Computing in Statistics, STAT:5400
Fall 2018

1 General Information

Instructor:	Kate Cowles, 374 SH, 335-0727 kate-cowles@uiowa.edu
Office hours:	T 2:30 - 3:20 p.m. W 10:30 - 11:20 p.m. Th 1:30 - 2:20 p.m. Please feel free to make appointments to see me outside of office hours, and to send me questions by e-mail.
Department:	Statistics and Actuarial Science, 241 SH
DEO:	Joe Lang, 241 SH, 335-0712 joseph-lang@uiowa.edu
Lectures:	M, W, F 30 SH 9:30 - 10:20
Lab:	substituting for some lectures 346 SH or 41 SH
Web page:	http://www.stat.uiowa.edu/∼kcowles/STAT5400_2018 Handouts, homework assignments, datasets, etc. will be posted on the public web page for you to download. Homework submission and posting of solutions will use the ICON web page.
Required readings:	See "Web Resources" section of course web page
Mathematical Sciences Library, In main library	Givens and Hoeting, *Computational Statistics*

2 Course goals and objectives

Through hands-on experience with real problems, students will learn computing skills essential in applied statistics and in research in methodological and theoretical statistics. Topics include the Linux operating system; R and SAS (statistical computing environments); LaTeX (mathematical document preparation language); reproducible research; database management; simulation methods (Monte Carlo studies, bootstrap, MCMC); statistical computing algorithms (Newton's method); interfacing to cyberinfrastructure resources.

3 Evaluation of students

3.1 Homework

In general, homework will be assigned each Fri. and will be due in class the following Fri. Exceptions to this schedule will be announced in class.

Homework should be submitted electronically through the ICON submission tools for this course (icon.uiowa.edu). Show your work when solving written homework problems. Complete code and output must be submitted for computer problems.

You are encouraged to study with others. However, if you do work with others on homework assignments, please: a) write up your own assignment and make sure you completely understand all solutions that you submit, and b) write the names of the others in your study group on your assignment.

Late homework is accepted only as required by university policy, i.e. due to "illness, mandatory religious obligations, or other unavoidable circumstances or University activities."

3.2 Exams

There will be two 2-hour hands-on computing midterm exams and one comprehensive 2-hour hands-on final exam. The midterms will be scheduled in the computer lab outside of the regular class period and will replace the lab session for that week. The final will be given in the computer lab during the scheduled final-exam period. The computing exams are open book and open notes.

Midterm 1	week of 9/24, 41 SH (replaces one lab)
Midterm 2	week of 10/29, 41 SH (replaces one lab)
Final exam	TBA

Missed exams may be made up only with documentation of reasons required by university policy (see "Late Homework" above).

3.3 Projects

Students will work in groups of two or three to carry out projects involving application of the statistical computing methods covered in the course to problems of their own choosing. I will be happy to work with you at each stage of your project. Examples of possible types of projects are:

- Design and carry out a simulation study to compare the properties of two or more statistical procedures
- Learn to use two or more R packages that we have not studied as a class. Apply them to perform useful analyses of a real dataset.
- Choose a research question and find data to address it. Use SAS to "clean" and prepare the data and to carry out an analysis.

Projects will be carried out in three phases. Please meet with me at least once while you are working on each phase.

- Project proposal (due 10/29) This is a detailed description of what you plan to do, including question(s) to be addressed, software to be used, methods to be applied.
- Project interim report (due 11/12) This informal report will indicate that your project is "on track." All computing should be completed at this point. The interim report will include results obtained thus far and a brief summary (hand-written is O.K.) of what they mean and what remains to be done. In addition, each member of the project team will list which tasks they have performed for the group.
- Project presentation (must be posted or submitted by 12/03)

  The final form of the project must be prepared in LaTeX . This can be either

  - a paper to be posted on the course web page (send PDF file to me for posting)
  - slides to accompany an oral presentation to the class (use computer and projector in the classroom)

  Presentations will be given in class during the week of 12/03.

3.4 Grading

The course components will be weighted as follows:

Homework	10%
Midterms	35% (17.5% each)
Project	20%
Final	35%

Grading will be on a curve, with +/− grades used. A grade of $A+$ represents exceptional work and rarely is awarded.

4 College of Liberal Arts and Sciences: Policies and Resources

The CLAS policies and procedures are stated at the following link:

`http://clas.uiowa.edu/faculty/teaching-policies-resources-syllabus-insert`

5 Syllabus

This approximate schedule will be updated as needed during the semester.

08/20 - 08/24	Intro to Linux
	Lab in 41 SH 08/24
08/27 - 08/31	Intro to LaTeX
	Lab in 41 SH 08/31
09/03 - 09/07	Intro to R
	(no class on 09/03; holiday)
	Lab in 41 SH 09/07
09/10-09/14	R packages
	Sweave and reproducible research
09/17-09/21	Newton's Method
	The bootstrap
09/24 - 09/28	The jackknife
	Midterm 1 (replaces a lab)
10/01 - 10/05	Simulation studies
10/08 - 10/12	Database concepts and Open Office Base
	Lab in 41 SH 10/12
10/15 - 10/19	Reading data into SAS
10/22 - 10/26	File handling in SAS; arrays
10/29 - 11/02	Formats; reports; proc tabulate, etc.
	project proposals due 10/29
	Midterm 2
11/05 - 11/09	Data checking and validation
11/12 - 11/16	SAS macro language
	project interm reports due 11/12
11/19 - 11/23	Thanksgiving break (no class)
11/26 - 11/30	Parallel and grid computing; review
	Lab in 41 SH 11/30
12/03 - 12/07	Project presentations
	Projects due 12/03
	Lab in 41 SH 12/07
Exam week	Final exam, TBA