Introduction to Statistical Computing - STAT 445/645

Fall 2018—DMSC 106—Mon,Wed 2:30pm - 3:45pm

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Office:	DMSC 224	**Hours**:	Tue 2:30pm-3:30pm, Wed 1:30pm-2:30pm, or by appointment

Catalog Description

Introduction to statistical computing; data visualization and manipulation; document creation; graphics; simulation techniques; parallel computing; estimation; optimization; advanced statistical methods.

400-level Student Learning Outcomes

UG1 Students will be able to implement statistical simulation, re-sampling techniques, and maximum likelihood estimation.

UG2 Students will be able to conduct a simulation-based power analysis.

UG3 Students will be able to write professional quality reports and computer code.

GRAD1 Students will be able to use statistical computing methods to complete a research project and effectively communicate their findings.

Course outcomes

Students will be able to ...

1. use R and RStudio.
2. produce HTML, PDF, or Word documents using R Markdown.
3. install R packages for computing tasks.
4. use R help functions.
5. use R vectors.
6. use R factors.
7. use R lists.
8. use DATA.FRAMES.
9. control flow in R using conditionals, etc..
10. iterate using loops in R.
11. iterate using the APPLY family.
12. manipulate numeric and text data using base R utilities.
13. write functions in R.
14. benchmark/profile R code.

15. write parallel R code.

16. import data from flat files, including .csv, .txt, .xlsx.

17. clean data for data analysis.

18. conduct an exploratory data analysis.

19. visualize data.

20. implement the graphic of graphics.

21. generate pseudo-random numbers.

22. simulate data via Monte Carlo techniques.

23. conduct simulation-based hypothesis tests.

24. conduct a simulation-based power analysis.

25. integrate functions using Monte Carlo techniques.

26. use re-sampling for statistical inference (bootstrap, jackknife).

27. use maximum likelihood estimation for statistical inference.

28. use Markov Chain Monte Carlo (MCMC) to sample from probability distributions.