

R bootcamp - August 2014: Syllabus/schedule

July 25, 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
 - * the working directory
 - * using packages (installing, loading, namespaces)
 - * Github and version control
 - * basic file reading/writing

- * foreign package
 - * getting R help online
- Module 3: Working with data (Chris P.)
 - * dataframes/matrices
 - * attributes, missing values and factors
 - * subsetting
 - * strings
 - * reading/writing 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.)
 - * 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 (Chris P.)
 - * 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 (Jarrod or Chris P.) (60 minutes)
 - * scripting, source(); separating data, code, figures
 - * R in batch mode and command line mode
 - * timing, memory use, debugging
 - * reproducible research with knitr, Rmd
 - * breakout problems
 - Break + 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)