

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

Basic idea of writing code for data analysis

1. Break down your process into small steps
2. Write precise instructions in the R language for each step
 - You do this in a document called an R script
3. Tell R to execute these instructions
4. R will give you the results (or an error message)

A quick tour around RStudio

A quick tour around RStudio

The screenshot displays the RStudio IDE interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. Below the menu is a toolbar with icons for file operations and running code. The main editor window shows a script named 'penguin_script.R' with the following R 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
```

The bottom-left pane is the Console, showing the R version (4.0.3) and the current directory. It displays the output of the script execution, including a warning message and the results of the last few lines of code:

```
R 4.0.3 · C:/Users/Selina_User/Files_Selina/Repos/02_workshops/intro-to-r/
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"
>
```

The bottom-right pane is the Environment pane, showing the current environment (Global Environment) and the data objects created. It lists 'someData' with 10 observations of 2 variables. Below this, it shows the values for 'variableA' and 'variableB':

variableA	num [1:3]
1	2
2	3

variableB	num
10.5	

The bottom-right pane also includes a Files pane showing the current directory structure, including files like .gitignore, day_00, day_01, day_02, day_03, day_04, example_files, 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

```
Console Terminal x Jobs x
R 4.0.3 · C:/Users/Selina_User/Files_Selina/Repos/02_workshops/intro-to-r/

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.

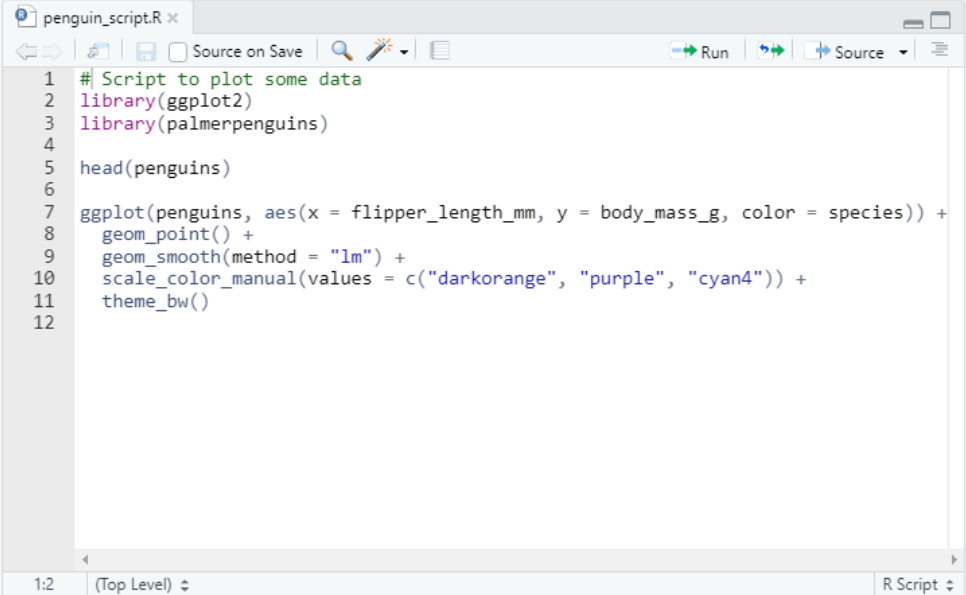
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Warning messages:
1: package 'devtools' was built under R version 4.0.5
2: package 'usethis' was built under R version 4.0.5
3: package 'reprex' was built under R version 4.0.5
> 4+4
[1] 8
> print("hello")
[1] "hello"
> |
```

Script pane

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

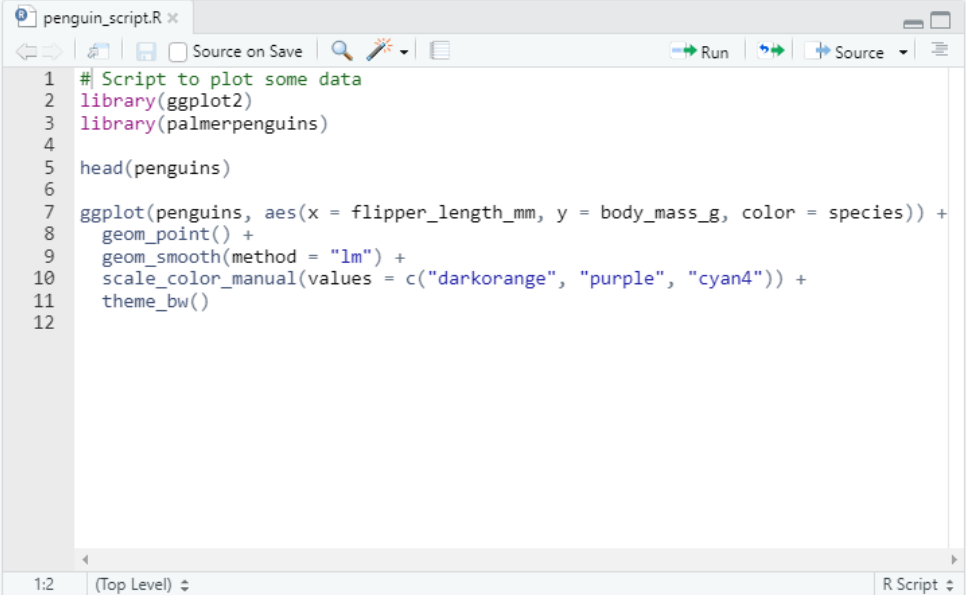


```
penguin_script.R x
Source on Save
Run
Source
1 # Script to plot some data
2 library(ggplot2)
3 library(palmerpenguins)
4
5 head(penguins)
6
7 ggplot(penguins, aes(x = flipper_length_mm, y = body_mass_g, color = species)) +
8   geom_point() +
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10  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



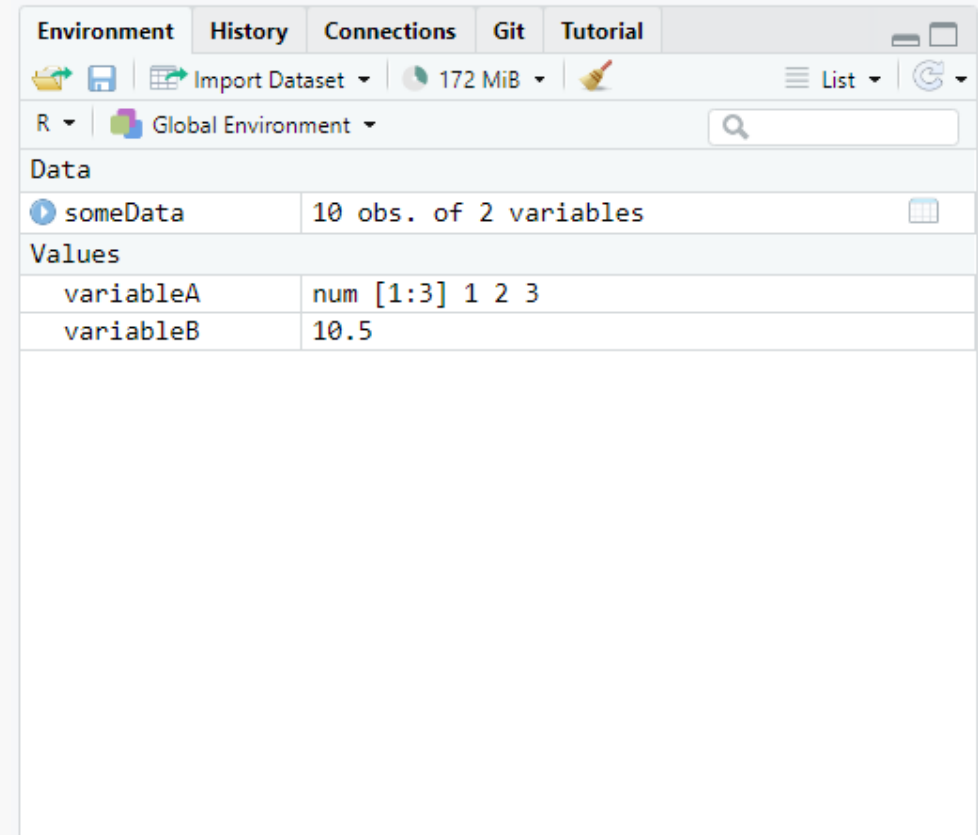
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12
```

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.

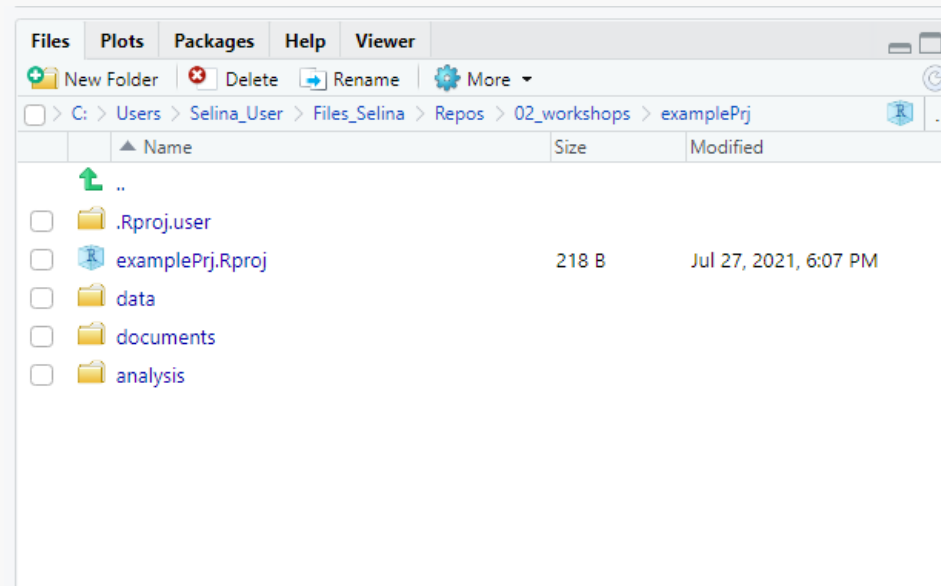
Environment pane

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



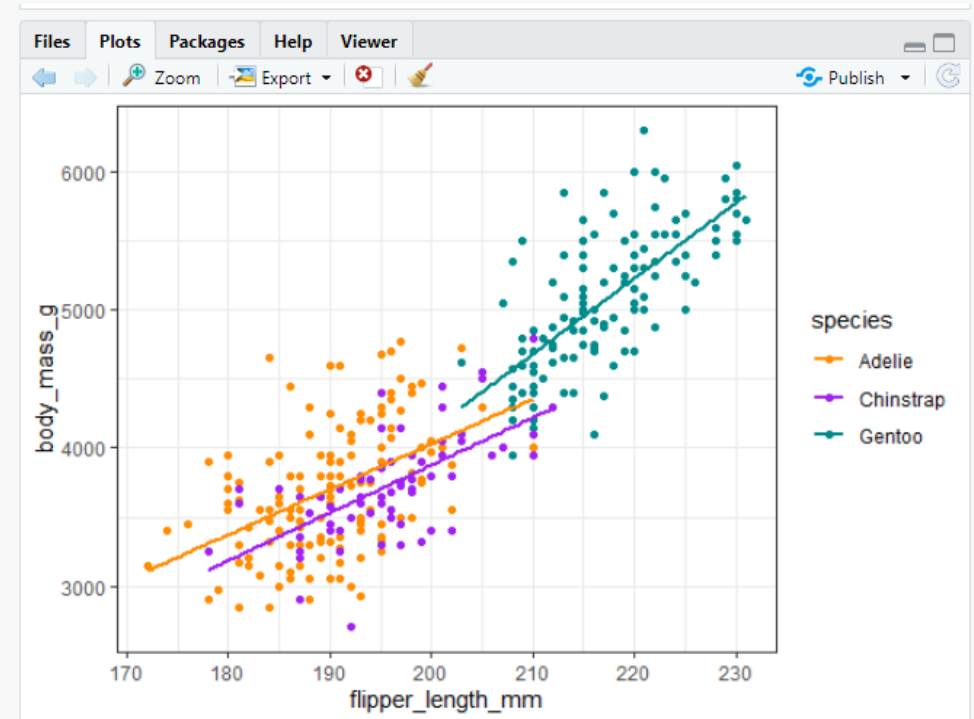
Files pane

- 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
|
|- documents
|   |
|   |- notes
|   |
|   |- reports
|
|- analysis
|   |
|   |- 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

```
Project
|
|- data
|
|- documents
|   |
|   |- notes
|   |
|   |- reports
|
|- analysis
|   |
|   |- 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

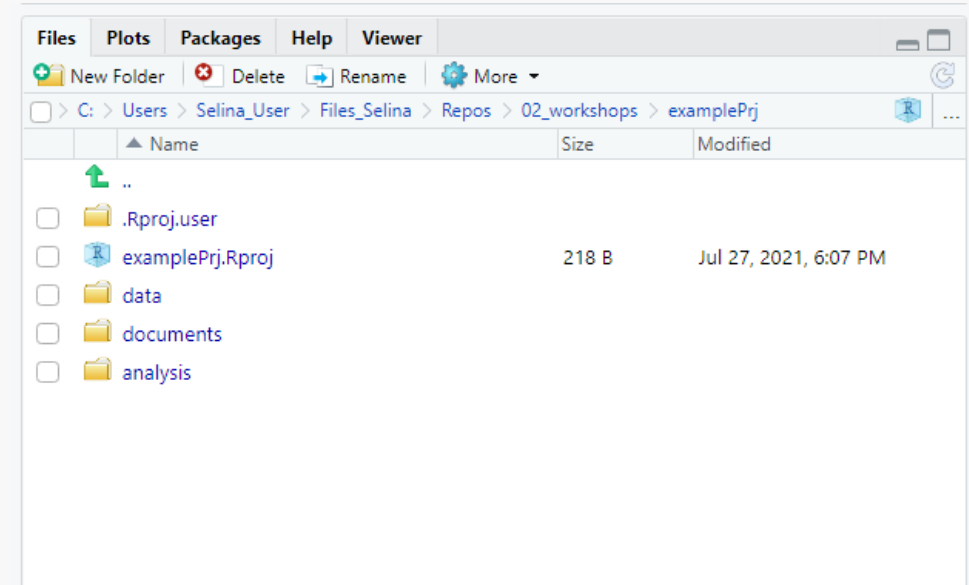
```
Project
|
|- data
|
|- documents
|   |
|   |- notes
|   |
|   |- reports
|
|- analysis
|   |
|   |- clean_data.R
|   |
|   |- statistics.R
|
|- *.Rproj
```

Example RStudio project structure

Create an RStudio project

Create a project from scratch:

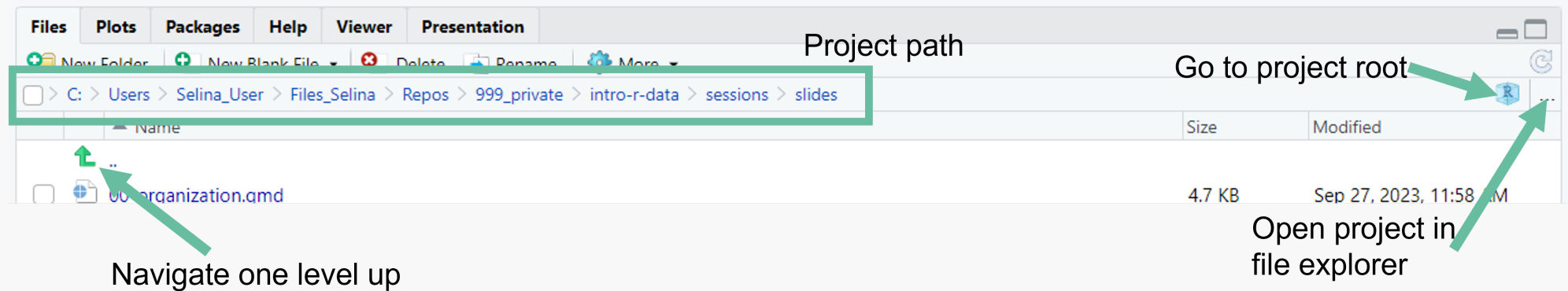
1. **File -> New Project -> New Directory -> New Project**
2. Enter a directory name (this will be the name of your project)
3. Choose the Directory where the project should be initiated
4. **Create Project**



Example RStudio project structure in the Files pane

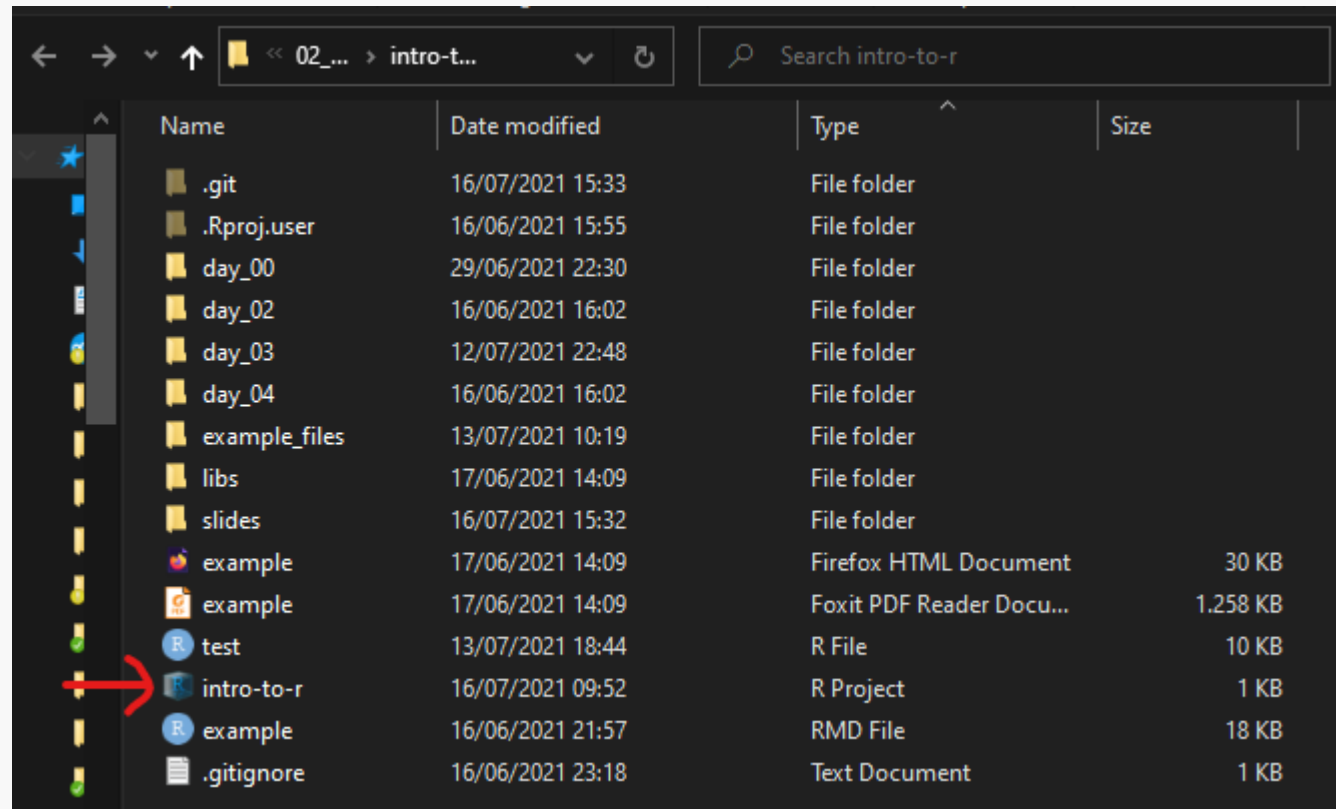
RStudio will now create and open the project for you.

Navigate an RStudio project



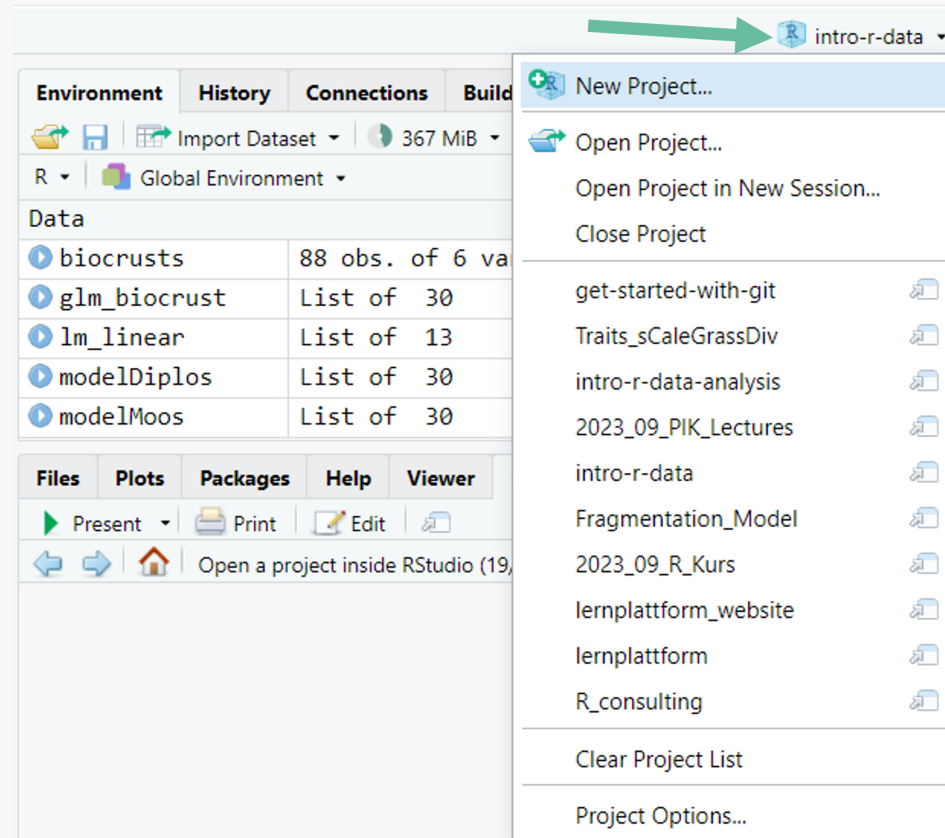
Open a project from outside RStudio

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 (25 min)

Set up your own RStudio project for this workshop

Find the task description [here](#)

