

Creating a project-oriented workflow in R

RProjects and the `here` package

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Learning Objectives

Today we will...

- learn about project-oriented workflows
- create an RProject
- use project-relative filepaths with the `here` package

Installation requirements

- required installations/recent versions of:
 - R
 - at least version **4.4.0**, “Puppy Cup”
 - check current version with **R.version**
 - download/update: <https://cran.r-project.org/bin/macosx/>
 - RStudio
 - at least version **2023.12.1.402**, “Ocean Storm”
 - Help > Check for updates
 - new install: <https://posit.co/download/rstudio-desktop/>

Project-oriented workflow

1. Folder structure:

- keeping everything related to a project in one place
- i.e., contained in a single folder, with subfolders as needed

2. Project-relative working directory

- the project folder should act as your working directory
- all file paths should be relative to this folder

Folder structure

- a core computer literacy skill
 - keep your Desktop as empty as possible
 - have a sensible folder structure
 - avoid mixing subfolders and files
 - i.e., if a folder contains subfolders, ideally it should not contain files

RProjects

- in data analysis, using an IDE is beneficial
 - e.g., RStudio
- most IDEs have their own implementation of a Project
- in RStudio, this is the RProject
 - creates a `.Rproj` file in a project folder
 - stores project settings
- you can have several RProjects open simultaneously
 - and run several scripts across projects simultaneously
- most importantly, RProjects (can) centralise a specific project's workflow and file path
- to read more about R Projects, check out [Section 6.2: Projects](#) from Wickham et al. (2023; or [Ch. 8 - Workflow: Projects](#) in Wickham & Grolemund, 2016)

Creating a new Project

- when?
 - whenever you're starting a new course or project which will use R
- why?
 - to keep all the relevant materials in one place
- where?
 - somewhere that makes sense, e.g., a folder called **SoSe2024** or **Mastersarbeit**
- how?
 - **File > New Project > New Directory > New Project > [Directory name] > Create Project**

New RProject

Create a new RProject for this workshop

- **File > New Project > New Directory > New Project > [Directory name] > Create Project**
- make sure you choose a sensible location

Opening a Project

- to open a project, locate its `.Rproj` file and double-click
- or if you're already in RStudio, you can use the Project (None) drop-down (top right)

Figure 1: Double-click `.Rproj`

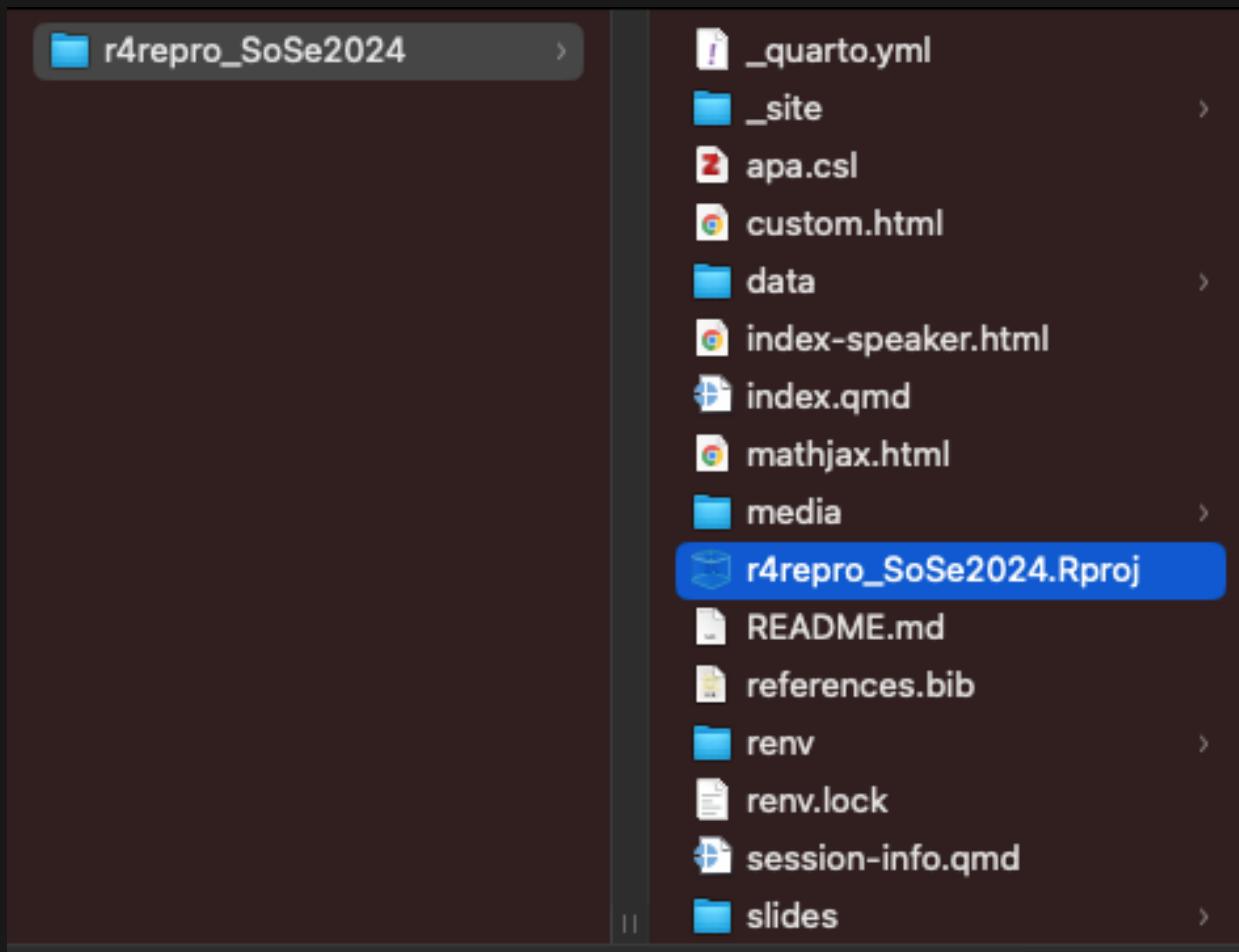
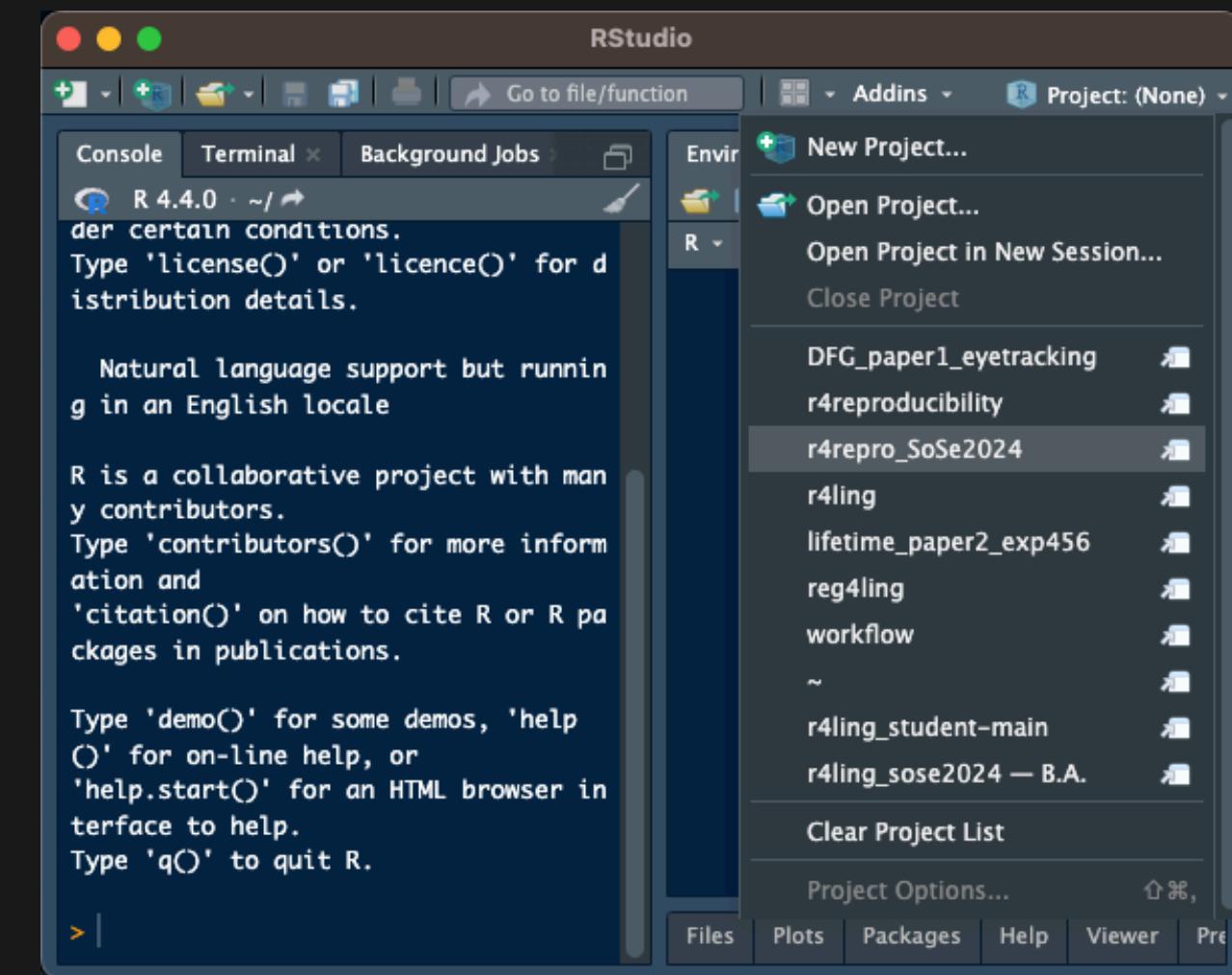


Figure 2: Open from RStudio

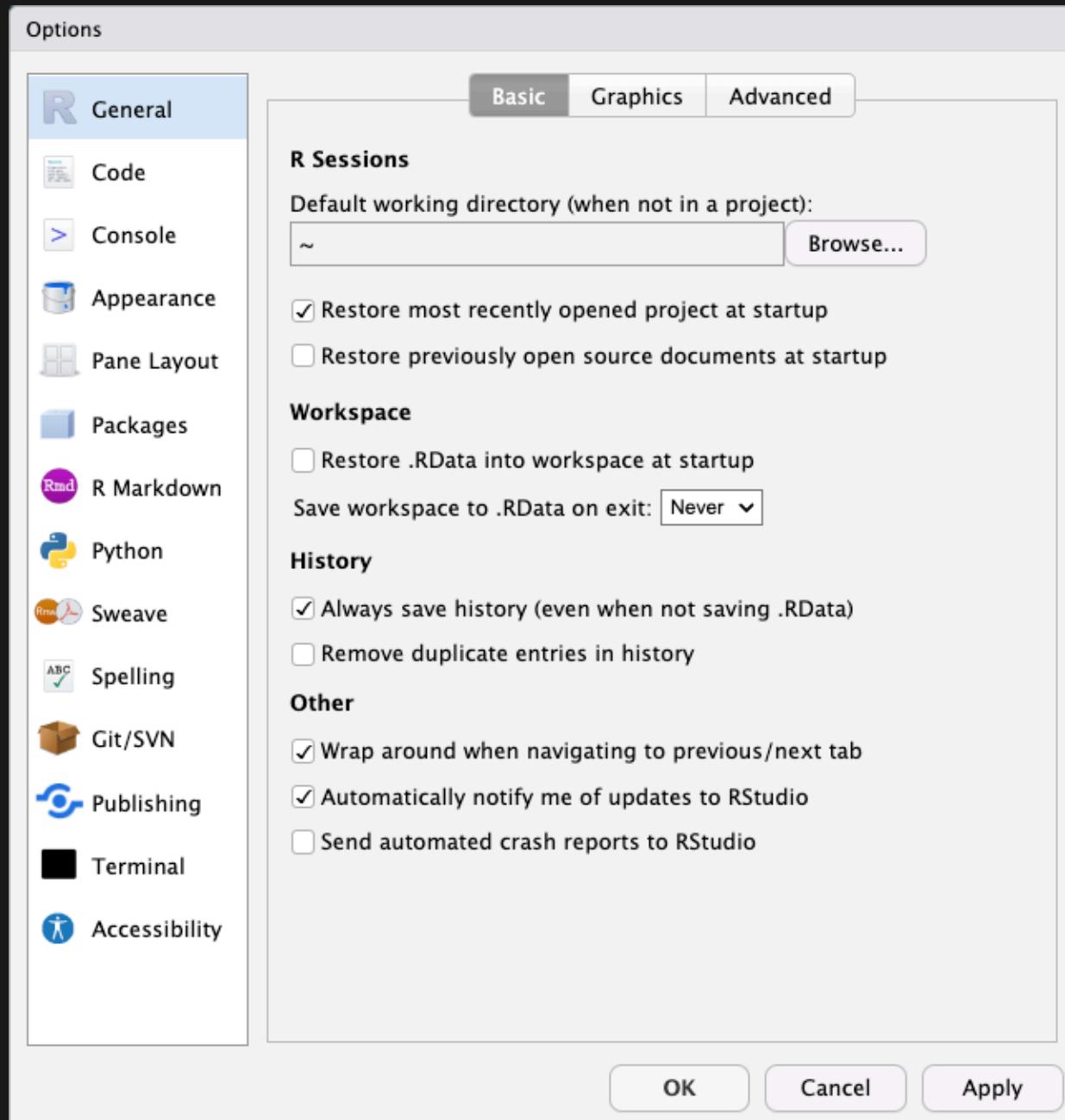


Adding a README file

- File > New File > Markdown File (*not R Markdown!*)
 - add some text describing the purpose of this project
 - include your name, the date
 - use Markdown formatting (e.g., # for headings, *italics*, **bold**)
- save as README.md in your project directory

Global RStudio options

Figure 3: RStudio settings for reproducibility



- Tools > Global Options
 - Workspace: Restore .RData into workspace at startup: NO
 - Save workspace to .RData on exit: Never
- this will ensure that you are always starting with a clean slate
 - and that your code is not dependent on some package or object you created in another session
- this is also how RMarkdown and Quarto scripts run
 - they start with an empty environment and run the script linearly

Global settings

Change your Global Options so that

- **Workspace:** Restore .RData into workspace at startup: NO
- Save workspace to .RData on exit: Never

Identifying your RProject

- there are a ways to check which (if any) RProject you're in
 - there are 6 differences between xyzfig-noproject and xyzfig-project
 - which is in an RProject session?

Spot the differences

Show the differences

Figure 4: RStudio Session A

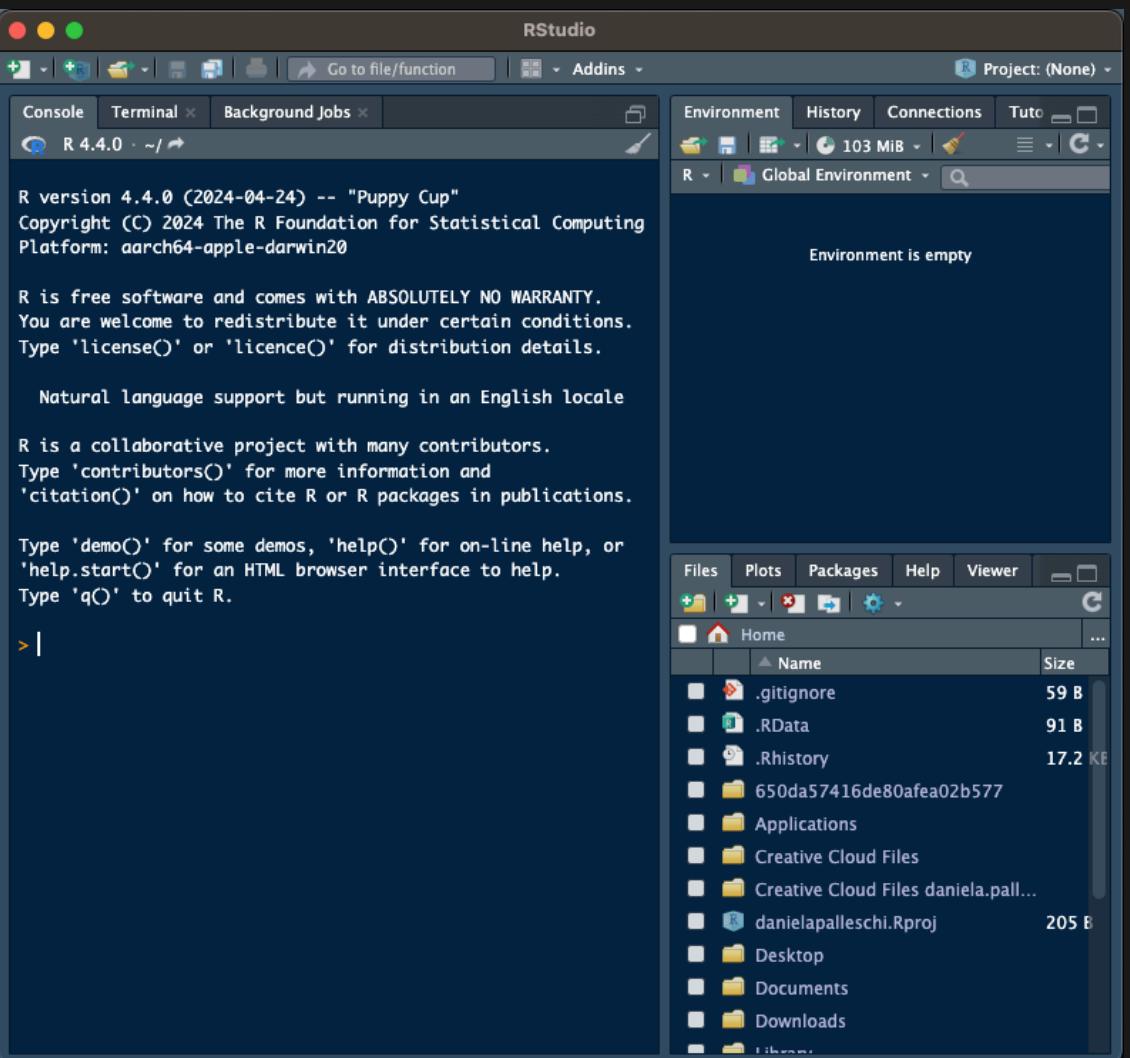
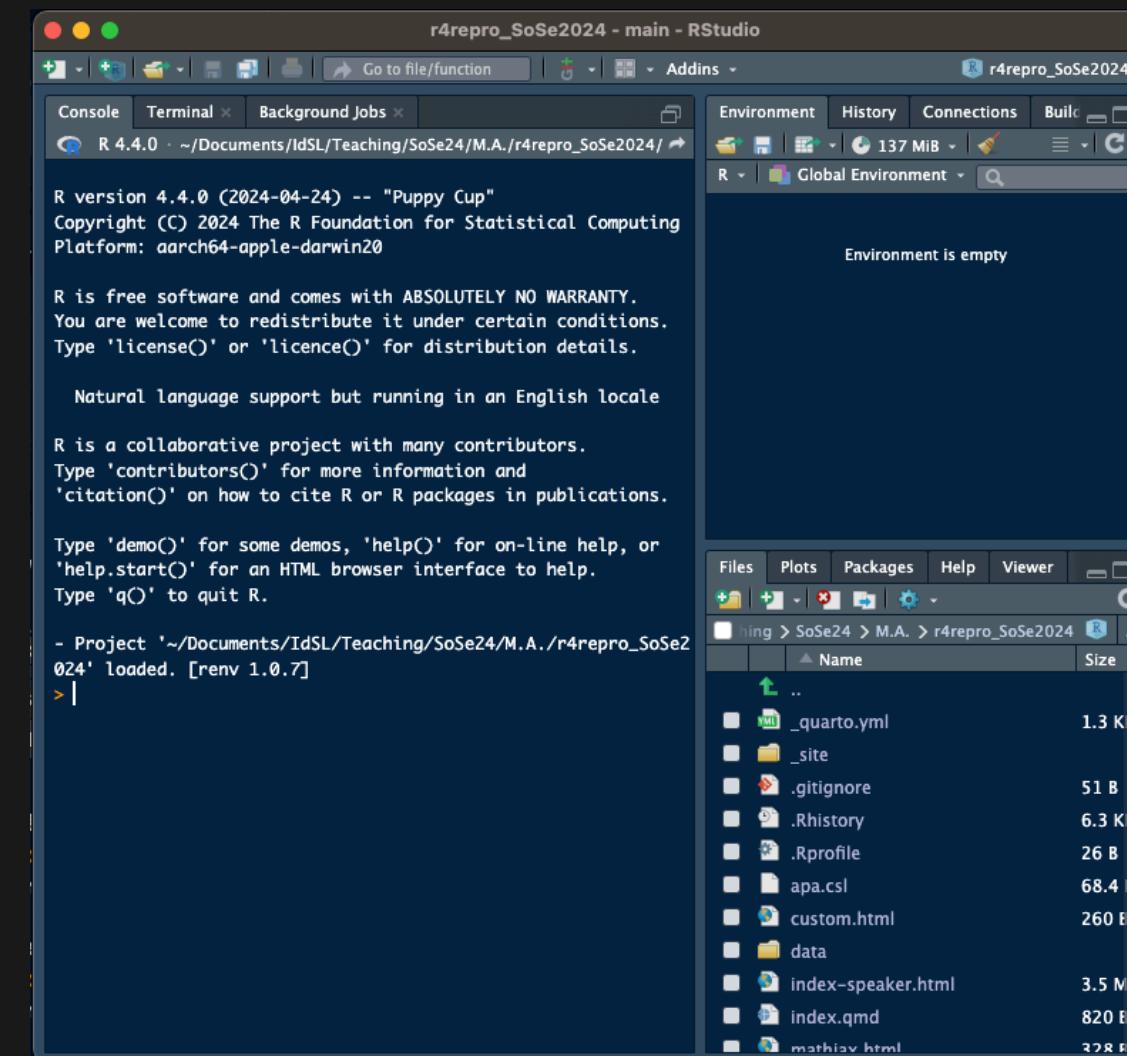


Figure 5: RStudio Session B



Folder structure

- some folders you'll typically want to have:
 - **data**: containing your dataset(s)
 - **scripts** (or **analyses**, etc.): containing any analysis scripts
 - **manuscript**: containing any write-ups of your results
 - **materials**: containing relevant experiment materials (e.g., stimuli)
- let's just create the first 2 (**data** and **scripts**)

data/

- do you have “raw”, i.e., pre-processed data?
 - if so, you might want to create a `raw` sub-folder
 - and any other relevant sub-folders (e.g., `processed` or `tidy`)
- download `the dataset` from the workshop repo (from Chromý et al., 2023)
 - *or*, move a dataset of your own to this folder

scripts/

- try to create a single script for each “product”
 - e.g., anonymised data, ‘cleaned’ data, data exploration, visualisation, analyses, etc.
- you can create sub-folders as the project develops and move scripts around
 - for now, let’s create a new script to take a look at our data



New script

Create a new Quarto script:

1. File > New File > Quarto Document
2. Add a title
3. Uncheck the Use Visual Editor box
4. Click Create
5. Save it in your `scripts/` folder: File > Save as...

Load in the data

- load in the data however you normally would
 - e.g., `readr::read_csv()`

here-package

- **here** package (Müller, 2020) enables file referencing
 - avoids the use of `setwd()`

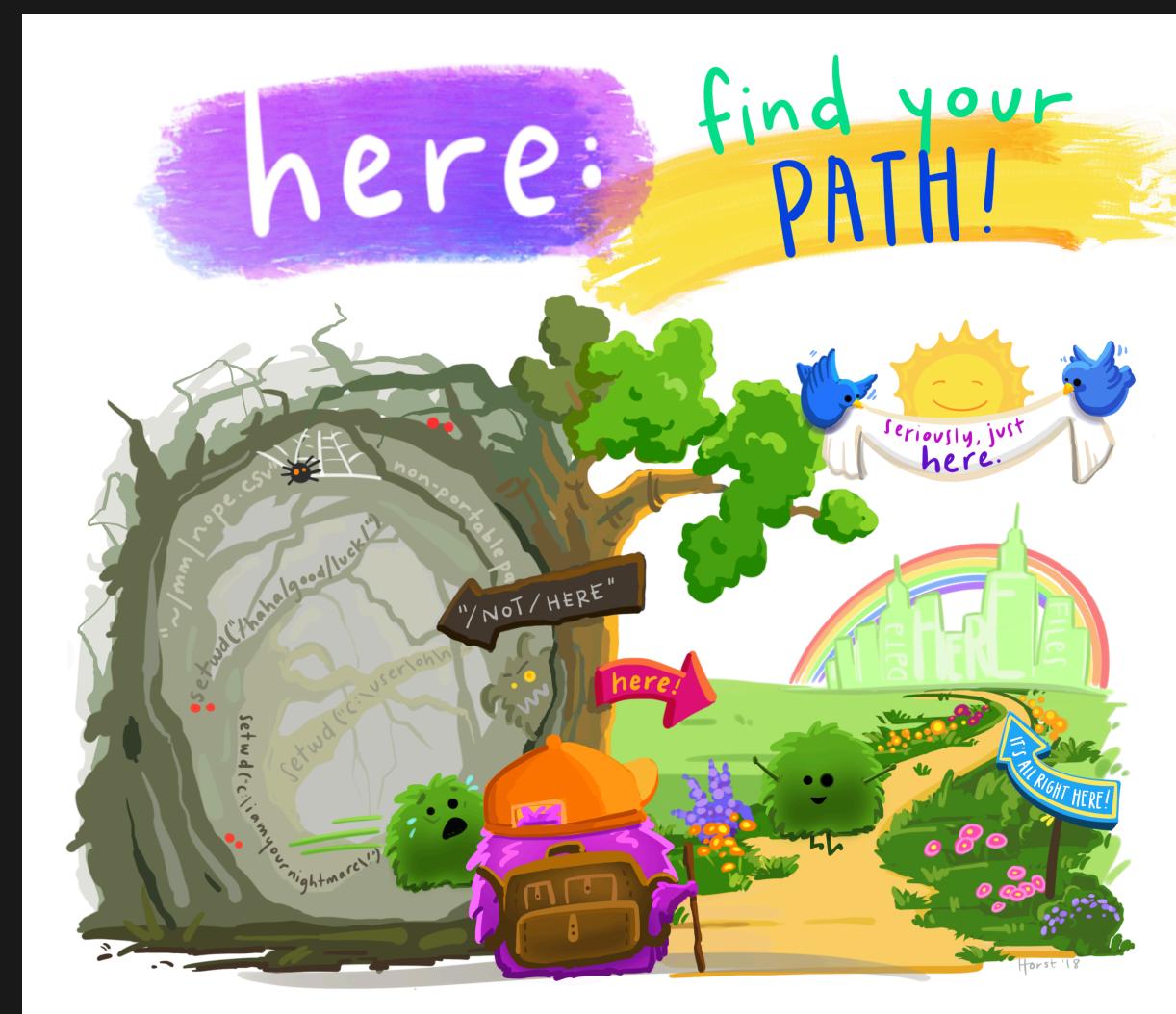


Figure 6: Illustration by Allison Horst

The problem with `setwd()`

If the first line of your R script is

`setwd("C:\Users\jenny\path\that\only\I\have")`

I will come into your office and SET YOUR COMPUTER ON FIRE.

— Jenny Bryan

- `setwd()` depends on your entire machine's folder structure
- `setwd()` breaks when you
 - send your project folder to a collaborator
 - make your analyses open
 - change the location of your project folder
- using slashes is also dependent on your operating system

The benefit of `here()`

- uses the top-level directory of your project as the working directory
- can separate folder names with a comma



Load the dataset using `here`

1. Install `here` (e.g., `install.packages("here")`)
2. Load `here` at the beginning of your package
 - or use `here::` before calling a function
3. Use the `here()` function to load in your data
4. Inspect the dataset however you usually would (e.g., `summary()`, `names()`, etc.)
5. Save your script

here::here()

- install package

```
In the Console
```

```
1 install.packages("here")
```

- load package and call the here function

```
1 # load package
2 library(here)
3
4 # read in data
5 df_data <- read.csv(here("data", "data_lifetime_pilot.csv"))
```

- or directly call the here function without loading the package

```
1 # read in data without loading here
2 df_data <- read.csv(here::here("data", "data_lifetime_pilot.csv"))
```

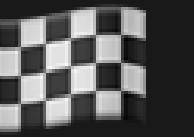
- note that I stored the data with the prefix df_
 - df stands for dataframe
- I recommend using object-type defining prefixes for all objects in your Environment
 - e.g., fit_ for models, fig_ for figures, sum_ for summaries, tbl_ for tables, etc.



Reproduce your analysis

1. Perform some data exploration (e.g., with `names()`, `summary()`, `dplyr::glimpse()`, whatever you typically do)
2. Save your script, then close RStudio/your Rproject.
3. Re-open the project. Can you re-run the script?

Learning objectives



Today we learned...

- learn about project-oriented workflows ✓
- create an RProject ✓
- establish a self-contained project environment with `here` ✓

References

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- Chromý, J., Brand, J., Laurinavichyute, A., & Lacina, R. (2023). Number agreement attraction in Czech and English comprehension: A direct experimental comparison. *Glossa Psycholinguistics*, 2(1), 1–20. <https://doi.org/10.5070/G6011235>
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- Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). *R for Data Science* (2nd ed.). <https://r4ds.hadley.nz/>
- Wickham, H., & Grolemund, G. (2016). *R for data science: Import, tidy, transform, visualize, and model data.* " O'Reilly Media, Inc.".