Introduction

Max Turgeon

STAT 3150–Statistical Computing

Course Outline

Lecture schedule

We meet twice a week on WebEx:

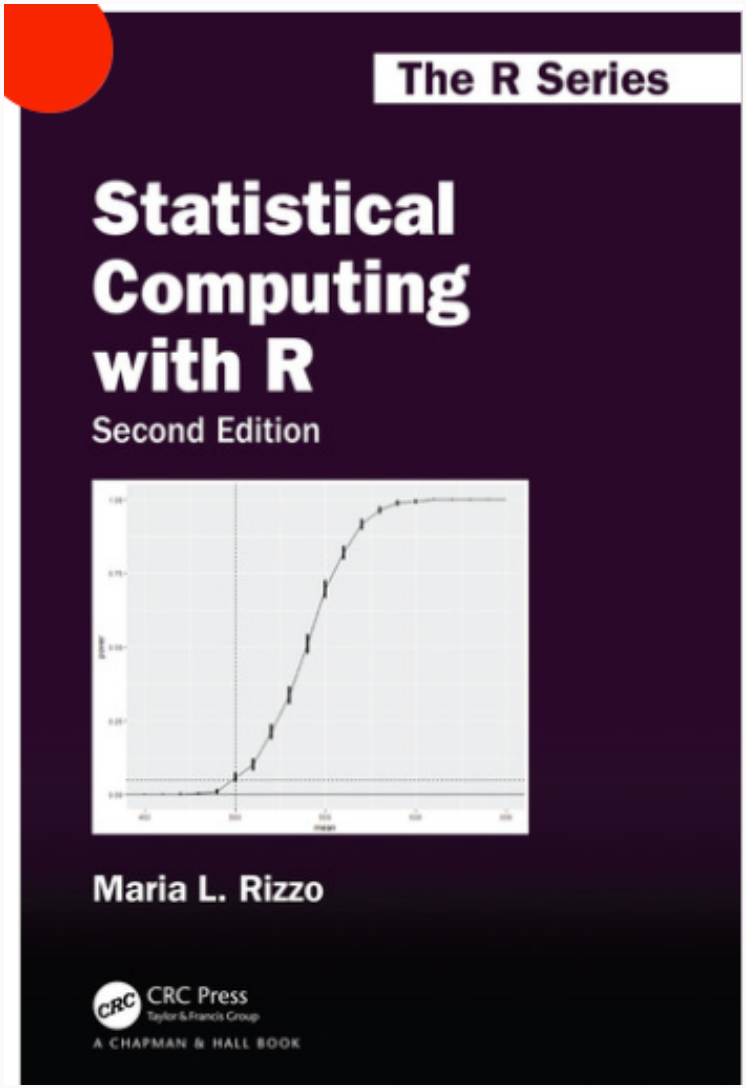
- **Tuesday** 10am to 11:20am
  - Traditional Lecture
- **Thursday** 10am to 11:20am
  - Discussion & Question Period

Both weekly meetings will be **recorded** and available on UM Learn

Personal Work

- We won't have time to cover all the material with only one lecture per week.
    - You're responsible for covering the *other half* of the material on your own.
    - Mainly through **interactive tutorials** (more on this later), but keep an eye on UM Learn for quizzes, extra course notes, examples, exercises, etc.

Textbook


The R Series
Statistical Computing with R
Second Edition
Maria L. Rizzo
CRC Press
Taylor & Francis Group
A CHAPMAN & HALL BOOK

Assessments

- **Goal**: More, lower-stake assessments (instead of a couple high-stake exams).
    - 6 assignments (10% each)
    - 2 midterms and 1 final (15% each)
    - Class participation (5%)

Assignments

- Assignments will be **entirely** done with Rmarkdown.
    - So are the slides!
- Your “zero-th” assignment is due next Monday.
    - It isn’t worth any point, it’s just to make sure that your computer can create PDF files from Rmarkdown files.
    - Follow the instructions on UM Learn

By the way, should I already know R?

- Short answer: you should have learned R in STAT 2150.
- Slightly longer answer: forgetting is human, we'll relearn together as needed.
    - Concepts will be introduced as needed, and through examples.
    - See UM Learn for extra reading material on R.
- **Important**: Let me know if some of the code isn't clear!
    - In particular, Thursdays can be used to go into more detail.

Class participation

- Two equally weighted components:
  - Summary quizzes on UM Learn (one per module + academic integrity)
  - In-class participation/Discussion groups

What is statistical computing? i

- At a basic level, statistical computing is *using computational tools* to solve *statistical problems*.
    - It is an integral part of modern statistics.
- **But what kind of problems?**

- Let's say you derived the asymptotic distribution of an estimator. *How well does it perform in finite sample sizes?*
    - Generate multiple datasets under the model and compute your estimator to get an estimate of the distribution.

What is statistical computing? ii

- You're doing Bayesian modeling. *How do I compute the posterior distribution of my parameters?*
  - Use importance sampling and/or Monte Carlo integration.
  - **STAT 4150**: Construct a Markov chain whose stationary distribution is your posterior distribution.
- I don't think the assumptions are met. *How do I get valid confidence intervals and hypothesis tests?*
  - Use bootstrap and/or permutation tests.
- My estimator has no closed-form solution. *How do I compute it?*
  - Use optimisation methods.