

# Introduction to RStudio

Day 1 - Introduction to Data Analysis with R

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# Difference between R and RStudio



R is the **programming language** and the **program** that does the actual work

- Can be used with many different programming environments



RStudio is the **integrated development environment (IDE)**

- Provides an interface to R
- Specifically built around R code
- Execute code
- Syntax highlighting
- File and project management
- ...

# Difference between R and RStudio



Analogy and image from [ModernDive Book](#)

## Summary

You can use R without RStudio but RStudio without R would be of little use

# A quick tour around RStudio

# A quick tour around RStudio

The screenshot displays the RStudio environment with the following components:

- Script Editor:** Contains a script named 'penguin\_script.R' with the following code:

```
1 # Script to plot some data
2 library(ggplot2)
3 library(palmerpenguins)
4
5 head(penguins)
6
7 ggplot(penguins, aes(x = flipper_length_mm, y = body_mass_g, color = species)) +
8   geom_point() +
9   geom_smooth(method = "lm") +
10  scale_color_manual(values = c("darkorange", "purple", "cyan4")) +
11  theme_bw()
12
```
- Environment Pane:** Shows the current environment with 'Global Environment' selected. It displays a data object 'someData' with 10 observations and 2 variables. The values for 'variableA' are 1, 2, 3 and for 'variableB' is 10.5.
- Console:** Shows the R session output, including the R license notice, version information (R 4.0.3), and the execution of the script. The output includes:

```
R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

Warning messages:
1: package 'devtools' was built under R version 4.0.5
2: package 'usethis' was built under R version 4.0.5
3: package 'reprex' was built under R version 4.0.5
> variableA <- c(1,2,3)
> variableB <- 10.5
> someData <- data.frame(a=1:10, b=1:10)
> 2+2
[1] 4
> print("hello")
[1] "hello"
>
```
- File Explorer:** Shows the file structure of the project, including folders like '.gitignore', 'day\_00', 'day\_01', 'day\_02', 'day\_03', 'day\_04', 'example\_files', and files like 'example.html', 'example.Rmd', 'intro-to-r.Rproj', and 'libs'.

# Console pane

- Execute R code
- Output from R code in scripts is printed there
- Type a command into the console and execute with **Enter/Return**



Tip

Use arrow keys to bring back last commands

```
R version 4.0.3 (2020-10-10) -- "Bunny-Wunnies Freak Out"
Copyright (C) 2020 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

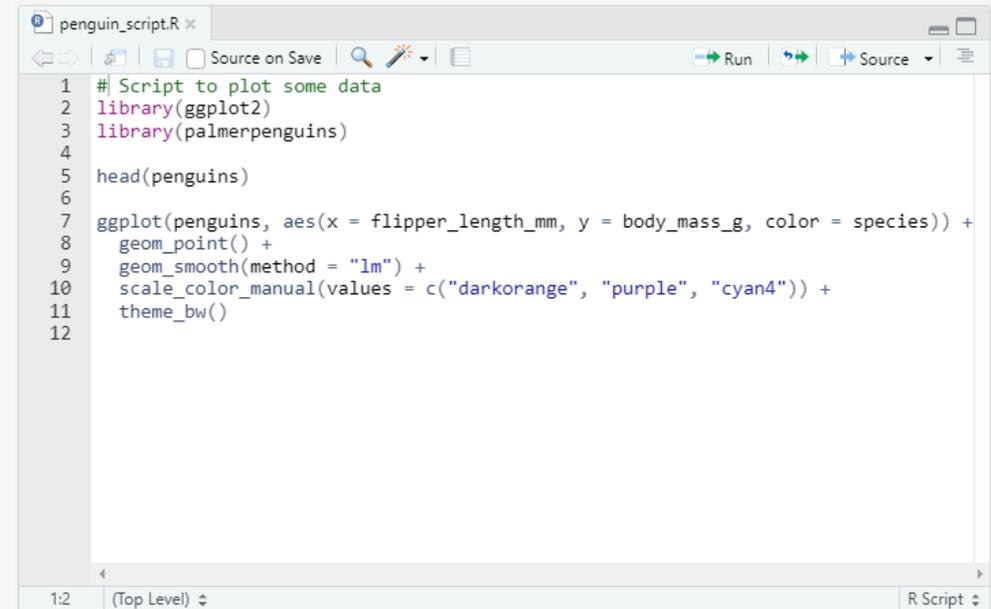
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Warning messages:
1: package 'devtools' was built under R version 4.0.5
2: package 'usethis' was built under R version 4.0.5
3: package 'reprex' was built under R version 4.0.5
> 4+4
[1] 8
> print("hello")
[1] "hello"
> |
```

# Script pane

- Write scripts with R code
  - Scripts are text files with R commands (file ending `.R`)
  - Use scripts to save commands for reuse



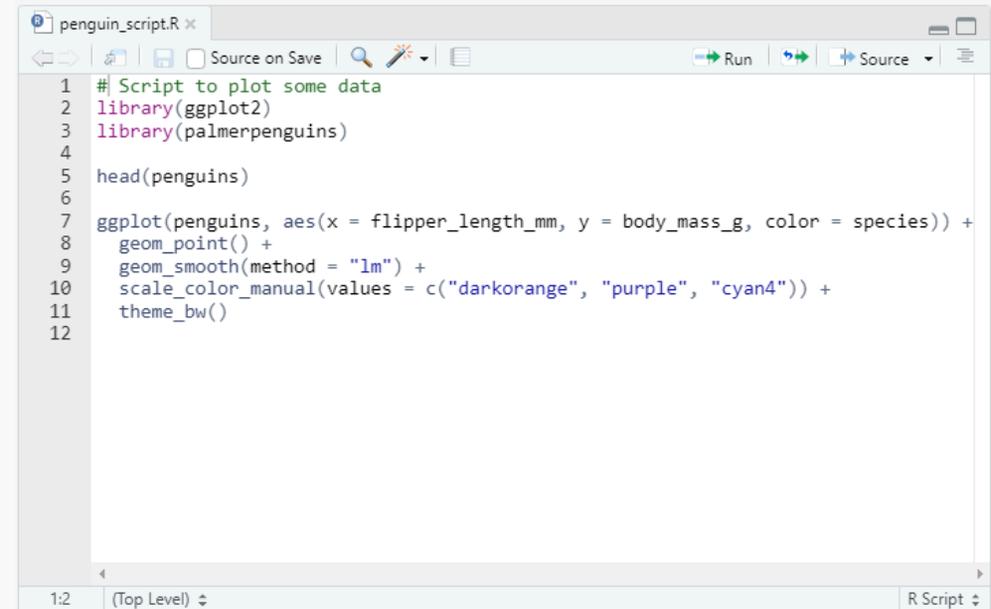
```
penguin_script.R x
Source on Save
Run
Source

1 # Script to plot some data
2 library(ggplot2)
3 library(palmerpenguins)
4
5 head(penguins)
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10  scale_color_manual(values = c("darkorange", "purple", "cyan4")) +
11  theme_bw()
12
```

1:2 (Top Level) R Script

# Script pane

- Create a new R script:  
**File -> New File -> R Script**
- Save an R script:  
**File->Save (Ctrl/Cmd + S)**
- Run code line by line with **Run button**  
**(Ctrl+Enter/Cmd+Return)**
- You can open multiple scripts



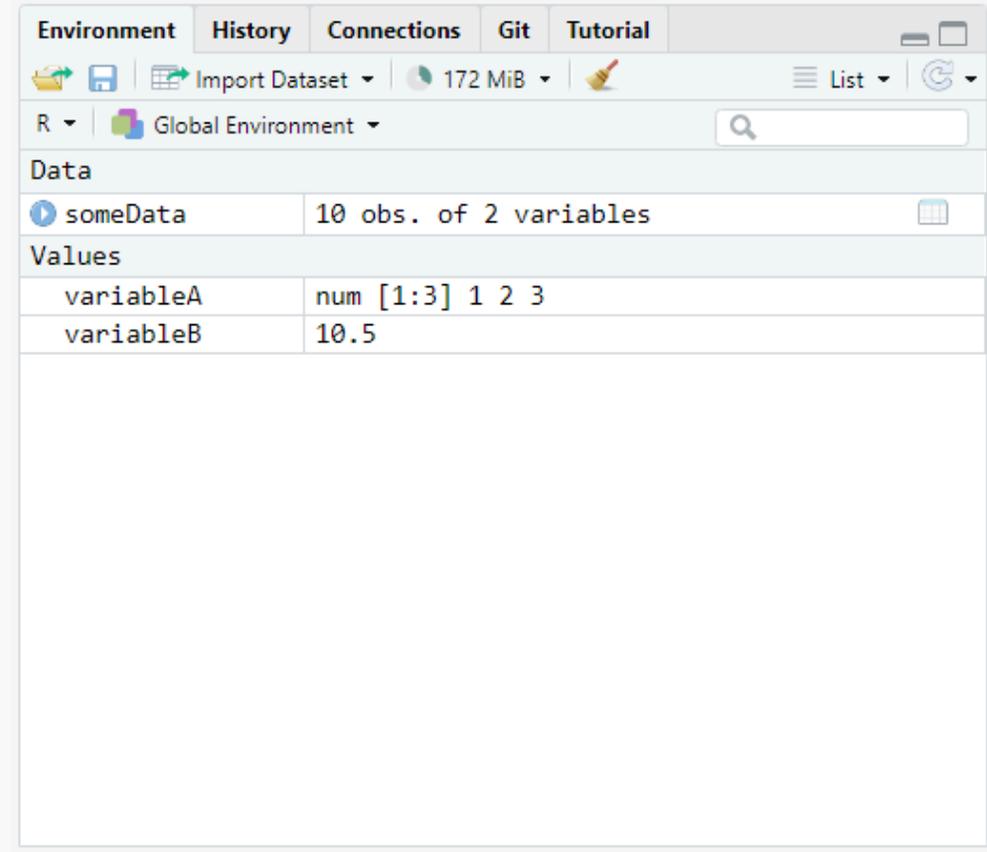
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11  theme_bw()
12
```

## Summary

Use **scripts** for all your analysis and for commands that you want to save.  
Use **console** for temporary commands, e.g. to test something.

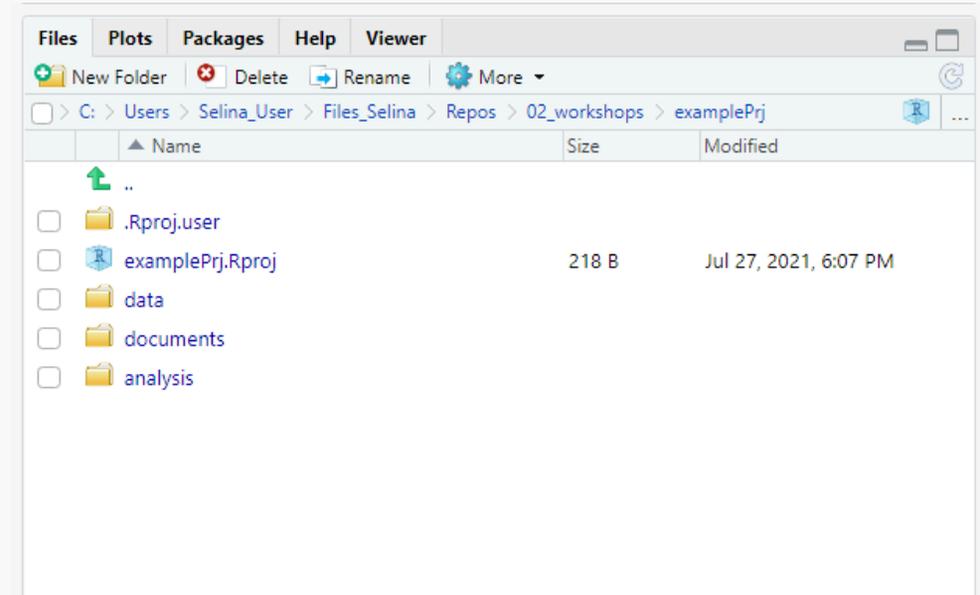
# Environment pane

- Shows objects currently present in the R session
- Is empty if you start R



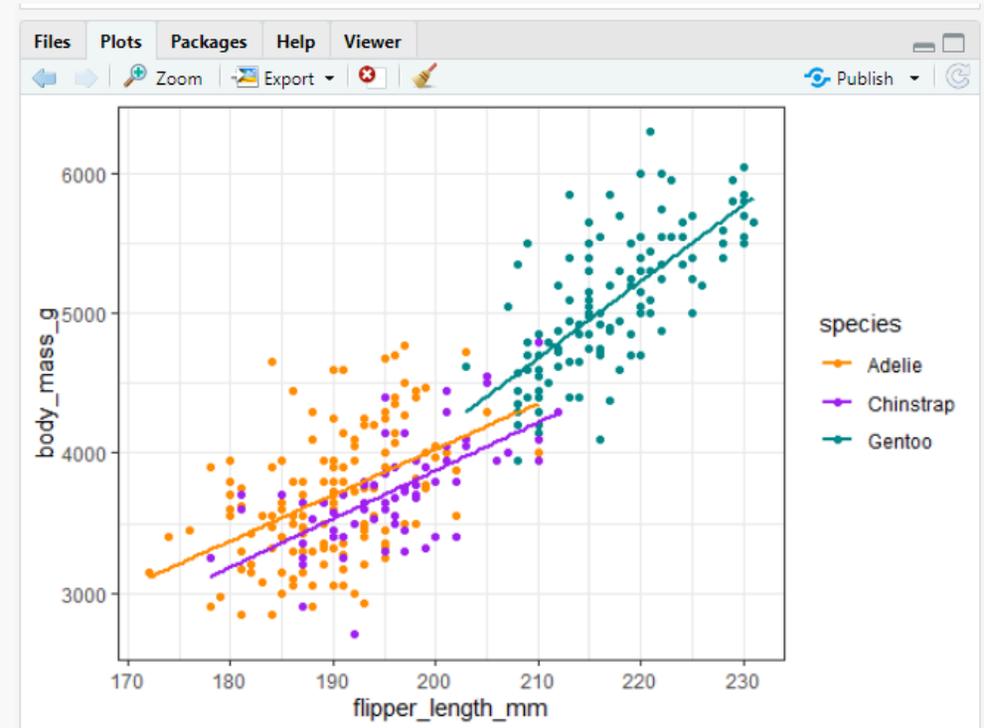
# Files pane

- Similar to Explorer/Finder
- Browse project structure and files
  - Find and open files
  - Create new folders
  - Delete files
  - Rename files
  - ...
- Practical if you don't want to switch between File Explorer and RStudio all the time



# Plot pane

- Plots that are created with R will be shown here



# Project oriented workflow

How to use RStudio to organize your projects

# Project oriented workflow

- One directory with all files relevant for project
  - Scripts, data, plots, documents, ...

```
MyProject
|
|- data
|
|- docs
|   |
|   |- notes
|   |
|   |- reports
|
|- R
|   |
|   |- clean_data.R
|   |
|   |- statistics.R
|
```

Example project structure

# Project oriented workflow

- One directory with all files relevant for project
  - Scripts, data, plots, documents, ...
- An RStudio project is just a normal directory with an **.Rproj** file

```
MyProject
|
|- data
|
|- docs
|   |
|   |- notes
|   |
|   |- reports
|
|- R
|   |
|   |- clean_data.R
|   |
|   |- statistics.R
|
|- MyProject.RProj
```

Example RStudio project structure

# Project oriented workflow

## Advantages of using RStudio projects

- Easy to navigate in R Studio (**File pane**)
- Easy to find and access scripts and data in RStudio
- Project root is working directory
- Open multiple projects simultaneously in separate RStudio instances

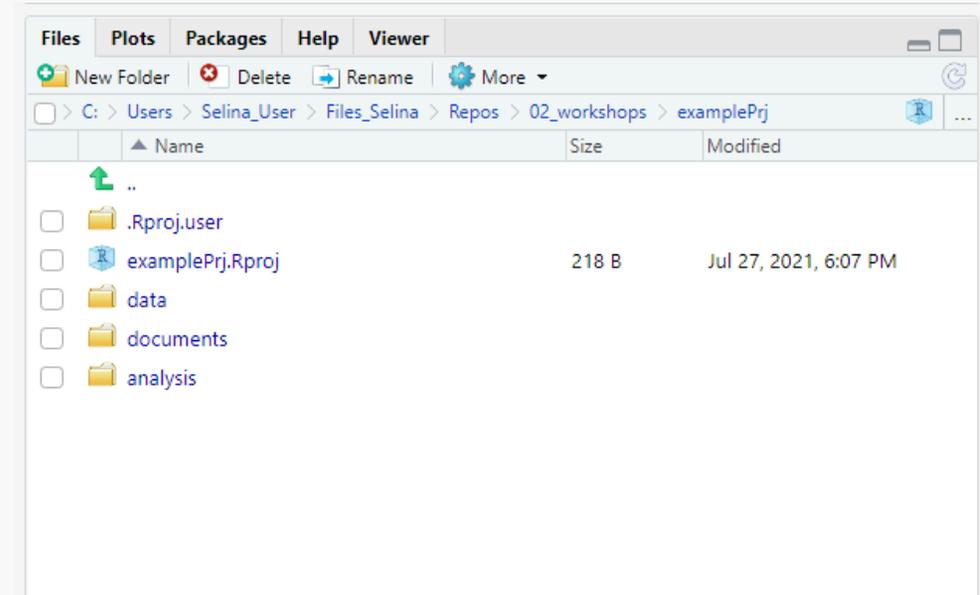
```
MyProject
|
|- data
|
|- docs
|   |
|   |- notes
|   |
|   |- reports
|
|- R
|   |
|   |- clean_data.R
|   |
|   |- statistics.R
|
|- *.Rproj
```

Example RStudio project structure

# Create an RStudio project

Create a project from scratch:

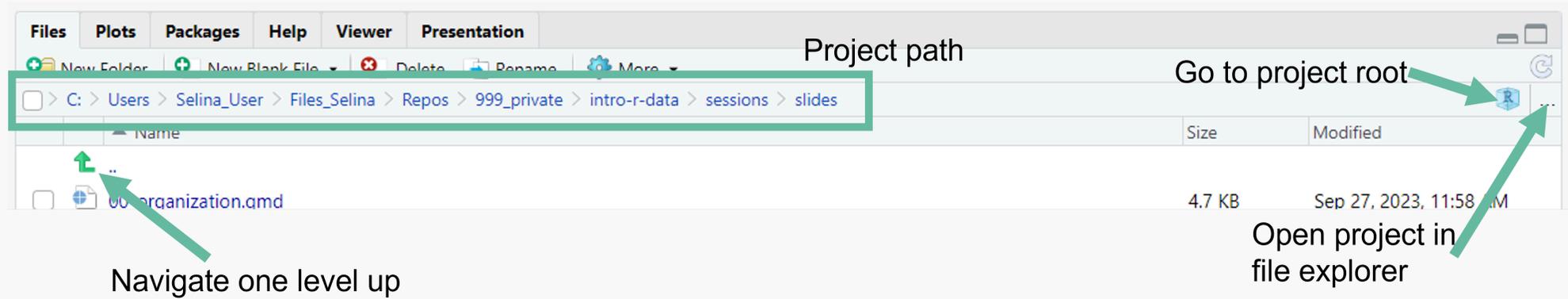
1. **File -> New Project -> New Directory -> New Project**
2. Enter a directory name (this will be the name of your project)
3. Choose the Directory where the project should be initiated
4. **Create Project**



Example RStudio project structure in the Files pane

RStudio will now create and open the project for you.

# Navigate an RStudio project

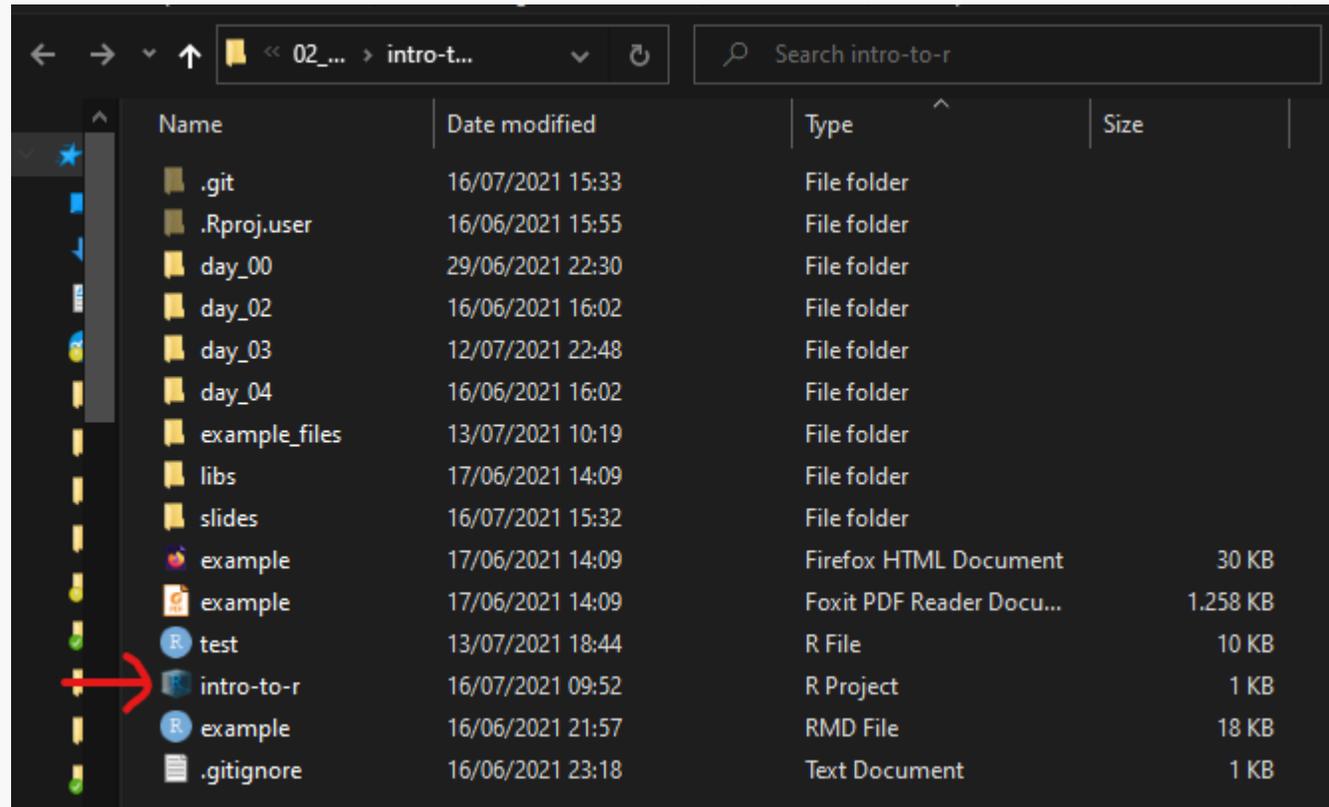


The screenshot shows the RStudio interface with the following elements:

- Project path:** A green box highlights the path `C: > Users > Selina_User > Files_Selina > Repos > 999_private > intro-r-data > sessions > slides`.
- Navigation icons:** A green arrow points to the up arrow icon (..) with the text "Navigate one level up".
- File list:** A table with columns "Name", "Size", and "Modified". The first row shows a file named "organization.qmd" with a size of 4.7 KB and a modification date of Sep 27, 2023, 11:58 AM.
- Action buttons:** A green arrow points to the "Go to project root" button (represented by a blue folder icon) with the text "Go to project root". Another green arrow points to the "Open project in file explorer" button (represented by a blue folder icon with a magnifying glass) with the text "Open project in file explorer".

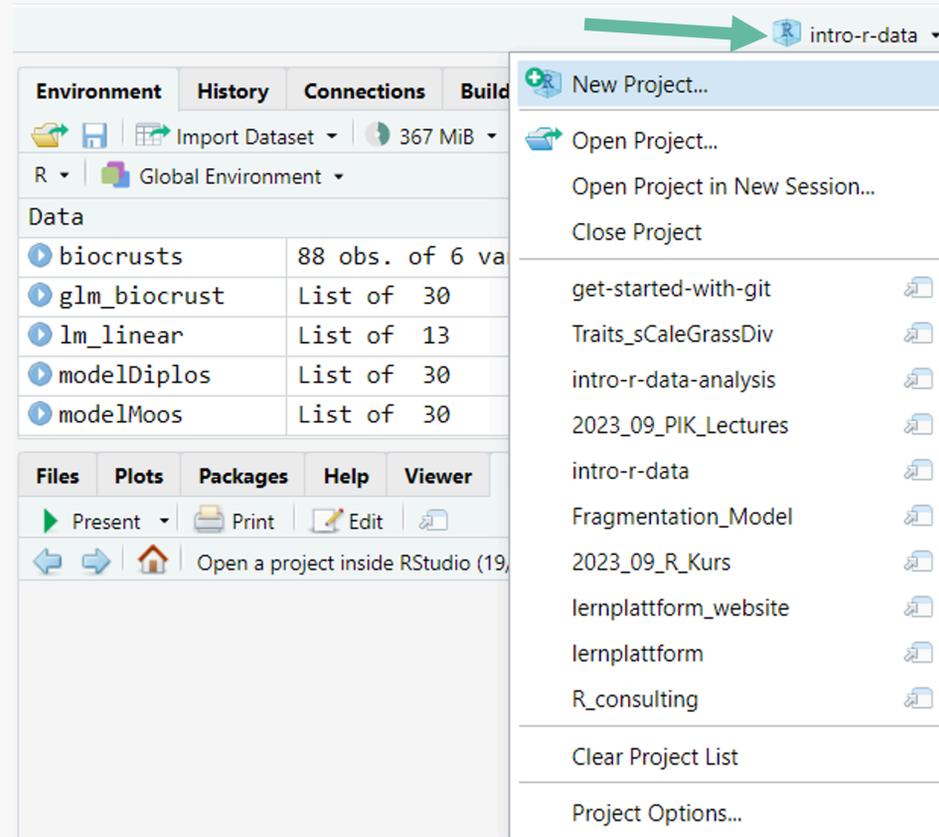
# Open a project from outside RStudio

To open an RStudio project from your file explorer/finder, just double click on the .Rproj file



# Open a project inside RStudio

To open an RStudio project from RStudio, click on the project symbol on the top right of R Studio and select the project from the list.



# A tip before we get started

Learn the most important keyboard shortcuts of R Studio.

Find all shortcuts under **Tools -> Keyboard Shortcuts Help**

- Save active file: Ctrl/Cmd + S
- Run current line: Ctrl/Cmd + Enter
- Create new R Script: Ctrl/Cmd + N
- Undo: Ctrl/Cmd + Z
- Redo: Ctrl/Cmd + Y
- Copy/Paste: Ctrl/Cmd + C/V

# Now you

## Task 1 (20 min)

Set up your own RStudio project for this workshop

Find the task description [here](#)