

Dynamic documents in R

reproducible research with R Markdown

2020-10-31

Rmarkdown

TEXT. CODE. OUTPUT.
(GET IT TOGETHER, PEOPLE.)



Artwork by @allison_horst

R Markdown



Authoring framework: code and text in same document

Reproducible: re-run your analysis

Flexible: Output to different formats easily



knitting

Your turn 1

Create a new R Markdown file. Go to File > New File > R Markdown. Press OK. Save the file and press the "Knit" button above.

02:00

The screenshot shows an RStudio interface with a document titled "1-example.Rmd". The code editor contains the following R Markdown code:

```
1---  
2 title: "Viridis Demo"  
3 output: html_document  
4---  
5  
6```{r include = FALSE}  
7 library(viridis)  
8```  
9  
10 The code below demonstrates two color palettes in the  
11 [viridis](https://github.com/sjmgarnier/viridis) package. Each  
12 plot displays a contour map of the Maunga Whau volcano in  
13 Auckland, New Zealand.  
14```{r}  
15 image(volcano, col = viridis(200))  
16```  
17  
18## Magma colors  
19  
20```{r}  
21 image(volcano, col = viridis(200, option = "A"))  
22```  
23
```

The code is annotated with three large orange curly braces:

- A brace on the left side of the first few lines of code is labeled "YAML Metadata".
- A brace spanning the explanatory text and the first code chunk is labeled "Plain text".
- A brace spanning the second code chunk is labeled "Code chunk".

R Markdown

Prose

Code

Metadata



R Markdown

Prose = Markdown

Code

Metadata



Basic Markdown Syntax

italic **bold**

italic __bold__

Basic Markdown Syntax

```
# Header 1
```

```
## Header 2
```

```
### Header 3
```

Try this later:

**Do the ten-twenty minute tutorial on
markdown at**

[https://commonmark.org/help/tutorial.](https://commonmark.org/help/tutorial)

R Markdown

Prose

Code = R code chunks

Metadata



Code chunks

```
```{r select_example, echo = FALSE}
gapminder %>%
 select(year, country)
```
```

Code chunks

fences (3
backticks)

```
r select_example, echo = FALSE}  
gapminder %>%  
  select(year, country)
```

Code chunks

chunk name

The diagram illustrates the structure of a code chunk. At the top, the text "chunk name" is displayed in blue. A black arrow points downwards from the right side of "chunk name" to the word "r" in the code below. Below "r", the text "select_example, echo = FALSE" is shown in orange. To the left of the code, the text "gapminder %>% select(year, country)" is displayed in a lighter gray font. Two black arrows point upwards from the bottom of "chunk arguments" to the "select_example" argument and the "country" argument in the code respectively.

```
r select_example, echo = FALSE
gapminder %>%
  select(year, country)
```

chunk arguments

Chunk options

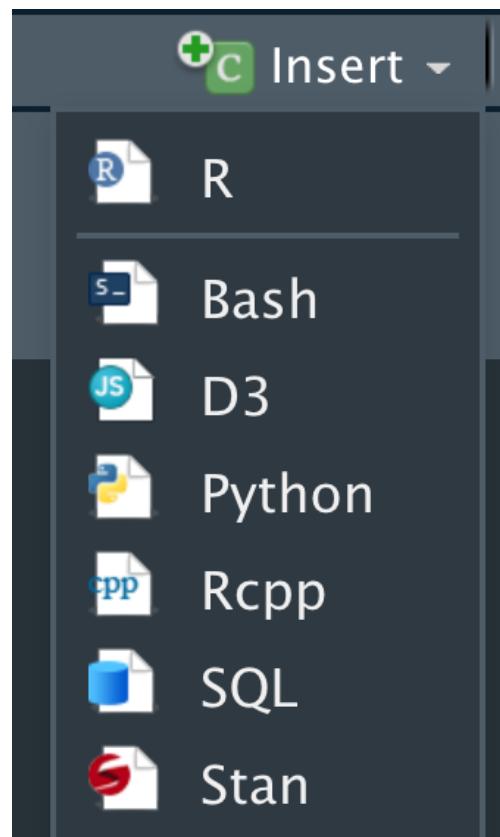
| Option | Effect |
|-----------------------------------|--|
| <code>include = FALSE</code> | run the code but don't print it or results |
| <code>eval = FALSE</code> | don't evaluate the code |
| <code>echo = FALSE</code> | run the code and output but don't print code |
| <code>message = FALSE</code> | don't print messages (e.g. from a function) |
| <code>warning = FALSE</code> | don't print warnings |
| <code>fig.cap = "Figure 1"</code> | caption output plot with "Figure 1" |

See the [knitr web page](#)

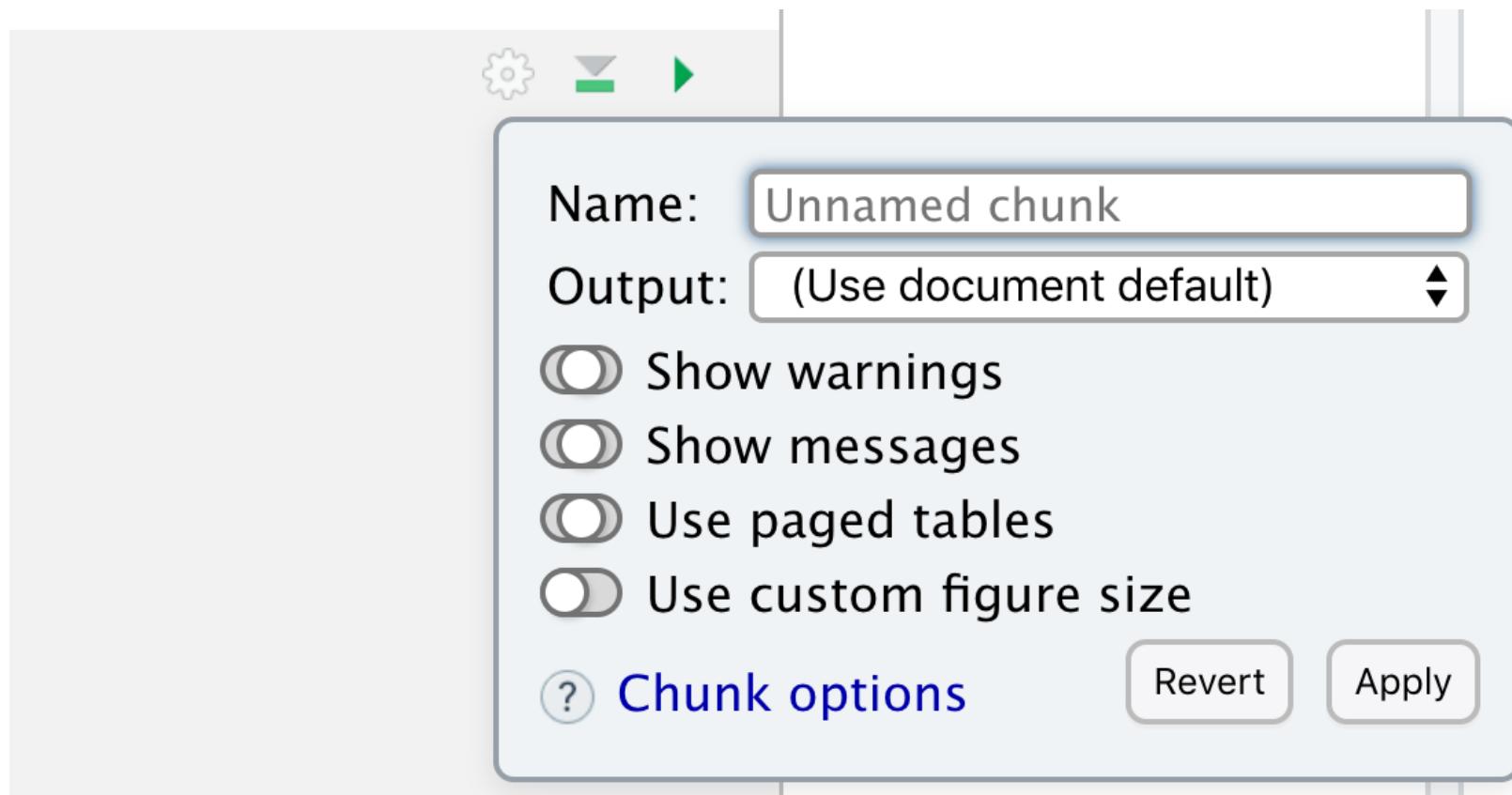
Engines

52! Including **Python, Julia, C++, SQL, SAS, and Stata**

Insert code chunks with cmd/ctrl + alt/option + I



Edit code chunk options



Your turn 2 (open 04_exercises_rmarkdown.Rmd)

Create a code chunk. You can type it in manually, use the keyboard short-cut (Cmd/Ctrl + Option/Alt + I), or use the "Insert" button above. Put the following code in it:

```
gapminder %>%
  slice(1:5) %>%
  knitr::kable()
```

Knit the document

03:00

Inline Code

Lore*m ipsum dolor sit
amet, consetetur
sadipscing
`r max(gapminder\$year)`
elitr, sed diam nonumy
eirmod tempor invidunt*

Inline Code

backticks
`r max(gapminder\$year)`
any R code

The diagram illustrates the use of backticks in R. A large orange bracket labeled "backticks" spans the entire code block. Inside the backticks, there is an orange plus sign followed by the letter "r". Below the backticks, the word "any R code" is written in blue. Arrows point from the text "backticks" and "any R code" towards the corresponding parts of the code block.

Your turn 3

Remove eval = FALSE so that R Markdown evaluates the code.

Use summarize() and n_distinct() to get the the number of unique years in gapminder and save the results as n_years.

Use inline code to describe the data set in the text below the code chunk and re-knit.

05:00

R Markdown

Prose

Code

Metadata = YAML



YAML Metadata

```
---
author: Malcolm Barrett
title: Quarterly Report
output:
  html_document: default
  pdf_document:
    toc: true
---
```

```
title: "Annual report"
```

```
author: Malcolm Barrett
```

```
date: "`r Sys.Date()`"
```

```
output:
```

```
pdf_document:
```

```
  toc: true
```

```
title: "Annual report"
author: Malcolm Barrett
date: "r Sys.Date()"

output:
  pdf_document:
    toc: true
```

key value

```
title: "Annual report"
```

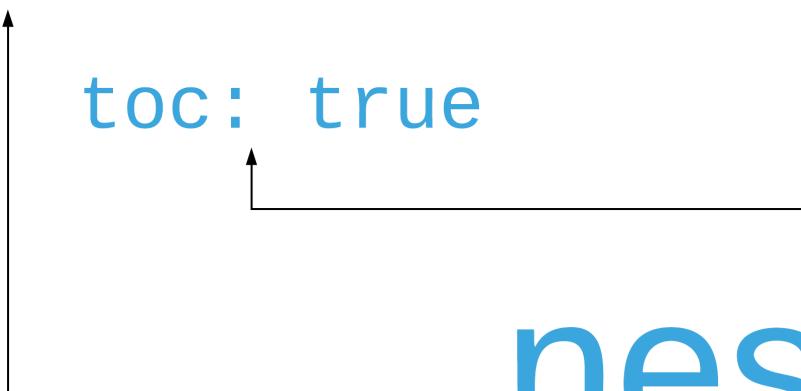
```
author: Malcolm Barrett
```

```
date: "``r Sys.Date()``"
```

```
output: ← top level
```

```
pdf_document:
```

```
  toc: true
```



```
nested
```

title: "Annual report"

author: Malcolm Barron

date: "r Sys.Date()"

output:

pdf_document:

toc: true

output
function

output

arguments



```
title: "Annual report"
```

```
author: Malcolm Barrett
```

```
date: "`r Sys.Date()`"
```

```
output:
```

```
pdf_document:
```

```
  toc: true
```

pdf_document(toc = TRUE)

Output formats

| Function | Outputs |
|---------------------------|---------------------|
| html_document() | HTML |
| pdf_document() | PDF |
| word_document() | Word .docx |
| odt_document() | .odt |
| rtf_document() | .rtf |
| md_document() | Markdown |
| slidy_presentation() | Slidy Slides (HTML) |
| beamer_presentation() | Beamer Slides (PDF) |
| ioslides_presentation() | ioslides (HTML) |
| powerpoint_presentation() | Powerpoint Slides |

Your turn 4

Set figure chunk options such as dpi, fig.width, and fig.height. Run knitr::opts_chunk\$get() in the console to see the defaults.

Change the YAML header above from output: html_document to another output type like pdf_document or word_document.

Add your name to the YAML header using author: Your Name.

05:00

What else can you do in R Markdown?

Parameterized reports

Include bibliographies and citations

Make cool stuff in R Markdown!

`bookdown`

`blogdown`

`these slides!`

Resources

R Markdown: A comprehensive but friendly introduction to R Markdown and friends. Free online.

R for Data Science: A comprehensive but friendly introduction to the tidyverse. Free online.

R Markdown for Scientists: R Markdown for Scientists workshop material.