Washington University in St. Louis
SDS 4135 - Applied Statistics Practicum
Fall 2025 – 3.0 Units

Lecture: Tuesday and Thursday 4:00 – 5:20 PM, January Hall, Room 00020, In-Person

Instructor: Joe Guinness (joeguinness@wustl.edu)

Office Hour: Thursday 3:00 – 4:00 PM, Jolley 538

Course Description:

This course develops critical thinking, practical data analysis skills, and effective communication by working on a series of data analysis projects. For each project, the instructor will give an introduction to the dataset and the desired outcome of the data analysis, along with a review of statistical methodology appropriate to each project. Students will be expected to produce written reports and give oral presentations for each project. The course will also cover how to collaborate on a data science project and produce information-rich data visualizations. We will also cover a number of practical skills for data analysis, including command line tools, version control, and reproducibility.

Prerequisite Courses: SDS 4130 (Linear Statistical Models)

Learning Goals:

(1) Use context to identify the question of interest
(2) Describe methods used to collect the data.
(3) Select an appropriate statistical model.
(4) Use software to carry out statistical analyses.
(5) Draw appropriate conclusions from the analysis.
(6) Clearly outline each analysis step in a written report, complete with tables and figures
(7) Build slides and give a clear oral presentation of their analysis.

Required Textbooks: None, notes posted to course github page.

Written Reports:

Working in small groups, students will collaborate on data analyses. Groups will be assigned by the instructor and will rotate from project to project. Each group will produce a written report for each project, not exceeding 5 pages, including all figures and tables. The reports should give an introduction to the problem being addressed, a description of the data, the statistical model and its motivation, the statistical methods used for the analysis, and a conclusion. Plots of the data and the results should be included as appropriate.

Presentations:

For each project, each group will prepare a presentation summarizing their analysis. Presentations will be given in class. The presentations will be interactive in that each student will be required to ask at least one question of their presenting classmates during each day of presentations.

Attendance and Participation:

Attendance is required and counts for 10% of the grade. Attendance will be taken at the beginning of each class. The attendance grade is the proportion of total classes attended. Reasonable accommodations will be made for extenuating circumstances.

Students are expected to listen to and engage with their classmates' presentations. Interactive feedback during in-class presentations is required and counts for 10% of the grade. Each student will be required to ask at least one question per day of presentations to earn their participation grade.

Grading:

Reports and presentations will be graded for clarity of writing (or speaking), quality of figures and tables, appropriateness of statistical model choice, appropriateness of methodology, and accuracy of conclusions drawn. Late reports are penalized by 50%. Late presentations are not allowed unless requested at the start of the semester.

The final grade is the weighted average of: reports (50%), presentations (30%), attendance and participation (20%).

Letter grades: [97-100] = A+, [93-97) = A, [90-93) = A-, [87-90) = B+, [83-87) = B, [80-83) = B-, etc.

Lecture Topics:

Group collaboration on github
Review of multiple linear regression and variable selection
Data analysis workflow
Organizing a project directory
Review of logistic regression and generalized linear models
Principles of good data visualizations
Design of Experiments
Command line tools
Random Effects
Models for Correlated data
Reproducibility
R packages
Spatial Analysis
Intro to Gaussian process models
Cloud Computing

University Policies: The university has a number of policies, resources, and recommendations: https://provost.wustl.edu/syllabi-resources-and-template-language-danforth-campus/