGally, ggridges, ggrepel, ggstance, patchwork, plotly, scales, shinyAce, Rcpp, gamlss.dist, ggdist, ggh4x, ggpmisc, quantreg

**License** MIT + file LICENSE

**SystemRequirements** pandoc with https support

**LazyData** true

**VignetteBuilder** knitr

**RoxygenNote** 7.3.0

**Encoding** UTF-8

**NeedsCompilation** no

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**Repository** CRAN

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# R topics documented:



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`covdatasim` *Correlated Covariates data*

---

## Description

A example dataset used to illustrate multivariate joint covariate effects.

## Usage

```
covdatasim
```

## Format

A dataset with 2000 rows and 5 variables

**ID** Subject ID

**AGE** Age in years

**WT** Weight in kg

**Sex** 0=male; 1=female

**ALB** Albumin in g/dL

## Source

simulated based on a real dataset

## draw_key — *Horizontal key drawing functions from ggstance in case it is deprecated*

### Description

Horizontal key drawing functions from ggstance in case it is deprecated

### Usage

```
draw_key_hpath(data, params, size)

draw_key_pointrangeh(data, params, size)
```

### Arguments

| | |
|---|---|
| data | A single row data frame containing the scaled aesthetics to display in this key |
| params | A list of additional parameters supplied to the geom. |
| size | Width and height of key in mm. |

### Value

A grid grob.

## expand_modelframe — *Expand covariate values choices and reference values varying one at a time*

### Description

Expand covariate values choices and reference values varying one at a time

### Usage

```
expand_modelframe(rv, covcol = "covname", ...)
```

### Arguments

| | |
|---|---|
| rv | a data.frame with columns names of covariate(s) and values equal reference |
| covcol | column name for the covariate being varied |
| ... | Arguments to be passed to methods |

### Value

A data.frame with combination of covariates

## Examples

```
reference.values <- data.frame(WT = 85, ALB = 45, SEX = 0)
covcomb <- expand_modelframe(
  WT  = c(56, 72, 98, 128), # P05, P25, P75, P95 # ref is P50
ALB = c(40, 50),          # P05, P95 # ref is P50
  SEX = c(1),               # Reference is for SEX=0 (female)
  rv = reference.values)
covcomb
```

---

`forest_plot` *Forest plot*

---

## Description

Produce forest plots to visualize covariate effects

## Usage

```
forest_plot(
  data,
  facet_formula = "covname~paramname",
  xlabel = "",
  ylabel = "",
  x_facet_text_size = 13,
  y_facet_text_size = 13,
  x_facet_text_angle = 0,
  y_facet_text_angle = 0,
  x_facet_text_vjust = 0.5,
  y_facet_text_vjust = 0.5,
  x_facet_text_hjust = 0.5,
  y_facet_text_hjust = 0.5,
  x_facet_text_col = "black",
  y_facet_text_col = "black",
  xy_facet_text_bold = TRUE,
  x_label_text_size = 16,
  y_label_text_size = 16,
  legend_title_size = 12,
  break_ylabel = FALSE,
  y_label_text_width = 25,
  table_text_size = 7,
  table_text_colour_overwrite = FALSE,
  table_text_colour = "none",
  base_size = 22,
  theme_benrich = FALSE,
  table_title = "",
  table_title_size = 15,
  ref_legend_text = "",
```

```
  area_legend_text = "",
  interval_legend_text = "",
  interval_legend_title = "",
  shape_legend_title = "",
  legend_order = c("pointinterval", "ref", "area", "shape"),
  combine_area_ref_legend = TRUE,
  combine_interval_shape_legend = FALSE,
  legend_position = "top",
  show_ref_area = TRUE,
  ref_area = c(0.8, 1.25),
  ref_area_col = "#BEBEBE50",
  show_ref_value = TRUE,
  ref_value = 1,
  ref_value_col = "black",
  ref_value_size = 1,
  ref_value_linetype = "dashed",
  ref_value_by_panel = FALSE,
  ref_value_by_panel_data = NULL,
  interval_col = "blue",
  interval_size = 1,
  interval_fatten = 4,
  interval_linewidth = 1,
  interval_shape = "circle small",
  bsv_col = "red",
  bsv_shape = "circle small",
  bsv_text_id = c("BSV", "bsv", "IIV", "Bsv"),
  interval_bsv_text = "",
  strip_col = "#E5E5E5",
  paramname_shape = FALSE,
  paramname_color = FALSE,
  legend_shape_reverse = FALSE,
  legend_color_reverse = FALSE,
  facet_switch = c("both", "y", "x", "none"),
  facet_scales = c("fixed", "free_y", "free_x", "free"),
  facet_space = c("fixed", "free_x", "free_y", "free"),
  facet_labeller = "label_value",
  label_wrap_width = 55,
  facet_labeller_multiline = FALSE,
  strip_placement = c("inside", "outside"),
  strip_outline = TRUE,
  facet_spacing = 5.5,
  major_x_ticks = NULL,
  major_x_labels = NULL,
  minor_x_ticks = NULL,
  x_range = NULL,
  logxscale = FALSE,
  show_yaxis_gridlines = TRUE,
  show_xaxis_gridlines = TRUE,
```

```
  show_table_facet_strip = "none",
  table_facet_switch = c("both", "y", "x", "none"),
  show_table_yaxis_tick_label = FALSE,
  reserve_table_xaxis_label_space = TRUE,
  table_panel_border = TRUE,
  table_position = c("right", "below", "none"),
  plot_table_ratio = 4,
  vertical_dodge_height = 0.8,
  legend_space_x_mult = 1,
  legend_ncol_interval = 1,
  legend_ncol_shape = 1,
  plot_margin = c(5.5, 5.5, 5.5, 5.5),
  table_margin = c(5.5, 5.5, 5.5, 5.5),
  legend_margin = c(0, 0.1, -0.1, 0),
  parse_xlabel = FALSE,
  parse_ylabel = FALSE,
  plot_title = "\n",
  return_list = FALSE
)
```

## Arguments

| | |
|---|---|
| `data` | Data to use. |
| `facet_formula` | Facet formula. |
| `xlabel` | X axis title. |
| `ylabel` | Y axis title. |
| `x_facet_text_size` | Facet text size X. |
| `y_facet_text_size` | Facet text size Y. |
| `x_facet_text_angle` | Facet text angle X. |
| `y_facet_text_angle` | Facet text angle Y. |
| `x_facet_text_vjust` | Facet text vertical justification. |
| `y_facet_text_vjust` | Facet text vertical justification. |
| `x_facet_text_hjust` | Facet text horizontal justification. |
| `y_facet_text_hjust` | Facet text horizontal justification. |
| `x_facet_text_col` | Facet text color default to black. |
| `y_facet_text_col` | Facet text color default to black. |

`xy_facet_text_bold`
: Bold Facet text. Logical TRUE FALSE.

`x_label_text_size`
: X axis labels size.

`y_label_text_size`
: Y axis labels size.

`legend_title_size`
: Legend title size if present.

`break_ylabel`
: Split Y axis labels into multiple lines. Logical FALSE TRUE.

`y_label_text_width`
: Number of characters to break Y axis labels.

`table_text_size`
: Table text size.

`table_text_colour_overwrite`
: Logical TRUE FALSE.

`table_text_colour`
: Table text color to be used and overwrites mapped color

`base_size`
: theme_bw base_size for the plot and table.

`theme_benrich`
: apply Benjamin Rich's theming.

`table_title`
: What text to use for table title (theme_benrich has a default).

`table_title_size`
: table title size.

`ref_legend_text`
: Reference legend text.

`area_legend_text`
: Area legend text.

`interval_legend_text`
: Pointinterval legend text.

`interval_legend_title`
: Pointinterval legend title defaults to empty.

`shape_legend_title`
: Shape legend title defaults to empty.

`legend_order`
: Legend order. A four-element vector with the following items ordered in your desired order: "pointinterval", "ref", "area", "shape". if an item is absent the legend will be omitted.

`combine_area_ref_legend`
: Combine reference and area legends if they share the same text?

`combine_interval_shape_legend`
: Combine interval and shape legends?

`legend_position`
: where to put the legend: "top", "bottom","right","none"

`show_ref_area`
: Show reference window?

`ref_area`
: Reference area. Two-element numeric vector multiplying the ref_value.

`ref_area_col`
: Reference area background color.

`show_ref_value` Show reference line?

`ref_value` X intercept of reference line.

`ref_value_col` Reference line color.

`ref_value_size` Reference line size.

`ref_value_linetype`
Reference line linetype.

`ref_value_by_panel`
The ref_value vary by panel TRUE or FALSE.

`ref_value_by_panel_data`
if ref_value_by_panel is TRUE, data.frame to use for Reference (lines).

`interval_col` Point range color. One or Multiple values.

`interval_size` Point range size. Default to 1

`interval_fatten`
Point range fatten. Default to 4

`interval_linewidth`
Point range line width. Default to 1

`interval_shape` Shape used for the Point Range. Default to "circle small".

`bsv_col` BSV pointinterval color. One value.

`bsv_shape` Shape used for the BSV Point Range. Default to "circle small".

`bsv_text_id` Text string(s) to identify BSV. Default to c("BSV","bsv","IIV","Bsv")

`interval_bsv_text`
BSV legend text.

`strip_col` Strip background color.

`paramname_shape`
Map symbol to parameter(s) name? TRUE or FALSE.

`paramname_color`
Map color to parameter(s) name? TRUE or FALSE.

`legend_shape_reverse`
TRUE or FALSE.

`legend_color_reverse`
TRUE or FALSE.

`facet_switch` Facet switch to near axis. Possible values: "both", "y", "x", "none".

`facet_scales` Facet scales. Possible values: "free_y", "fixed", "free_x", "free".

`facet_space` Facet spaces. Possible values: "fixed", "free_x", "free_y", "free".

`facet_labeller` Facet Labeller. Default "label_value" any other valid ‘facet_grid‘ labeller can be specified.

`label_wrap_width`
How many characters before breaking the line. Numeric value. any other valid ‘facet_grid‘ labeller can be specified.

`facet_labeller_multiline`
break facet strips into multiple lines. Logical TRUE FALSE.

`strip_placement`
: Strip placement. Possible values: "inside", "outside".

`strip_outline`
: Draw rectangle around the Strip. Logical TRUE FALSE.

`facet_spacing`
: Control the space between facets in points.

`major_x_ticks`
: X axis major ticks. Numeric vector.

`major_x_labels`
: X axis labels. Character vector should be same length as major_x_ticks.

`minor_x_ticks`
: X axis minor ticks. Numeric vector.

`x_range`
: Range of X values. Two-element numeric vector.

`logxscale`
: X axis log scale. Logical TRUE FALSE.

`show_yaxis_gridlines`
: Draw the y axis gridlines. Logical TRUE FALSE.

`show_xaxis_gridlines`
: Draw the x axis gridlines. Logical TRUE FALSE.

`show_table_facet_strip`
: Possible values: "none", "both", "y", "x".

`table_facet_switch`
: Table facet switch to near axis. Possible values: "both", "y", "x", "none".

`show_table_yaxis_tick_label`
: Show table y axis ticks and labels?

`reserve_table_xaxis_label_space`
: keep space for the x axis label to keep alignment.

`table_panel_border`
: Draw the panel border for the table. Logical TRUE FALSE.

`table_position`
: Table position. Possible values: "right", "below", "none".

`plot_table_ratio`
: Plot-to-table ratio. Suggested value between 1-5.

`vertical_dodge_height`
: Amount of vertical dodging to apply on segments and table text.

`legend_space_x_mult`
: Multiplier to adjust the spacing between legend items.

`legend_ncol_interval`
: Control the number of columns for the pointinterval legend.

`legend_ncol_shape`
: Control the number of columns for the shape legend.

`plot_margin`
: Control the white space around the main plot. Vector of four numeric values for the top, right, bottom and left sides.

`table_margin`
: Control the white space around the table. Vector of four numeric values for the top, right, bottom and left sides.

`legend_margin`
: Control the white space around the plot legend. Vector of four numeric values for the top, right, bottom and left sides.

`parse_xlabel`
: treat xlabel as an expression. Logical FALSE TRUE.

`parse_ylabel`
: treat ylabel as an expression. Logical FALSE TRUE.

`plot_title`
: main plot title default to a line break.

`return_list`
: What to return if True a list of the main and table plots is returned instead of the gtable/plot.

## Examples

```
library(dplyr)
library(ggplot2)

# Example 1

plotdata <- get_sample_data("forest-plot-table.csv")
plotdata <- plotdata %>%
  mutate(midlabel = format(round(mid,2), nsmall = 2),
         lowerlabel = format(round(lower,2), nsmall = 2),
         upperlabel = format(round(upper,2), nsmall = 2),
         LABEL = paste0(midlabel, " [", lowerlabel, "-", upperlabel, "]"))
param <- "BZD AUC"
plotdata <-  filter(plotdata,paramname==param)
plotdata$covname <- reorder(plotdata$covname,plotdata$upper,FUN =max)
plotdata$label <- reorder(plotdata$label,plotdata$scen)
covs <- c("WEIGHT","AGE")
plotdata <-  filter(plotdata,covname%in%covs)
forest_plot(plotdata,
            ref_legend_text = "Reference (vertical line)",
            area_legend_text = "Reference (vertical line)",
            xlabel = paste("Fold Change in", param, "Relative to Reference"),
            logxscale = TRUE, major_x_ticks =c(0.1,1,1.5),
            show_ref_area = FALSE,
            paramname_color =TRUE,
            interval_col =c("steelblue","red","steelblue","red"),
            facet_formula = "covname~.",
            facet_scales = "free_y",
            facet_space = "free_y",
            show_table_facet_strip = "none",
            table_position = "right",
            plot_title = "",
            plot_table_ratio = 4)

# Example 2

plotdata <- get_sample_data("forest-plot-table.csv")
plotdata <- plotdata %>%
  mutate(midlabel = format(round(mid,2), nsmall = 2),
         lowerlabel = format(round(lower,2), nsmall = 2),
         upperlabel = format(round(upper,2), nsmall = 2),
         LABEL = paste0(midlabel, " [", lowerlabel, "-", upperlabel, "]"))
param <- c("BZD AUC","BZD Cmax")
plotdata <-  filter(plotdata,paramname%in%param)
plotdata <-  filter(plotdata,covname%in%"WEIGHT")
plotdata$covname <- reorder(plotdata$covname,plotdata$upper,FUN =max)
plotdata$label <- reorder(plotdata$label,plotdata$scen)
forest_plot(plotdata,
            ref_legend_text = "Reference (vertical line)",
            area_legend_text = "Reference (vertical line)",
            xlabel = paste("Fold Change of Parameter", "Relative to Reference"),
            show_ref_area = FALSE,
```

```
              facet_formula = "covname~paramname",
              facet_scales = "free_y",
              facet_space = "free_y",
              x_facet_text_size = 10,
              y_facet_text_size = 10,
              y_label_text_size = 10,
              y_label_text_width = 15,
              x_label_text_size = 10,
              facet_switch = "both",
              show_table_facet_strip = "both",
              show_table_yaxis_tick_label = TRUE,
              table_position = "below",
              plot_title = "",
              plot_table_ratio = 1)
## Not run:

# Example 3a

plotdata <- get_sample_data("forest-plot-table.csv")
plotdata <- plotdata %>%
  mutate(midlabel = format(round(mid,2), nsmall = 2),
         lowerlabel = format(round(lower,2), nsmall = 2),
         upperlabel = format(round(upper,2), nsmall = 2),
         LABEL = paste0(midlabel, " [", lowerlabel, "-", upperlabel, "]"))
plotdata$covname <- reorder(plotdata$covname,plotdata$upper,FUN =max)
plotdata$label <- reorder(plotdata$label,plotdata$scen)

plotdata$compound <- c(rep("1-OH",30),rep("BZD",30))
plotdata$paramname <- c(rep("AUC",15),rep("CMAX",15),rep("AUC",15),rep("CMAX",15))

forest_plot(plotdata,
             ref_area = c(0.8, 1.2),
            x_facet_text_size = 13,
            y_facet_text_size = 13,
             ref_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
            area_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
             xlabel = "Fold Change Relative to Parameter",
             facet_formula = covname~compound,
             facet_switch = "both",
             facet_scales = "free",
             facet_space = "fixed",
             paramname_shape = TRUE,
             legend_shape_reverse = TRUE,
             interval_shape = c("square","triangle"),
             paramname_color =  FALSE,
             combine_interval_shape_legend = FALSE,
             table_position = "right", plot_title = "",
         ref_area_col = rgb( col2rgb("gray50")[1], col2rgb("gray50")[2],col2rgb("gray50")[3],
                             max = 255, alpha = 0.1*255 ) ,
             interval_col = c("steelblue"),
             strip_col = "lightblue",
             plot_table_ratio = 1.5)
```

```
# Example 3b

plotdata$paramname <- c(rep("1-OH",30),rep("BZD",30))
plotdata$paramname2 <- c(rep("AUC",15),rep("CMAX",15),rep("AUC",15),rep("CMAX",15))
forest_plot(plotdata,
            show_ref_area = TRUE,
            x_facet_text_size = 13,
            y_facet_text_size = 13,
            ref_legend_text = "Reference (vertical line)",
            area_legend_text = "Reference (vertical line)",
            xlabel = "Fold Change Relative to Parameter",
            facet_formula = covname~paramname2,
            facet_switch = "both",
            facet_scales = "free",
            facet_space = "free",
            legend_order = c("shape","pointinterval","ref"),
            paramname_shape = TRUE,
            interval_shape = c("diamond","diamond filled",
                               "diamond","diamond filled"),
            paramname_color =  TRUE,
            combine_interval_shape_legend = TRUE,
            legend_shape_reverse = TRUE,
            legend_color_reverse = TRUE,
            interval_legend_title="Median (points)\n95% CI (horizontal lines)",
            table_position = "right", plot_title = "",
            ref_area_col = "gray85" ,
            interval_col = c("#ee3124", "#fdbb2f"),
            strip_col = "#475c6b",
            y_facet_text_col = "white",x_facet_text_col = "white",
            major_x_labels         = c("1/2", "0.8","1", "1.25", "2"),
            logxscale = TRUE, major_x_ticks =c(0.5,0.8,1,1.25,2),
            table_text_size = 5,
            plot_table_ratio = 1.5,
            ref_value_by_panel = TRUE,
            ref_value_by_panel_data = as.data.frame(
            plotdata %>%
            distinct(paramname2,covname) %>%
            dplyr::mutate(xintercept=ifelse(paramname2=="CMAX",1,1.2))))

# Example 3

plotdata <- get_sample_data("forestplotdatacpidata.csv")
forest_plot(plotdata,
             ref_area = c(0.8, 1.2),
             x_facet_text_size = 12,
             y_facet_text_size = 12,
             y_label_text_size = 10,
             x_label_text_size = 10,
             table_text_size = 6,
             plot_table_ratio = 1.5,
            ref_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
           area_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
            xlabel = "Fold Change Relative to RHZE",
```

```
            facet_formula = "covname~paramname",
            table_position = "below",
            show_table_facet_strip = "both",
            show_table_yaxis_tick_label = TRUE)

# Example 4
plotdata <- get_sample_data("dataforest.csv")
plotdata <- plotdata %>%
  dplyr::mutate(midlabel = format(round(mid,2), nsmall = 2),
         lowerlabel = format(round(lower,2), nsmall = 2),
         upperlabel = format(round(upper,2), nsmall = 2),
         LABEL = paste0(midlabel, " [", lowerlabel, "-", upperlabel, "]"))
plotdata <- plotdata %>%
  filter(covname%in%c("Weight"))
plotdata$label <- as.factor(as.character(plotdata$label))
plotdata$label <- factor(plotdata$label, c("36.2 kg","66 kg","110 kg"))
forest_plot(plotdata,
            ref_area = c(0.8, 1.2),
            x_facet_text_size = 13,
            y_facet_text_size = 13,
           ref_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
          area_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
            xlabel = "Fold Change Relative to Parameter",
            facet_formula = "covname~paramname",
            facet_switch = "both",
            facet_scales = "free",
            facet_space = "fixed",
            table_position = "below",
            plot_table_ratio = 1,
            show_table_facet_strip = "both",
            show_table_yaxis_tick_label = TRUE)

# Example 5

forest_plot(plotdata,
            ref_area = c(0.8, 1.2),
            x_facet_text_size = 13,
            y_facet_text_size = 13,
           ref_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
          area_legend_text = "Reference (vertical line)\n+/- 20% limits (colored area)",
            xlabel = "Fold Change Relative to Parameter",
            facet_formula = "covname~.",
            facet_switch = "both",
            facet_scales = "free",
            facet_space = "fixed",
            paramname_shape = TRUE,
            table_position = "none",
        ref_area_col = rgb( col2rgb("gray50")[1], col2rgb("gray50")[2],col2rgb("gray50")[3],
            max = 255, alpha = 0.1*255 ) ,
            interval_col = "steelblue",
            strip_col = "lightblue",
            plot_table_ratio = 1)
```

```
## End(Not run)
```

---

`get_sample_data` *Get sample dataset*

---

## Description

Get a sample dataset that is included with the package to plot a forest plot.

## Usage

```
get_sample_data(dataset = "dfall.csv")
```

## Arguments

| | |
|---|---|
| `dataset` | A sample dataset file. |

---

`prezista` *Prezista Drug Label Data*

---

## Description

A dataset containing an excerpt from the official Prezista FDA Drug Label to help in the app exploration.

## Usage

```
prezista
```

## Format

A dataset with 33 rows and 6 variables

**covname** Covariate Name, a character variable with two values Protease Inihibitors and Other Antiretrovirals

**label** Covariate value label, a character variable with several possible values

**paramname** Parameter on which the effects are shown, a character variable with three possible values Cmax, AUC and Cmin

**mid** Middle value for the effects, the median from the uncertainty distribution

**lower** Lower value for the effects usually the 5% from the uncertainty distribution

**upper** Upper value for the effects usually the 95% from the uncertainty distribution

## Source

Table 16 from https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/021976s045_202895s020lbl.pdf

## run_interactiveforestplot *Run the interactiveforestplot application*

### Description

Run the `interactiveforestplot` application.

### Usage

```
run_interactiveforestplot(data = NULL)
```

### Arguments

| | |
|---|---|
| `data` | optional data to load when the app is launched |

### Examples

```
if (interactive()) {
  run_interactiveforestplot()
}
```

## wtage *Weight Age CDC growth charts data*

### Description

Weight-for-age, 2 to 20 years, LMS parameters and selected smoothed weight percentiles in kilograms, by sex and age.

### Usage

```
wtage
```

### Format

A dataset with 436 rows and 14 variables

**Sex** 1=male; 2=female

**Agemos** Age in months

**L** skewness distribution parameter

**M** location distribution parameter

**S** scale distribution parameter

**P3** Smoothed third percentile

**P5** Smoothed fifth percentile

**P10** Smoothed tenth percentile

**P25** Smoothed twenty fifth percentile

**P50** Smoothed fiftieth percentile

**P75** Smoothed seventy fifth percentile

**P90** Smoothed ninetieth percentile

**P95** Smoothed ninety fifth percentile

**P97** Smoothed ninety seventh percentile

## Source

CDC website https://www.cdc.gov/growthcharts/data/zscore/wtage.csv

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