Create Awesome LaTeX Table with knitr::kable and kableExtra

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Contents

Please see the package documentation site for how to use this package in HTML and more.

Overview

The goal of `kableExtra` is to help you build common complex tables and manipulate table styles. It imports the pipe `%>%` symbol from `magrittr` and verbalizes all the functions, so basically you can add "layers" to a kable output in a way that is similar with `ggplot2` and `plotly`.

To learn how to generate complex tables in LaTeX, please visit http://haozhu233. github.io/kableExtra/awesome_table_in_html.html.

Installation

```
install.packages("kableExtra")

# For dev version
# install.packages("devtools")
devtools::install_github("haozhu233/kableExtra")
```

Getting Started

Here we are using the first few columns and rows from dataset `mtcars`

```
library(knitr)
library(kableExtra)
dt <- mtcars[1:5, 1:6]
```

When you are using `kable()`, if you don't specify `format`, by default it will generate a markdown table and let pandoc handle the conversion from markdown to HTML/PDF. This is the most favorable approach to render most simple tables as it is format independent. If you switch from HTML to pdf, you basically don't need to change anything in your code. However, markdown doesn't support complex table. For example, if you want to have a double-row header table, markdown just cannot provide you the functionality you need. As a result, when you have such a need, you should **define `format` in `kable()`** as either "html" or "latex". *You can also define a global option at the beginning using* `options(knitr.table.format = "latex")` *so you don't repeat the step every time.* **In this tutorial, I'll still put format="latex" in the function in case users just want to quickly replicate the results. In practice, you don't need to define those formats.**

Starting from `kableExtra` 0.9.0, when you load this package (`library(kableExtra)`), **it will automatically set up the global option 'knitr.table.format' based on your current environment**. Unless you are rendering a PDF, `kableExtra` will try to render a HTML table for you. **You no longer need to manually set either the global option or the `format` option in each `kable()` function**. I'm still including the explanation above here in this vignette so you can understand what is going on behind the scene. Note that this is only an global option. You can manually set any format in `kable()` whenever you want. I just hope you can enjoy a peace of mind in most of your time.

You can disable this behavior by setting `options(kableExtra.auto_format = FALSE)` before you load `kableExtra`.

```
# If you are using kableExtra < 0.9.0, you are recommended to set a global option first.
# options(knitr.table.format = "latex")
## If you don't define format here, you'll need put `format = "latex"`
## in every kable function.
```

LaTeX packages used in this package

If you are using a recent version of rmarkdown, you are recommended to load this package entirely via `library(kableExtra)` or `require(kableExtra)` because this package will load all necessary LaTeX packages, such as `booktabs` or `multirow`, for you automatically. Note that, if you are calling functions from `kableExtra` via `kableExtra::kable_styling()` or if you put `library(kableExtra)` in a separate R file that is **sourced** by the rmarkdown document, these packages won't be loaded. Furthermore, you can suppress this auto-loading behavior by setting a global option `kableExtra.latex.load_packages` to be `FALSE` before you load `kableExtra`.

```
# Not evaluated. Ilustration purpose
options(kableExtra.latex.load_packages = FALSE)
library(kableExtra)
```

If you are using R Sweave, beamer, R package vignette template, tufte or some customized rmarkdown templates, you can put the following meta data into the `yaml` section. If you are familar with LaTeX and you know what you are doing, feel free to remove unnecessary packages from the list.

```
header-includes:
  - \usepackage{booktabs}
  - \usepackage{longtable}
  - \usepackage{array}
  - \usepackage{multirow}
  - \usepackage[table]{xcolor}
  - \usepackage{wrapfig}
  - \usepackage{float}
  - \usepackage{colortbl}
  - \usepackage{pdflscape}
  - \usepackage{tabu}
  - \usepackage{threeparttable}
  - \usepackage{threeparttablex}
  - \usepackage[normalem]{ulem}
  - \usepackage{makecell}
```

Plain LaTeX

Plain LaTeX table looks relatively ugly in 2017.

```
# Again, with kableExtra >= 0.9.0, `format = "latex"` is automatically defined
# when this package gets loaded. Otherwise, you still need to define formats
kable(dt)
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

```
# Same: kable(dt, "latex")
```

LaTeX table with booktabs

Similar to Bootstrap in HTML, in LaTeX, you can also use a trick to make your table look prettier as well. The different part is that, this time you don't need to pipe kable outputs to another function. Instead, you should call `booktabs = T` directly in `kable()`.

```
kable(dt, "latex", booktabs = T)
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Table Styles

`kable_styling` in LaTeX uses the same syntax and structure as `kable_styling` in HTML. However, instead of `bootstrap_options`, you should specify `latex_options` instead.

LaTeX options

Similar with `bootstap_options`, `latex_options` is also a charter vector with a bunch of options including `striped`, `hold_position` and `scale_down`.

Striped

Even though in the LaTeX world, people usually call it `alternative row colors` but here I'm using its bootstrap name for consistency. Note that to make it happen, LaTeX package `xcolor` is required to be loaded. In an environment like rmarkdown::pdf_document (rmarkdown 1.4.0 +), `kable_styling` will load it automatically if `striped` is enabled. However, in other cases, you probably need to import that package by yourself.

```
kable(dt, "latex", booktabs = T) %>%
  kable_styling(latex_options = "striped")
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Hold position

If you provide a table caption in `kable()`, it will put your LaTeX tabular in a `table` environment, unless you are using `longtable`. A `table` environment will automatically find the best place (it thinks) to put your

table. However, in many cases, you do want your table to appear in a position you want it to be. In this case, you can use this `hold_position` options here.

```r
kable(dt, "latex", caption = "Demo table", booktabs = T) %>%
  kable_styling(latex_options = c("striped", "hold_position"))
```

Table 1: Demo table

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

If you find `hold_position` is not powerful enough to literally PIN your table in the exact position, you may want to use `HOLD_position`, which is a more powerful version of this feature. For those who are familiar with LaTeX, `hold_position` uses `[!h]` and `HOLD_position` uses `[H]` and the `float` package.

Scale down

When you have a wide table that will normally go out of the page, and you want to scale down the table to fit the page, you can use the `scale_down` option here. Note that, if your table is too small, it will also scale up your table. It was named in this way only because scaling up isn't very useful in most cases.

```r
kable(cbind(dt, dt, dt), "latex", booktabs = T) %>%
  kable_styling(latex_options = c("striped", "scale_down"))
```

	mpg	cyl	disp	hp	drat	wt	mpg	cyl	disp	hp	drat	wt	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620	21.0	6	160	110	3.90	2.620	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	21.0	6	160	110	3.90	2.875	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320	22.8	4	108	93	3.85	2.320	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	21.4	6	258	110	3.08	3.215	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440	18.7	8	360	175	3.15	3.440	18.7	8	360	175	3.15	3.440

```r
kable(cbind(dt), "latex", booktabs = T) %>%
  kable_styling(latex_options = c("striped", "scale_down"))
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Repeat header in longtable

In `kableExtra` 0.3.0 or above, a new option `repeat_header` was introduced into `kable_styling`. It will add header rows to longtables spanning multiple pages. For table captions on following pages, it will append *"continued"* to the caption to differentiate. If you need texts other than *"(continued)"* (for example, other languages), you can specify it using `kable_styling(..., repeat_header_text = "xxx")`. If you want to completely replace the table caption instead of appending, you can specify it in the option `repeat_header_method`.

```
long_dt <- rbind(mtcars, mtcars)

kable(long_dt, "latex", longtable = T, booktabs = T, caption = "Longtable") %>%
  add_header_above(c(" ", "Group 1" = 5, "Group 2" = 6)) %>%
  kable_styling(latex_options = c("repeat_header"))
```

Table 2: Longtable

	Group 1					Group 2					
	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	1
Duster 360	14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	4
Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4
Chrysler Imperial	14.7	8	440.0	230	3.23	5.345	17.42	0	0	3	4
Fiat 128	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
Honda Civic	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
Toyota Corolla	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1
Toyota Corona	21.5	4	120.1	97	3.70	2.465	20.01	1	0	3	1
Dodge Challenger	15.5	8	318.0	150	2.76	3.520	16.87	0	0	3	2
AMC Javelin	15.2	8	304.0	150	3.15	3.435	17.30	0	0	3	2
Camaro Z28	13.3	8	350.0	245	3.73	3.840	15.41	0	0	3	4
Pontiac Firebird	19.2	8	400.0	175	3.08	3.845	17.05	0	0	3	2
Fiat X1-9	27.3	4	79.0	66	4.08	1.935	18.90	1	1	4	1
Porsche 914-2	26.0	4	120.3	91	4.43	2.140	16.70	0	1	5	2
Lotus Europa	30.4	4	95.1	113	3.77	1.513	16.90	1	1	5	2
Ford Pantera L	15.8	8	351.0	264	4.22	3.170	14.50	0	1	5	4
Ferrari Dino	19.7	6	145.0	175	3.62	2.770	15.50	0	1	5	6
Maserati Bora	15.0	8	301.0	335	3.54	3.570	14.60	0	1	5	8
Volvo 142E	21.4	4	121.0	109	4.11	2.780	18.60	1	1	4	2

Table 2: Longtable *(continued)*

	Group 1					Group 2					
	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX41	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag1	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
Datsun 7101	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive1	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout1	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2
Valiant1	18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	1
Duster 3601	14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	4
Merc 240D1	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 2301	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
Merc 2801	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C1	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE1	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL1	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC1	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood1	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental1	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4
Chrysler Imperial1	14.7	8	440.0	230	3.23	5.345	17.42	0	0	3	4
Fiat 1281	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
Honda Civic1	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
Toyota Corolla1	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1
Toyota Corona1	21.5	4	120.1	97	3.70	2.465	20.01	1	0	3	1
Dodge Challenger1	15.5	8	318.0	150	2.76	3.520	16.87	0	0	3	2
AMC Javelin1	15.2	8	304.0	150	3.15	3.435	17.30	0	0	3	2
Camaro Z281	13.3	8	350.0	245	3.73	3.840	15.41	0	0	3	4
Pontiac Firebird1	19.2	8	400.0	175	3.08	3.845	17.05	0	0	3	2
Fiat X1-91	27.3	4	79.0	66	4.08	1.935	18.90	1	1	4	1
Porsche 914-21	26.0	4	120.3	91	4.43	2.140	16.70	0	1	5	2
Lotus Europa1	30.4	4	95.1	113	3.77	1.513	16.90	1	1	5	2
Ford Pantera L1	15.8	8	351.0	264	4.22	3.170	14.50	0	1	5	4
Ferrari Dino1	19.7	6	145.0	175	3.62	2.770	15.50	0	1	5	6
Maserati Bora1	15.0	8	301.0	335	3.54	3.570	14.60	0	1	5	8
Volvo 142E1	21.4	4	121.0	109	4.11	2.780	18.60	1	1	4	2

Full width?

If you have a small table and you want it to spread wide on the page, you can try the `full_width` option. Unlike `scale_down`, it won't change your font size. You can use `column_spec`, which will be explained later, together with `full_width` to achieve the best result.

```r
kable(dt, "latex", booktabs = T) %>%
  kable_styling(full_width = T) %>%
  column_spec(1, width = "8cm")
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Position

Table Position only matters when the table doesn't have `full_width`. You can choose to align the table to `center` or `left` side of the page. The default value of position is `center`.

Note that even though you can select to `right` align your table but the table will actually be centered. Somehow it is very difficult to right align a table in LaTeX (since it's not very useful in the real world?). If you know how to do it, please send out an issue or PR and let me know.

```
kable(dt, "latex", booktabs = T) %>%
  kable_styling(position = "center")
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Becides these three common options, you can also wrap text around the table using the `float-left` or `float-right` options. Note that, like `striped`, this feature will load another non-default LaTeX package `wrapfig` which requires rmarkdown 1.4.0 +. If you rmarkdown version < 1.4.0, you need to load the package through a customed LaTeX template file.

```
kable(dt, "latex", booktabs = T) %>%
  kable_styling(position = "float_right")
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Cras sit amet mauris in ex ultricies elementum vel rutrum dolor. Phasellus tempor convallis dui, in hendrerit mauris placerat scelerisque. Maecenas a accumsan enim, a maximus velit. Pellentesque in risus eget est faucibus convallis nec at nulla. Phasellus nec lacinia justo. Morbi fermentum, orci id varius accumsan, nibh neque porttitor ipsum, consectetur luctus

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

risus arcu ac ex. Aenean a luctus augue. Suspendisse et auctor nisl. Suspendisse cursus ultrices quam non vulputate. Phasellus et pharetra neque, vel feugiat erat. Sed feugiat elit at mauris commodo consequat. Sed congue lectus id mattis hendrerit. Mauris turpis nisl, congue eget velit sed, imperdiet convallis magna. Nam accumsan urna risus, non feugiat odio vehicula eget.

Font Size

If one of your tables is huge and you want to use a smaller font size for that specific table, you can use the `font_size` option.

```r
kable(dt, "latex", booktabs = T) %>%
  kable_styling(font_size = 7)
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Column / Row Specification

Column spec

When you have a table with lots of explanatory texts, you may want to specify the column width for different column, since the auto adjust in HTML may not work in its best way while basic LaTeX table is really bad at handling text wrapping. Also, sometimes, you may want to highlight a column (e.g., a "Total" column) by making it bold. In these scenarios, you can use `column_spec()`. You can find an example below.

```r
text_tbl <- data.frame(
  Items = c("Item 1", "Item 2", "Item 3"),
  Features = c(
    "Lorem ipsum dolor sit amet, consectetur adipiscing elit. Proin vehicula tempor ex. Morbi malesuada
    "In eu urna at magna luctus rhoncus quis in nisl. Fusce in velit varius, posuere risus et, cursus a
    "Vivamus venenatis egestas eros ut tempus. Vivamus id est nisi. Aliquam molestie erat et sollicitud
  )
)

kable(text_tbl, "latex", booktabs = T) %>%
  kable_styling(full_width = F) %>%
  column_spec(1, bold = T, color = "red") %>%
  column_spec(2, width = "30em")
```

Items	Features
Item 1	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Proin vehicula tempor ex. Morbi malesuada sagittis turpis, at venenatis nisl luctus a.
Item 2	In eu urna at magna luctus rhoncus quis in nisl. Fusce in velit varius, posuere risus et, cursus augue. Duis eleifend aliquam ante, a aliquet ex tincidunt in.
Item 3	Vivamus venenatis egestas eros ut tempus. Vivamus id est nisi. Aliquam molestie erat et sollicitudin venenatis. In ac lacus at velit scelerisque mattis.

Row spec

Similar with `column_spec`, you can define specifications for rows. Currently, you can either bold or italicize an entire row. Note that, similar to other row-related functions in `kableExtra`, for the position of the target row, you don't need to count in header rows or the group labeling rows.

```
kable(dt, "latex", booktabs = T) %>%
  kable_styling("striped", full_width = F) %>%
  column_spec(7, border_left = T, bold = T) %>%
  row_spec(1, strikeout = T) %>%
  row_spec(3:5, bold = T, color = "white", background = "black")
```

	mpg	cyl	disp	hp	drat	**wt**
~~Mazda RX4~~	~~21.0~~	~~6~~	~~160~~	~~110~~	~~3.90~~	**~~2.620~~**
Mazda RX4 Wag	21.0	6	160	110	3.90	**2.875**
Datsun 710	**22.8**	**4**	**108**	**93**	**3.85**	**2.320**
Hornet 4 Drive	**21.4**	**6**	**258**	**110**	**3.08**	**3.215**
Hornet Sportabout	**18.7**	**8**	**360**	**175**	**3.15**	**3.440**

Header Rows

One special case of `row_spec` is that you can specify the format of the header row via `row_spec(row = 0, ...)`.

```
kable(dt, "latex", booktabs = T, align = "c") %>%
  kable_styling(latex_options = "striped", full_width = F) %>%
  row_spec(0, angle = 45)
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Cell/Text Specification

Function `cell_spec` is introduced in version 0.6.0 of `kableExtra`. Unlike `column_spec` and `row_spec`, **this function is designed to be used before the data.frame gets into the `kable` function**. Comparing with figuring out a list of 2 dimensional indexes for targeted cells, this design is way easier to learn and use, and it fits perfectly well with `dplyr`'s `mutate` and `summarize` functions. With this design, there are two things to be noted: * Since `cell_spec` generates raw `HTML` or `LaTeX` code, make sure you remember to put `escape = FALSE` in `kable`. At the same time, you have to escape special symbols including `%` manually by yourself * `cell_spec` needs a way to know whether you want `html` or `latex`. You can specify it locally in function or globally via the `options(knitr.table.format = "latex")` method as suggested at the beginning. If you don't provide anything, this function will output as HTML by default.

Currently, `cell_spec` supports features including bold, italic, monospace, text color, background color, align, font size & rotation angle. More features may be added in the future. Please see function documentations as reference.

Conditional logic

It is very easy to use `cell_spec` with conditional logic. Here is an example.

```r
library(dplyr)
mtcars[1:10, 1:2] %>%
  mutate(
    car = row.names(.),
    # You don't need format = "latex" if you have ever defined options(knitr.table.format)
    mpg = cell_spec(mpg, "latex", color = ifelse(mpg > 20, "red", "blue")),
    cyl = cell_spec(cyl, "latex", color = "white", align = "c", angle = 45,
                    background = factor(cyl, c(4, 6, 8),
                                            c("#666666", "#999999", "#BBBBBB"))),
  ) %>%
  select(car, mpg, cyl) %>%
  kable("latex", escape = F, booktabs = T, linesep = "")
```

car	mpg	cyl
Mazda RX4	21	6
Mazda RX4 Wag	21	6
Datsun 710	22.8	4
Hornet 4 Drive	21.4	6
Hornet Sportabout	18.7	8
Valiant	18.1	6
Duster 360	14.3	8
Merc 240D	24.4	4
Merc 230	22.8	4
Merc 280	19.2	6

Visualize data with Viridis Color

This package also comes with a few helper functions, including `spec_color`, `spec_font_size` & `spec_angle`. These functions can rescale continuous variables to certain scales. For example, function `spec_color` would map a continuous variable to any viridis color palettes. It offers a very visually impactful representation in a tabular format.

```r
iris[1:10, ] %>%
  mutate_if(is.numeric, function(x) {
    cell_spec(x, "latex", bold = T, color = spec_color(x, end = 0.9),
              font_size = spec_font_size(x))
  }) %>%
  mutate(Species = cell_spec(
    Species, "latex", color = "white", bold = T,
    background = spec_color(1:10, end = 0.9, option = "A", direction = -1)
  )) %>%
  kable("latex", escape = F, booktabs = T, linesep = "", align = "c")
```

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5	3.4	1.5	0.2	setosa
4.4	2.9	1.4	0.2	setosa
4.9	3.1	1.5	0.1	setosa

In the example above, I'm using the `mutate` functions from `dplyr`. You don't have to use it. Base R solutions like `iris$Species <- cell_spec(iris$Species, color = "red")` also works.

Text Specification

If you check the results of `cell_spec`, you will find that this function does nothing more than wrapping the text with appropriate HTML/LaTeX formatting syntax. The result of this function is just a vector of character strings. As a result, when you are writing a `rmarkdown` document or write some text in shiny apps, if you need extra markups other than **bold** or *italic*, you may use this function to color, change font size or rotate your text.

An aliased function `text_spec` is also provided for a more literal writing experience. The only difference is that in LaTeX, unless you specify `latex_background_in_cell = FALSE` (default is `TRUE`) in `cell_spec`, it will define cell background color as `\cellcolor{}`, which doesn't work outside of a table, while for `text_spec`, the default value for `latex_background_in_cell` is `FALSE`.

```r
sometext <- strsplit(paste0(
  "You can even try to make some crazy things like this paragraph. ",
  "It may seem like a useless feature right now but it's so cool ",
  "and nobody can resist. ;)"
), " ")[[1]]
text_formatted <- paste(
  text_spec(sometext, "latex", color = spec_color(1:length(sometext), end = 0.9),
            font_size = spec_font_size(1:length(sometext), begin = 5, end = 20)),
  collapse = " ")

# To display the text, type `r text_formatted` outside of the chunk
```

You can even try to make some crazy things like this paragraph. It may seem like a useless feature right now but it's so cool and nobody can resist. ;)

Grouped Columns / Rows

Add header rows to group columns

Tables with multi-row headers can be very useful to demonstrate grouped data. To do that, you can pipe your kable object into `add_header_above()`. The header variable is supposed to be a named character with the names as new column names and values as column span. For your convenience, if column span equals to

1, you can ignore the `=1` part so the function below can be written as 'add_header_above(c(" ","Group 1" = 2, "Group 2" = 2, "Group 3" = 2)).

```
kable(dt, "latex", booktabs = T) %>%
  kable_styling() %>%
  add_header_above(c(" " = 1, "Group 1" = 2, "Group 2" = 2, "Group 3" = 2))
```

	Group 1		Group 2		Group 3	
	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

In fact, if you want to add another row of header on top, please feel free to do so. Also, since kableExtra 0.3.0, you can specify `bold` & `italic` as you do in `row_spec()`.

```
kable(dt, "latex", booktabs = T) %>%
  kable_styling(latex_options = "striped") %>%
  add_header_above(c(" ", "Group 1" = 2, "Group 2" = 2, "Group 3" = 2)) %>%
  add_header_above(c(" ", "Group 4" = 4, "Group 5" = 2)) %>%
  add_header_above(c(" ", "Group 6" = 6), bold = T, italic = T)
```

	Group 6					
	Group 4				Group 5	
	Group 1		Group 2		Group 3	
	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Group rows via labeling

Sometimes we want a few rows of the table being grouped together. They might be items under the same topic (e.g., animals in one species) or just different data groups for a categorical variable (e.g., age < 40, age > 40). With the new function `group_rows()` in `kableExtra`, this kind of task can be completed in one line. Please see the example below. Note that when you count for the start/end rows of the group, you don't need to count for the header rows nor other group label rows. You only need to think about the row numbers in the "original R dataframe".

```
kable(mtcars[1:10, 1:6], "latex", caption = "Group Rows", booktabs = T) %>%
  kable_styling() %>%
  group_rows("Group 1", 4, 7) %>%
  group_rows("Group 2", 8, 10)
```

In case some users need it, you can define your own gapping spaces between the group labeling row and previous rows. The default value is `0.5em`.

Table 3: Group Rows

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160.0	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875
Datsun 710	22.8	4	108.0	93	3.85	2.320
Group 1						
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440
Valiant	18.1	6	225.0	105	2.76	3.460
Duster 360	14.3	8	360.0	245	3.21	3.570
Group 2						
Merc 240D	24.4	4	146.7	62	3.69	3.190
Merc 230	22.8	4	140.8	95	3.92	3.150
Merc 280	19.2	6	167.6	123	3.92	3.440

```r
kable(dt, "latex", booktabs = T) %>%
  group_rows("Group 1", 4, 5, latex_gap_space = "2em")
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Group 1						
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

If you prefer to build multiple groups in one step, you can use the short-hand `index` option. Basically, you can use it in the same way as you use `add_header_above`. However, since `group_row` only support one layer of grouping, you can't add multiple layers of grouping header as you can do in `add_header_above`.

```r
kable(mtcars[1:10, 1:6], "latex", caption = "Group Rows", booktabs = T) %>%
  kable_styling() %>%
  group_rows(index=c(" " = 3, "Group 1" = 4, "Group 2" = 3))
# Not evaluated. The code above should have the same result as the first example in this section.
```

Note that `kable` has a relatively special feature to handle **align** and it may bring troubles to you if you are not using it correctly. In the documentation of the **align** argument of `kable`, it says:

> If `length(align) == 1L`, the string will be expanded to a vector of individual letters, e.g. `'clc'` becomes `c('c', 'l', 'c')`, **unless the output format is LaTeX**.

For example,

```r
kable(mtcars[1:2, 1:2], "latex", align = c("cl"))
# \begin{tabular}{l|cl|cl}  # Note the column alignment here
# \hline
#   & mpg & cyl\\
# ...
```

LaTeX, somehow shows surprisingly high tolerance on that, which is quite unusual. As a result, it won't throw an error if you are just using `kable` to make some simple tables. However, when you use `kableExtra`

to make some advanced modification, it will start to throw some bugs. As a result, please try to form a habit of using a vector in the `align` argument for `kable` (tip: you can use `rep` function to replicate elements. For example, `c("c", rep("l", 10))`).

Row indentation

Unlike `group_rows()`, which will insert a labeling row, sometimes we want to list a few sub groups under a total one. In that case, `add_indent()` is probably more appropriate.
For advanced users, you can even define your own css for the group labeling.

```
kable(dt, "latex", booktabs = T) %>%
  add_indent(c(1, 3, 5))
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Group rows via multi-row cell

Function `group_rows` is great for showing simple structural information on rows but sometimes people may need to show structural information with multiple layers. When it happens, you may consider using `collapse_rows` instead, which will put repeating cells in columns into multi-row cells.

In LaTeX, `collapse_rows` adds some extra hlines to help differentiate groups. You can customize this behavior using the `latex_hline` argument. You can choose from `full` (default), `major` and `none`. Vertical alignment of cells is controlled by the `valign` option. You can choose from "top", "middle"(default) and "bottom". Be cautious that the vertical alignment option was only introduced in multirow in 2016. If you are using a legacy LaTeX distribution, you will run into trouble if you set `valign` to be either "top" or "bottom".

```
collapse_rows_dt <- data.frame(C1 = c(rep("a", 10), rep("b", 5)),
                 C2 = c(rep("c", 7), rep("d", 3), rep("c", 2), rep("d", 3)),
                 C3 = 1:15,
                 C4 = sample(c(0,1), 15, replace = TRUE))
kable(collapse_rows_dt, "latex", booktabs = T, align = "c") %>%
  column_spec(1, bold=T) %>%
  collapse_rows(columns = 1:2, latex_hline = "major", valign = "middle")
```

C1	C2	C3	C4
		1	1
		2	1
		3	1
	c	4	0
		5	0
a		6	1
		7	0
		8	0
	d	9	1
		10	1
		11	1
	c	12	0
b		13	1
	d	14	1
		15	1

Right now, you can't automatically make striped rows based on collapsed rows but you can do it manually via the `extra_latex_after` option in `row_spec`. This feature is not officially supported. I'm only document it here if you want to give it a try.

```
kable(collapse_rows_dt[-1], "latex", align = "c", booktabs = T) %>%
  column_spec(1, bold = T, width = "5em") %>%
  row_spec(c(1:7, 11:12) - 1, extra_latex_after = "\\rowcolor{gray!6}") %>%
  collapse_rows(1, latex_hline = "none")
```

C2	C3	C4
	1	1
	2	1
	3	1
c	4	0
	5	0
	6	1
	7	0
	8	0
d	9	1
	10	1
	11	1
c	12	0
	13	1
d	14	1
	15	1

When there are too many layers, sometimes the table can become too wide. You can choose to stack the first few layers by setting `row_group_label_position` to `stack`.

```
collapse_rows_dt <- expand.grid(
  Country = sprintf('Country with a long name %s', c('A', 'B')),
  State = sprintf('State %s', c('a', 'b')),
  City = sprintf('City %s', c('1', '2')),
  District = sprintf('District %s', c('1', '2'))
) %>% arrange(Country, State, City) %>%
  mutate_all(as.character) %>%
  mutate(C1 = rnorm(n()),
```

```
          C2 = rnorm(n())))

kable(collapse_rows_dt, "latex",
      booktabs = T, align = "c", linesep = '') %>%
  collapse_rows(1:3, row_group_label_position = 'stack')
```

	City	District	C1	C2
Country with a long name A				
State a				
	City 1	District 1	-0.0437556	-0.4418928
		District 2	1.1566871	-1.9284910
	City 2	District 1	0.1657307	0.5428581
		District 2	0.4742717	-2.1926857
State b				
	City 1	District 1	1.5554271	0.6452154
		District 2	-0.6240334	1.8152936
	City 2	District 1	0.0388192	0.0753284
		District 2	1.5142104	1.3673435
Country with a long name B				
State a				
	City 1	District 1	1.2852814	0.3076673
		District 2	1.2162887	0.2670077
	City 2	District 1	-0.3872107	0.3861746
		District 2	-1.4133964	2.3773701
State b				
	City 1	District 1	-0.4570653	1.4259281
		District 2	0.6788911	-0.7151813
	City 2	District 1	1.2371987	0.9120287
		District 2	-1.8523561	0.0816860

To better distinguish different layers, you can format the each layer using `row_group_label_fonts`. You can also customize the hlines to better differentiate groups.

```
row_group_label_fonts <- list(
  list(bold = T, italic = T),
  list(bold = F, italic = F)
  )
kable(collapse_rows_dt, "latex",
                  booktabs = T, align = "c", linesep = '') %>%
  column_spec(1, bold=T) %>%
  collapse_rows(1:3, latex_hline = 'custom', custom_latex_hline = 1:3,
              row_group_label_position = 'stack',
              row_group_label_fonts = row_group_label_fonts)
```

	City	District	C1	C2
Country with a long name A				
State a				
	City 1	District 1	-0.0437556	-0.4418928
		District 2	1.1566871	-1.9284910
	City 2	District 1	0.1657307	0.5428581
		District 2	0.4742717	-2.1926857
State b				
	City 1	District 1	1.5554271	0.6452154
		District 2	-0.6240334	1.8152936
	City 2	District 1	0.0388192	0.0753284
		District 2	1.5142104	1.3673435
Country with a long name B				
State a				
	City 1	District 1	1.2852814	0.3076673
		District 2	1.2162887	0.2670077
	City 2	District 1	-0.3872107	0.3861746
		District 2	-1.4133964	2.3773701
State b				
	City 1	District 1	-0.4570653	1.4259281
		District 2	0.6788911	-0.7151813
	City 2	District 1	1.2371987	0.9120287
		District 2	-1.8523561	0.0816860

Table Footnote

Now it's recommended to use the new `footnote` function instead of `add_footnote` to make table footnotes.

Documentations for `add_footnote` can be found here.

There are four notation systems in `footnote`, namely `general`, `number`, `alphabet` and `symbol`. The last three types of footnotes will be labeled with corresponding marks while `general` won't be labeled. You can pick any one of these systems or choose to display them all for fulfilling the APA table footnotes requirements.

```
kable(dt, "latex", align = "c") %>%
  kable_styling(full_width = F) %>%
  footnote(general = "Here is a general comments of the table. ",
           number = c("Footnote 1; ", "Footnote 2; "),
           alphabet = c("Footnote A; ", "Footnote B; "),
           symbol = c("Footnote Symbol 1; ", "Footnote Symbol 2")
           )
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Note:
Here is a general comments of the table.
[1] Footnote 1;
[2] Footnote 2;
[a] Footnote A;
[b] Footnote B;
[*] Footnote Symbol 1;
[†] Footnote Symbol 2

You can also specify title for each category by using the `***_title` arguments. Default value for `general_title` is "Note:" and "" for the rest three. You can also change the order using `footnote_order`. You can even display footnote as chunk texts (default is as a list) using `footnote_as_chunk`. The font format of the titles are controlled by `title_format` with options including "italic" (default), "bold" and "underline".

```
kable(dt, "latex", align = "c", booktabs = T) %>%
  footnote(general = "Here is a general comments of the table. ",
           number = c("Footnote 1; ", "Footnote 2; "),
           alphabet = c("Footnote A; ", "Footnote B; "),
           symbol = c("Footnote Symbol 1; ", "Footnote Symbol 2"),
           general_title = "General: ", number_title = "Type I: ",
           alphabet_title = "Type II: ", symbol_title = "Type III: ",
           footnote_as_chunk = T, title_format = c("italic", "underline")
           )
```

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

General: Here is a general comments of the table.
Type I: [1] Footnote 1; [2] Footnote 2;
Type II: [a] Footnote A; [b] Footnote B;
Type III: [*] Footnote Symbol 1; [†] Footnote Symbol 2

If you need to add footnote marks in a table, you need to do it manually (no fancy) using `footnote_marker_***()`. Remember that similar with `cell_spec`, you need to tell this function whether you want it to do it in `HTML` (default) or `LaTeX`. You can set it for all using the `knitr.table.format` global option. Also, if you have ever used `footnote_marker_***()`, you need to put `escape = F` in your `kable` function to avoid escaping of special characters. Note that if you want to use these `footnote_marker` functions in `kableExtra` functions like `group_rows` (for the row label) or `add_header_above`, you need to set `double_escape = T` and `escape = F` in those functions. I'm trying to find other ways around. Please let me know if you have a good idea and are willing to contribute.

```
dt_footnote <- dt
names(dt_footnote)[2] <- paste0(names(dt_footnote)[2],
                        # That "latex" can be eliminated if defined in global
                        footnote_marker_symbol(1, "latex"))
```

Table 4: s

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Note:
Here is a very very very very very very very very very very very very very very very very very very very long footnote

```r
row.names(dt_footnote)[4] <- paste0(row.names(dt_footnote)[4],
                          footnote_marker_alphabet(1))
kable(dt_footnote, "latex", align = "c", booktabs = T,
      # Remember this escape = F
      escape = F) %>%
  footnote(alphabet = "Footnote A; ",
          symbol = "Footnote Symbol 1; ",
          alphabet_title = "Type II: ", symbol_title = "Type III: ",
          footnote_as_chunk = T)
```

	mpg	cyl[*]	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Hornet 4 Drive[a]	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

Type II: [a] Footnote A;
Type III: [*] Footnote Symbol 1;

If your table footnote is very long, please consider to put your table in a `ThreePartTable` frame. Note that, in kableExtra version <= 0.7.0, we were using `threeparttable` but since kableExtra 0.8.0, we start to use `ThreePartTable` from `threeparttablex` instead. `ThreePartTable` supports both the `longtable` and `tabu` environments.

```r
kable(dt, "latex", align = "c", booktabs = T, caption = "s") %>%
  footnote(general = "Here is a very very very very very very very very very very very very very v
          threeparttable = T)
```

LaTeX Only Features

Linebreak processor

Unlike in HTML, where you can use `<br>` at any time, in LaTeX, it's actually quite difficult to make a linebreak in a table. Therefore I created the `linebreak` function to facilitate this process. Please see the Best Practice for Newline in LaTeX Table for details.

```
dt_lb <- data.frame(
  Item = c("Hello\nWorld", "This\nis a cat"),
  Value = c(10, 100)
)

dt_lb %>%
  mutate_all(linebreak) %>%
  kable("latex", booktabs = T, escape = F,
        col.names = linebreak(c("Item\n(Name)", "Value\n(Number)"), align = "c"))
```

Item (Name)	Value (Number)
Hello World	10
This is a cat	100

At the same time, since `kableExtra 0.8.0`, all `kableExtra` functions that have some contents input (such as `footnote` or `group_rows`) will automatically convert `\n` to linebreaks for you in both LaTeX and HTML.

Table on a Landscape Page

Sometimes when we have a wide table, we want it to sit on a designated landscape page. The new function `landscape()` can help you on that. Unlike other functions, this little function only serves LaTeX and doesn't have a HTML side.

```
kable(dt, "latex", caption = "Demo Table (Landscape)[note]", booktabs = T) %>%
  kable_styling(latex_options = c("hold_position")) %>%
  add_header_above(c(" ", "Group 1[note]" = 3, "Group 2[note]" = 3)) %>%
  add_footnote(c("This table is from mtcars",
                 "Group 1 contains mpg, cyl and disp",
                 "Group 2 contains hp, drat and wt"),
               notation = "symbol") %>%
  group_rows("Group 1", 4, 5) %>%
  landscape()
```

Table 5: Demo Table (Landscape)[*]

	Group 1[†]			Group 2[‡]		
	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875
Datsun 710	22.8	4	108	93	3.85	2.320
Group 1						
Hornet 4 Drive	21.4	6	258	110	3.08	3.215
Hornet Sportabout	18.7	8	360	175	3.15	3.440

[*] This table is from mtcars
[†] Group 1 contains mpg, cyl and disp
[‡] Group 2 contains hp, drat and wt

Use LaTeX table in HTML or Word

If you want to include a LaTeX rendered table in your HTML or Word document, or if you just want to save table as an image, you may consider using `kable_as_image()`. Note that this feature requires you to have magick installed (`install.packages("magick")`). Also, if you are planning to use it on Windows, you need to install Ghostscript. This feature may not work if you are using tinytex. If you are using tinytex, please consider using other alternatives to this function.

```r
# Not evaluated.

# The code below will automatically include the image in the rmarkdown document
kable(dt, "latex", booktabs = T) %>%
  column_spec(1, bold = T) %>%
  kable_as_image()

# If you want to save the image locally, just provide a name
kable(dt, "latex", booktabs = T) %>%
  column_spec(1, bold = T) %>%
  kable_as_image("my_latex_table")
```

From other packages

Since the structure of `kable` is relatively simple, it shouldn't be too difficult to convert HTML or LaTeX tables generated by other packages to a `kable` object and then use `kableExtra` to modify the outputs. If you are a package author, feel free to reach out to me and we can collaborate.

tables

The latest version of `tables` comes with a `toKable()` function, which is compatiable with functions in `kableExtra` (>=0.9.0).