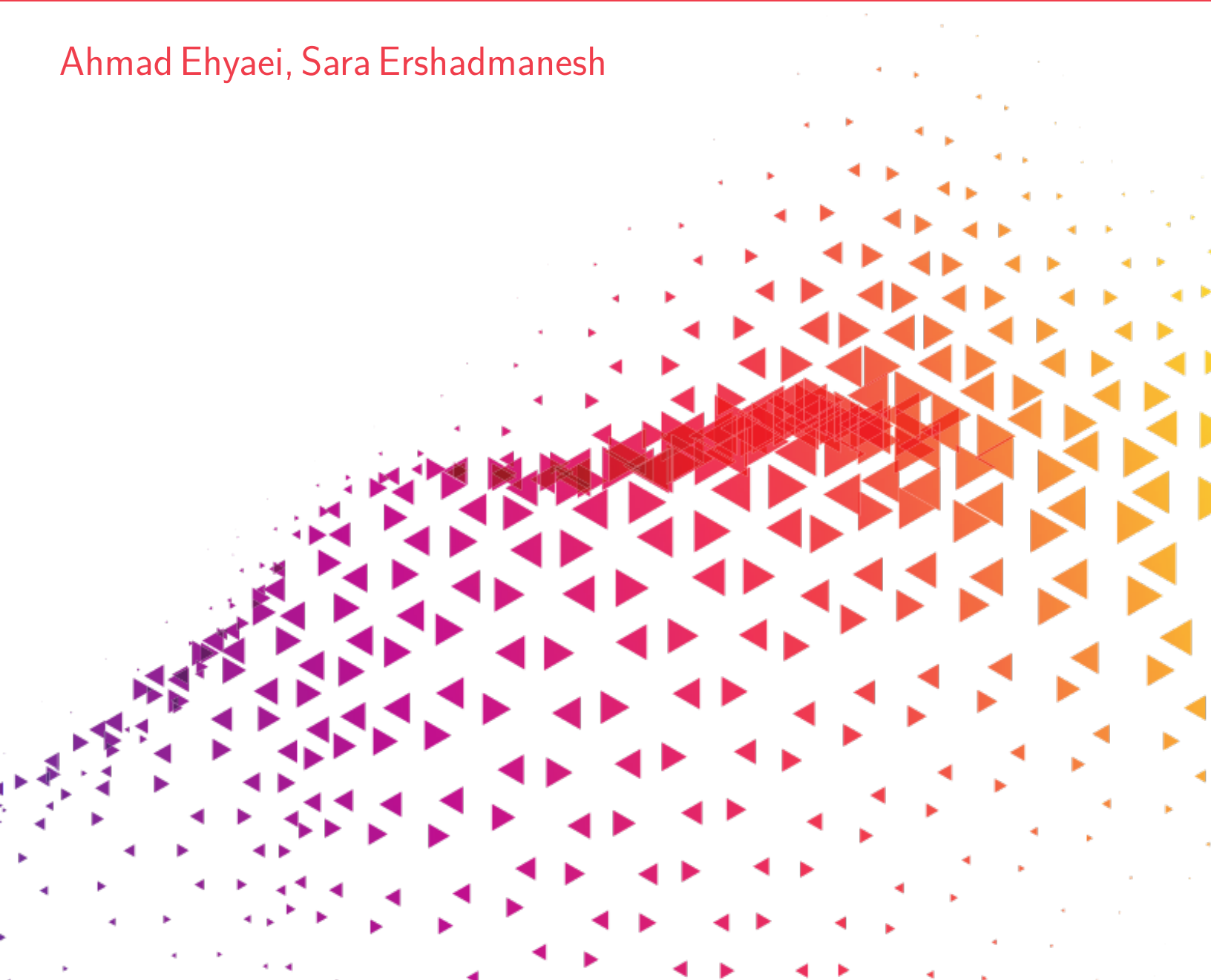# STATISTICAL ANALYSIS OF BEHAVIORAL DATA

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Contents

Chapter 1

Introduction

The bookdown framwrok is a free R package that makes it easier to write books and long reports using R Markdown. PDF, Gitbook, and epub are some of bookdown's output formats.

Chapter 2

Markdown

Markdown is a basic syntax that allows you to format text using headers, lists, boldface, and other formatting options. This markup language is widely used, and you'll almost certainly find apps that support it. Here's a brief rundown of what Markdown syntax is, how to use it.

2.1 Headers

```
#     heading 1
##    heading 2
###   heading 3
#### heading 4
#####  heading 5
###### heading 6
```

2.2 Emphasis

```
_Emphasized text_ or *Emphasized text*

~~Strikethrough text~~

__Strong text__ or **Strong text**

Strikethrough uses two tildes. ~~Scratch this.~~

___Strong emphasized text___ or ***Strong emphasized text***
```

Emphasized text or Emphasized text

~~Strikethrough text~~

Strong text or **Strong text**

Strikethrough uses two tildes. ~~Scratch this.~~

Strong emphasized text or **Strong emphasized text**

2.3 Links

```
[My GitHub Repository](https://github.com/Ehyaei) or https://github.com/Ehyaei

[heading-1](#heading-1 "Goto heading-1")
```

My GitHub Repository or https://github.com/Ehyaei

Emphasis

2.4 Blockquotes

```
> To be, or not to be, that is the question.

>> To be, or not to be, that is the question.
```

> To be, or not to be, that is the question.
>
>> To be, or not to be, that is the question.

2.5 Lists

```
* unordered list
* item 2`
     + sub-item 1
     + sub-item 2

1. ordered list`
2. item 2`
     + sub-item 1
     + sub-item 2
```

· unordered list
· item 2
  - sub-item 1
  - sub-item 2

1. ordered list
2. item 2
   · sub-item 1
   · sub-item 2

2.6 Task List

```
- [x] task 1
- [ ] task 2

- [ ] task 1
  - [ ] subtask
```

☒ task 1

☐ task 2

☐ task 1

   ☐ subtask

2.7 Table

```
Header1 | Header2
------ | ------
Cell11 | Cell12
Cell21 | Cell22
```

Header1	Header2
Cell11	Cell12
Cell21	Cell22

Chapter 3

Code and Formula

We can simply execute R codes among text in chunk contexts using RMakrdown. There are several possibilities in each chunk. Set `echo=TRUE`, for example, if you want to show the code.

```
summary(cars)
     speed           dist
 Min.   : 4.0   Min.   :  2.00
 1st Qu.:12.0   1st Qu.: 26.00
 Median :15.0   Median : 36.00
 Mean   :15.4   Mean   : 42.98
 3rd Qu.:19.0   3rd Qu.: 56.00
 Max.   :25.0   Max.   :120.00
```

We can run inline R code 2^10= 1024

3.1 Math Formula

We can easily write math expressions by latex syntax. Inline LateX equations can be written in a pair of dollar signs

$$f\left(k\right) = \binom{n}{k} p^k \left(1 - p\right)^{n-k}$$

Also, we can write formulas by using dollar signs. For example, if we write `$\beta$` then we see β.

Chapter 4

Figure

This package includes several ggplot themes and palettes for creating plots with MPI custom design.

4.1 Color Palette

To find a color palette, Some colors are chosen from the Pantone list that is different from the two main colors. Color selection is a process in progress.
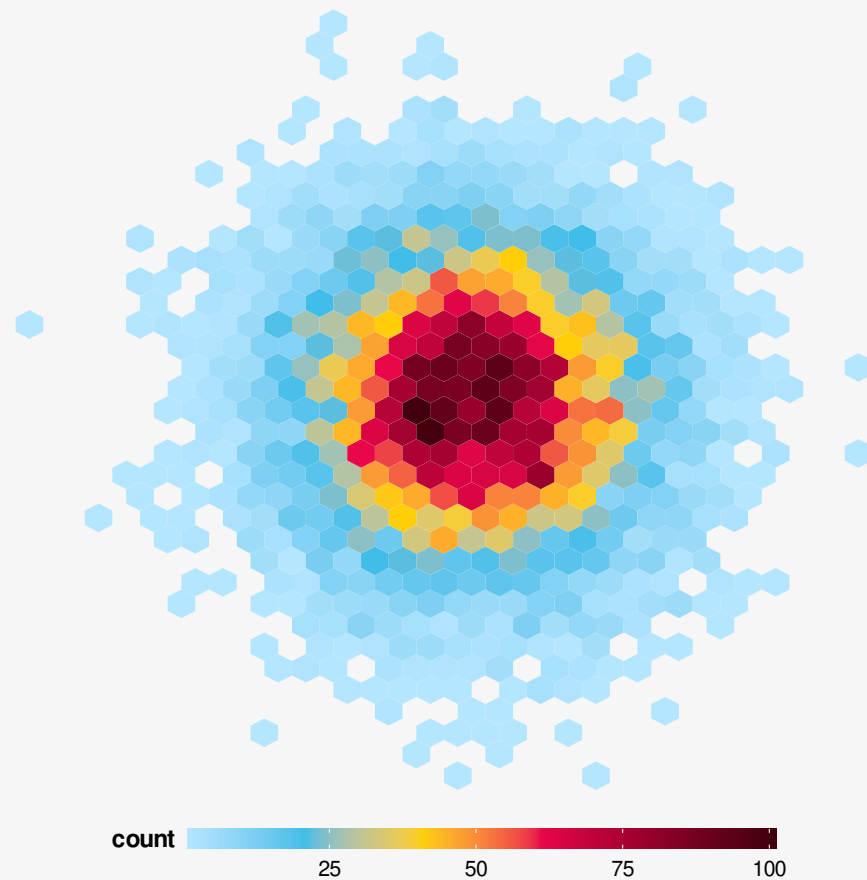
```
scales::show_col(palette_mpi(),ncol = 3)
```

|		
#E90649	#116656	#40BDE8
#FF7300	#FFCE09	#FA9FCC
#0067C6	#62BD19	#CDC9C4

There are some examples here,

A continuous palette can be seen in the example below.

4.2 Theme

The major goal of the theme was to keep things simple so that you could concentrate on the data. As a result, the chart's components, such as the axes, are smaller and less eye - catching.

```r
k = 5
df1 = data.frame(x = rnorm(100*k), y = rnorm(100*k),type = letters[1:k]) %>%
  mutate(x = x+ as.integer(as.factor(type)))
ggplot(df1,aes(x = x, fill = type)) +
  geom_density(col = "transparent",alpha = 0.7) +
  labs(x = "X Value",y = "Density")+
  bottom_legend()
```
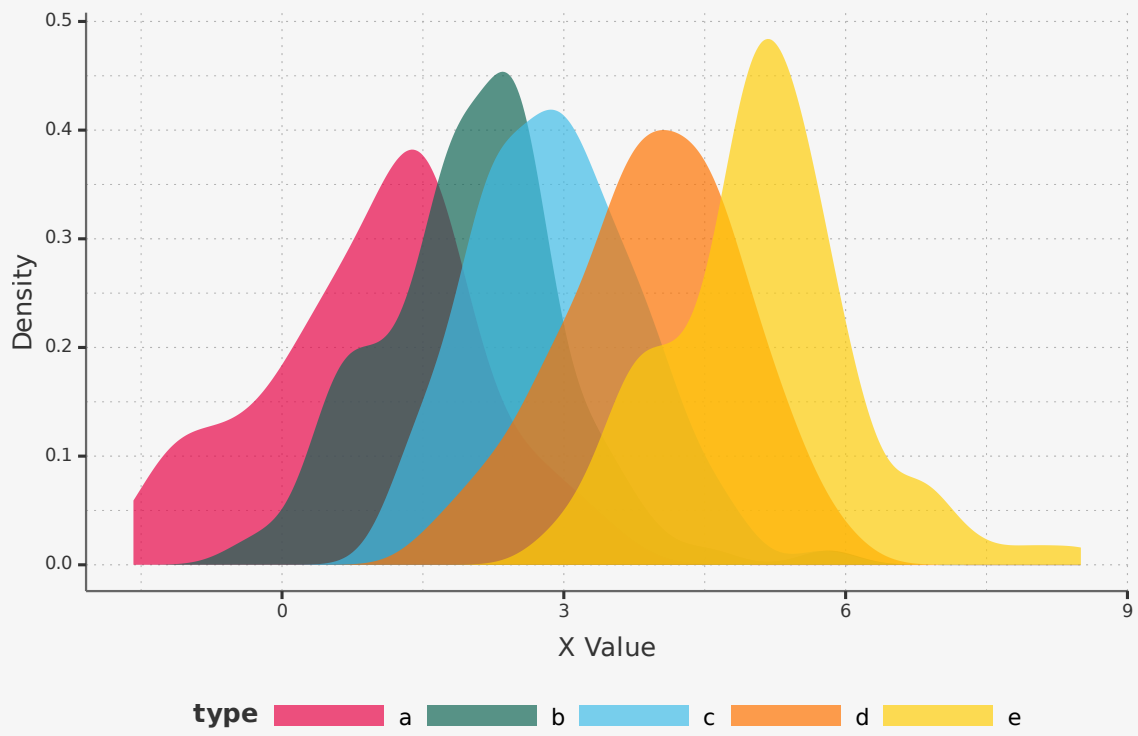
Chapter 5

Table

In data analysis, providing a summary of the data in the form of a table, in addition to generating a graph, is highly beneficial for expressing the results.

To generate tables, you can use a variety of R packages. kableExtra and gt are the two main packages

5.1 gt

To learn about the gt package features and see many examples, you can see An informative document, gt-cookbook.

```r
head(mtcars) %>%
  gt(rownames_to_stub = TRUE) %>%
  opt_row_striping() %>%
  tab_header(
    title = "Motor Trend Car Road Tests",
    subtitle = "From the 1974 Motor Trend US magazine"
  )
```

Motor Trend Car Road Tests
From the 1974 Motor Trend US magazine

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225	105	2.76	3.460	20.22	1	0	3	1

Many features of the `gt` package can be customized, including:

- · Make changes to the table columns format, color, size and…
- · Insert row information, including names and groups.
- · Use headers, spanners, and footers to add extra information.
- · Change table style.

```r
gtcars %>%
    filter(ctry_origin %in% c("United States", "Japan")) %>%
    select(mfr:year, mpg_c, mpg_h, ctry_origin, msrp) %>%
    gt(
        rowname_col = "ctry_origin",
        groupname_col = "year"
    ) %>%
    summary_rows(
        groups = TRUE,
        columns = c("msrp"),
        fns = list(Total = ~sum(.))
    ) %>%
    grand_summary_rows(
        columns = c("msrp"),
        fns = list(Overall = ~sum(.))
    ) %>%
  data_color(
    columns = c("mpg_c", "mpg_h"),
    colors = scales::col_numeric(
      palette = c(
        "white", "green"),
      domain = c(10, 25))
  ) %>%
  fmt_missing(
        columns = contains("mpg"),
        missing_text = ""
    )
```

	mfr	model	mpg_c	mpg_h	msrp
2017					
United States	Ford	GT	11	18	447000
Japan	Acura	NSX	21	22	156000
United States	Dodge	Viper	12	19	95895
United States	Tesla	Model S			74500
Total	—	—	—	—	$773,395.00$
2016					
Japan	Nissan	GT-R	16	22	101770
United States	Chevrolet	Corvette	15	22	88345

Total	—	—	—	—	$190,115.00$
Overall	—	—	—	—	$963,510.00$

5.2 kableExtra

The `kableExtra` package is intended to enhance the basic functionality of `knitr::kable` tables. The most impressive aspect of `kableExtra` is that the majority of its table capabilities are compatible with both HTML and PDF. It's a good choice of `kableExtra` if you can generate a PDF (LaTex) report. For more example of use this package for PDF output see this manual. Below, there are some examples from kableExtra documents that are shown. strongly recommends using the `booktabs = T` option for pdf output. In the HTML manual, this option is removed.

```
dt <- mtcars[1:5, 1:6]
dt %>%
kbl() %>%
    kable_material(c("striped", "hover"))
```

	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

```
mtcars[1:8, 1:8] %>%
  kbl() %>%
  kable_paper(full_width = F) %>%
  column_spec(2, color = spec_color(mtcars$mpg[1:8]),
              link = "https://haozhu233.github.io/kableExtra/") %>%
  column_spec(6, color = "white",
              background = spec_color(mtcars$drat[1:8], end = 0.7),
              popover = paste("am:", mtcars$am[1:8]))
```
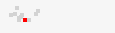
	mpg	cyl	disp	hp	drat	wt	qsec	vs
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0
Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0
Valiant	18.1	6	225.0	105	2.76	3.460	20.22	1
Duster 360	14.3	8	360.0	245	3.21	3.570	15.84	0
Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1

```r
mpg_list <- split(mtcars$mpg, mtcars$cyl)
disp_list <- split(mtcars$disp, mtcars$cyl)
inline_plot <- data.frame(cyl = c(4, 6, 8), mpg_box = "", mpg_hist = "",
                          mpg_line1 = "", mpg_line2 = "",
                          mpg_points1 = "", mpg_points2 = "", mpg_poly = "")
inline_plot %>%
  kbl(booktabs = TRUE) %>%
  kable_paper(full_width = FALSE) %>%
  column_spec(2, image = spec_boxplot(mpg_list)) %>%
  column_spec(3, image = spec_hist(mpg_list)) %>%
  column_spec(4, image = spec_plot(mpg_list, same_lim = TRUE)) %>%
  column_spec(5, image = spec_plot(mpg_list, same_lim = FALSE)) %>%
  column_spec(6, image = spec_plot(mpg_list, type = "p")) %>%
  column_spec(7, image = spec_plot(mpg_list, disp_list, type = "p")) %>%
  column_spec(8, image = spec_plot(mpg_list, polymin = 5))
```

cyl	mpg_box	mpg_hist	mpg_line1	mpg_line2	mpg_points1	mpg_points2	mpg_poly
4							
6							
8							

Chapter 6

Environment

Block content can be useful for informing or alerting your readers about a specific topic. We use the `awesomebox` and `tcolorbox` Latex packages for colored block content. For supplemental information, you can use notes, tips, info, error, and warning elements. Each block serves a specific semantic purpose.

> **Note**
> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

> **Tip**
> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

> **Think**
> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

> **Warning**
> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

> Lorem Ipsum is simply dummy text of the printing and typesetting industry.

To Do

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Theorem 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Definition 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Lemma 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Corollary 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Proposition 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Exercise 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Example 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Remark 6.0.1

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Proof 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Solution 6.0.1

Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Exercise Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Solution Lorem Ipsum is simply dummy text of the printing and typesetting industry.

Chapter 7

Reference