



e-Rum2020

VIRTUAL CONFERENCE

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MILANO

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02_Basics

A UNIFIED APPROACH FOR WRITING AUTOMATIC REPORTS

Parameterization and Generalization of R- Markdown

Rmd: what is it?

Authoring framework for data science

Can be used to

- **Save** and **run** code
- Generate *high quality* reports



Both *computing code* and *description* in *same document*

Results are **automatically generated** from source code

Rmd: Why?

- Mix text and code chunks
- Customizable layout
- Personal website
- Personalized reports
- Interactive plots allowed
- Books
- Other languages friendly:
 - ◆ Python
 - ◆ SQL
 - ◆ C++
 - ◆ ...



Rmd: Why?

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- Interactive plots allowed
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- Other languages friendly:
 - ◆ Python
 - ◆ SQL
 - ◆ C++
 - ◆ ...

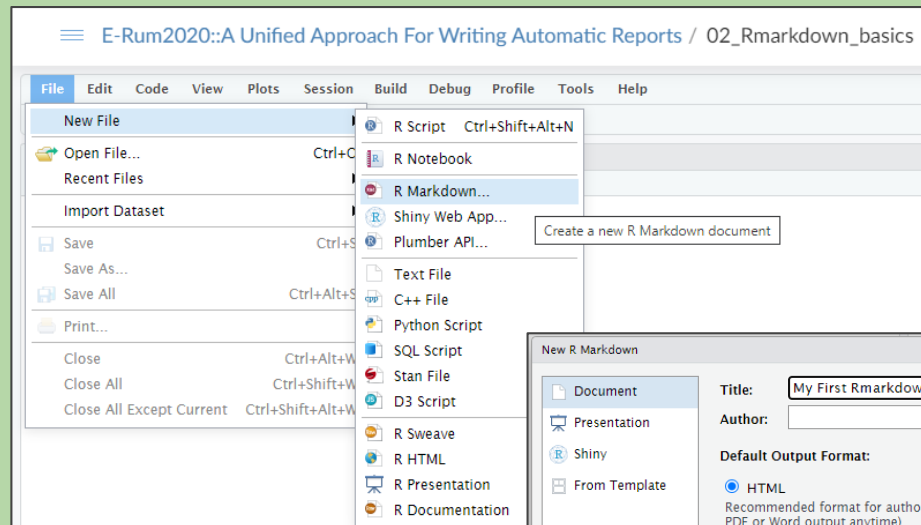


...and much more..

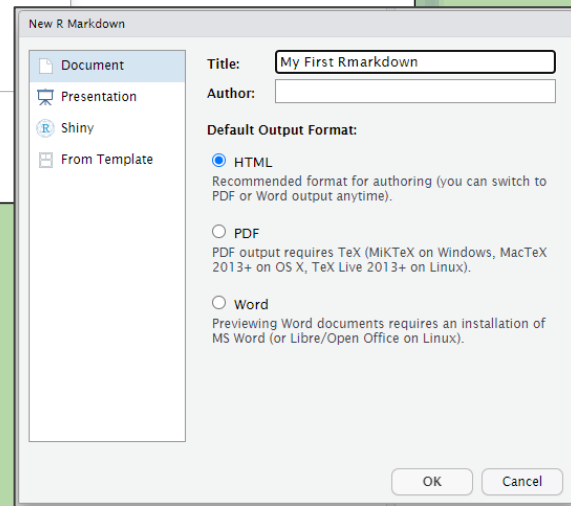
Your turn: Exercise 1

Create your first R Markdown document

1. Select New File from the File Menu



2. Choose Document, select HTML as your output type and title the document "My First R Markdown"

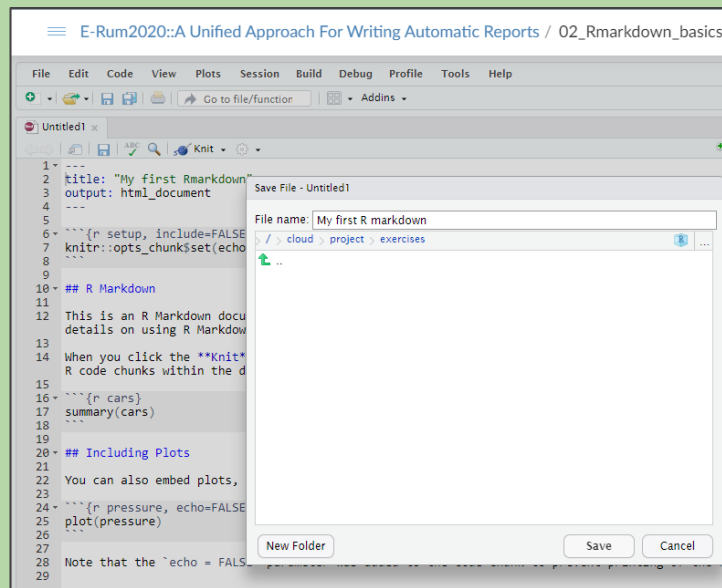


Time: 5 min

Your turn: Exercise 1

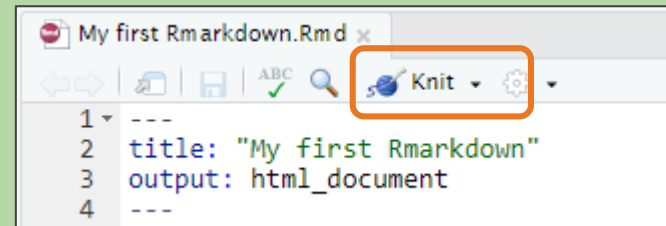
Create your first R Markdown document

3. Save File in "exercise" folder as "My First Markdown"



5:00

4. Knit the document

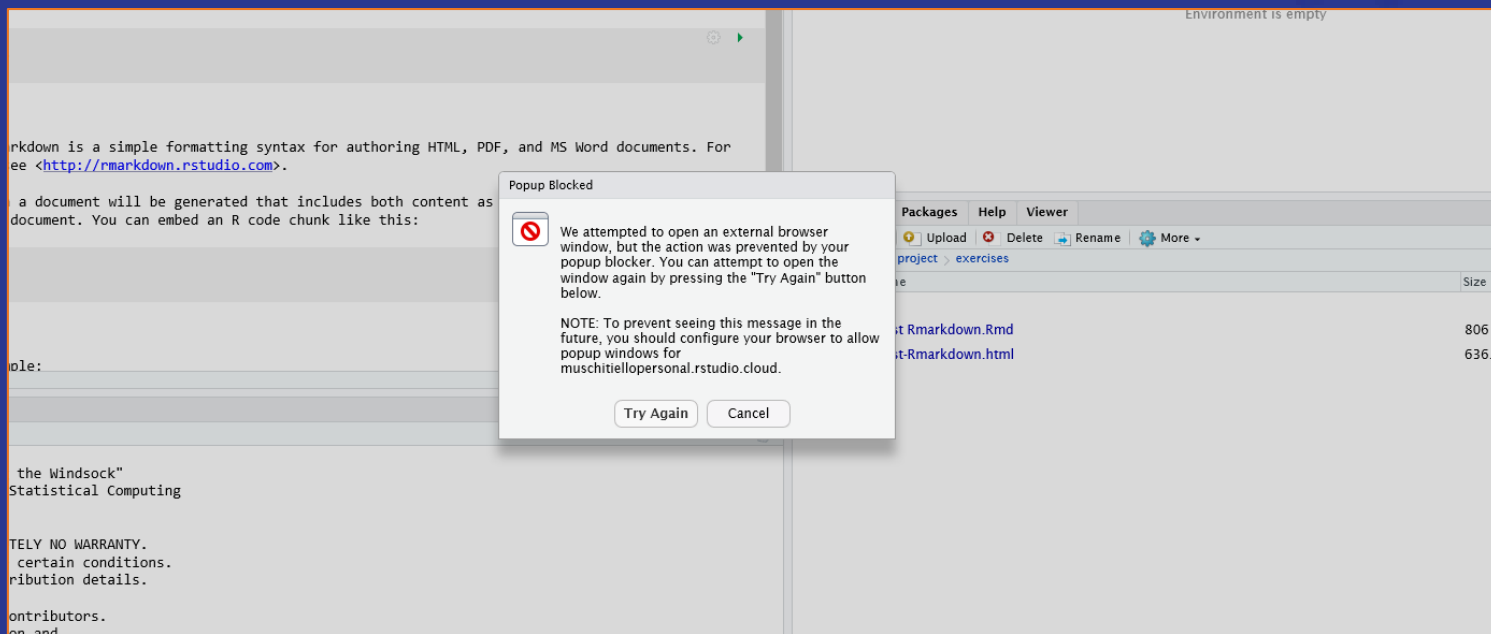


Time: 5 min

Your turn: Exercise 1

Create your first R Markdown document

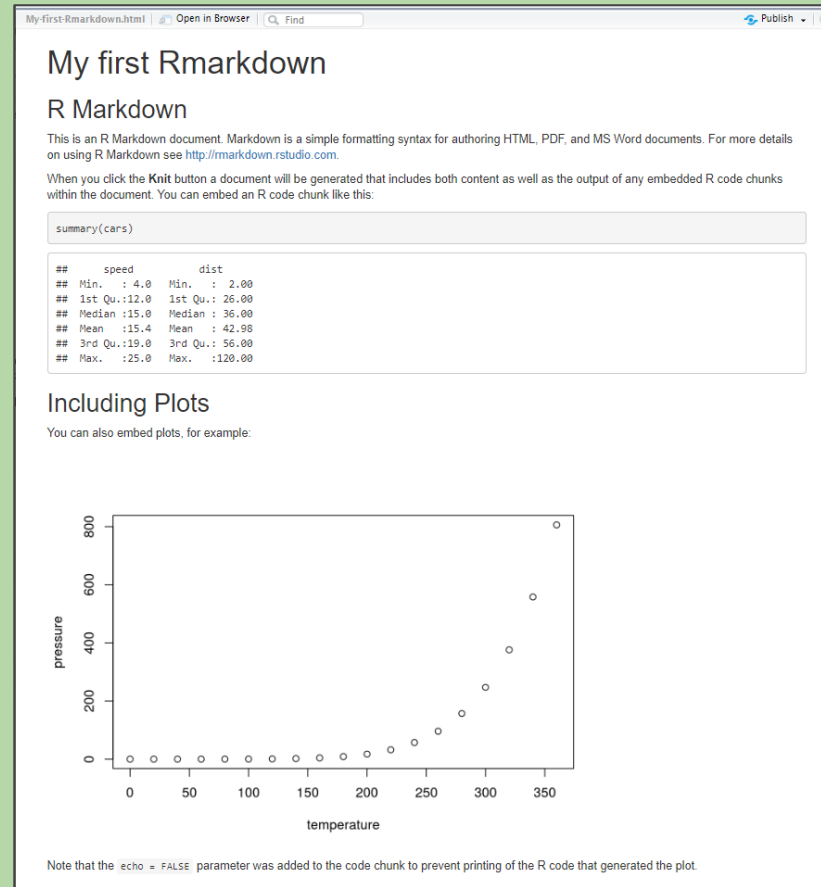
Don't Panic!!!! Click "Try Again" and it should be fine!



Your turn: Exercise 1

Create your first R Markdown document

Output



Time: 5 min



See what's underneath

Three main components in Rmd:

1. Metadata

2. Text

3. Code



1. Metadata: the YAML header

```
1 ---  
2 title: "My first Rmarkdown"  
3 output: html_document  
4 ---
```

Written between the three dashes

Written in YAML (YAML Aint Markup Language)*



Sources:

<https://en.wikipedia.org/wiki/YAML>

1. Metadata: the YAML header

```
1 ---  
2 title: "My First Markdown"  
3 output: html_document  
4 author: "Nick Stamboglis"  
5 date: "`r format(Sys.time(), '%e %B %Y')`"  
6 ---
```

- Safer to always quote
- Indentation matters
- Options available
- Logicals allowed

Source:

<https://bookdown.org/yihui/bookdown/r-markdown.html>

<https://holtzy.github.io/Pimp-my-rmd/>

2. Text

```

5
6 # Header 1
7
8 ## Header 2
9
10 ### Header 3
11
12 *italics* or _italics_
13
14 **bold** or __bold__
15
16 `inline code`
17
18 [links](https://github.com/muschitiello)
19
20 etc.
21
22 Lists:
23
24 * Item 1
25 * Item 2
26   + Item 2a
27   + Item 2b
28
29 1. Item 1
30 2. Item 2
31 3. Item 3
32
33 > Block Quotes
34
35 Horizontal rules:
36
37 ***
38
39 ---
40
41 superscript^2^
42

```



Header 1

Header 2

Header 3

italics or *italics*

bold or **bold**

`inline code`

[links](#)

etc.

Lists:

- Item 1
- Item 2
 - Item 2a
 - Item 2b

1. Item 1
2. Item 2
3. Item 3

Block Quotes

Horizontal rules:

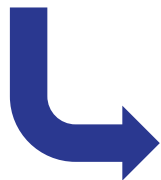
superscript²

2. Mathematics

```

5
6 # Inline math code
7
8 Inline LaTeX equations can be written in a pair of dollar signs
9 using the LaTeX syntax, e.g., `$\lim_{x \to \infty} f(x)$` (actual
10 output:$\lim_{x \to \infty} f(x)$)
11
12 # Centered math code
13
14 Math expressions of the display style can be written in a pair of
15 double dollar signs, e.g., `$$x_{\{1\}} + x_{\{2\}} + \cdots + x_{\{n\}}$$`,
16 and the output looks like this:
17
18 $$x_{\{1\}} + x_{\{2\}} + \cdots + x_{\{n\}}$$

```



Inline math code

Inline LaTeX equations can be written in a pair of dollar signs using the LaTeX syntax, e.g.,
`$\lim_{x \to \infty} f(x)$` (actual output: $\lim_{x \rightarrow \infty} f(x)$)

Centered math code

Math expressions of the display style can be written in a pair of double dollar signs, e.g.,
`$$x_{\{1\}} + x_{\{2\}} + \cdots + x_{\{n\}}$$`, and the output looks like this:

$$x_1 + x_2 + \cdots + x_n$$



[Click here for Suggestions for the use of mathematics in Rmarkdown](#)

3. Code

```

5
6 # Inline code
7
8 Today is `r format(Sys.time(), '%e %B %Y')`.
9
10 # Code Chunks
11
12 You can easily add a code chunk by clicking **Ctrl + Alt + I**
13 ```{r, include = TRUE}
14
15 # Appearing Code
16 summary(cars)
17
18 ```
19
20 # Chunk Options
21
22 Chunk output can be customized with knitr options arguments set in
23 the {} of a chunk header. The most common options are:
24
25 - `include = FALSE` prevents code and results from appearing in
26   the finished file. R Markdown still runs the code in the chunk,
27   and the results can be used by other chunks.
28 - `echo = FALSE` prevents code, but not the results from
29   appearing in the finished file. This is a useful way to embed
30   figures.
31
32 For a complete list see [R Markdown reference
33 guide](https://rstudio.com/wp-content/uploads/2015/03/rmarkdown-re
34 ference.pdf?_ga=2.116435842.520650959.1591111953-1268727786.157331
35 1084)
36
37
38
39

```



Inline code

Today is 2 June 2020.

Code Chunks

You can easily add a code chunk by clicking **Ctrl + Alt + I**

```
# Appearing 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
```

Chunk Options

Chunk output can be customized with knitr options arguments set in the {} of a chunk header. The most common options are:

- `include = FALSE` prevents code and results from appearing in the finished file. R Markdown still runs the code in the chunk, and the results can be used by other chunks.
- `echo = FALSE` prevents code, but not the results from appearing in the finished file. This is a useful way to embed figures.

For a complete list see [R Markdown reference guide](#)

[R Markdown Reference Guide](#)

3.Code (bonus tip)

```

4 ---
5
6 ```{r setup, include=FALSE}
7 knitr::opts_chunk$set(echo = TRUE)
8 ```
9
10 ## R Markdown
11
12 This is an R Markdown document. Markdown is a simple formatting syntax
13 for authoring HTML, PDF, and MS Word documents. For more details on
14 using R Markdown see <http://rmarkdown.rstudio.com>.
15
16 When you click the **Knit** button a document will be generated that
17 includes both content as well as the output of any embedded R code
18 chunks within the document. You can embed an R code chunk like this:
19
20 ```{r cars}
21 summary(cars)
22 ```
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
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81
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97
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99
100

```

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

```

19
20 ## Including Plots
21

```



Code chunks can be
run before knitting to
debug and preview

[R Markdown Reference Guide](#)

4. And more

- Images
- Bibliography
- Citations
- . . .



Your turn: Exercise 2



02_Rmarkdown_components.Rmd

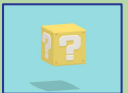
Add or change
components in Rmarkdown

Add equation of the “mean” in exercise 2:

```
56  
57 · ### Equation of the *mean*  
58  
59 $$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$
```

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

60



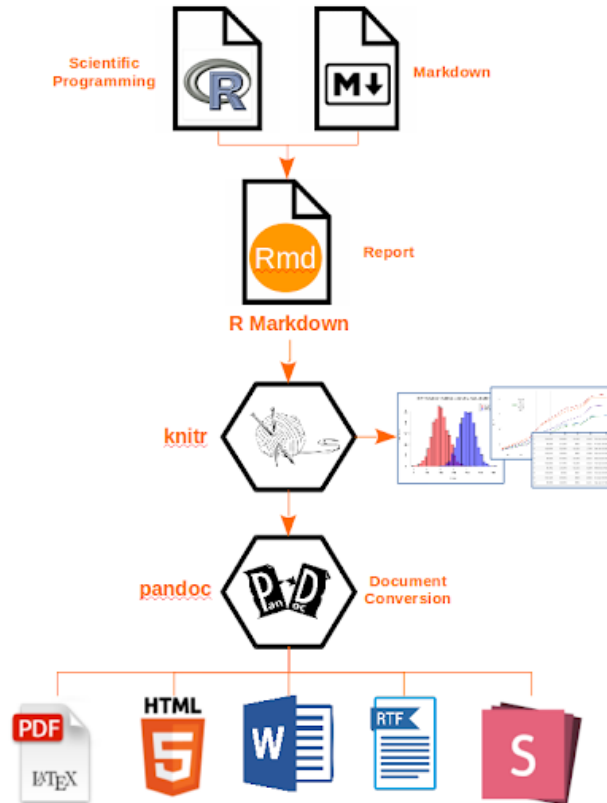
Time: 5 min

Output formats

Multiples formats

- HTML
- PDF
- Word
- Slides
- Latex document
- Dashboards
- Website

... and more!



Sources:
<https://bookdown.org/yihui/bookdown/r-markdown.html>

Your turn: Exercise 3

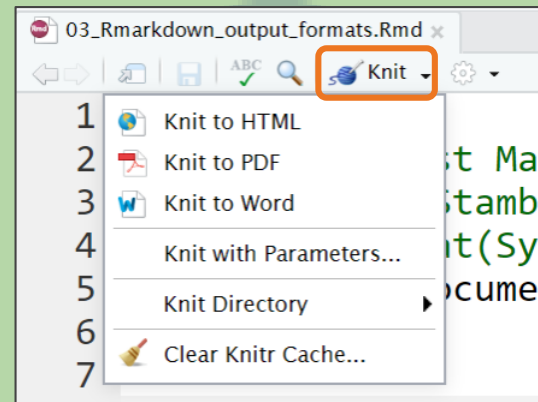
03_Rmarkdown_output_formats.Rmd

Knit in different output formats

```
1 ---
2 title: "My First Markdown"
3 author: "Nick Stamboglis"
4 date: "`r format(Sys.time(), '%e %B %Y')`"
5 output: pdf_document
6 ---
```

```
1 ---
2 title: "My First Markdown"
3 author: "Nick Stamboglis"
4 date: "`r format(Sys.time(), '%e %B %Y')`"
5 output: word_document
6 ---
```

```
1 ---
2 title: "My First Markdown"
3 author: "Nick Stamboglis"
4 date: "`r format(Sys.time(), '%e %B %Y')`"
5 output: html_document
6 ---
```



Time: 5 min

Resources:

R Markdown :: CHEAT SHEET

What is R Markdown?

Anal file - An R Markdown file is a record of your research. It contains the code that a scientist needs to reproduce your work along with the narrative that a reader needs to understand your work.

Reproducible Research - At the click of a button, or the type of a command, you can reuse the code in an R Markdown file to regenerate your work and export the results as a document.

Dynamic Documents - You can choose to export the finished report as a variety of formats, including HTML, PDF, MS Word, or EPUB documents. These are all based on slides, notebooks, and more.

Workflow

1. Open a new **Anal File** or **R Markdown** file.
2. Edit the file. You can write R code, insert a new chunk, or insert a new slide.
3. Run the code in the console.
4. Export the document as a PDF, HTML, or other format.

render

Use **render()** to render text at console. Important args:

```
render("report.Rmd", output = "pdf", preview = TRUE)
```

Embed code with knitr syntax

INLINE CODE - Knitr supports inline code with `knitr::`r`()`. Roughly appears as text without code.

CODE CHUNKS - Code chunks are enclosed with ````` and `````. Place chunk options in the first line of the chunk.

GLOBAL OPTIONS - Global options are placed at the top of the document, e.g. `knitr::opts_chunk$set(echo = TRUE)`.

IMPORTANT CHUNK OPTIONS

- cache** - cache results for future knits (default = FALSE)
- cache.path** - directory to save cached results in (default = "cache/")
- comment** - text to be included in the output (default = "#")
- echo** - TRUE to be included in the output (default = TRUE)
- fig.height** - height of figure in inches (default = 8.5)
- fig.width** - width of figure in inches (default = 11.5)
- fig.align** - alignment of figure (default = "center")
- fig.cap** - figure caption (default = "Figure 1: A line plot showing the relationship between x and y.")
- fig.asp** - aspect ratio of figure (default = 1)
- fig.dpi** - dots per inch (default = 300)
- fig.ext** - file extension (default = "png")
- fig.path** - directory to save figures (default = "figures/")
- fig.show** - TRUE to show figures (default = TRUE)
- fig.width** - width of figure in inches (default = 11.5)
- fig.height** - height of figure in inches (default = 8.5)
- fig.align** - alignment of figure (default = "center")
- fig.cap** - figure caption (default = "Figure 1: A line plot showing the relationship between x and y.")
- fig.asp** - aspect ratio of figure (default = 1)
- fig.dpi** - dots per inch (default = 300)
- fig.ext** - file extension (default = "png")
- fig.path** - directory to save figures (default = "figures/")
- fig.show** - TRUE to show figures (default = TRUE)

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R Markdown Cheat Sheet

The R Series

R Markdown

The Definitive Guide

HTML, PDF, LaTeX, Kindle, ePub, etc.

rmd Structure

Parameters

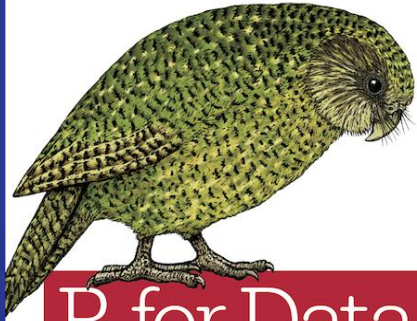
Interactive Documents

Yihui Xie
J. J. Allaire
Garrett Grolmund

CRC Press
Taylor & Francis Group
A CHAPMAN & HALL BOOK

R Markdown The Definitive Guide

O'REILLY®



R for Data Science

VISUALIZE, MODEL, TRANSFORM, TIDY, AND IMPORT DATA

Hadley Wickham & Garrett Grolmund

R for Data Science

Questions



Next up: Parametrization



Source: giphy.com