



e-Rum2020

VIRTUAL CONFERENCE

17/20 JUNE
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++
 - ◆ ...



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- Other languages friendly:
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 - ◆ SQL
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 - ◆ ...

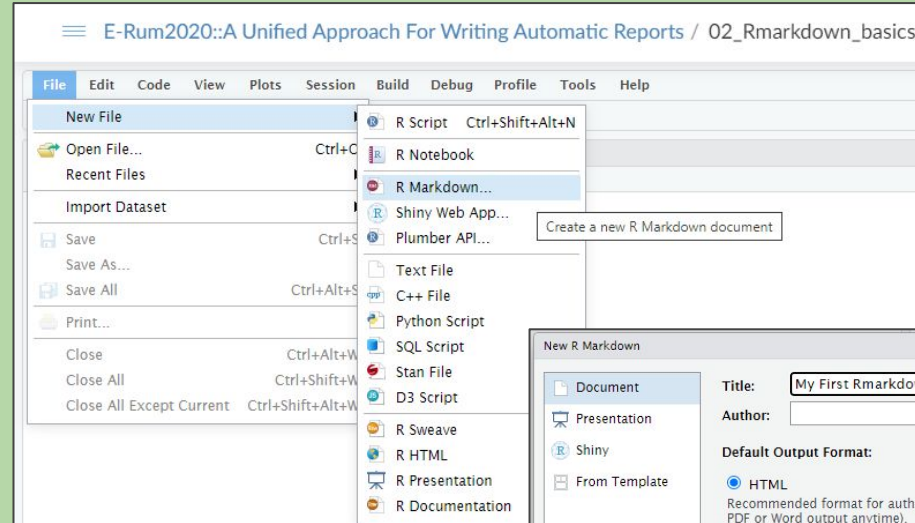


...and much more..

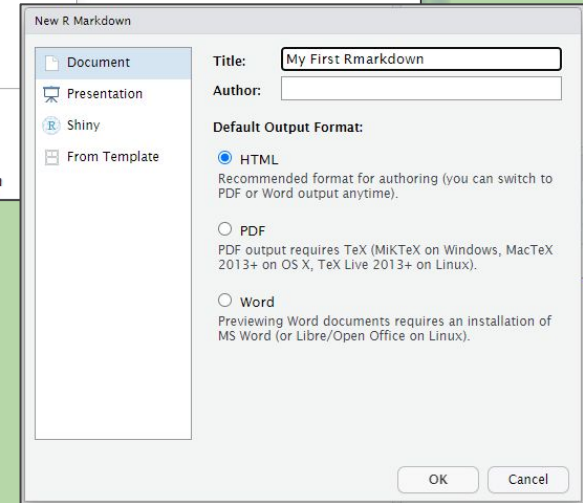
Your turn: Exercise 1

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"

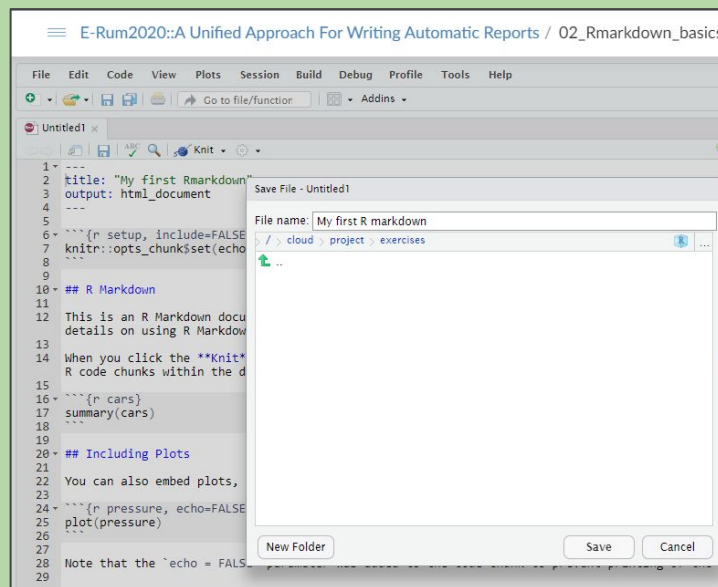


Time: 5 min

Your turn: Exercise 1

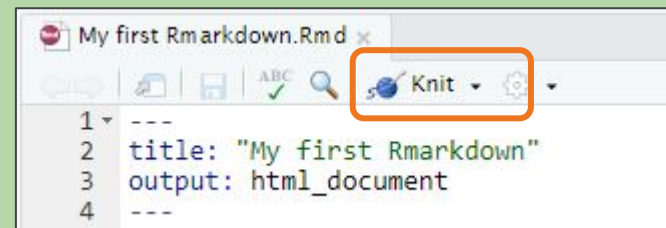
Create your first R Markdown document

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



5:00

4. Knit the document

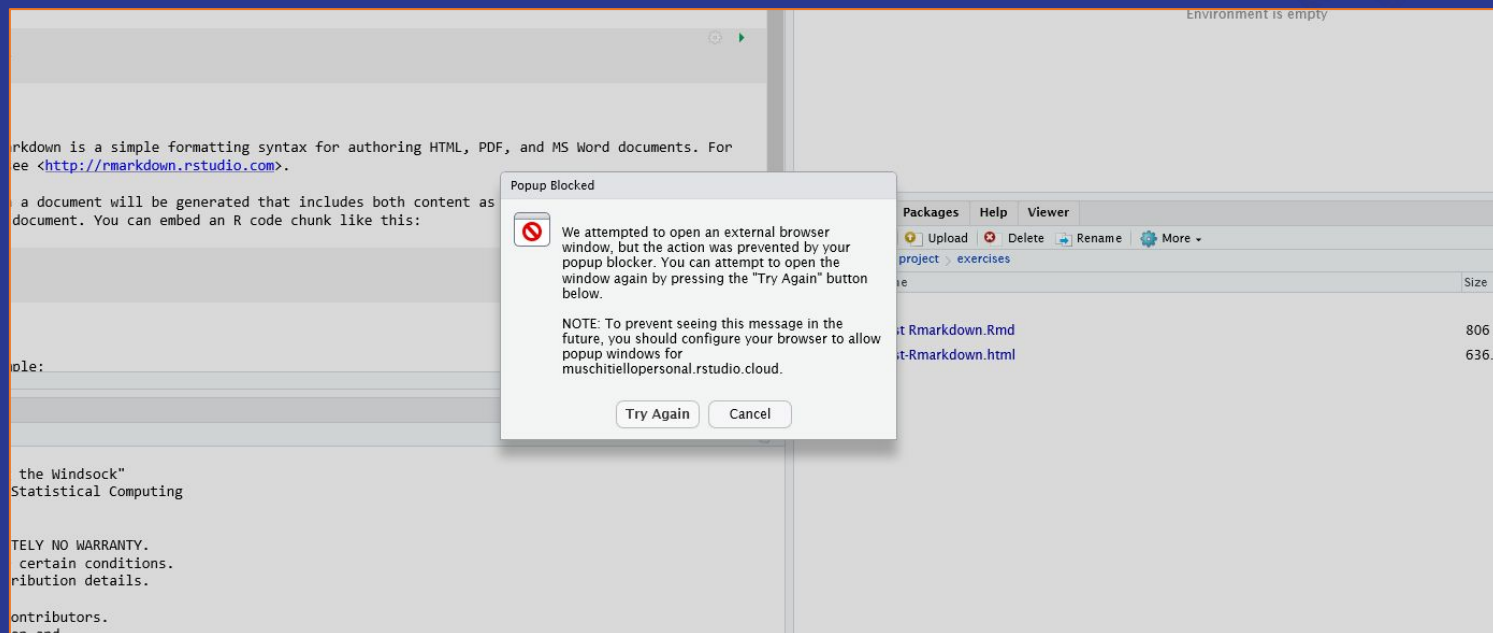


Time: 5 min

Your turn: Exercise 1

Create your first R Markdown document

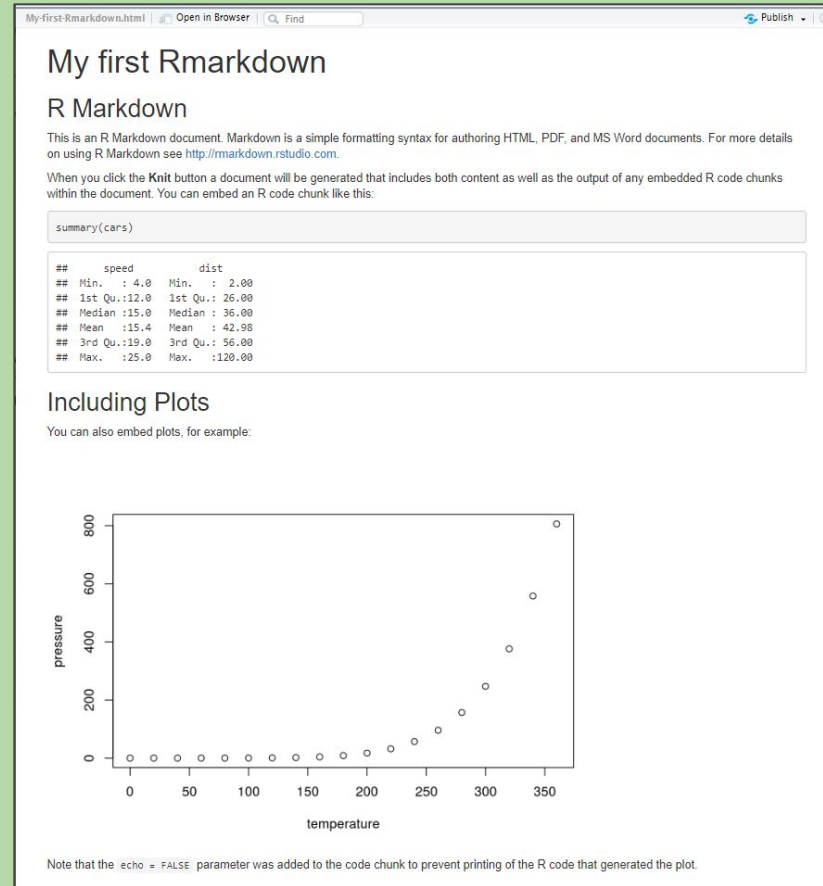
Don't Panic!!!! Click "Try Again" and it should be fine!



Your turn: Exercise 1

Create your first R Markdown document

Output

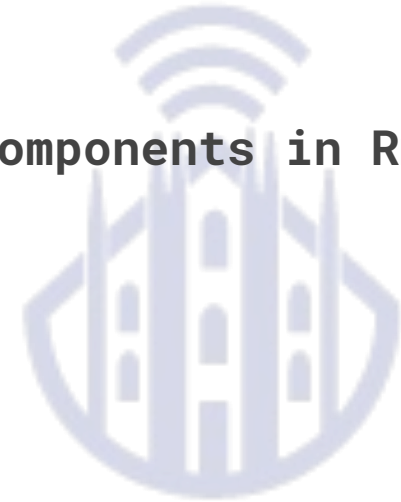


Time: 5 min

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 link-citations: yes  
7 ---
```

- 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

L^AT_EX
Friendly

```

5
6 ▾ # Inline math code
7
8 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:$\lim_{x \to \infty} f(x)$)
9
10 ▾ # Centered math code
11
12 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:
13
14 $$x_{1} + x_{2} + \cdots + x_{n}$$

```



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](https://rstudio.com/wp-content/uploads/2015/03/rmarkdown-reference.pdf?_ga=2.116435842.520650959.1591111953-1268727786.1573311084)

[R Markdown Reference Guide](https://rstudio.com/wp-content/uploads/2015/03/rmarkdown-reference.pdf?_ga=2.116435842.520650959.1591111953-1268727786.1573311084)

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
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31
32
33
34
35
36
37
38
39
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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

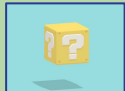
Add or change
components in Rmarkdown

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
```



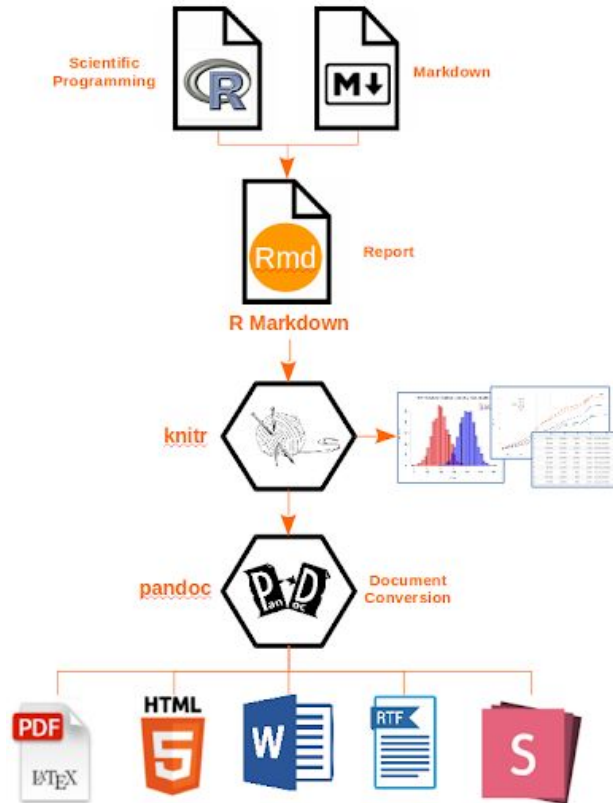
Time: 5 min

Output formats

Multiples formats

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

... and more!



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

Your turn: Exercise 3

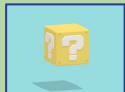
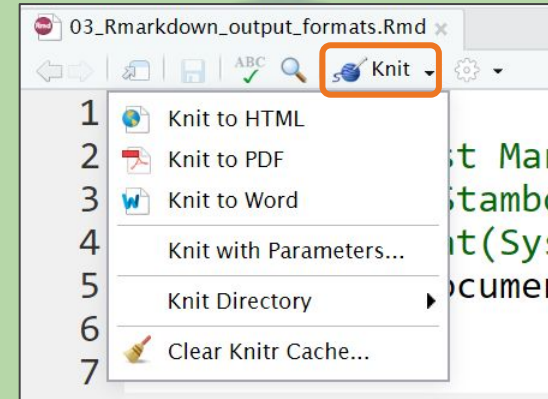
03_Rmarkdown_output_formats.Rmd

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?

Render File: An R Markdown file is a record of your research. It captures 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 convert the code in an R Markdown file to reproduce your work and export the result as an external report.

Dynamic Documents: You can choose to export the R Markdown report as a variety of different file formats, including HTML, PDF, MS Word, or EPUB documents. You can also export as a slide presentation, a book, or a website.

Workflow

1. Open a new R Markdown file in RStudio
2. Edit the R Markdown file to add content
3. Render the R Markdown file to create a report
4. Preview the report in a web browser
5. Export the report to a file format
6. Use the report file to share your work

Embed code with knitr syntax

INLINE CODE: Results appear as text without code.

CODE CHUNKS: Code is executed and the results are displayed.

GLOBAL OPTIONS: Options that affect the entire document.

IMPORTANT CHUNK OPTIONS:

- cache:** cache results for future use (default = FALSE)
- cache.path:** directory to store cached results (default = ".cache/")
- comment:** text to be included in the output (default = "#")
- echo:** TRUE to echo code, FALSE to suppress (default = TRUE)
- eval:** TRUE to evaluate code, FALSE to suppress (default = TRUE)
- fig.height, fig.width:** dimensions of plots in inches (default = 8.5, 11)
- fig.path:** directory to save plots (default = ".figs/")
- fig.width, fig.height:** dimensions of plots in inches (default = 8.5, 11)
- highlight:** TRUE to highlight source code (default = TRUE)
- message:** TRUE to display messages (default = FALSE)
- results:** TRUE to display results (default = TRUE)
- self-contained:** TRUE to make the document self-contained (default = FALSE)
- show.output.on.console:** TRUE to show output on the console (default = TRUE)
- show.messages:** TRUE to show messages (default = TRUE)
- verbose:** TRUE to show verbose output (default = TRUE)
- warning:** TRUE to show warnings (default = TRUE)
- zip:** TRUE to zip the output (default = FALSE)
- zip.path:** directory to save zipped output (default = ".zip/")
- zip.type:** type of zip file (default = "bzip2")
- zip.verbose:** TRUE to show verbose output (default = TRUE)
- zip.type:** type of zip file (default = "bzip2")
- zip.verbose:** TRUE to show verbose output (default = TRUE)

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R Markdown Cheat Sheet

The R Series

R Markdown

The Definitive Guide

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

Parameters: Parameters are used to control the output of the document. They are defined in the YAML header of the document.

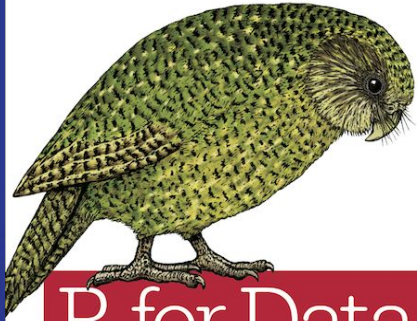
Interactive Documents: Interactive documents allow you to create documents that can be executed and viewed in a web browser.

Yihui Xie
J. J. Allaire
Garrett Golemund

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 Golemund

R for Data Science

Questions



Next up: Parametrization



Source: giphy.com