Example 8-week R coding tutorial for undergraduate students

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. (0214). 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.