

Term Information

Effective Term Spring 2021

General Information

Course Bulletin Listing/Subject Area Statistics
Fiscal Unit/Academic Org Statistics - D0694
College/Academic Group Arts and Sciences
Level/Career Undergraduate
Course Number/Catalog 4302
Course Title Computational Statistics
Transcript Abbreviation Comp Stat
Course Description Topics in computational statistics using the R software, including design and execution of classical and modern Monte Carlo experiments, and statistical inference based on resampling methods, such as bootstrap, jackknife, and permutation.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites Prereq: 4301; or permission of the instructor.
Exclusions
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 27.0501
Subsidy Level Baccalaureate Course
Intended Rank Junior, Senior

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors

Course Details

Course goals or learning objectives/outcomes

- Import data sets of various formats into R.
- Design and perform simple Monte Carlo experiments.
- Use resampling methods to carry out statistical inference.
- Produce numerical and graphical summaries of data and their analysis.
- Communicate findings through written reports and online tools.

Content Topic List

- Introduction to statistical analyses in the R software
- Data manipulation in R
- Simulation of random variables
- Monte Carlo methods
- Bootstrap, jackknife, and permutation tests
- Analysis of dependent observations
- Numerical methods in R

Sought Concurrence

No

Attachments

- STAT4302.pdf

(Syllabus. Owner: Lee, Yoonkyung)

Comments

- This course proposal is to be considered concurrently with the program proposal for the undergraduate Statistics major. *(by Lee, Yoonkyung on 08/28/2017 05:16 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Lee, Yoonkyung	09/04/2017 09:20 PM	Submitted for Approval
Approved	Lee, Yoonkyung	09/04/2017 09:28 PM	Unit Approval
Approved	Haddad, Deborah Moore	09/05/2017 10:57 AM	College Approval
Pending Approval	Nolen, Dawn Vankeerbergen, Bernadette Chantal Oldroyd, Shelby Quinn Hanlin, Deborah Kay Jenkins, Mary Ellen Bigler	09/05/2017 10:57 AM	ASCCAO Approval

Syllabus for Stat 4302: Computational Statistics

Instructor:

Office:

Office Hours:

Office Phone:

E-mail:

Format: Three credit hours; three 55-minute in-class meetings per week

Prerequisites: Stat 4301 or permission of the instructor

Required Text: *Statistical Computing with R*, Maria L. Rizzo, CRC Press.

Course Description and Learning Outcomes: This course covers a number of topics in the area of computational statistics, using the statistical software R. Students will use their knowledge in theoretical and applied statistics to design and perform classical and modern Monte Carlo experiments. The students will also be exposed to statistical inference based on resampling methods (bootstrap, jackknife and permutation tests).

Upon successful completion of the course, students will be able to

1. Import data sets of various formats into R.
2. Design and perform simple Monte Carlo experiments.
3. Use resampling methods to carry out statistical inference.
4. Produce numerical and graphical summaries of their analysis.
5. Communicate findings through written reports and online tools.

Homework: Homework problems will be assigned and graded weekly.

Exams: There will be two take-home exams: a midterm and a final, both in the format of a small statistical application project. You will be asked to write a report which must be word-processed, and must include numerical and graphical summaries of your analyses as well as your computer code.

Final Grade:

The final course grade will be based on the following weighting of assessment components:

Homework – 30%

Midterm – 30%

Final exam – 40%

Tentative Course Schedule:

Weeks	Topic	Suggested subtopics
1	Introduction to R	R programming environment, R Studio, R Markdown
2, 3	Working with Data in R	data summarization, data types and representation, data visualization
4, 5	Methods for Simulating Random Variables	inverse transform, accept-reject methods, importance sampling, etc.
6, 7	Monte Carlo Methods	Monte Carlo integration, variance reduction, Monte Carlo hypothesis testing
8, 9	Bootstrap & Jackknife, Permutation tests	Bootstrap, jackknife, permutation tests
10, 11, 12	Statistical Inference with Dependent Observations	Dependent observations (time series, spatial data), statistical inference via simulation of dependent variates (simulation of random fields, Gibbs sampling, Metropolis-Hastings algorithms)
13, 14	Numerical Methods in R	Root finding, Newton-Raphson, optimization, EM algorithm, smoothing, etc.

Throughout the course students will be working with modern and complex data sets, including but not limited to: spatio-temporal data, social network data, experimental data. Students will get exposure to retrieving data from on-line repositories (i.e., weather data centers) as well as collecting their own data (i.e., scraping websites). The course will put emphasis on effective and efficient functional programming techniques which will be taught throughout the course via tutorials and examples.

Academic Misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Special Accommodations: Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614-292-3307, slds@osu.edu; slds.osu.edu.