

R: A Hitchhikers Guide to Reproducible Research

- Take control



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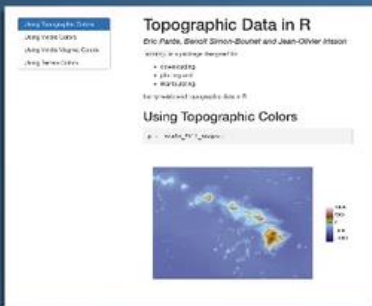
School of Public Health

 @B_A_Palmer

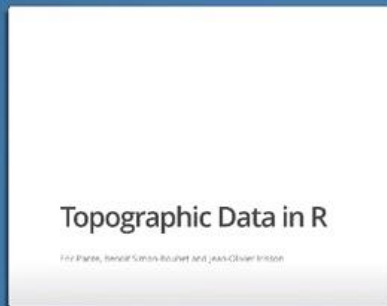
R Markdown

- R Markdown combines the code you wrote, the output produced and you own comments
- You can view it as a digital lab notebook, where you are both recording what you're doing, and what you were thinking while you were doing it!
- R Markdown outputs can take many forms
 - Word documents, PDFs, slideshows etc.
- Once created the .Rmd file get sent to knitr, which executes the chunks of code and creates a new markdown document
 - this is then processed by pandoc which creates the finished file
 - knitr and pandoc are external websites

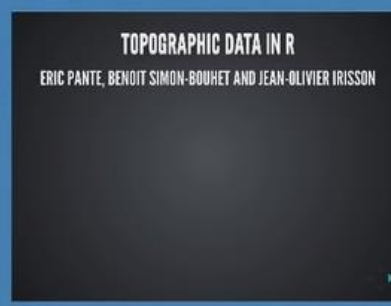
What has R Markdown ever done for us?



html



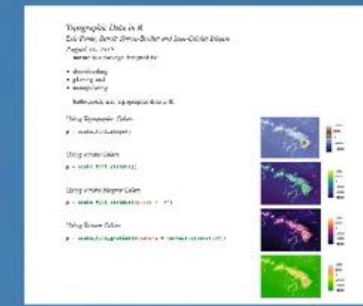
ioslides



reveal.js



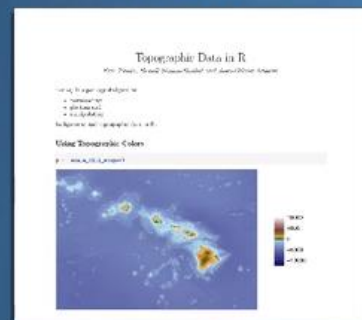
rtf



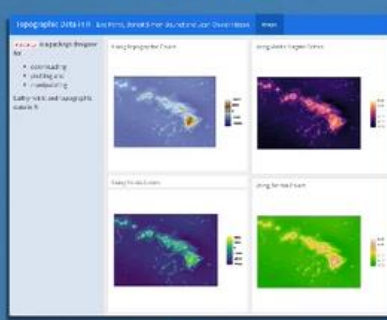
tufte handout



book



pdf



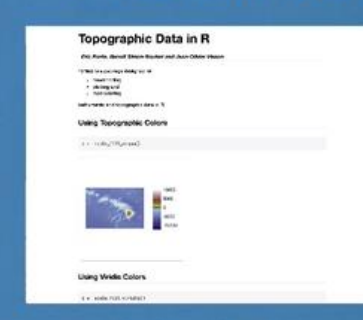
dashboard



slidy



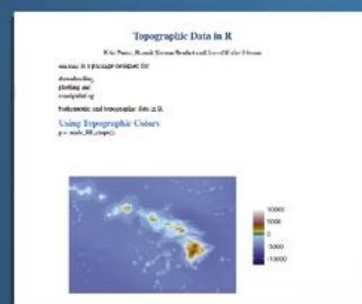
markdown



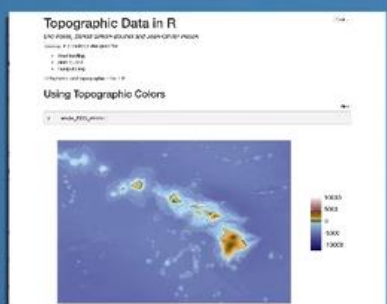
package vignette



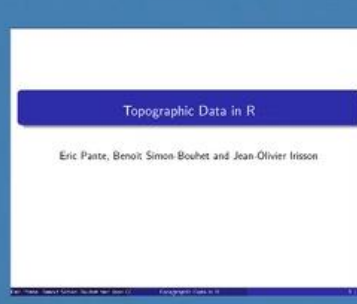
website



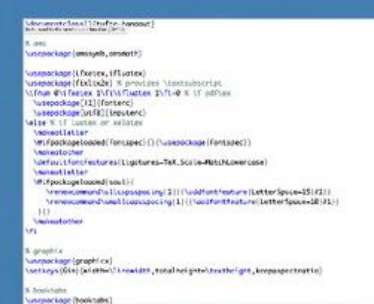
Word



notebook



beamer



latex



custom template



shiny app

R Markdown

YAML header

```
---  
title: "Diamond sizes"  
date: 2016-08-25  
output: html_document  
---
```

Chunks of code

```
```{r setup, include = FALSE}  
library(ggplot2)
library(dplyr)
smaller <- diamonds %>%
 filter(carat <= 2.5)
```
```

Plain text with data
outputs from R code

```
We have data about `r nrow(diamonds)`  
diamonds. Only  
`r nrow(diamonds) - nrow(smaller)` are  
larger than  
2.5 carats. The distribution of the  
remainder is shown below:
```

Chunks of code

```
```{r, echo = FALSE}  
smaller %>%
 ggplot(aes(carat)) +
 geom_freqpoly(binwidth = 0.01)
```
```

R Markdown

Knit the document

Insert new chunk

A YAML
header

Text formatted
with Markdown

Code
chunk

```
example_report.Rmd* x
[Navigation icons] [Knit] [Settings]
[Insert] [Up] [Down] [Run] [Refresh] [List icon]

1 ---
2 title: "This is a reproducible document"
3 author: "Dr. Brendan Palmer"
4 date: "2nd August 2019"
5 output:
6   word_document:
7     fig_height: 4
8     fig_width: 6
9 ---
10
11 # This is the beginning of the project
12
13 Our initial reports might be restricted to lab meetings etc. We can use `R Markdown`
14 show the code we are using, so that the meetings are not just a demonstration of t
15 results, but also an examination of the `code` used to obtain them.
16
17 ## Data overview
18
19 The plot below is call from the ggplot object entitled `report_plot` created in the
20 script `03_final_analysis.R`.
21
22 ```{r Plots from script, echo = FALSE}
23
24 library(tidyverse)
25 library(knitr)
26
27 source("scripts/03_final_analysis.R")
28
29 # The location of the Rmd file dictates whether the path to other files is intact
30
31 report_plot
32
33 ```
```

Click to run all
code chunks
above

Run code in the
chunk

R Markdown - Headers

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



Header 1
Header 2
Header 3
Header 4
Header 5
Header 6

R Markdown - Formatting

Text

italics

__bold__

``code``



Text

italics

bold

code

R Markdown - Lists

Bullets

- * bullet 1
- * bullet 2

Numbered list

1. item 1
2. item 2



Bullets

- bullet 1
- bullet 2

Numbered list

1. item 1
2. item 2

R Markdown - Hyperlinks

This is a
`[link](www.git.com)`.



This is a [link](#).

R Markdown - Equations

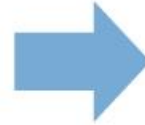
According to
Einstein,
`$E=mc^{\{2\}}$`



According to
Einstein, $E = mc^2$

R Markdown - Images

```
  
The RStudio logo.
```



R Markdown – Code chunks

```
Here's some code  
```\r  
dim(iris)
```
```



Here's some code

```
dim(iris)
```

```
## [1] 150 5
```

R Markdown – Code chunks

```
Here's some code  
```${r echo=FALSE}  
dim(iris)
```
```



Here's some code

```
## [1] 150 5
```

- Displays the results but not the code

R Markdown – Code chunks

```
Here's some code  
```${r eval=FALSE}  
dim(iris)
```
```



Here's some code

```
dim(iris)
```

- Displays the code, but not the results (code is not run)

R Markdown – Code chunks

```
Here's some code  
```${r include=FALSE}  
dim(iris)
```
```



Here's some code

- Neither code nor results displayed (but the code is run)

R Markdown

Tips:

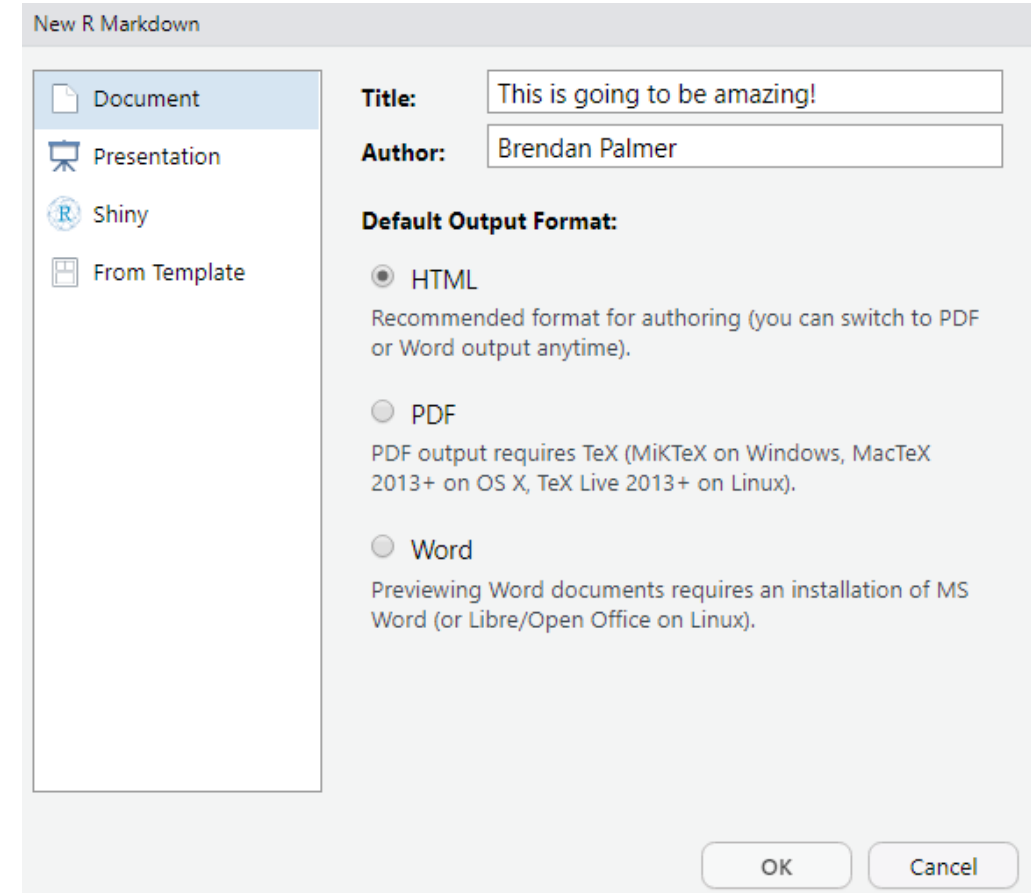
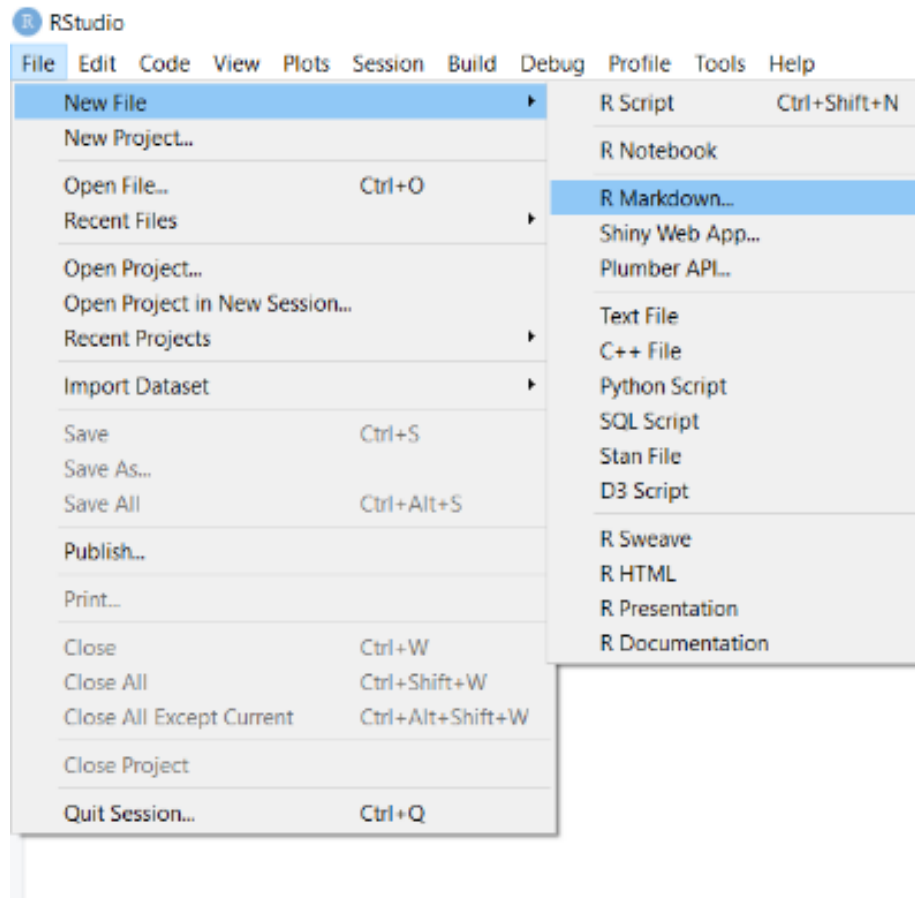
- Ensure each notebook has a descriptive title
- If you reach a research dead end, don't delete it
 - Write a note about it. It may be useful later
- At the end of each day run a clean knit of the note book
- If there's an error message, correct it while its still fresh in your mind
- If you want your code to be reproducible in the long run, you'll need to keep a rigorous track of the package versions
 - Consider using the packrat package to help with this
- For an deeper dive into R Markdown visit <https://bookdown.org/yihui/rmarkdown>

Introduction to R Markdown

- We're now going to look at a R Markdown file that provides some of the tips and tricks you'll need yourselves
 - Code chunks
 - Formatting
 - Tables
 - Figures etc.
- Open the R Markdown file `Day_3/intro_to_RMarkdown.rmd`
- Open the R Markdown file `Day_3/code_chunks.rmd`
- Open the R Markdown file `fancy_R-markdown_bits.rmd`

Worksheet – R Markdown DIY

- Create a R Markdown document and begin compiling



- Save the file as `Day_3/diy_r_markdown.rmd`

What does this allow us to do?

