

Data Science for Operational Researchers Using R Online

1. Introduction to R and Posit Cloud

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https://github.com/JimDuggan/explore_or

R is an extremely versatile open source programming language
for statistics and data science.

— Norman Matloff ([Matloff, 2011](#))

Motivation

- R is an open source programming language, and a valuable computational tool that can be applied to the field of operations research.
- R provides excellent features such as data representation, data manipulation, and data analysis.
- These features can be integrated with operations research techniques (e.g., simulation, linear programming, and data science) to support an information workflow

Instructor – Jim Duggan



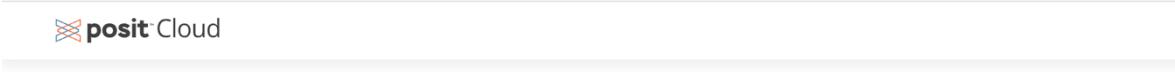
- Lectures in
 - Programming (R, Python),
 - Modelling & Simulation
- Research interests:
 - System Dynamics
 - Computational Epidemiology
 - Data Science

<https://github.com/JimDuggan>

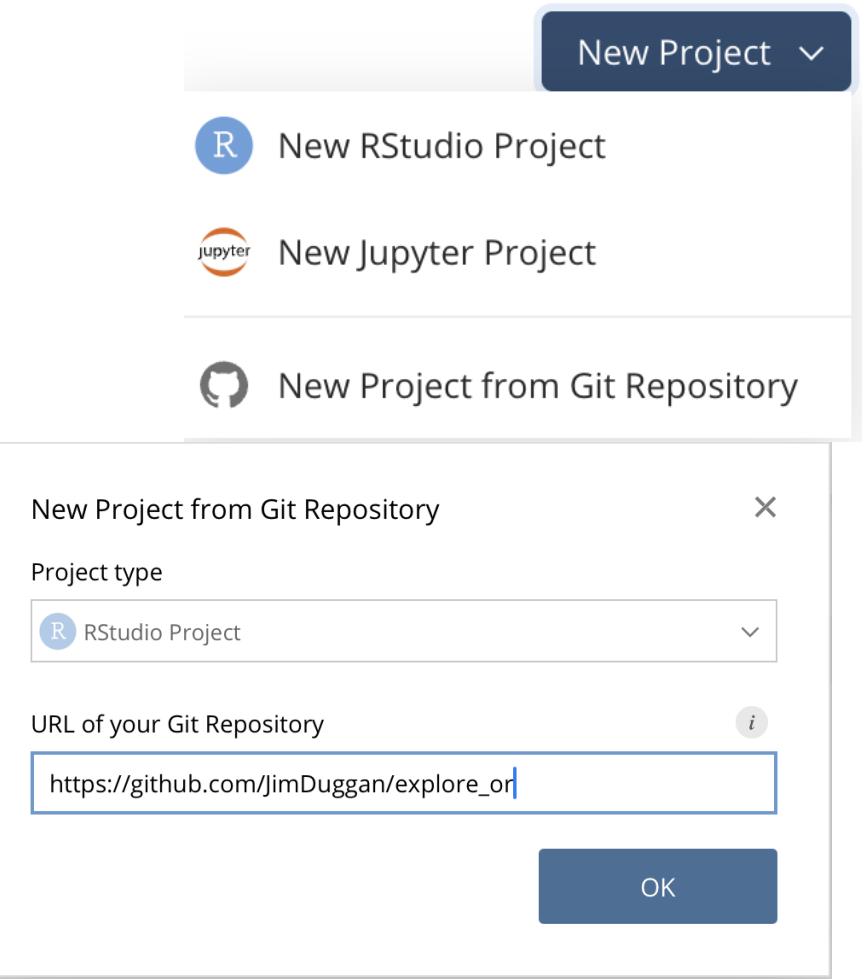


First Steps: Posit Cloud – Create Your Account

<https://posit.cloud/>



If you already have a shinyapps.io account, you can log in using your existing credentials.



IDE Available for running scripts

The screenshot shows the Posit Cloud IDE interface. On the left is a sidebar with navigation links: Spaces (Your Workspace, CT1100 Workspace, New Space), Learn (Guide, What's New, Recipes, Cheatsheets), Help (Current System Status, Posit Community), Info (Plans & Pricing, Terms and Conditions), and a logo for 'posit Cloud'. The main workspace has tabs for README.Rmd and Chapter1.R. The Chapter1.R tab contains the following R code:

```
1 # Chapter 1: Getting Started with R
2
3 # Assign 25 to x
4 x <- 25
5 # Display x
6 x
7 # Add 21 to x and store the result y
8 y <- x + 25
9 # Display y
10 y
11
12
13 # Call the function c()
14 # Store the result in the variable v
15 v <- c(10, 20, 30)
16 # Display v
17 v
18
19 sum(v)
20 mean(v)
21 sqrt(v)
22
```

The R console at the bottom shows the output of the script:

```
R > R 4.5.1 - /cloud/project/ ↵
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

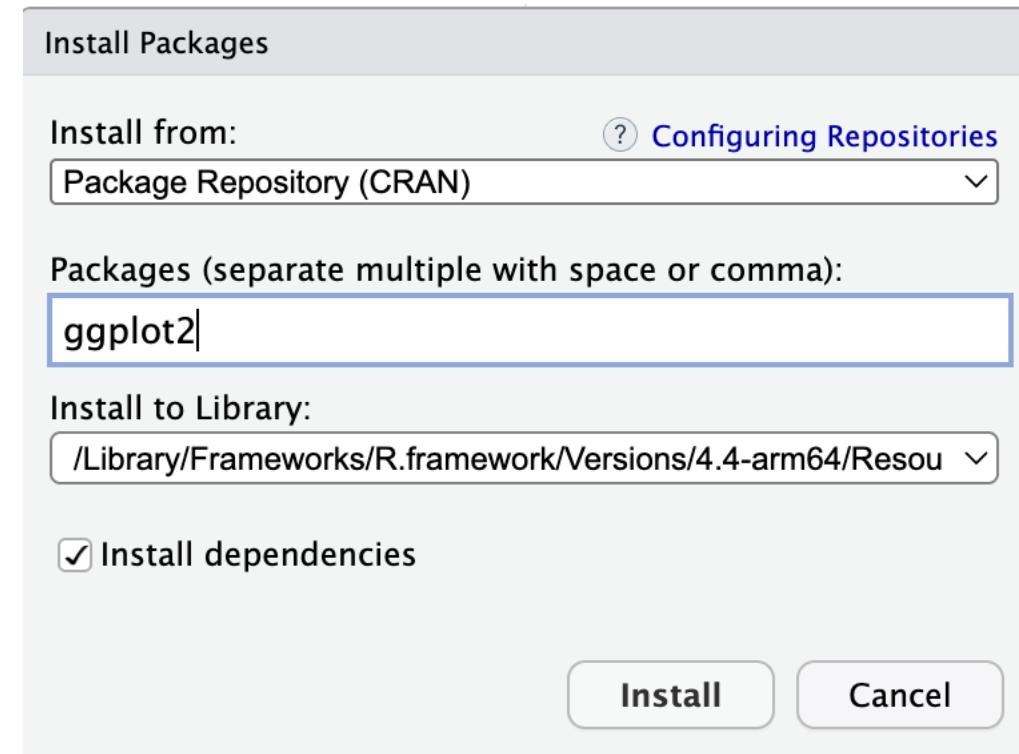
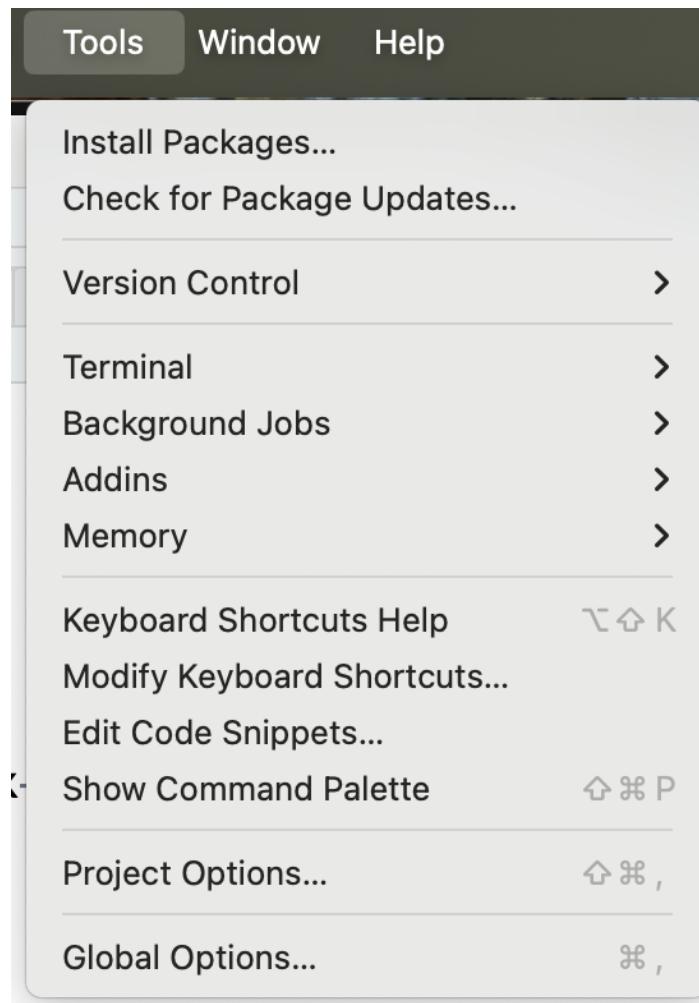
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> source("~/cloud/project/Part I/01 Getting Started/src/Chapter1.R")
Error in library(aimsir17) : there is no package called 'aimsir17'
Show Traceback
Rerun with Debug
```

The right side of the interface includes a RAM monitor, settings, user profile (Jim Duggan), and version R 4.5.1. It also features tabs for Environment, History, Connections, Git, and Tutorial. The Environment tab shows the Global Environment with variables mod, p1, v, x, X, y, and Y. The Files tab shows the project structure:

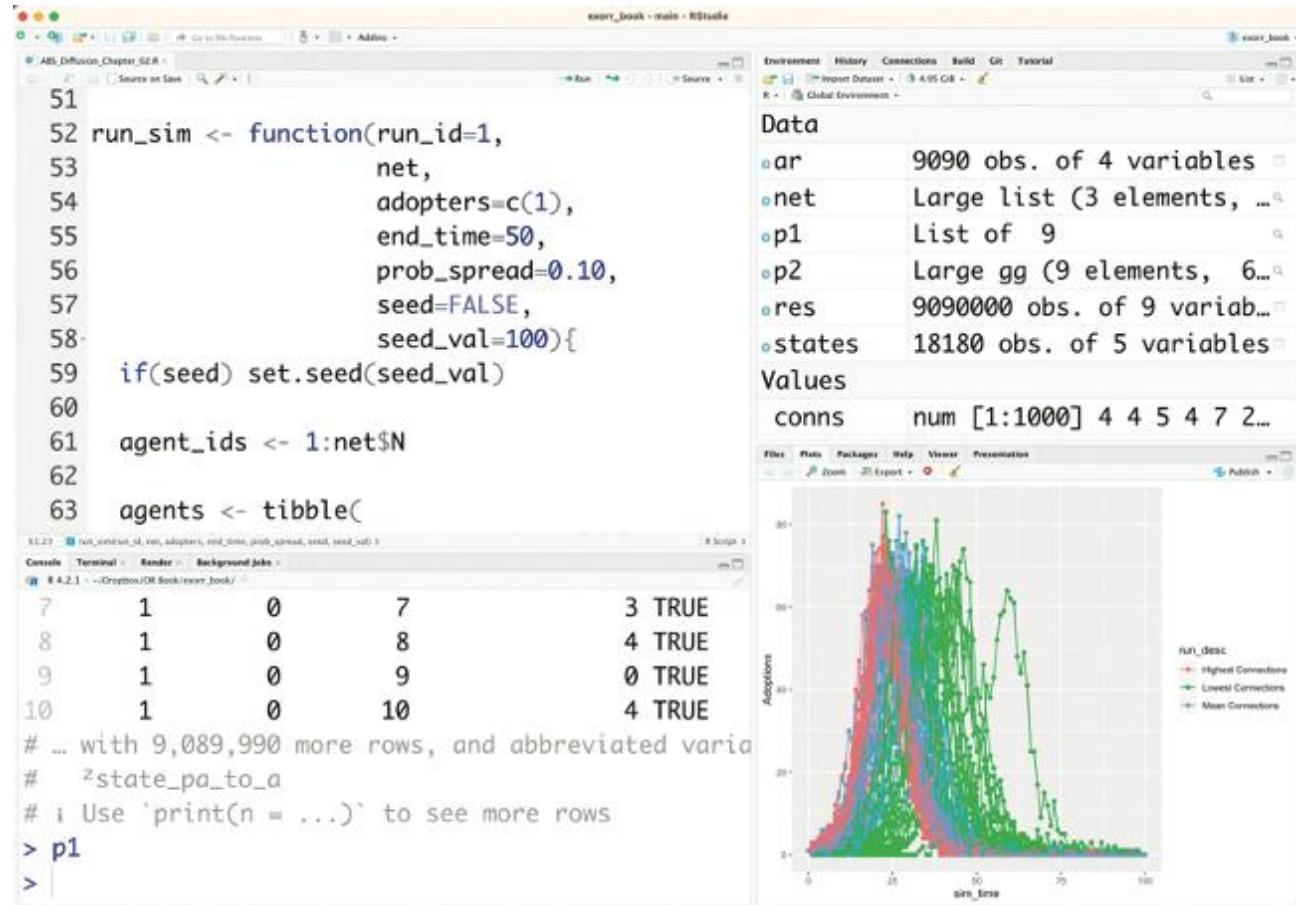
Name	Size	Modified
..		
.gitignore	40 B	Nov 3, 2025, 1:46 PM
.Rhistory	0 B	Nov 3, 2025, 1:46 PM
BookCover.png	44.2 KB	Nov 3, 2025, 1:46 PM
Courses		
explore_or.Rproj	253 B	Nov 3, 2025, 1:46 PM
LICENSE	1 KB	Nov 3, 2025, 1:46 PM
Part I		
Part II		
Part III		
README.html	618.7 KB	Nov 3, 2025, 1:46 PM
README.md	8.6 KB	Nov 3, 2025, 1:46 PM

Install Packages



Posit cloud IDE

- A **source code editor**, where R scripts can be created, edited, and saved.
- The **R console**, which allows you to create and explore variables, and observe the immediate impact of passing an instruction to R.
- **Files and plots**, where we can see the full file system for your written code (folders, sub-folders, files), and also view any generated plots.
- The **global environment** which shows what variables you have created, and therefore which ones can be explored and used for data processing.



Some tips...

1. The “**Source**” button, which appears on the editor panel, will execute the currently active R script from start to finish.
2. The **question mark** is used to provide help. For example `?sample` will inform you of how the function `sample()` works.
3. The **double question mark** provides access to further resources. For example, if you type `??ggplot2` at the console, you can browse vignettes relating to plotting with `ggplot2`.
4. The menu option “**Session>Clear Workspace**” will clear all variables from your global environment. This is useful before you run a script, just to ensure that no current variable could disrupt your data processing workflow.
5. The menu option “**Tools>Install Packages... .**” will allow you to access CRAN and install any of the available libraries.

R and Functions

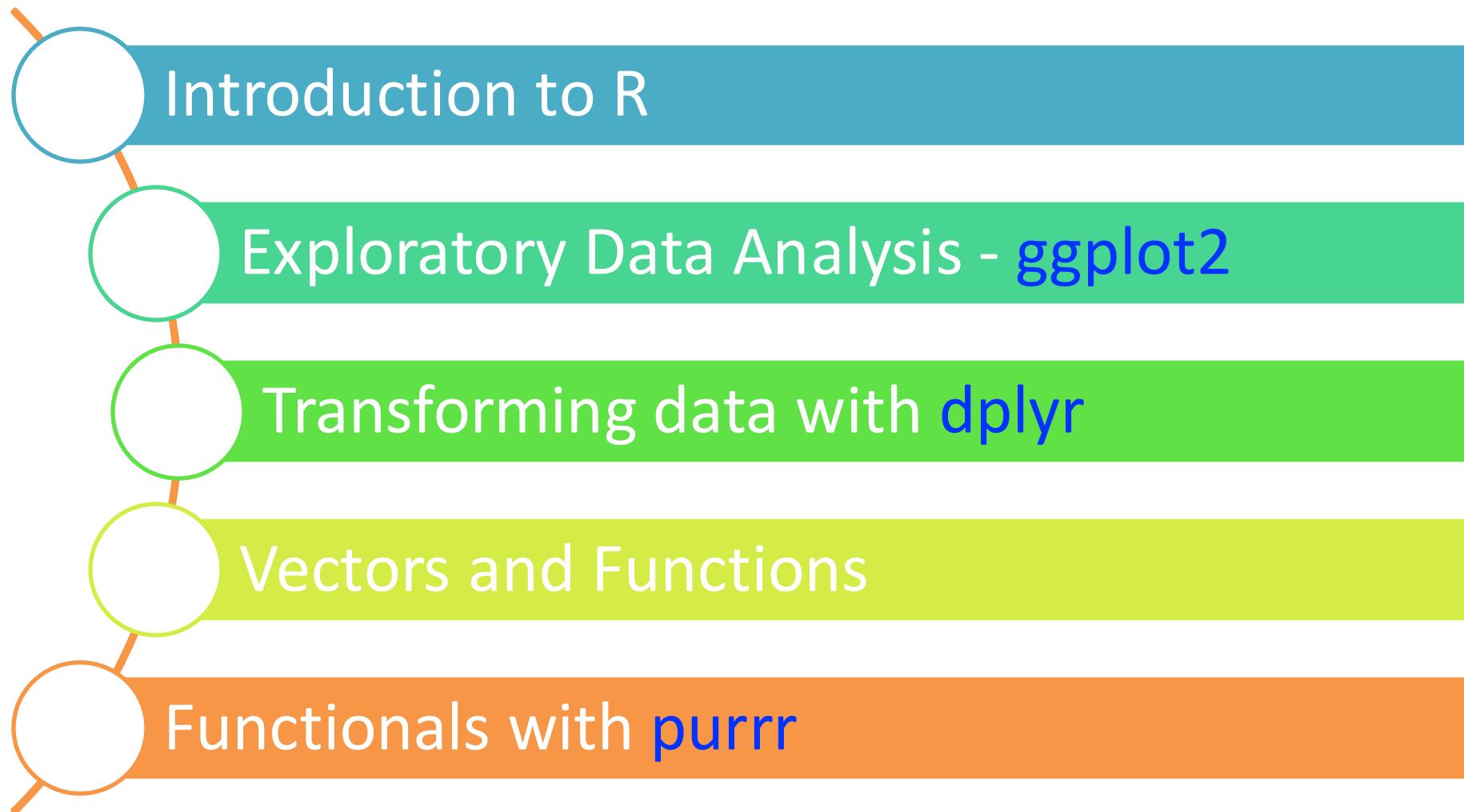
- Functions are central to programming in R.
- There are **two kinds of functions**:
(1) those available within base R, and other libraries; and (2) functions written by programmers for their own use.
- (Note the term base R is used to describe the core version of R).
- All functions take a set of arguments as input, and then return a result.

```
# Call the function c()  
# Store the result in the variable v  
v <- c(10, 20, 30)  
# Display v
```

```
v  
#> [1] 10 20 30
```

```
sum(v)  
#> [1] 60  
mean(v)  
#> [1] 20  
sqrt(v)  
#> [1] 3.162 4.472 5.477
```

Day 1 Overview



Day 2 Overview

