R bootcamp - August 2014: Syllabus/schedule

July 30, 2014

Unless otherwise noted, modules are about 75 minutes long, including time for work on breakout problems.

- Day 1 morning (8:30-12:15) (learning R)
  - Module 0: Introduction, what is R, starting R, why R? why not R? (Chris P.) (10 minutes)
  - Module 1: Basics of R, with Rstudio (Chris P.)
    * 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 (20 minutes)
  - Module 2: Managing R and your analyses (Chris P.) (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

  - Module 3: Working with data (Gabriela)
    * dataframes/matrices
    * attributes, missing values and factors
    * subsetting
    * strings
    * more on reading data
    * breakout problems

- Lunch (on your own) (12:15-1:45)
- Day 1 afternoon (1:45-5:00) (programming and real-world work)
  - Module 4: Calculations (Chris P./Jarrod)
    * vectorized calculations and efficiency
    * apply, lapply
    * tabulation, stratified analyses, aggregation, merging data
    * breakout problems
  - Break (20 minutes)
  - Module 5: Doing useful stuff (Chris K.)
    * stratified analyses: groupwise operations (see plyr: subset, mutate, summarise, arrange); split-apply-combine
    * reshape
    * regression, GLMs
    * breakout problems/homework

- Day 2 morning (9-12:30) (more real-world work)
  - Module 6: Programming in R (Jarrod)
    * go over homework
    * loops, if-else
    * writing your own functions, function arguments, functions as objects
    * basic scoping and environments
    * breakout problems
  - Module 7: Some core tools (Chris P.) (45 minutes)

        * smoothing
        * optimization
        * simulation, sample()
        * dates and times
        * breakout
    - Break (20 minutes)
    - Module 8: Graphics (Chris K.)
        * exporting graphics (vector/raster formats)
        * lattice graphics
        * ggplot2
        * breakout problems

- Lunch (on your own) (12:30-2:00)
- Day 2 afternoon (2:00-4:30) (more advanced topics)
    - Module 9: Workflows, coding practices, and project management (Chris P.) (60 minutes)
        * debugging, timing, memory use
        * scripting, source(), batch jobs
        * good coding practices
        * reproducible research
    - Break (fill out feedback forms) (20 minutes)
    - Module 10: Advanced topic morsels (Chris P.) (60 minutes)
        * OOP (S3, S4, ReferenceClasses)
        * computing on the language (using R to write and evaluate R code)
        * errors and try-catch
        * encodings
        * working with databases
        * parallel processing: foreach, parApply, RNG issues
        * breakout problems
    - Module 11: Wrapping up (Chris P.) (15 minutes)
        * R inconsistencies and different ways to do things
        * Where to learn more (campus and non-campus resources)