

1. Introduction

Who are we?

- General intro
- R/statistics experience
- Substantive interests

Outline

- Logistics of Statistics II
- Assignments
- RStudio
- RMarkdown

Logistics of Statistics II

Statistical Modeling & Causal Inference

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Lectures	8-10 (lab 1) 10-12 (lab 2)					
Exam-style question submission on Moodle (18h)	Assignment submission deadline via Moodle (noon)			Do readings for next week, think about lit question		
Assignments go online						

Syllabus

Statistical Modeling & Causal Inference

Week	Topic / Lecture	Assignment / Lab
1	Counterfactual Causality	Intro / Logistics
2	Potential Outcomes Framework	Data manipulation
3	Causal Graphs	Causal Graphs assignment
4	Regression	Regression
5	Matching	Matching assignment
6	Instrumental Variables	Instrumental Variables

Week	Topic / Lecture	Assignment / Lab
7	Regression Discontinuity Design	RDD assignment
8	Difference-in-Difference	DiD & synthetic controls
9	Panel data	Panel data assignment
10	Moderation & Mechanisms	Moderation & Mechanisms
11	Validity & Generalizability	Statistical power assignment
12	Planning & Evaluating	Final exam revision

Grading

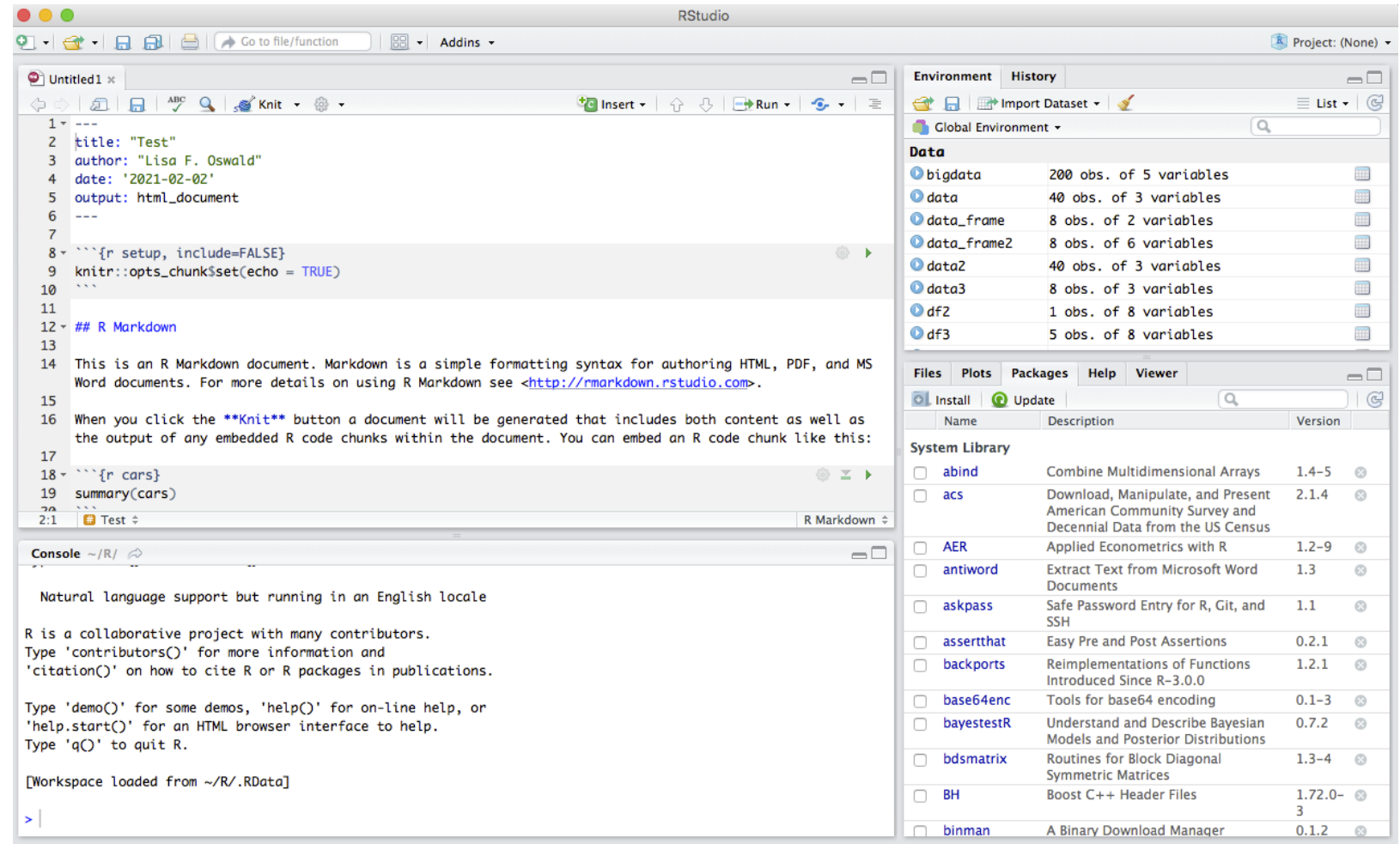
- 40% take-home assignments, submitted via Moodle
 - Deadline: Tuesdays at noon on the week after publication
- 35% in-class or online final exam
 - Final exam week
- 25% final replication project
 - Deadline: TBA
- Exam-style questions via Moodle
 - Deadline: Mondays at 18h

Weekly assignments

- Materials will be uploaded after the lecture
- Materials will consist of:
 - RMarkdown template with questions
 - Dataset
- Your task:
 - Get the assignment via **Moodle**
 - Work on the assignment in an **RMarkdown** document (in **RStudio**)
 - Knit the document to an HTML file
 - Upload the HTML file via **Moodle**

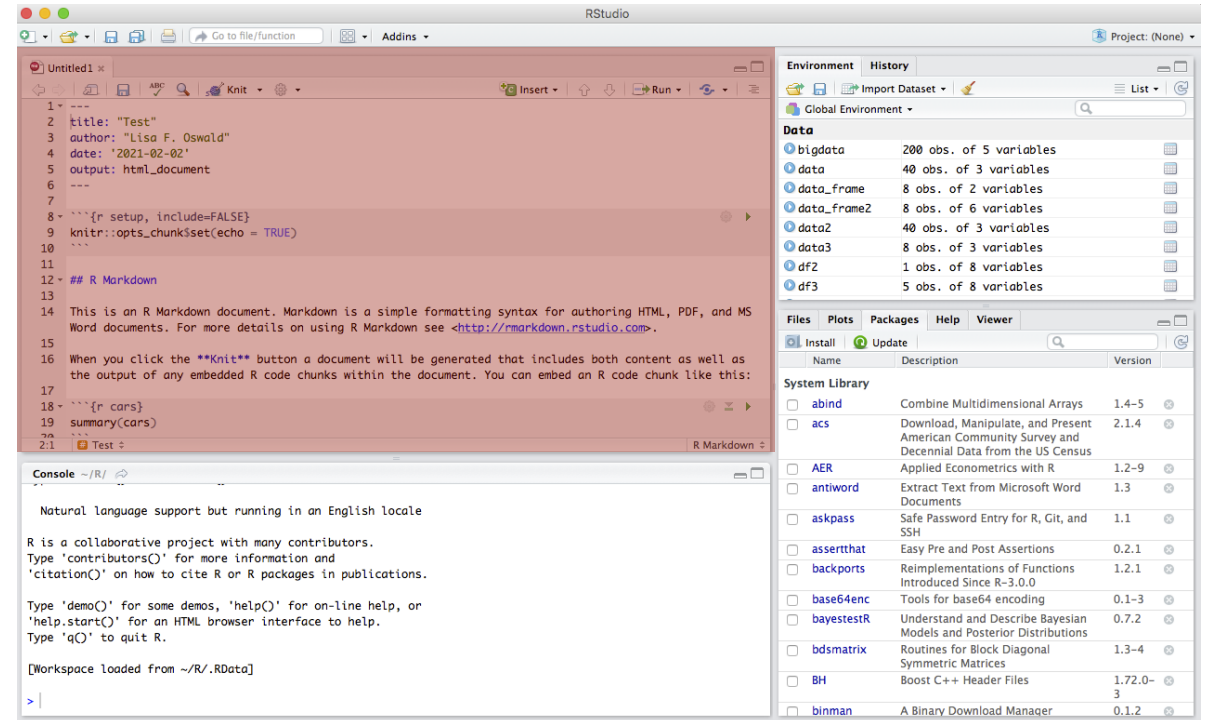
RStudio

- Download latest version of R
- Download RStudio
- IDE to use R
- Free and open source
- Interface divided into 4 panes



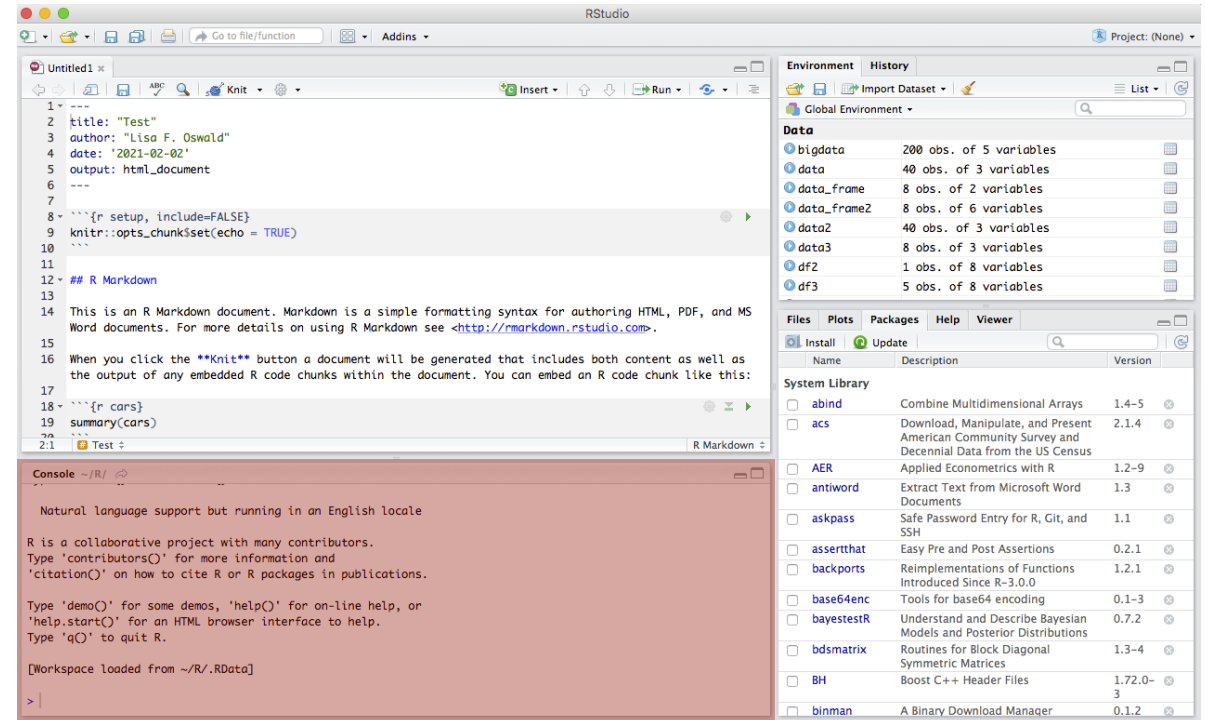
Editor in RStudio

- Source for your scripts and documents
- Only commands that are typed into a script can be saved
- Press `cmd + enter` to send commands to the console (to be executed)
- Comment your code using `#`



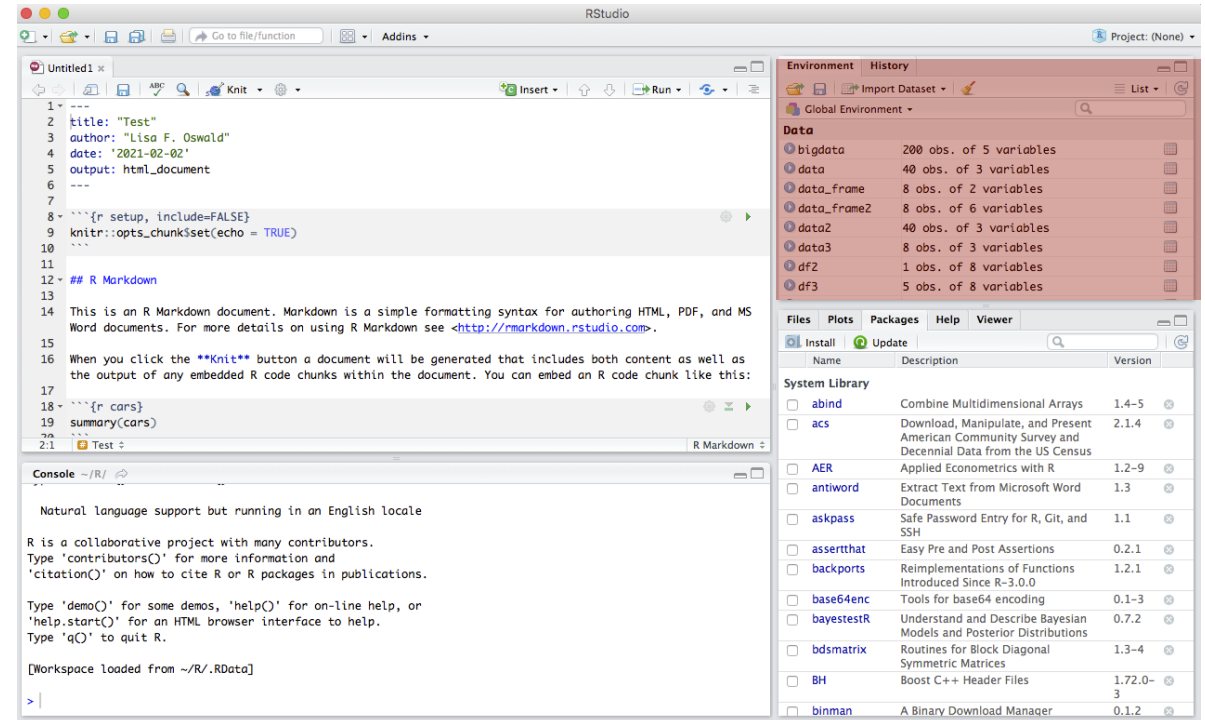
Console in RStudio

- Immediate execution of R commands by the computer
- Display of results of executed commands
- Press `enter` to execute commands
- Shows `>` if ready to accept commands



Environment in RStudio

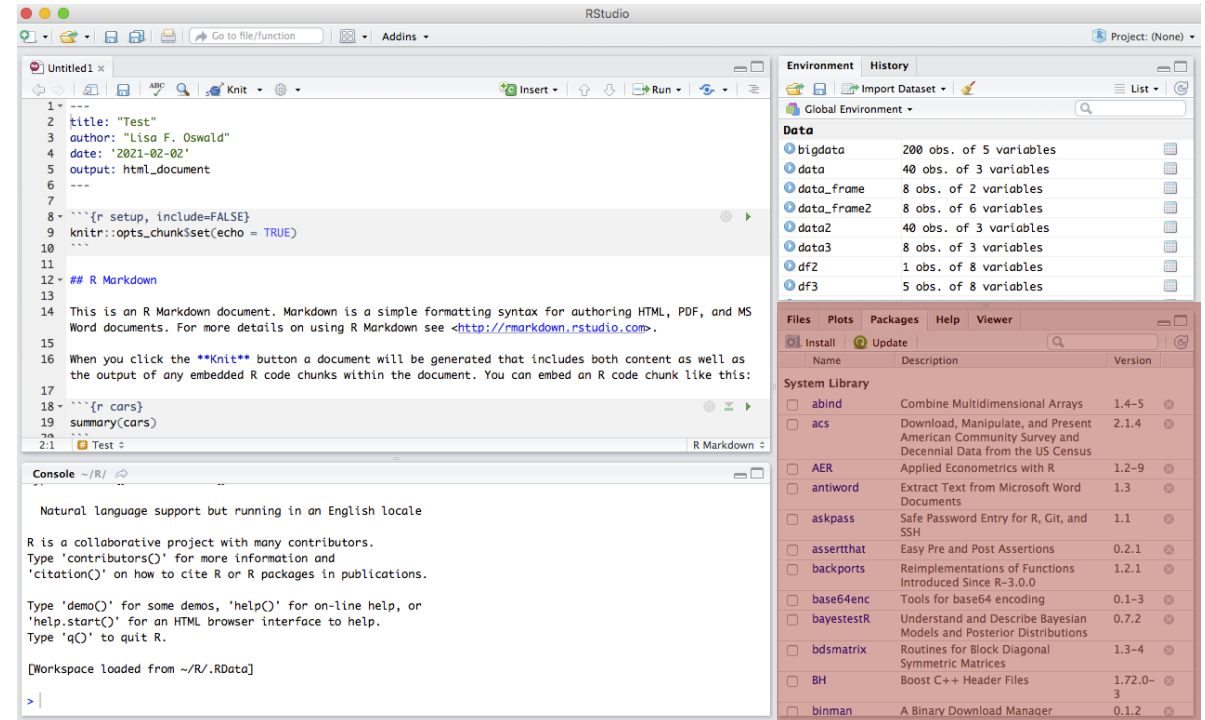
- Environment and History
- Convenient monitor for data, variables, etc
- Helps with reading in files “manually”
- Often useful to clear environment when you run into troubles



Rest in RStudio

Statistical Modeling & Causal Inference

- Files/Plots/Packages/Help/Viewer
- Displays Plots and Tables
- Overview of installed and loaded packages
- Help to learn more about packages and functions



R Markdown

RMarkdown is an authoring framework for data science. A single RMarkdown file can be used to:

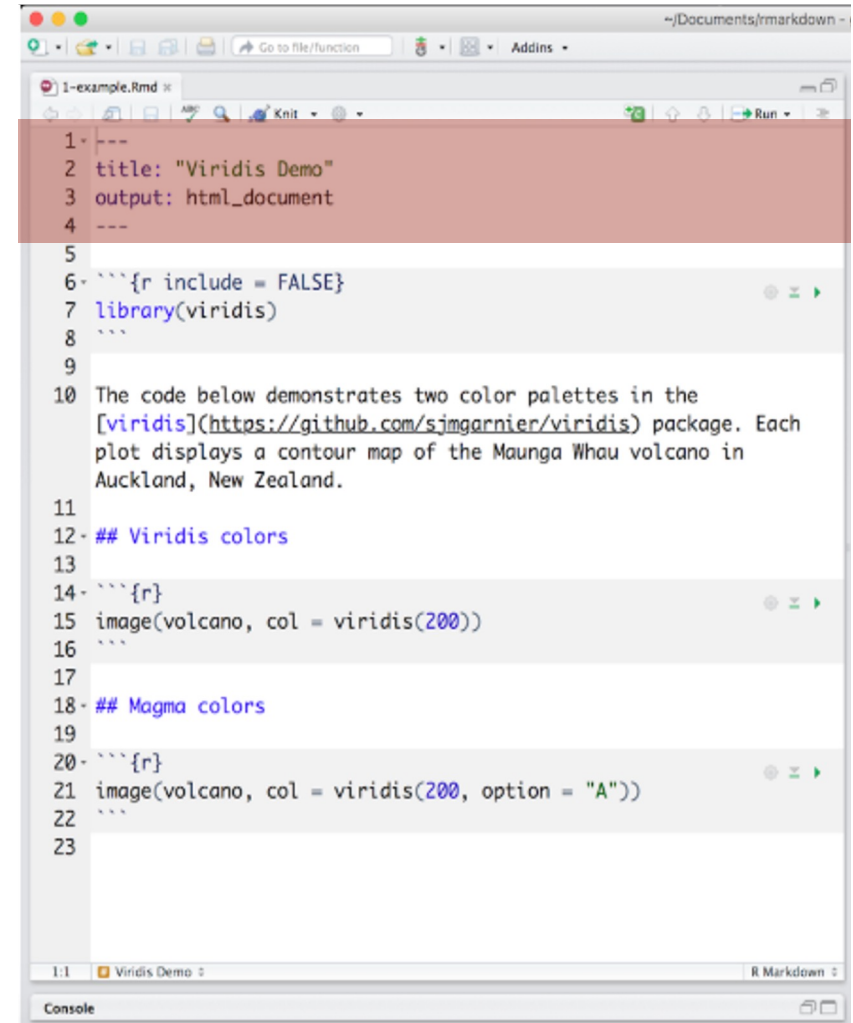
- Save and execute code
- Generate high quality reports that can be shared with an audience

We will use RMarkdown to submit our weekly assignments.



Headers in Rmarkdown

- YAML headers surrounded by “---”
Meta-data that guides the file build-up process.



```
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
15 ## Viridis colors
16
17 ```{r}
18 image(volcano, col = viridis(200))
19 ```
20
21 ## Magma colors
22
23 ```{r}
24 image(volcano, col = viridis(200, option = "A"))
25 ```
26
27
```

1:1 Viridis Demo R Markdown

Console

R Code in Rmarkdown

- R code chunks surrounded by `` ` ``
- Chunks take code as an input. It works just like usual R code.

start a chunk: $\backslash \backslash \backslash \{r\}$

end a chunk: ` ` `



Text in Rmarkdown

- Text mixed with simple text formatting Takes text as input.

```
# H1
## H2
### H3

**bold text**

*italicized text*

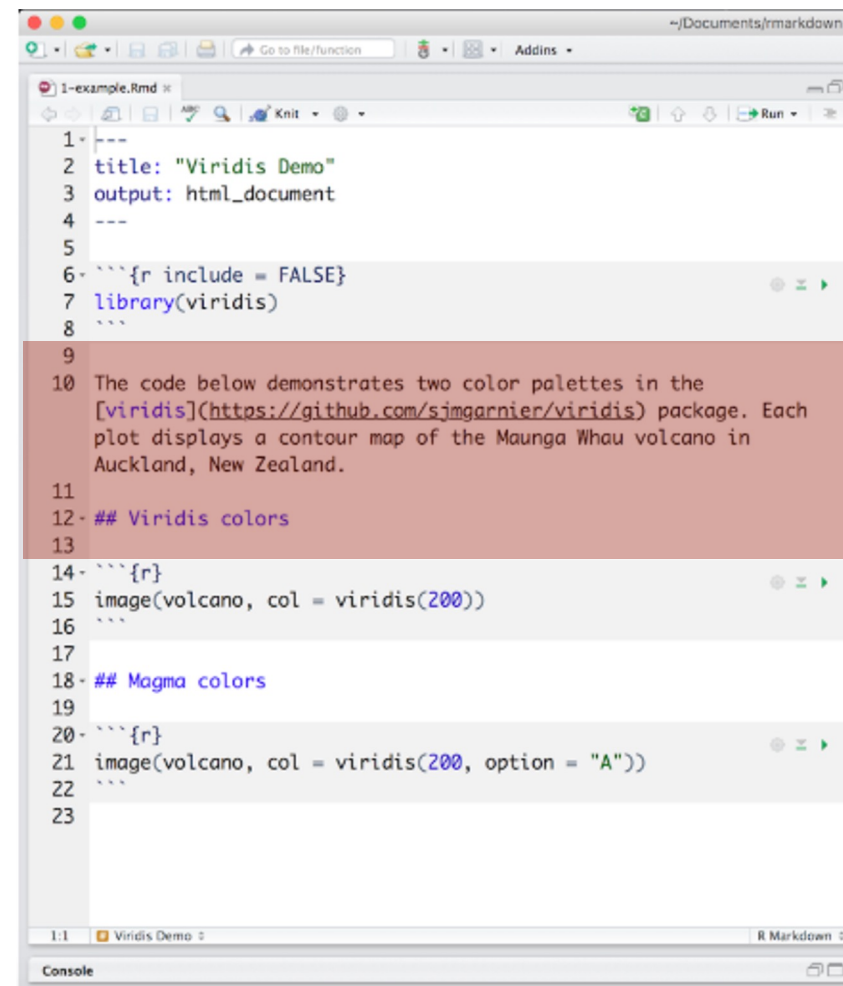
> blockquote

1. First item
2. Second item
3. Third item

- First item
- Second item
- Third item

`code`

---
```



The screenshot shows an R Markdown document titled "1-example.Rmd" in a text editor. The document contains a YAML header, R code to load the 'viridis' package, a text paragraph, and two R code blocks for generating contour maps. The rendered output is shown below the code blocks.

```
1 ---
2 title: "Viridis Demo"
3 output: html_document
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6 ```{r include = FALSE}
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17 ```
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19 ## Magma colors
20
21 ```{r}
22 image(volcano, col = viridis(200, option = "A"))
23 ```
```

The rendered output shows a paragraph of text followed by two contour maps of the Maunga Whau volcano. The first map uses the 'viridis' color palette, and the second map uses the 'magma' color palette. The text in the paragraph is highlighted in red in the original image.

Deadly sins in Rmarkdown

1. `install.packages()`
2. `View()`
3. Actual errors in the code

Coding issues

First, don't panic, take a step back. Then:

1. Check your code (missing parentheses, packages, stray commas, etc.)
2. Google the error message
3. Search on Stackoverflow or look on YouTube
4. Ask for help (from stackoverflow, friends, or your TA)

Further Resources

- Reminder of the basics – Recordings & materials of workshop
- A comprehensive guide to R: <http://qpolr.com/>
- RMarkdown: The definitive guide <https://tinyurl.com/y4tyfqmg>
- For any coding issues – <https://stackoverflow.com/>
- Hertie's Data Science Lab – Research Consulting