

# 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](https://github.com/JimDuggan/explore_or)

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

— Norman Matloff ([Matloff, 2011](#))

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# Motivation

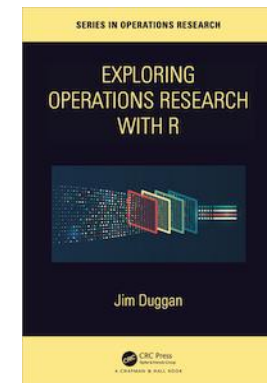
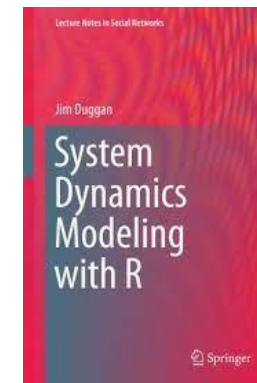
- R is an open source programming language, and a valuable computational tool that can be applied to the field of **operations research**.
- R provides excellent features such as data representation, data manipulation, and data analysis.
- These features can be integrated with operations research techniques (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/>






Friction free data science

Posit Cloud (formerly RStudio Cloud) lets you access Posit's powerful set of data science tools right in your browser – no installation or complex configuration required.

**GET STARTED** **ALREADY A USER? LOG IN**


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

**New Project** ▾

-  New RStudio Project
-  New Jupyter Project
-  New Project from Git Repository

**New Project from Git Repository** ✕

Project type

 RStudio Project ▾

URL of your Git Repository ⓘ

**OK**

# IDE Available for running scripts

The screenshot displays the Posit Cloud IDE interface. The top bar shows the Posit Cloud logo and the workspace name 'Your Workspace / explore\_or'. The left sidebar contains navigation links for Spaces, Your Workspace, CT1100 Workspace, New Space, Learn, Guide, What's New, Recipes, Cheatsheets, Help, Current System Status, Posit Community, Info, Plans & Pricing, and Terms and Conditions.

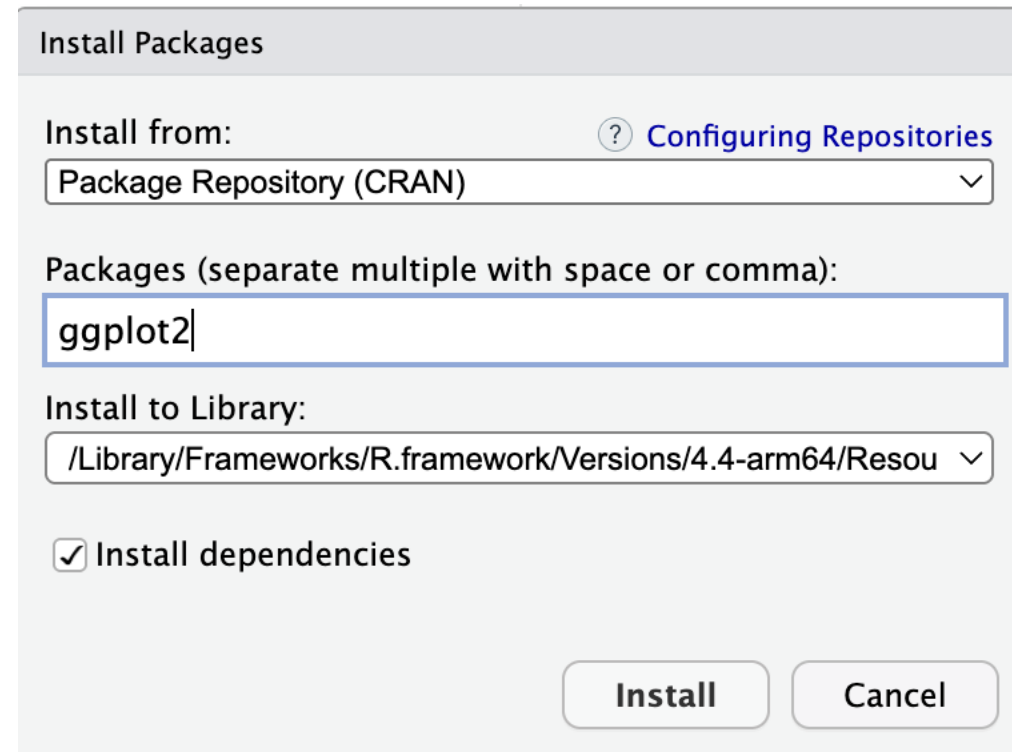
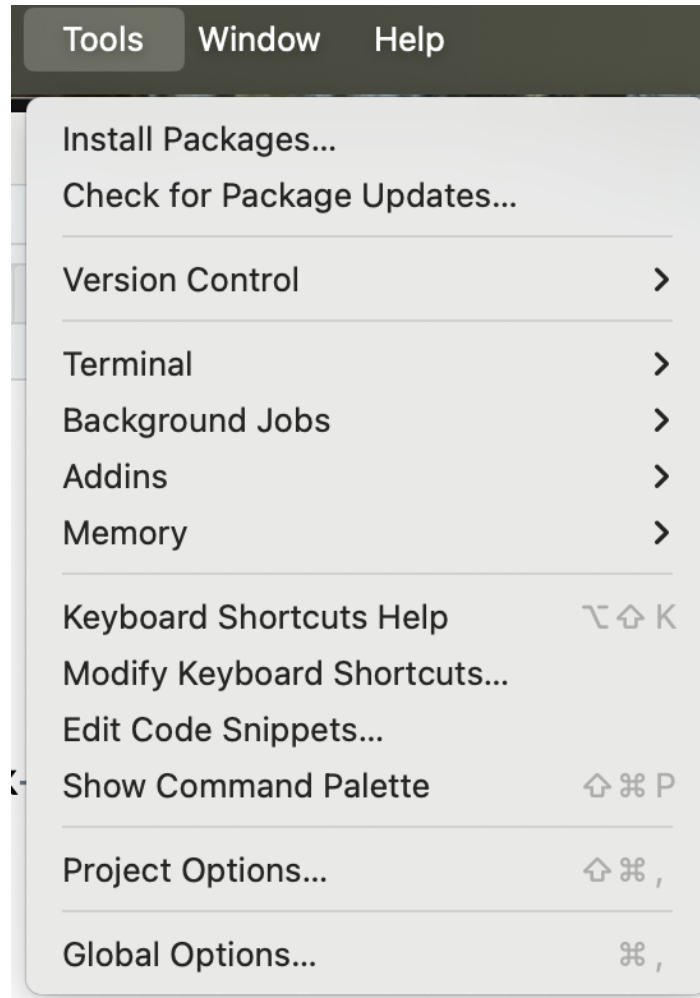
The main editor area shows an R script titled 'Chapter1.R' with the following code:

```
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 console at the bottom shows the output of the script, including an error message: 'Error in library(aimsir17) : there is no package called 'aimsir17''. Below the error, a message suggests trying the R Graphics Cookbook: <https://r-graphics.org>.

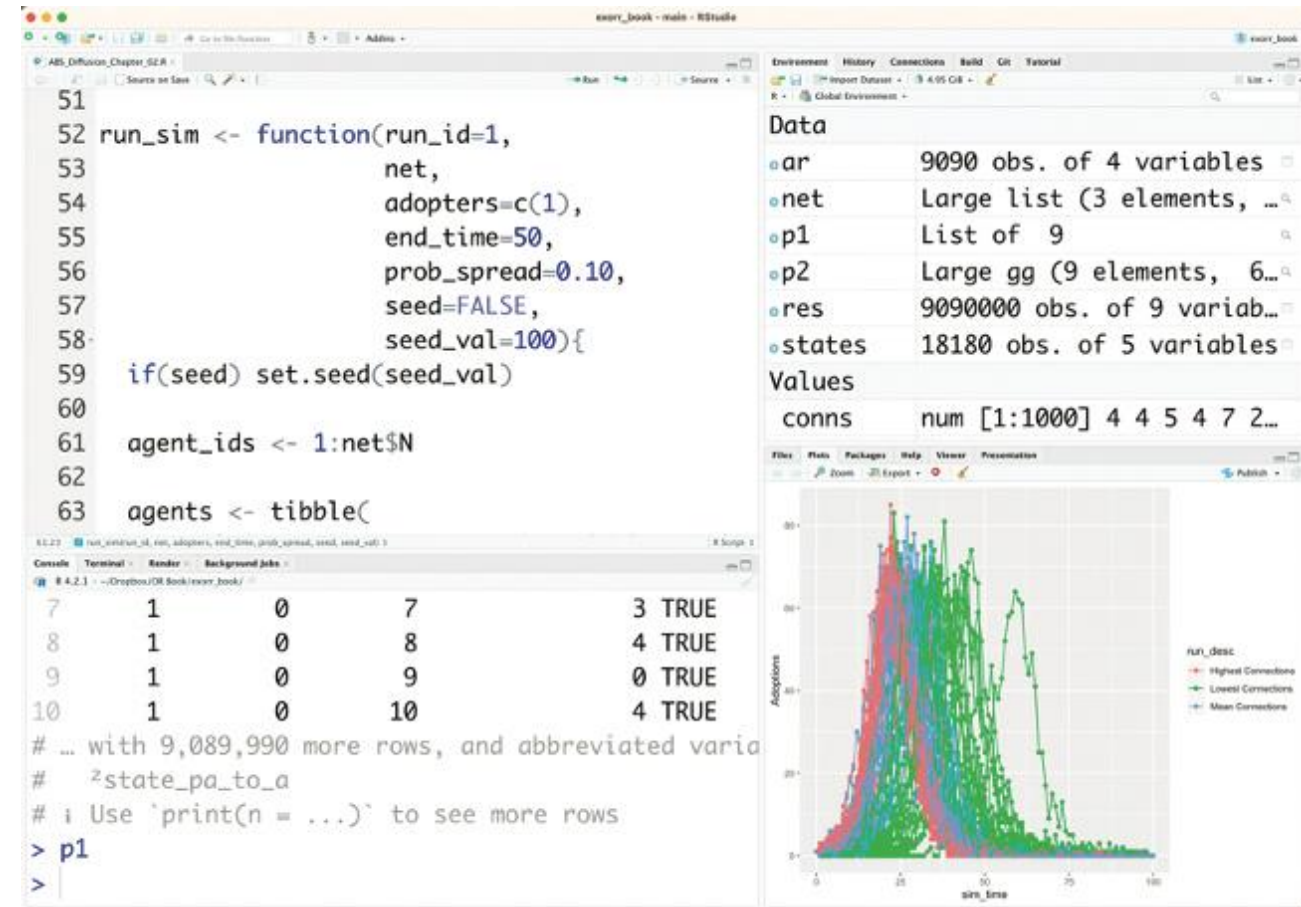
The right sidebar contains several panels: Environment, History, Connections, Git, Tutorial, Data, and Files. The Data panel shows a list of variables and their values. The Files panel shows a directory tree with files like .gitignore, .Rhistory, BookCover.png, Courses, explore\_or.Rproj, LICENSE, Part I, Part II, Part III, README.html, and README.md.

# 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

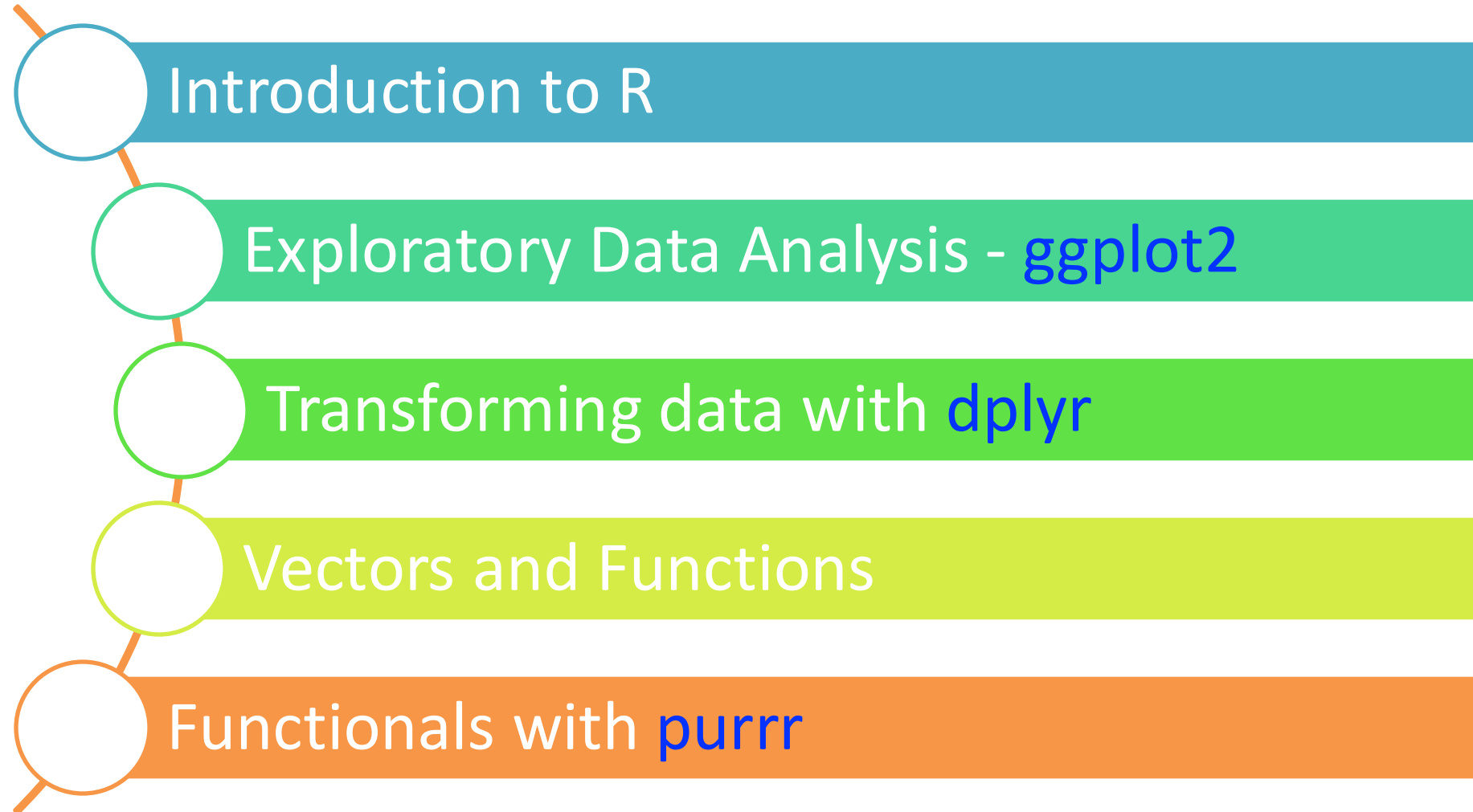
- Functions are central to programming in R.
- There are **two kinds of functions**: (1) those available within base R, and other libraries; and (2) functions written by programmers for their own use.
- (Note the term base R is used to describe the core version of R).
- All functions take a set of arguments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

