

Example 8-week R coding tutorial for undergraduate students

Note: Download this PDF document to access links since they will not render in GitHub
The course has been generalized to learn R coding skills with basic datasets

Week 1: Introduction to R and to the project

Reading material:

Chapter 1 - [Introduction to Data Science: Getting started with R and RStudio](#)

Chapter 2 - [Introduction to Data Science: R Basics](#)

Chapter 3 - [Introduction to Data Science: R Programming](#)

Coding challenges:

Complete the [exercises in Chapter 2 and 3](#) of Introduction to Data Science

Bonus coding challenges:

[Basics of programming in R](#) - swirl course

Primary literature (to discuss together):

Biodegradation and Bioinformatics: Arora PK, Bae H. (2014). Integration of bioinformatics to biodegradation. Biol Proced Online. 16:8.

<https://biologicalproceduresonline.biomedcentral.com/articles/10.1186/1480-9222-16-8>

Review articles (bonus reading):

Pathway Prediction System: Gao J, Ellis LB, Wackett LP. (2011) "The University of Minnesota Pathway Prediction System: multi-level prediction and visualization." Nucleic Acids Research 39 Suppl 2: W406-11.

https://academic.oup.com/nar/article/39/suppl_2/W406/2505766

Week 2: Data wrangling

Reading material:

Chapter 4 - [Introduction to Data Science: The tidyverse](#)

Chapter 5 - [Introduction to Data Science: Data import](#)

Bonus reading material:

[Data wrangling in R](#)

[Wrangling unruly data](#)

[Joining data tables](#)

Coding challenges:

Complete the [exercises in Chapter 4 and 5](#) of Introduction to Data Science

Data carpentry [dplyr exercises](#)
[Data wrangling exercises](#)

Bonus challenges:

[Getting and cleaning data](#) - swirl course

Week 3: Data visualization with ggplot2

Main package documentation:

[ggplot2](#) - for customizable graphs

Reading material:

Chapter 6 - [Introduction to Data Science: Introduction to data visualization](#)

Chapter 7 - [Introduction to Data Science: ggplot2](#)

[10 levels of ggplot, from basic to beautiful](#)

Coding exercises:

Exercises from [Chapter 7](#) of Introduction to Data Science

[Basic graphics with ggplot exercises](#)

[How to plot with ggplot and patchwork exercises](#)

Bonus material:

Browse the [ggplot2 gallery](#) for inspiration!

[A ggplot2 cheatsheet](#)

Now apply these skills to make graphs for your own research project!

Week 4: Interactive data visualization with plotly

Main package documentation:

[plotly](#) - interactive graphing library

Reading material:

Chapters 1-6 - [Plotly R](#) book

Coding challenges:

[Getting started with plotly exercises](#)

[Advanced plots and features](#)

Now apply these skills to make interactive visualizations in plotly for your own research project!

Week 5: Introduction to descriptive analytics and statistics

Main package documentation:

[R stats](#) package

Reading material:

Chapter 11 - [Introduction to Data Science: Robust summaries](#)

Chapter 12 - [Introduction to Data Science: Statistics with R](#)

[Descriptive statistics in R](#) (using your new ggplot2 skills!)

Coding challenges:

Exercises from [Chapters 11 and 12](#) of Introduction to Data Science

Bonus coding challenges:

swirl course - [Regression models](#)

swirl course - [Statistical inference](#)

Now apply these skills to do some descriptive analysis and statistics for your own dataset!

Week 6: Basics of R Shiny web applications I

Main package documentation:

[R Shiny](#) - for building interactive web apps

[flexdashboard](#) - use Markdown syntax to build interactive dashboards

Reading material:

[The basic parts of a Shiny app](#)

Bonus:

For inspiration, see the [R Shiny app gallery](#)

Coding challenges:

[Building a Shiny apps exercises](#)

[How to create a flexdashboard: exercises](#)

Now build a basic Shiny app for your own research purposes!

Week 7: Basics of R Shiny web applications II

Main package documentation:

[R Shiny](#) - for building interactive web apps

[flexdashboard](#) - use Markdown syntax to build interactive dashboards

Reading/lecture material:

[Reactivity 101](#)

[Reactivity in Shiny](#)

Coding challenges:

[Shiny app layouts](#) exercises

[Interactive data tables](#) exercises

Make improvements to your Shiny app!

Week 8: Geospatial mapping (optional, if relevant for research project)

Main package documentation:

[ggmap](#) - spatial visualization

[leaflet](#) - interactive maps

Coding challenges:

[Leaflet mapping exercise 1](#)

[Leaflet mapping exercises 2](#)

Now apply these skills to make a map using data for your research project!

Or choose to learn an additional topic in R that is more relevant to your research.