STAT 6730 — Autumn 2016

Introduction to Computational Statistics

meetings:	MW 1:50–2:45 in Enarson 211 (M, map) and EA 295 (W, map)
instructor:	Vincent Q. Vu (vqv at stat osu edu)
office hours:	M 10:30–12:30 in Cockins Hall 325
web:	www.vince.vu/courses/6730

1 Overview

Computational statistics is an area within statistics that encompasses computational and graphical approaches to solving statistical problems. Students will learn how to manipulate data, design and perform simple Monte Carlo experiments, and be able to use resampling methods such as the Bootstrap. They will be introduced to technologies that are useful for statistical computing. Through creating customized graphical and numerical summaries students will be able to discuss the results obtained from their analyses. The topics of the course include:

1. Introduction to R
2. Dynamic and reproducible reports with R Markdown
3. Data manipulation in R
4. Visualization of data
5. Smoothing and density estimation
6. Generating random variables
7. Monte Carlo simulation
8. The Bootstrap
9. Permutation methods
10. Cross-validation

2 Course materials

There is no required book for the course. The primary resource for reading will be slides and additional references assigned for reading by the instructor. The following software is required:

- R www.r-project.org
- RStudio www.rstudio.com

Students are expected to be able to access working installations of **current versions** of the required software on either their personal computer or a campus computer. The following are recommended reading/viewing:

- An Introduction to R by the R Core Team
- Intro to R video series by Google Developers
- R Markdown by RStudio
- R style guide by Hadley Wickham

3 Prerequisites

This course is intended to be taking during the second year of the MAS program. It is expected that students will have exposure at a mathematical level to foundational concepts in probability and statistics including random variables, estimation, hypothesis testing, and linear regression. The formal prerequisites for this course are: Stat 6301 and 6302 or equivalent; Stat 6410 and 6450, or Stat 6910 and 6950, or permission of the instruction. Previous programming experience is not required, but familiarity with computer systems is expected.

4 Coursework & Grading

There will be homework, labs, two in-class exams, and a final exam:

- 15% Homework (due at the beginning of class on due date)
- 15% Labs (Wednesday meetings)
- 20% Exam 1 (October 5)
- 20% Exam 2 (November 9)
- 30% Final project

Inform the instructor of any scheduling conflicts at least two weeks in advance.

4.1 Homework and labs

Homeworks will generally be assigned on a biweekly basis. Students are required to use `R Markdown` for their homeworks. They should be written in a style that smoothly integrates prose, code, tables and graphics. **It should be human-readable**. Submit both the **source code** in Carmen Dropbox and **hard copy** of the generated document in class. Late homework will not be accepted. Homework will be graded on a 3 point scale: 1 point for good-faith effort, 1 point for technically-correct working solutions, 1 point for well-formated and easily-readable code.

Labs will consist of in-class exercises. Like homework, students are required to use `R Markdown` and the lab report should be written in a style that smoothly integrates prose, code, tables and graphics. **It should be human-readable**. Submit the **source code** in Carmen Dropbox at the end of the period. Labs will be graded on the same 3 point scale as in homework.

Homework and lab assignments in the wrong format (e.g. `.pdf`, plain text, `.doc`) will receive 0 points automatically, no exceptions.

4.2 Exams

Both exams are open book/internet access, but absolutely no communicating with other humans. Each exam is cumulative.

4.3 Final project

Students will be assigned to small groups to work on a final data analysis project. The instructor will provide a list of topics. Each group will cooperate on the data analysis, report writing, and making a presentation on the project in class.

4.4 Fine Print

4.4.1 Academic Misconduct

Students are encouraged to work with others on the homework, however final solutions must be written on your own. Academic misconduct **will not be tolerated** and will be dealt with procedurally in accordance with university policy.

4.4.2 Accommodations for Students with Disabilities

If you have a documented disability, please register with the Office for Disability Services (ODS). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they can be implemented in a timely fashion. If you have any questions about this process please contact ODS at (614) 292-3307.

4.4.3 Disclaimer

This syllabus is a approximate guide to the course content and dates, however the instructor reserves the right to deviate from the syllabus. An updated version of the syllabus will be maintained on the course webpage.