R bootcamp - August 2019: Syllabus/schedule

August 8, 2019

Unless otherwise noted, modules are about 75 minutes long: 45 minutes for presentation, 20 minutes for breakout and 10 minutes for discussion of solutions.

- Day 1 morning (8:30-12:15) (learning R)

    - Module 0: Introduction, what is R, starting R, why R? why not R? (Chris) (15 minutes)

    - Module 1: Basics of R, with Rstudio (Chris)

        * R as a calculator
        * helpful shortcuts: tab-complete, up arrow, Ctrl-{up arrow}
        * vectors and indexing and subset assignment
        * some basic functions; help()
        * vectorized calculations, comparisons
        * basic R objects: vectors, matrices, dataframes, lists
        * basic graphics
        * breakout problems

    - Break (15 minutes)

    - Module 2: Managing R and your analyses (Chris) (45 minutes)

        * managing R objects, the R workspace
        * using packages (installing, loading, namespaces)
        * the working directory and basic file reading/writing
        * Git, Github and version control
        * getting R help online
        * breakout problems

- Module 3: Working with data (Chris) (45 minutes)

    * dataframes/matrices

    * attributes, missing values and factors

    * subsetting

    * strings

- Lunch (on your own) (12:00-1:30)

- Day 1 afternoon (1:30-5:00) (data processing and manipulation)

    - Module 3: Working with data, continued (Chris) (40 minutes)

        * more on reading data

        * breakout problems

TRACK 2 splits from TRACK 1

    - Track 2: Session 1 (Evan)

        * Revisit variables, data types, data structures

    - Break (15 minutes)

    - Track 2: Session 2 (Evan)

        * Revisit data frames, subsetting, and data summarization

- Day 2 morning (9-12:45) (programming and data analysis)

TRACK 2 rejoins TRACK 1

    - Module 6: Data manipulation using the tidyverse (Dana)

        * stratified analyses: groupwise operations and split-apply-combine using dplyr

        * reshaping and tidying data

        * breakout problems/homework

    - Break (15 minutes)

    - Module 7: Data analysis (Nima)

        * regression, GLMs

        * smoothing

        * optimization

        * simulation, sample()

* dates and times

  * breakout problems

  - Module 8: Graphics (Dana)

    * exporting graphics (vector/raster formats)

    * lattice graphics

    * ggplot2

    * breakout problems

- Lunch (on your own) (12:45-2:00)

- Day 2 afternoon (2:00-4:30) (more advanced topics)

  TRACK 2 splits from TRACK 1

  - Track 2: Session 3 (Evan)

    * Revisit base graphics and ggplot, data analysis

  - Break (15 minutes)

  - Track 2: Session 4 (Evan)

    * Programming: for loops, if-then-else conditionals, functions

    * Automation example: Monte Carlo simulation and the birthday problem

  TRACK 2 rejoins TRACK 1

  - Module 11: Wrapping up (Chris) (15 minutes)

    * R inconsistencies and different ways to do things

    * Where to learn more (campus and non-campus resources)