Data Science for WASH

An opportunity for the sector

Lars Schöbitz

2021-07-29

Slides: larnsce.github.io/co-wash-symposium-2021/

Welcome! 

Lars Schöbitz

Environmental Engineer
Open Science Specialist @ ETH Zurich
Instructor for Data Science with R

Georges Mikhael

Independent Sanitation Consultant
Novice R user

Housekeeping

- Keep your microphone muted
- Post questions to the Zoom Chat
- Questions will be addressed at the end
- Technical difficulties cannot be addressed

Note: This Zoom Meeting will be recorded

Photo by: Sofia Geada

Do you sometimes wonder:

- Where people defecate in the open within a city? And if there are water bodies nearby?
- Who lives downstream of contaminated water bodies? And what the prevalence of diarrhea is in those communities?
- Whether access to safe drinking water decreases the rate of diarrheal disease?

If so, then you might also wonder:

- How to use data visualiation to answer these questions?
- How to combine your data with other open data to answer these questions?
- How to get data into the right structure to perform different types of analyses?

Artwork from @juliesquid for @openscapes (illustrated by @allison_horst).

Relevance of the topic

- Deriving actions from data plays a key role in every organisation
- Demand on WASH professionals to analyse data is increasing
- Little attention given to the competencies needed to satisfy this demand
- Investing into becoming a data-driven organisation will pay off in the long run

Data Science - FAQ

Q: What is data science?
A: In data science you turn raw data into understanding, insight and knowledge.

Q: What is R?
A: It's a computing language used for data science.

Q: Is Data Science = Statistics?
A: No, but they are closely related.

Q: Is Data Science = Computer Science?
A: No, but many themes are shared.

Data Science for WASH - FAQ

Q: Will I learn how to do machine learning?
Nope, not at all. You will learn core concepts such as descriptive statistics, data visualisation, and (some) basic modeling.

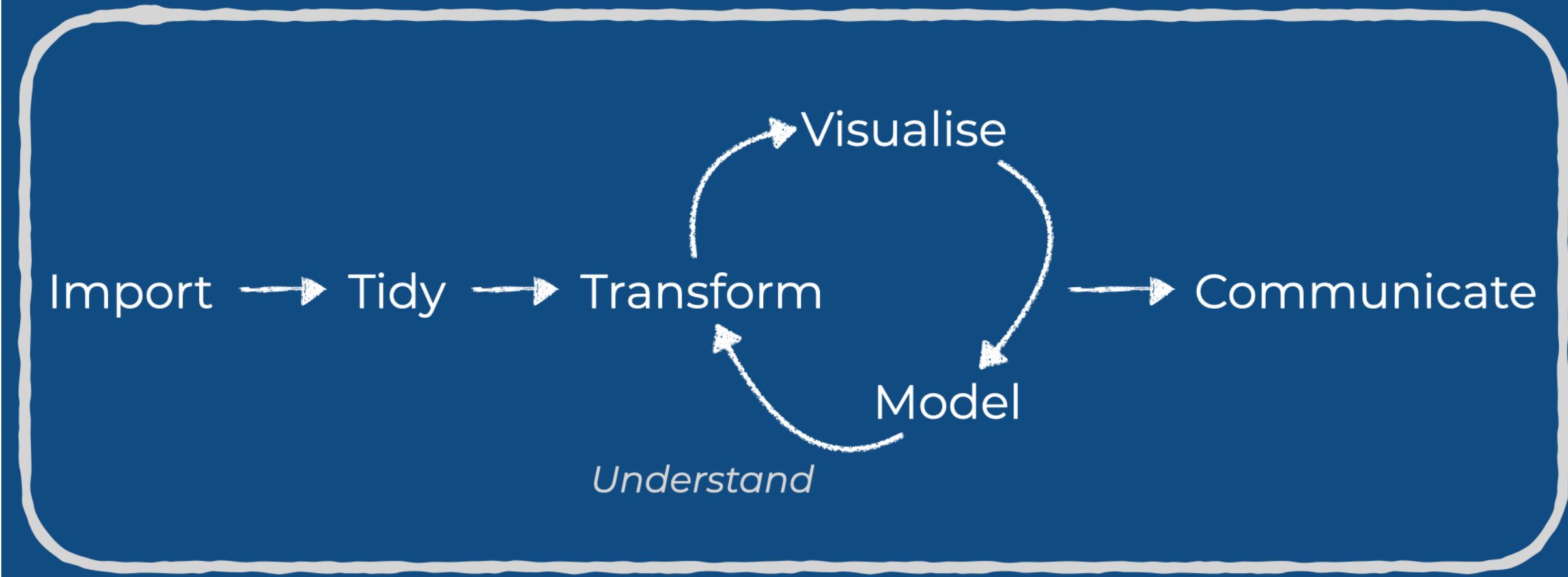
Q: Do I need any prior experience?
A: Nope, my courses are targeted at novice users.

Q: What do I need to learn data science?
A: (1) A mindset for openness to change; (2) A good portion of vulnerability; (3) A friendly and open community.

Q: And how long does it take to learn data science?
A: Three months with tutoring support and a time effort of 12 hours per week.

Data Science Lifecycle

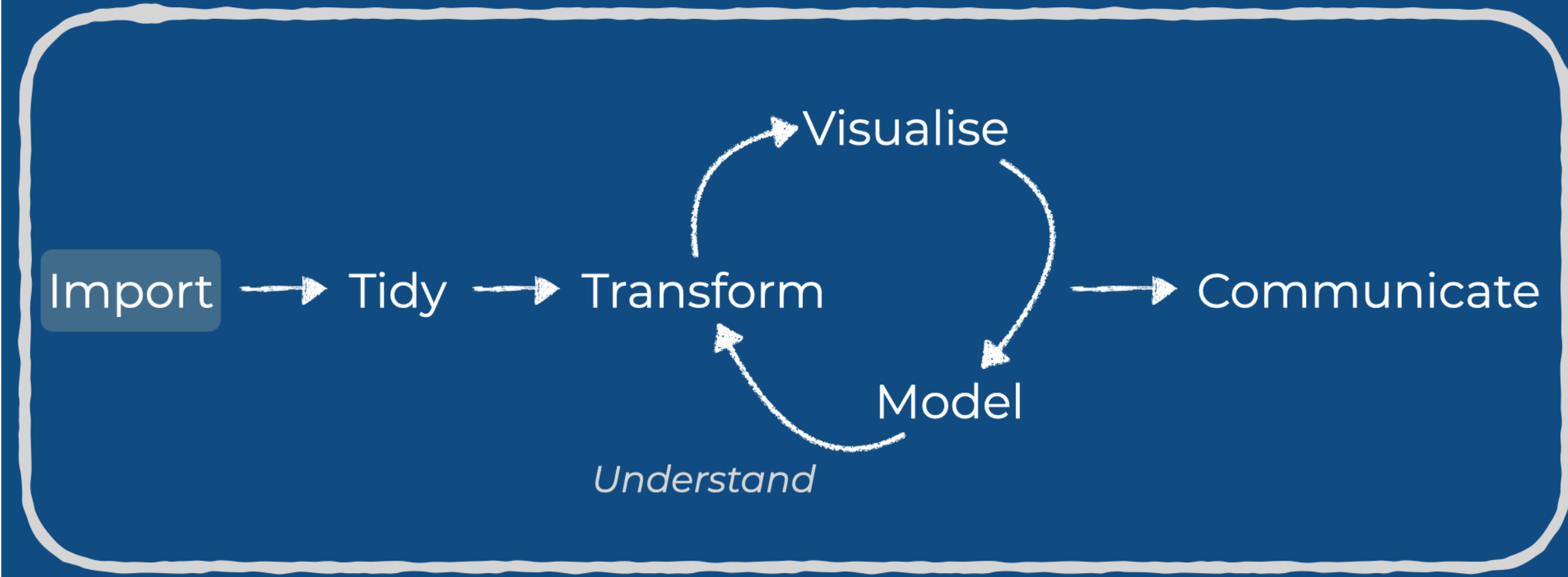
Data Science Lifecycle



From: https://r4ds.had.co.nz/

Data Science Lifecycle

Get your data into R

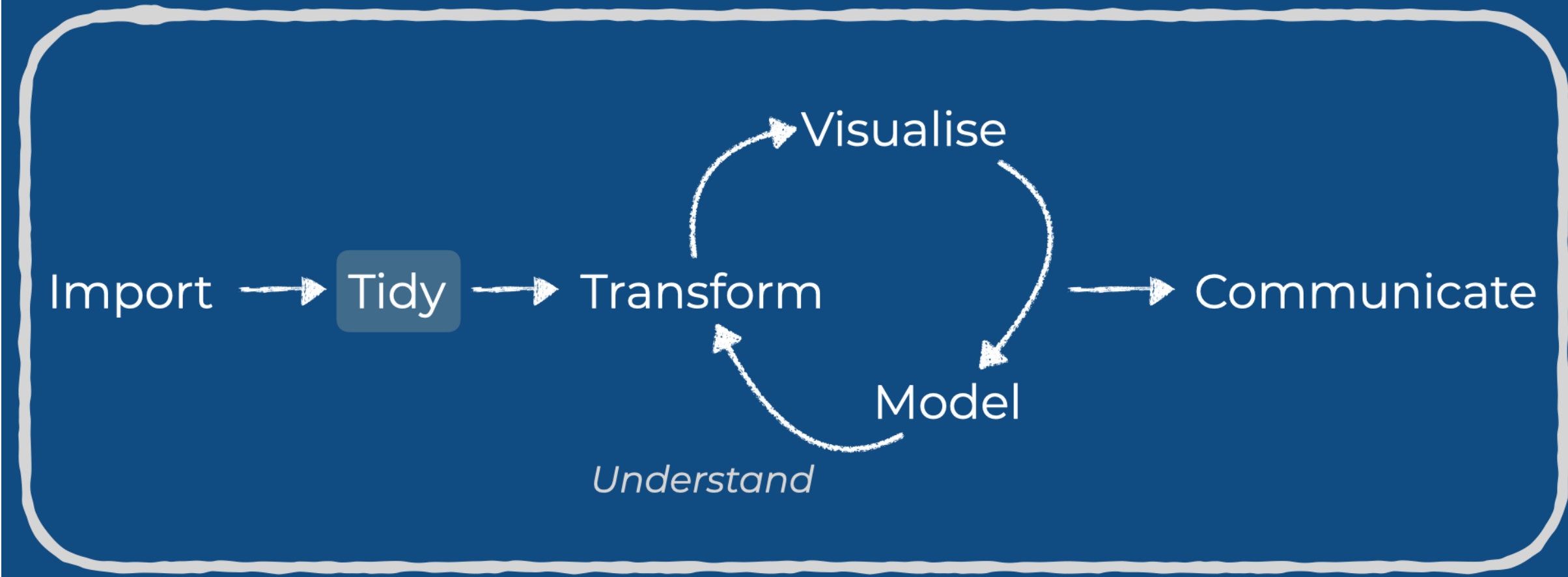


Program

From: https://r4ds.had.co.nz/

Data Science Lifecycle

Store your data in a consistent form



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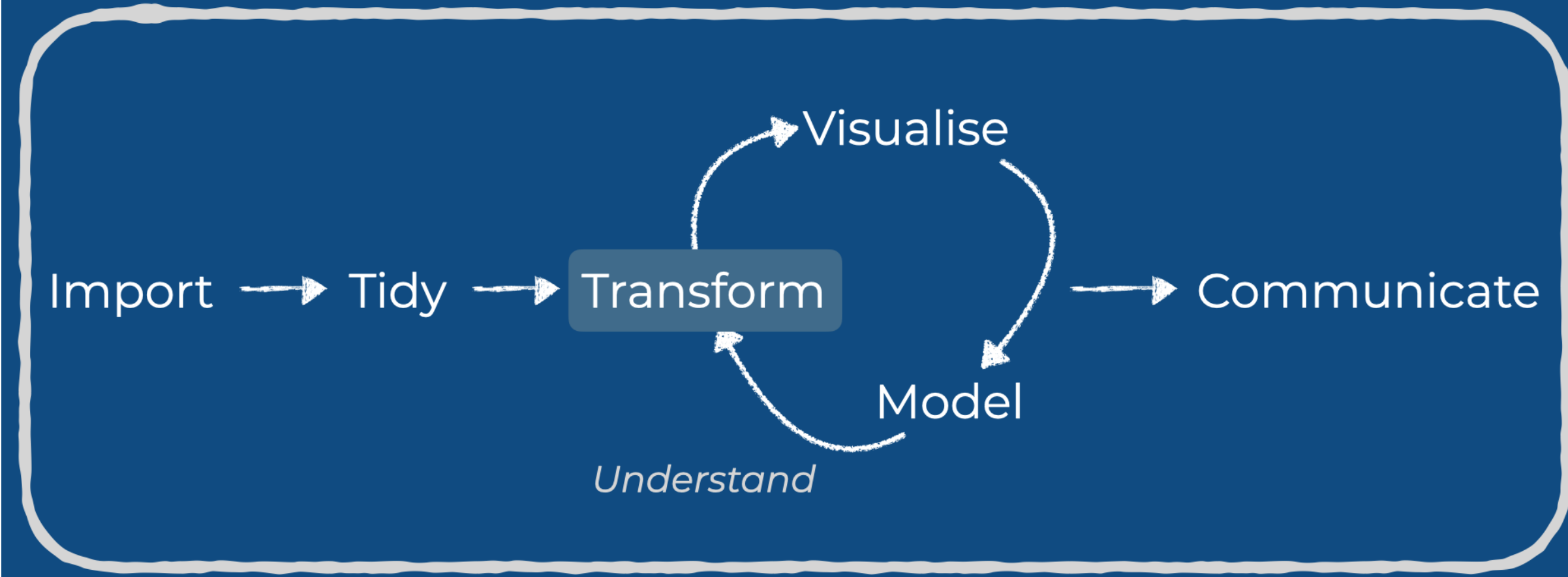
Data Science Lifecycle

Narrow down + Create new variables + Summary stats



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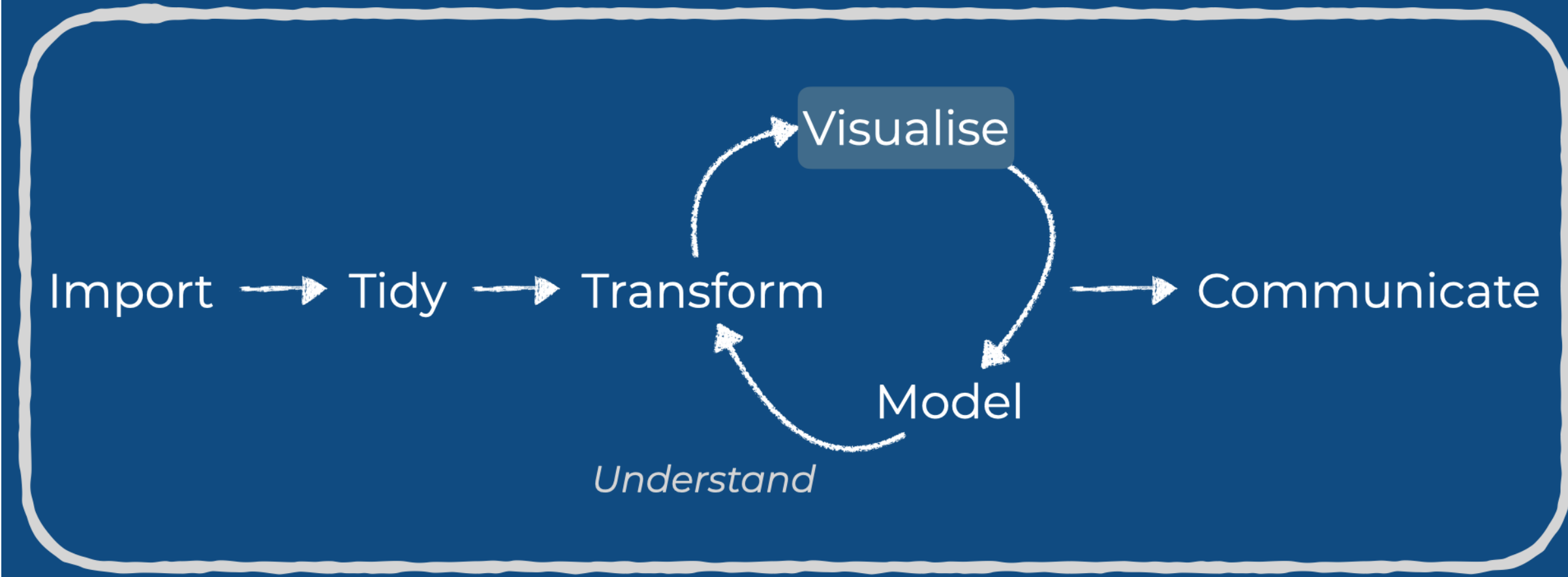
Data Science Lifecycle

Explore your with visual representations



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Data Science Lifecycle

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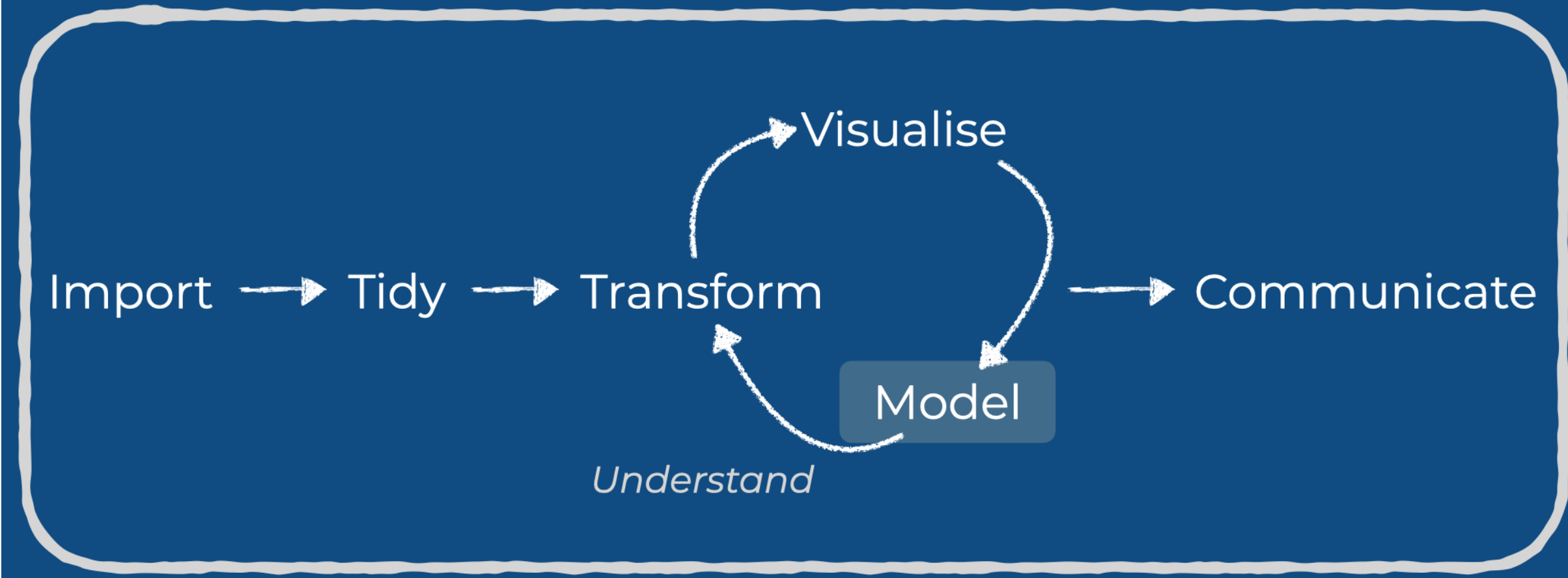

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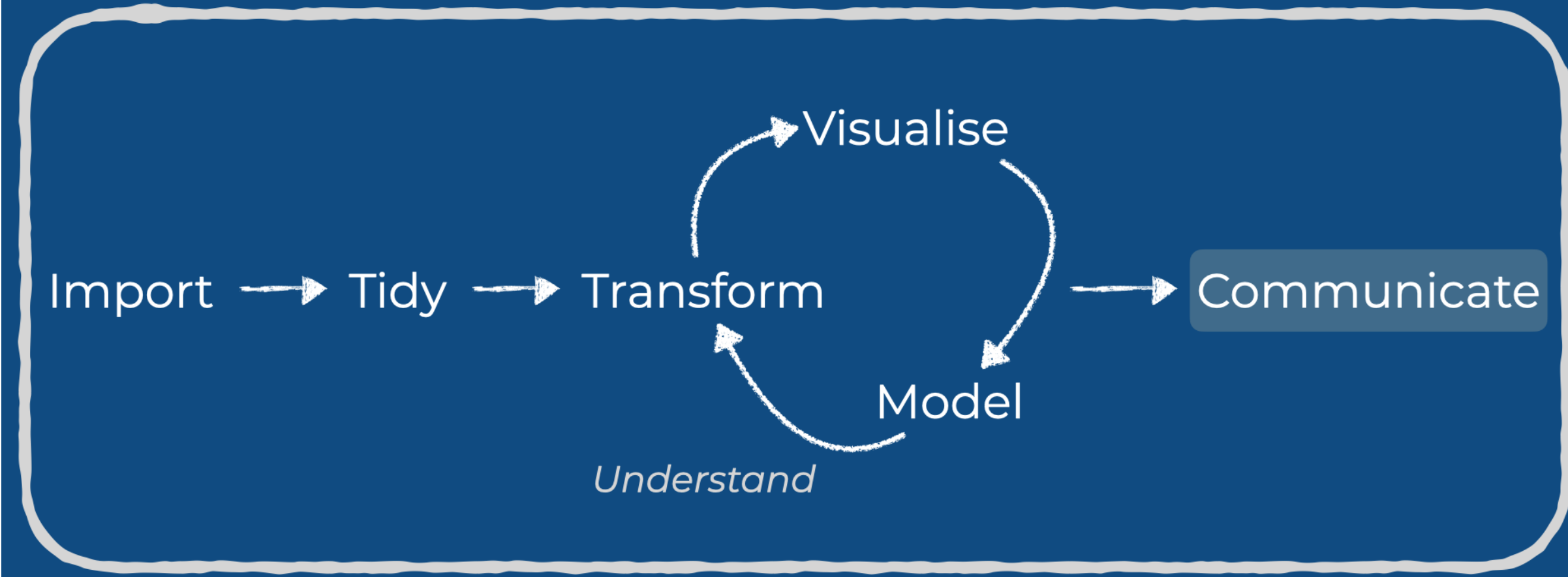
Data Science Lifecycle

Share your findings with others



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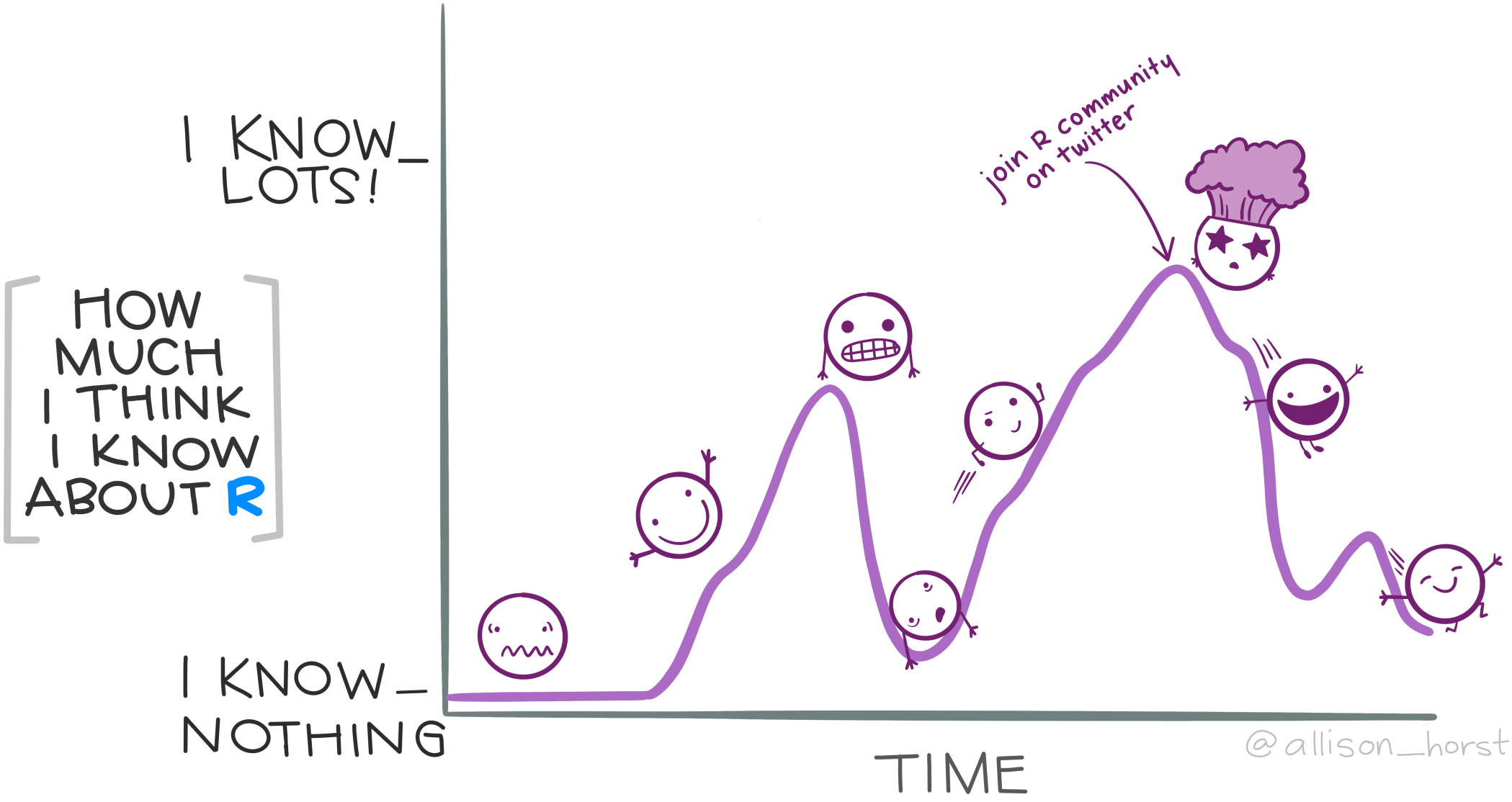


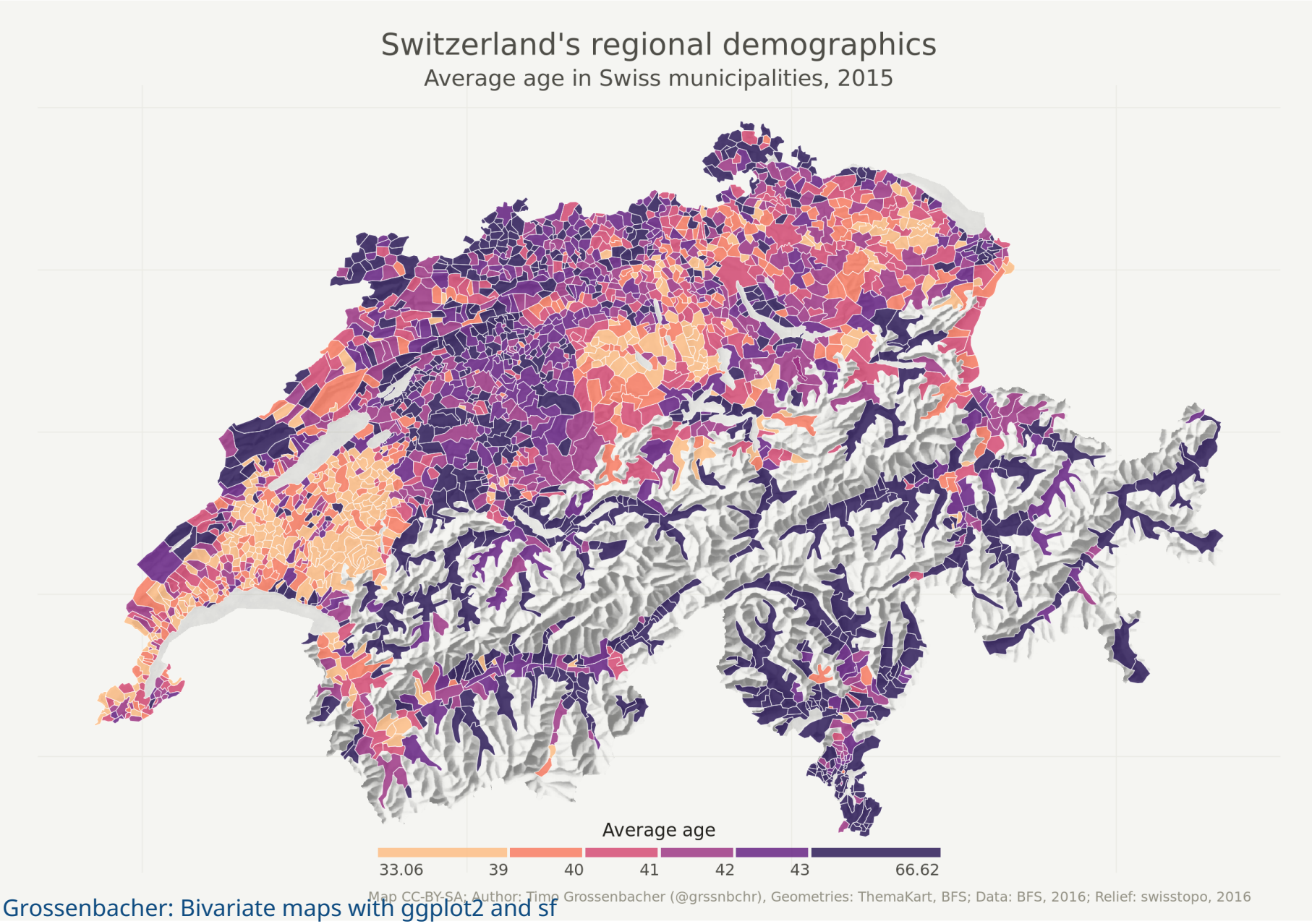
Artwork by @allison_horst

Awesome things you can do with R

Slides Code Code output Interactive output

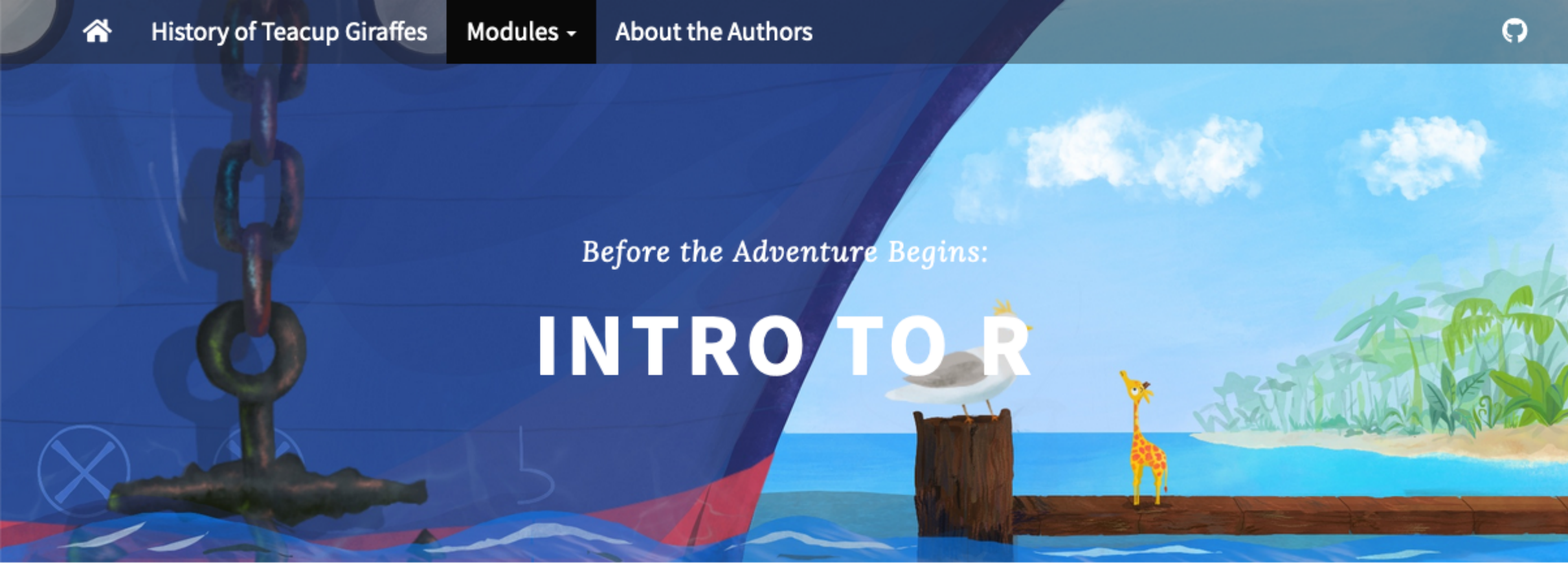
These slides are made with R. They can include:

- Code
- Its output
- Interactive output
- Maps



From: Timo Grossenbacher: Bivariate maps with ggplot2 and sf

From: https://larnsce.github.io/co-wash-symposium-2021/



From: https://tinystats.github.io/teacups-giraffes-and-statistics/index.html

Ready to begin?

You're about to start an adventure to learn R and statistics. If this is your first time working with R, then you should begin on this page. If you're comfortable with R basics and you'd like to start with the statistical content, please proceed onto the islands with this link.

R for Data Science

Search

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1 Introduction

Explore

2 Introduction

3 Data visualisation

4 Workflow: basics

5 Data transformation

6 Workflow: scripts

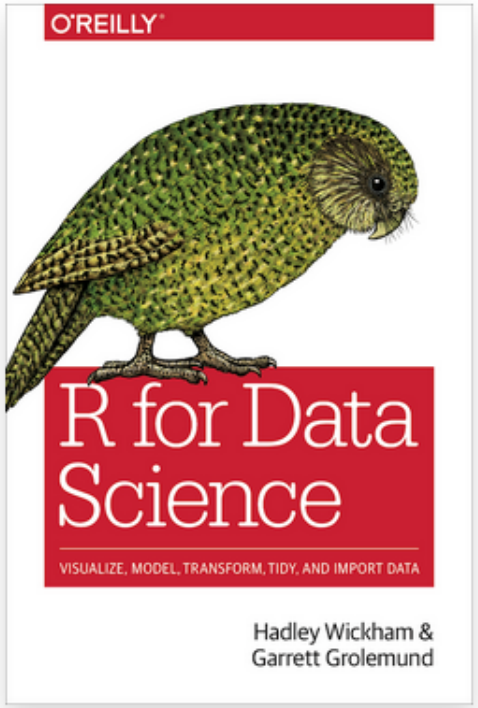
7 Exploratory Data Analysis

8 Workflow: projects

Wrangle

Welcome

This is the website for **"R for Data Science"**. This book will teach you how to do data science with R: You'll learn how to get your data into R, get it into the most useful structure, transform it, visualise it and model it. In this book, you will find a practicum of skills for data science. Just as a chemist learns how to clean test tubes and stock a lab, you'll learn how to clean data and draw plots—and many other things besides. These are the skills that allow data science to happen, and here you will find the best practices for doing each of these things with R. You'll learn how to use the grammar of graphics, literate



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Welcome

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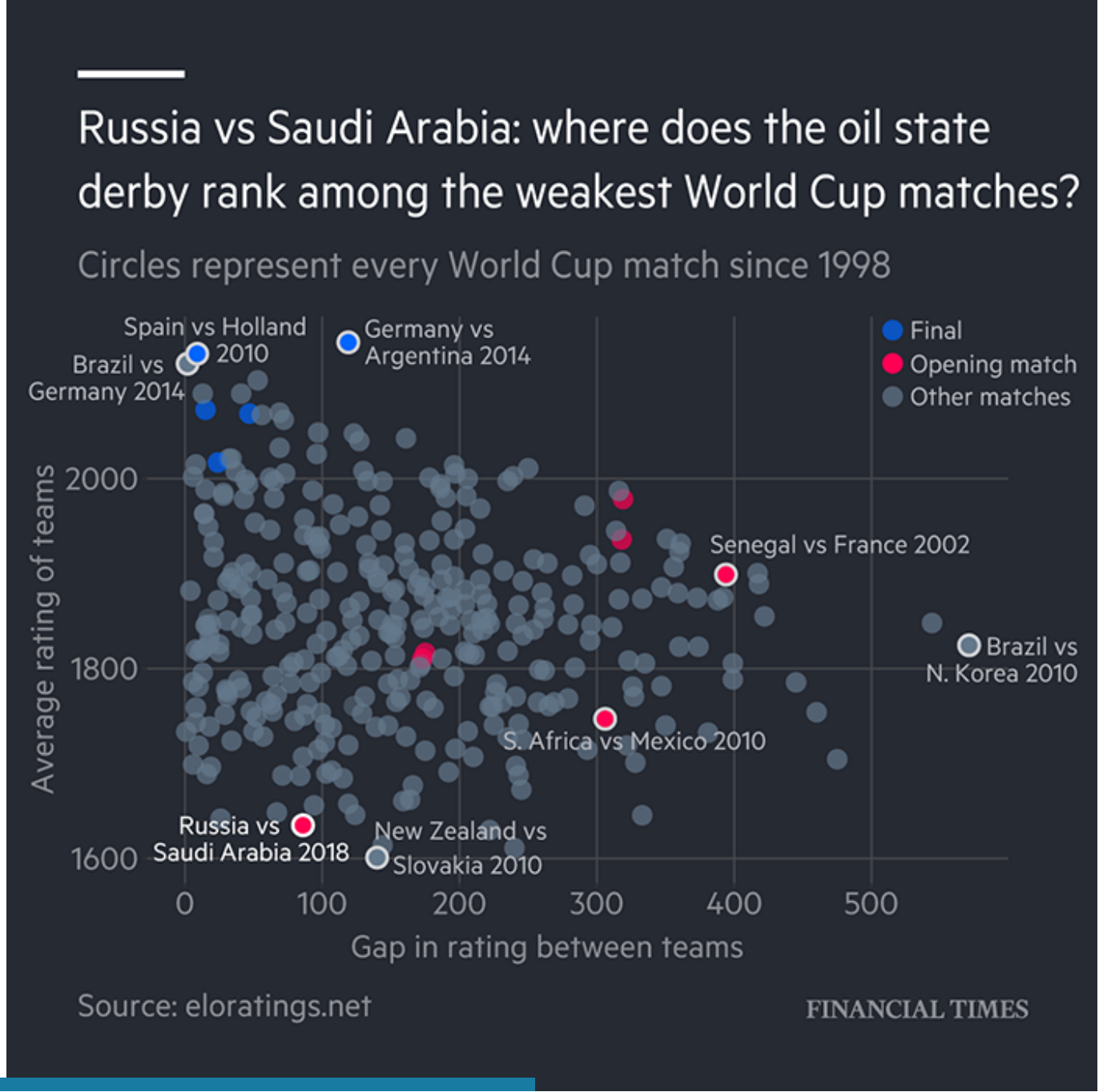
Russia vs Saudi Arabia: where does the oil state derby rank among the weakest World Cup matches?
Circles represent every World Cup match since 1998
Spain vs Holland 2010
Germany vs Argentina 2014
Brazil vs Germany 2014
Final
Opening match
Other matches
Senegal vs France 2002
Brazil vs N. Korea 2010
S. Africa vs Mexico 2010
Russia vs Saudi Arabia 2018
New Zealand vs Slovakia 2010
Average rating of teams
2000
1800
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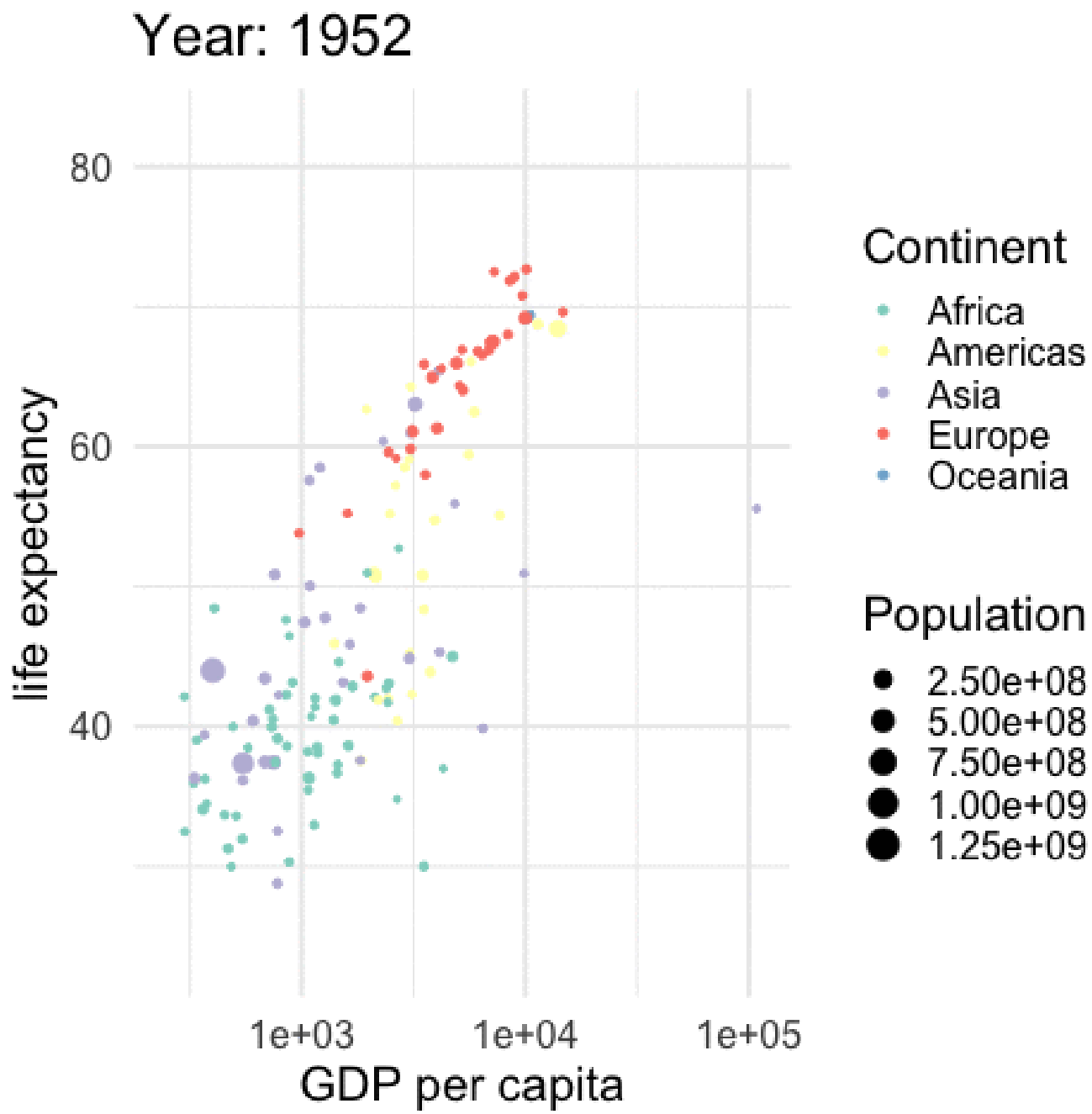
500
Gap in rating between teams
Source: eloratings.net
FINANCIAL TIMES

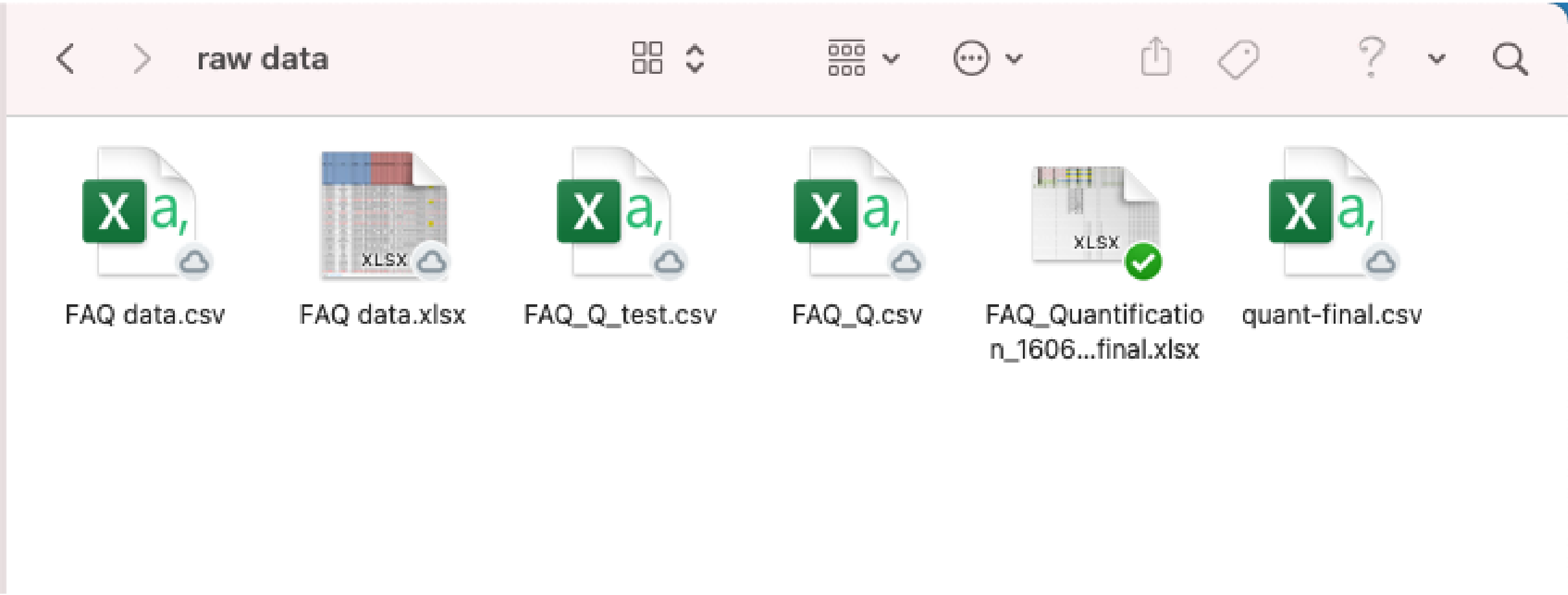
Hans Rosling's Gapminder



Click here for the code

My data analysis projects

what it used to look like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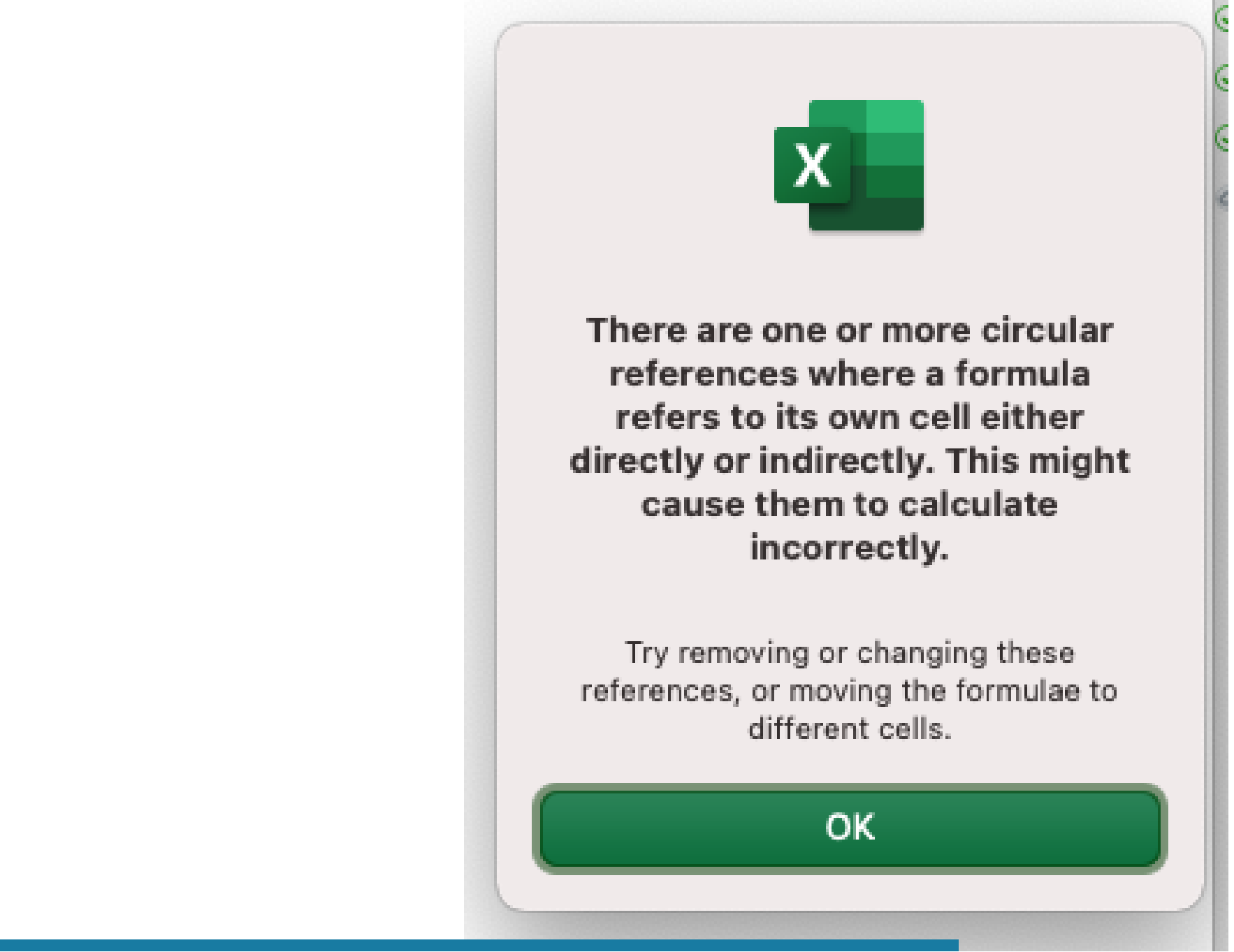
There are one or more circular references where a formula refers to its own cell either directly or indirectly. This might cause them to calculate incorrectly.
Try removing or changing these references, or moving the formulae to different cells.
OK

AutoSave OFF FAQ_Quantification_160621_final

Home Insert Draw Page Layout Formulas Data Review View Tell me Share Comments

Default Normal Page Break Preview Page Layout Custom Views Show Zoom 150% Zoom to 100% Zoom to Selection New Window Arrange All Freeze Panes Freeze Top Row Freeze First Column Split Hide Unhide Switch Windows View Macros Record Macro Use Relative References

AC2 fx L/d

	X	Y	Z	AA	AB	AC
1	Solid waste production	Water usage	Excreta Production (1)	FS/WW production (2)	FS accumulation (3a) (mean)	FS accumulation (3a) (Q1)
2	kg/cap*d	L/cap*d	L/d	L/d	L/d	L/d
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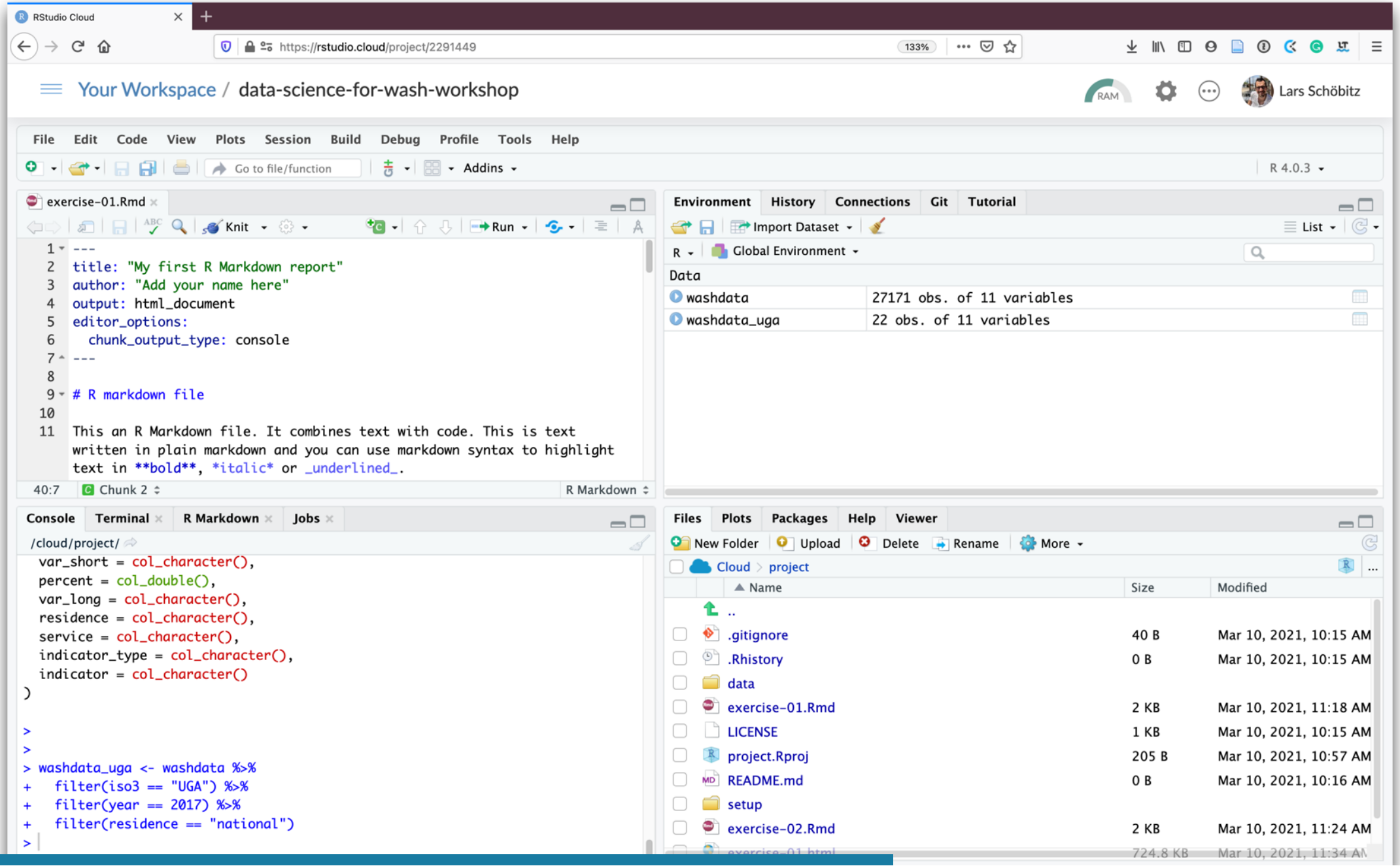
SED Input Scenarien Sheet1 +

My data analysis projects

what it looks like now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3 author: "Add your name here"
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6 chunk_output_type: console
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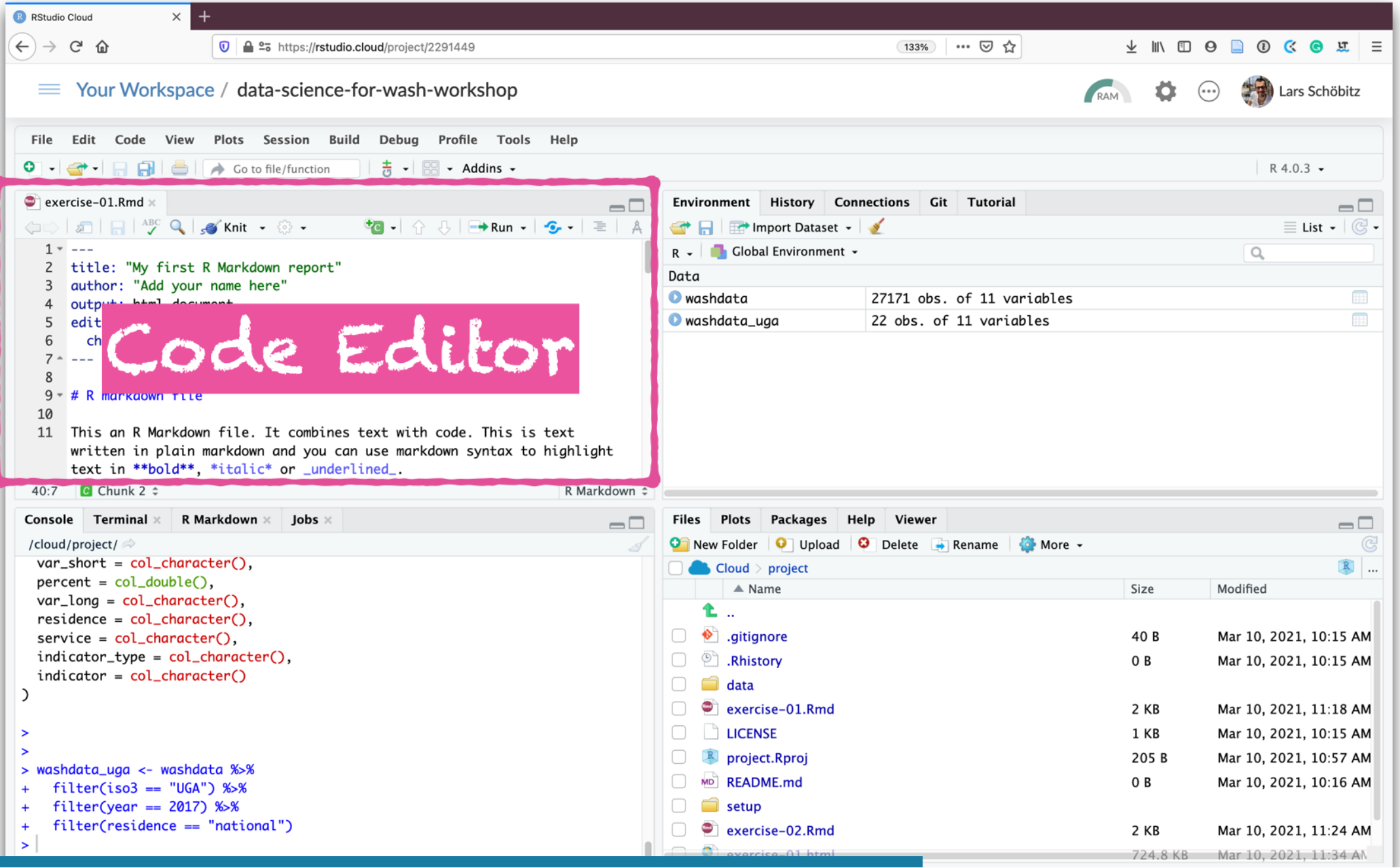
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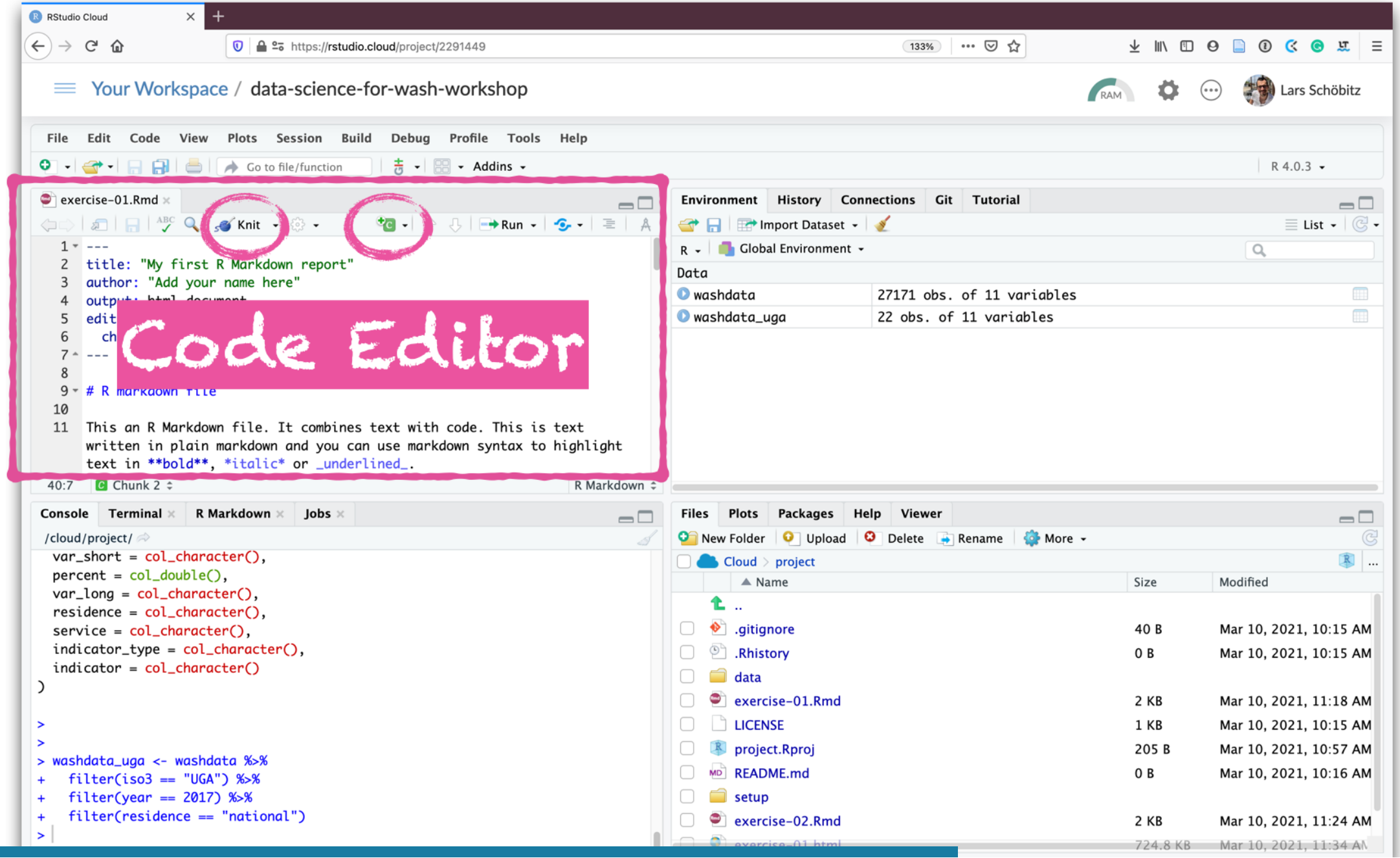
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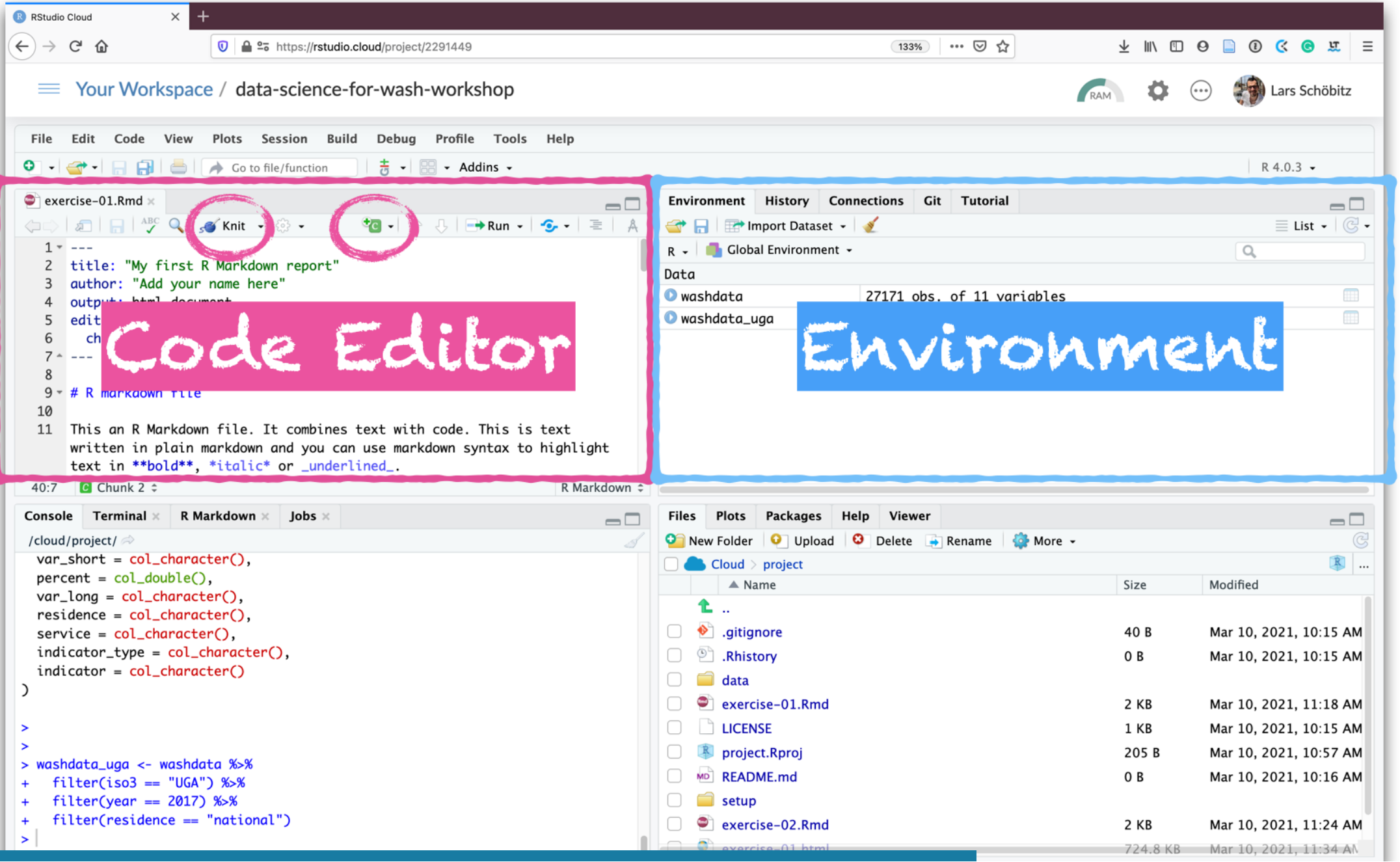
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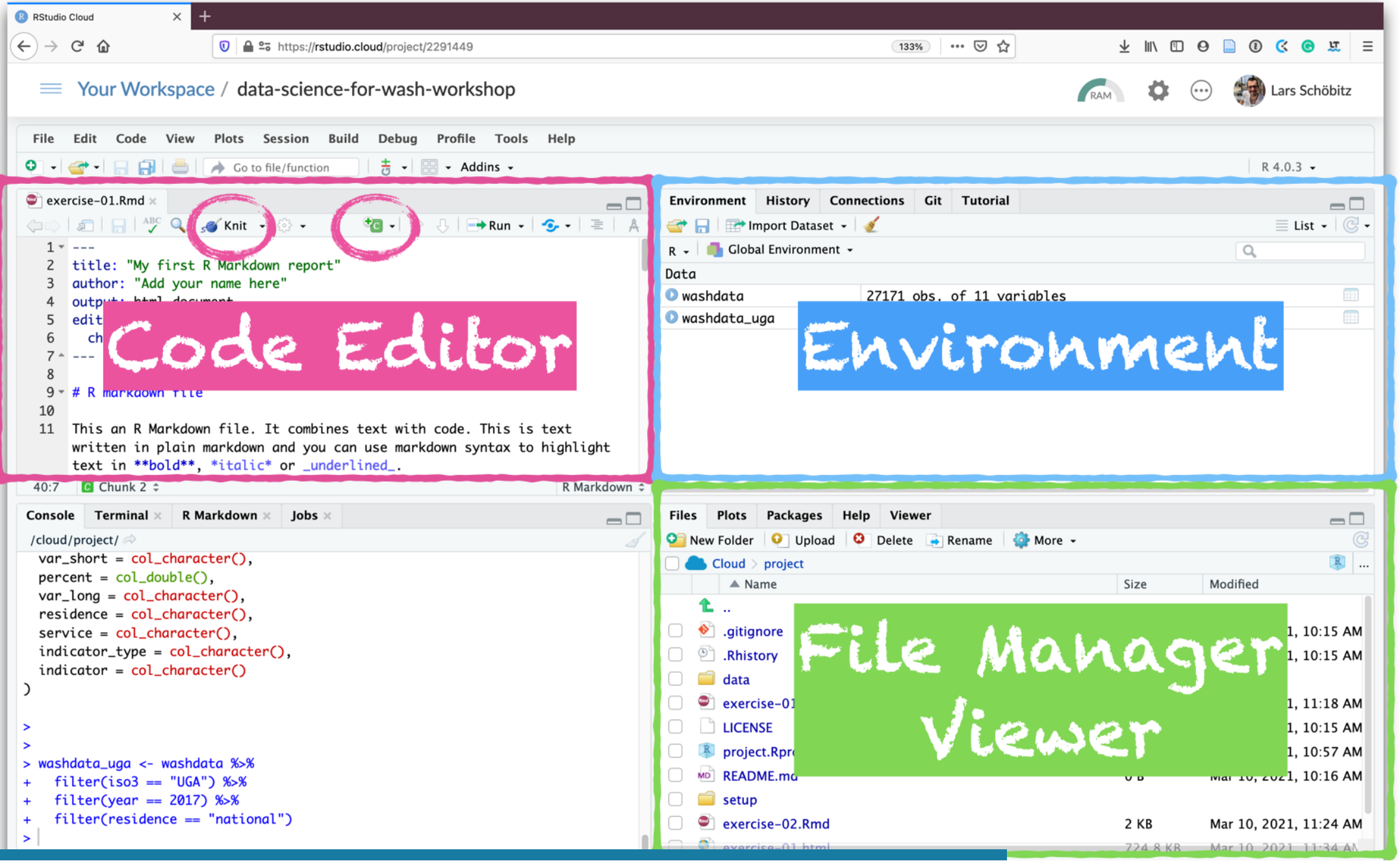
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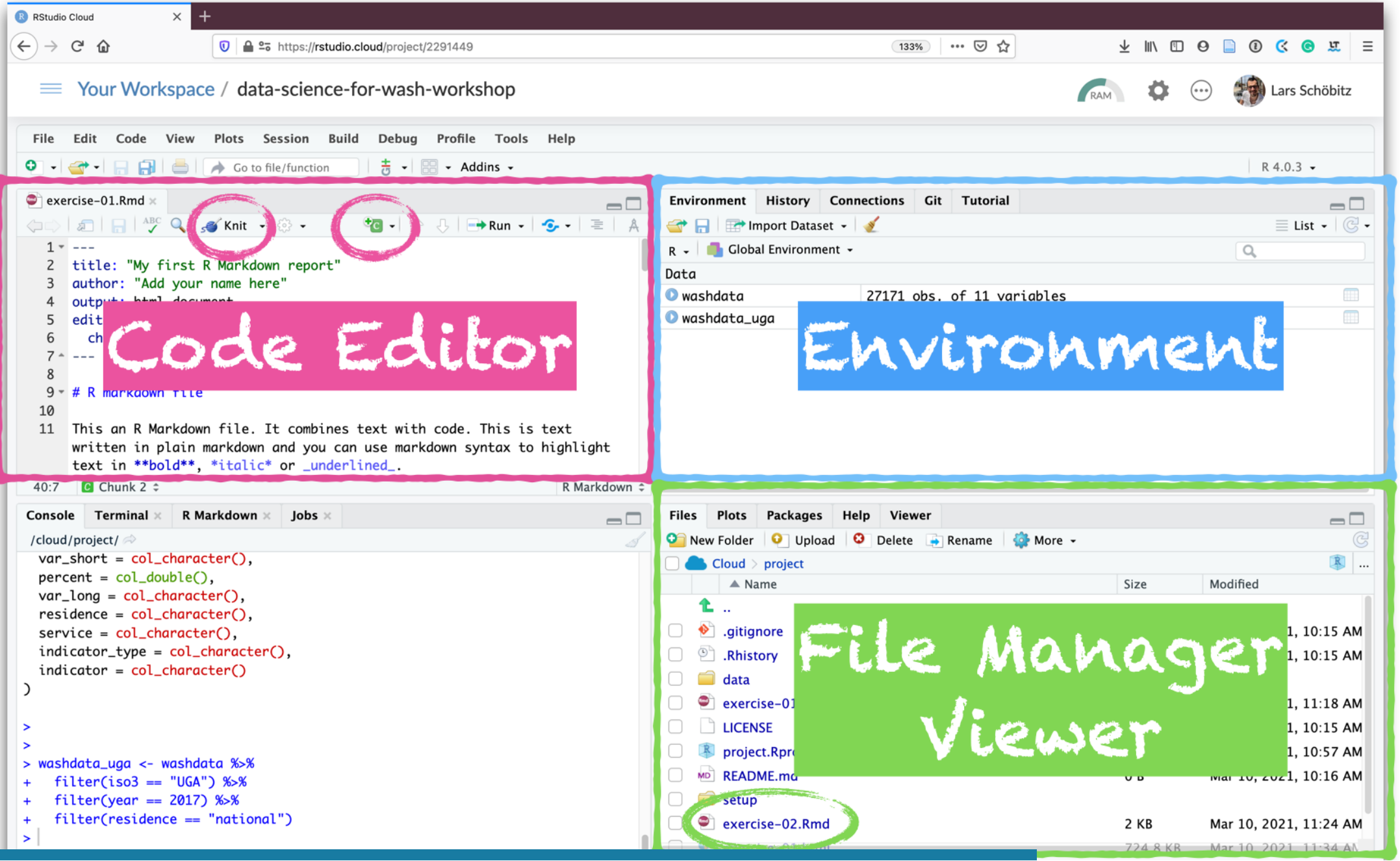
setup
exercise-02.Rmd
2 KB
Mar 10, 2021, 11:24 AM
File Manager
Viewer


RStudio Cloud
https://rstudio.cloud/project/2291449
Your Workspace / data-science-for-wash-workshop
Lars Schöbitz
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
R 4.0.3
exercise-01.Rmd
Knit
Run
1 ---
2 title: "My first R Markdown report"
3 author: "Add your name here"
4 output: html_document
5 edit
6 ch
7 ---
8
9 # R markdown file
10
11 This an R Markdown file. It combines text with code. This is text written in plain markdown and you can use markdown syntax to highlight text in **bold**, *italic* or _underlined_.
Code Editor
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Chunk 2
R Markdown
Environment
History
Connections
Git
Tutorial
Import Dataset
List
R
Global Environment
Data
washdata
27171 obs. of 11 variables
washdata_uga
Environment
Console
Terminal
R Markdown
Jobs
/cloud/project/
var_short = col_character(),
percent = col_double(),
var_long = col_character(),
residence = col_character(),
service = col_character(),
indicator_type = col_character(),
indicator = col_character()
)
>
>
> washdata_uga <- washdata %>%
+ filter(iso3 == "UGA") %>%
+ filter(year == 2017) %>%
+ filter(residence == "national")
>
Files
Plots
Packages
Help
Viewer
New Folder
Upload
Delete
Rename
More
Cloud
project
Name
Size
Modified
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.gitignore
.Rhistory
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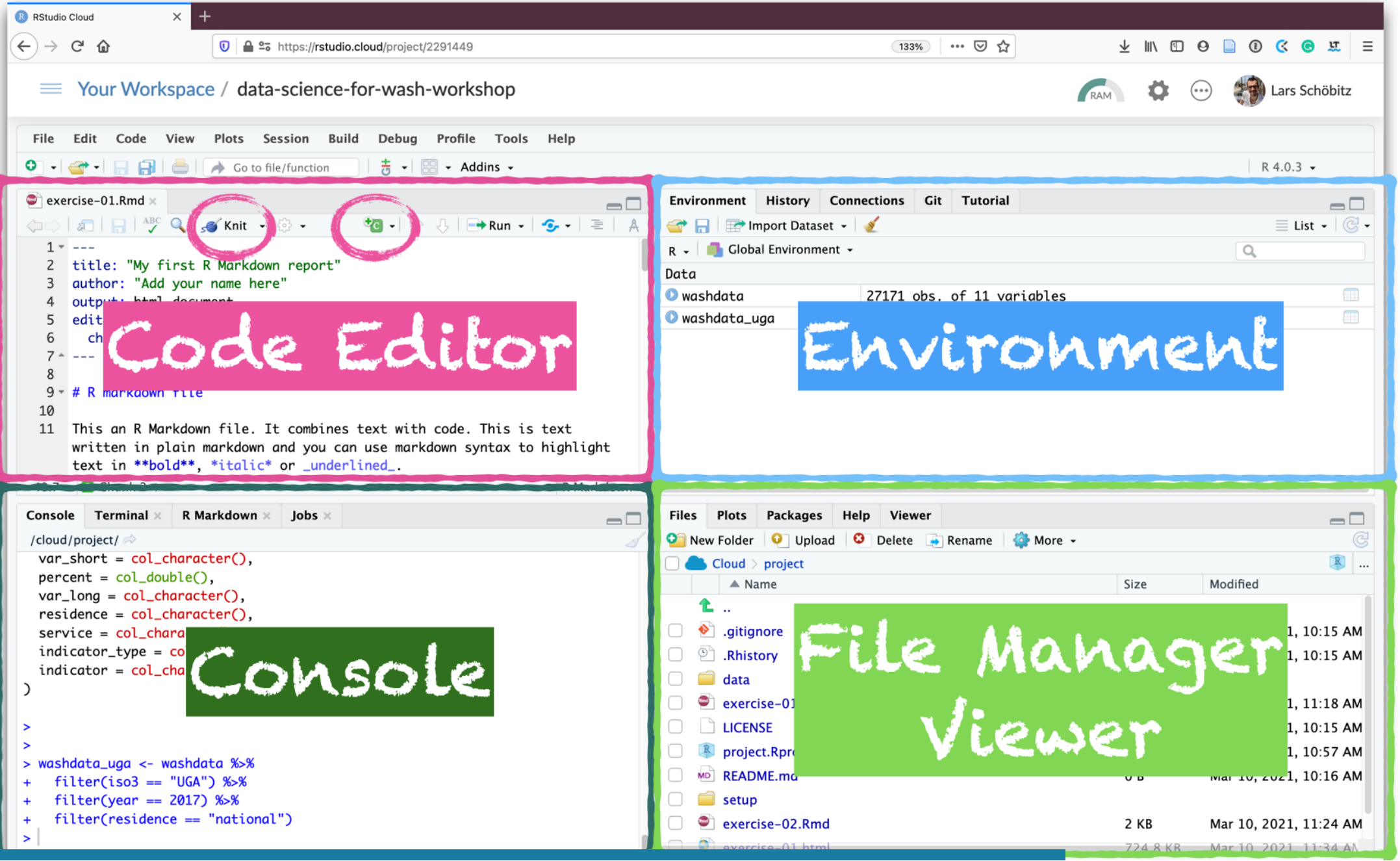
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New Folder Upload Delete Rename More
Cloud project
Name Size Modified
..
.gitignore
.Rhistory
data
exercise-01
LICENSE
project.Rpr
README.md
setup
exercise-02.Rmd 2 KB Mar 10, 2021, 11:24 AM
File Manager
Viewer

Let's put *work* into this workshop

Requirements

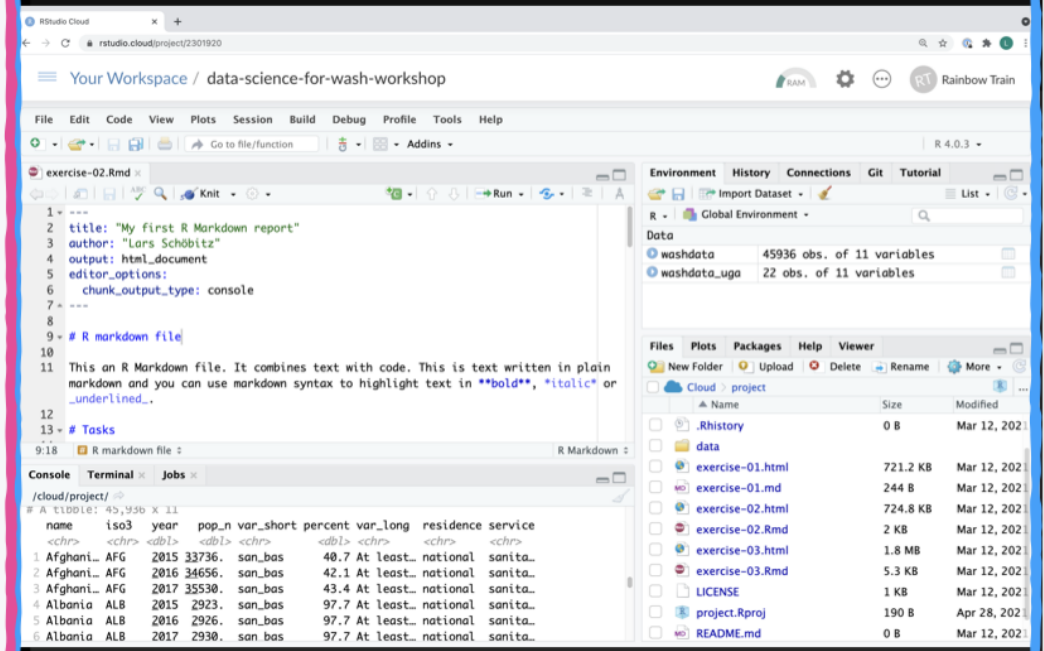
1. A free account on RStudio Cloud
    - https://rstudio.cloud/plans/free
2. One of Mozilla Firefox, Google Chrome, Microsoft Edge, Safari, Opera
    - just **not** the Internet Explorer
3. A laptop or desktop computer
    - it will be hard to do on a phone or tablet
4. And if you haven't seen it, please read the Code of Conduct after this workshop

Window 1: RStudio Cloud

Window 2: Zoom

where you write code yourself

where you watch me write code



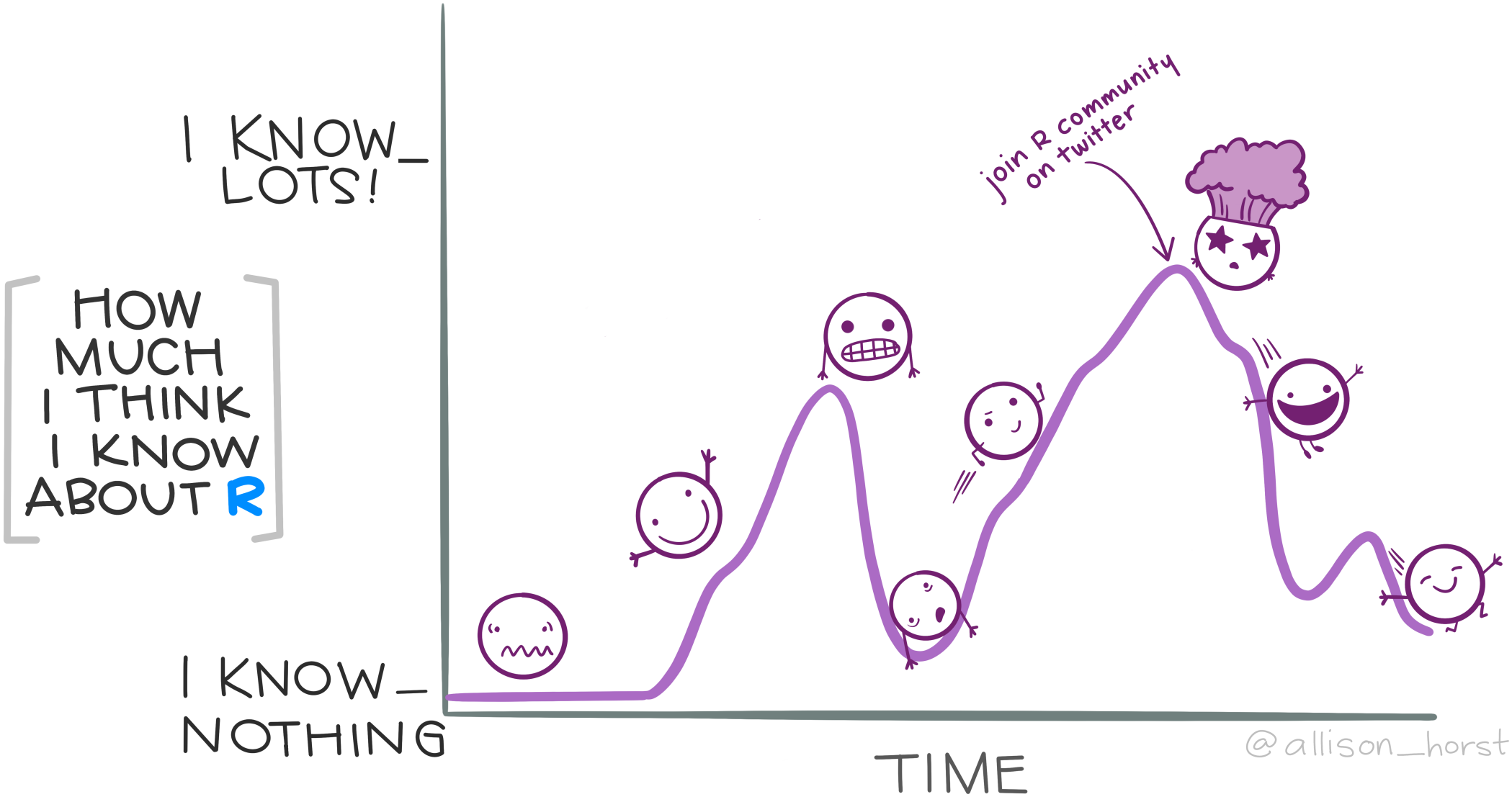
Your Turn

Step 1: Open this link in your browser

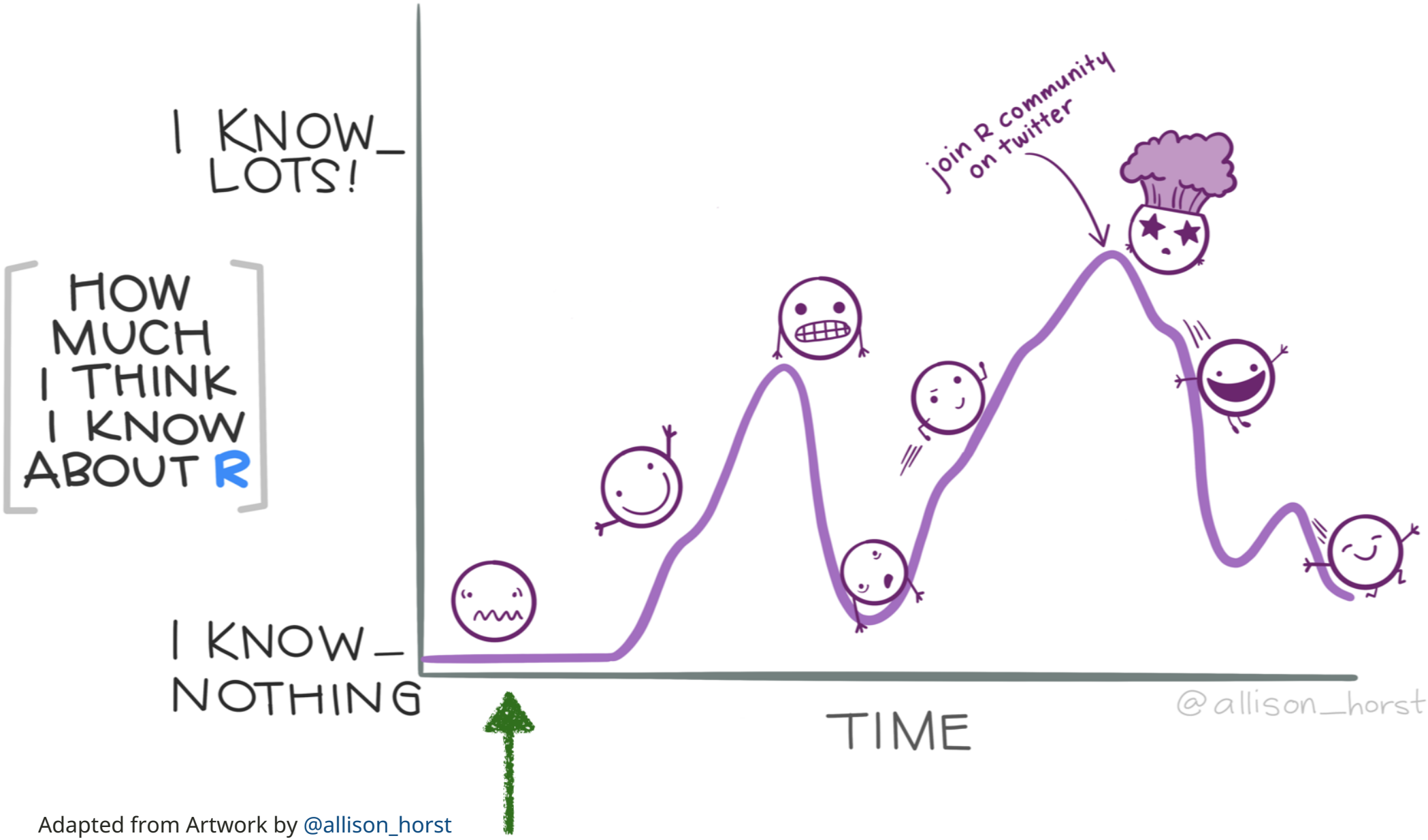
rstudio.cloud/project/2301653

Step 2: Create your own permanent project copy

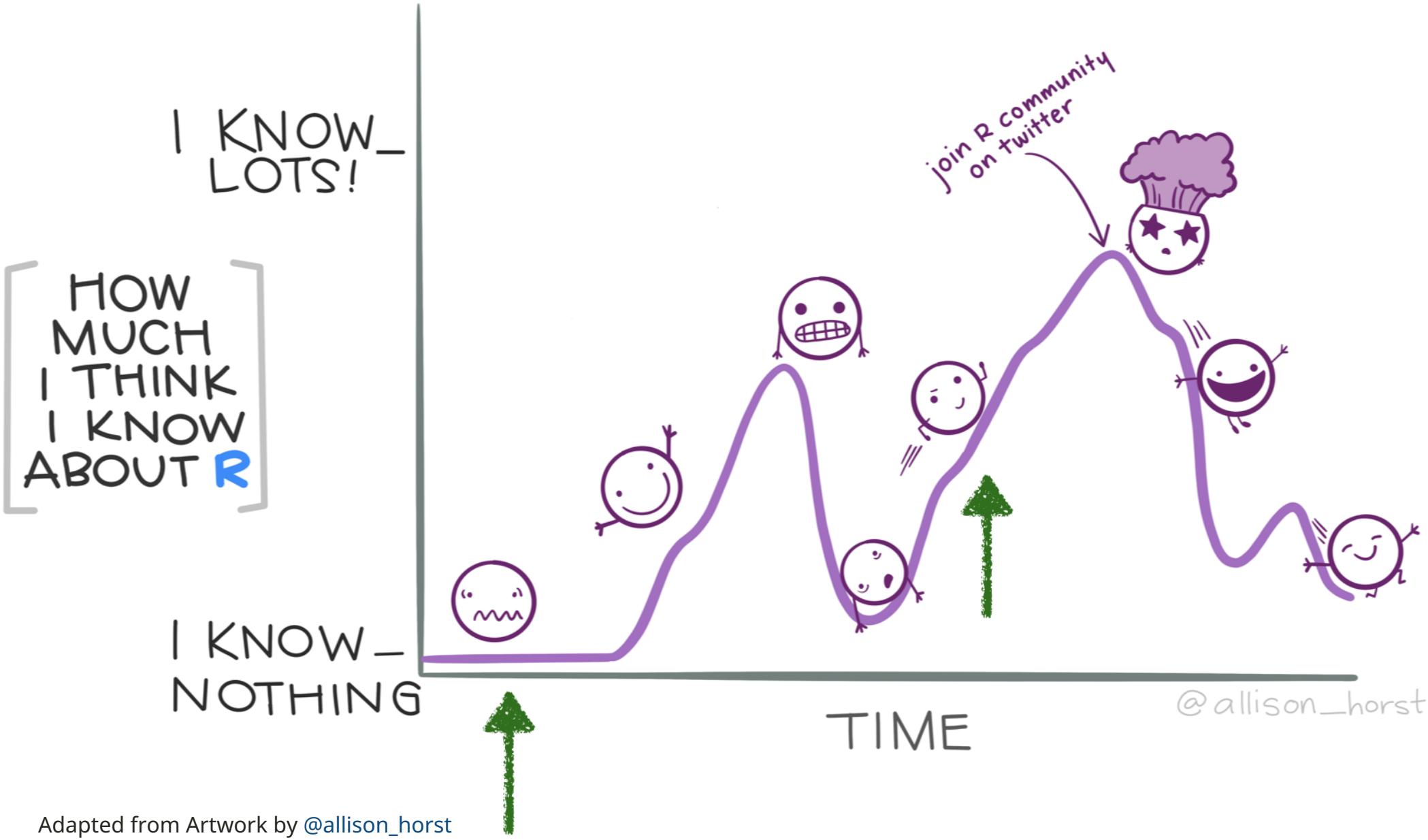
What's next?



Artwork by @allison_horst



Adapted from Artwork by @allison_horst



Adapted from Artwork by @allison_horst

If you could not follow through the exercises for any reason

Contact me: Lars@Lse.de

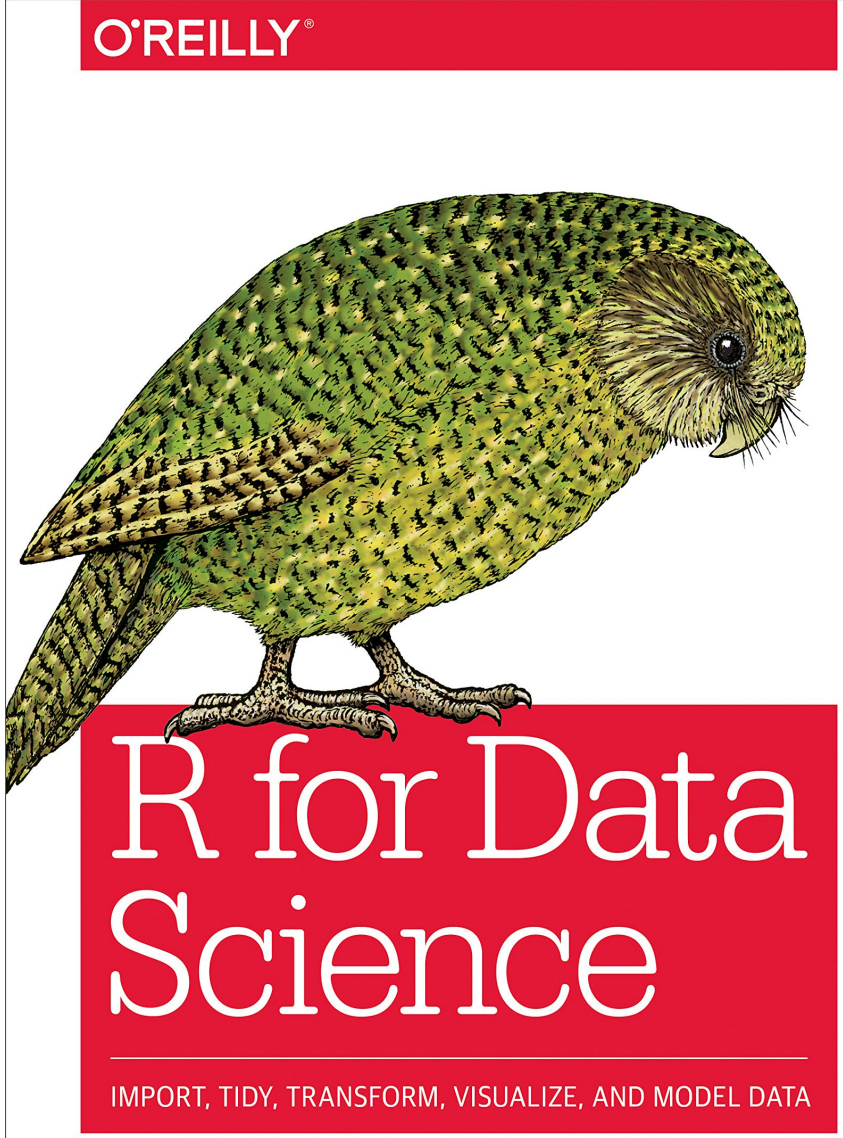
If you are interested in a course on Data Science for WASH

Fill out this form:
forms.gle/XaDNE3Z6SJrxo2BM8

- 10 questions
- done in 5 minutes

If you want to continue learning now

- Book: https://r4ds.had.co.nz/
- Community: https://www.rfordatasci.com/



If you are interested in following along the development of Data Science for WASH

- Join Slack Workspace: **Link to Workspace**
- Follow along on Twitter: **@washdata**
- Get in touch via E-Mail: **Lars@Lse.de**

If you know of someone that could be interested

- **Date:** 4th November 2021
- **Time:** 3 PM (CET)
- **Sign-up Link:** https://us02web.zoom.us/meeting/register/tZwucOmsqjorGdQe3lykOPl24hdFpwc4E

🌻 Thank you!

For joining!

For R packages {xaringan} and {xaringanthemer}, which where used to create these slides.

Slides

PDF version: Download here

Web version: https://larnsce.github.io/co-wash-symposium-2021/