ILLINOIS
School of Information Sciences

IS517: Methods for Data Science

Fall 2025
Tuesdays, 9:00 AM - 11:50 AM
46 Grad Sch of Lib & Info Science

Instructor
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Acknowledgement
The instructor thanks Professors Yang Wang, Victoria Stodden, Vetle Torvik, and Abbass Al Sharif for generously sharing their materials. The materials for this course, including the syllabus, were adapted from these shared materials with permission.

Course Description
A dramatic increase in computing power has enabled new areas of data science to develop in statistical modeling and analysis. These areas cover predictive and descriptive learning and bridge between ideas and theory in statistics, computer science, and artificial intelligence. We will cover methods, including predictive learning: estimating models from data to predict future outcomes. Regression topics include linear regression with recent advances using large numbers of variables, smoothing techniques, additive models, and local regression. Classification topics include linear regression, regularization, logistic regression, discriminant analysis, splines, support vector machines, generalized additive models, naive Bayes, mixture models, and nearest neighbor methods as time permits. We situate the course components in the "data science lifecycle" as part of the larger set of practices in the discovery and communication of scientific findings.

This course will move rapidly. The course will include computer exercises using *Python* and other relevant computing languages.

Prerequisites
LIS542 Data, Stat, Info, or equivalent (e.g., intro probability/stats STAT100, CS361, or ECON202) and LIS490IDS/CS398ID/STAT490 or CS101 or equivalent; or consent of the

instructor. Linear Algebra recommended at the level of MATH125; Calculus recommended at the level of MATH220.

Course Objectives
The overall goal of this course is to ***develop a functional data science perspective of the world***. More specifically, the objectives are:

1. To gain a broad exposure to data science methods through lectures and discussions.
2. To develop a working proficiency in selected data science techniques through hands-on exercises.
3. To nurture the ability to detect opportunities to apply these concepts, principles, and techniques in new scenarios by independent exploration of resources beyond the course materials and through a course project.
4.

Course materials
Our main textbook is: An Introduction to Statistical Learning, by James, Witten, Hastie, Tibshirani (ISL). With supplemental text: Elements of Statistical Learning, 2nd Edition, by Hastie, Tibshirani, Friedman (ESL).

Assignments and Methods of Assessment

- Home assignments 40%
- Project proposal 5%
- Project proposal presentation 5%
- Final project report 30%
- Final project presentation 10%
- Class participation 10%

Assignment Rules
Criteria for grading homework assignments include (but are not limited to) creativity and the amount of original work demonstrated in the assignment. However, students are permitted to use and adapt the work of others, provided that the following guidelines are followed:

- Use of other people's material must not infringe the copyright of the original author, nor violate the terms of any licensing agreement. Know and respect the principles of fair use with respect to copyrighted material.
- Students must scrupulously attribute the original source and author of whatever material has been adapted for the assignment. Summarize the changes or adaptations that have been made. Make plain how much of the assignment represents original work.

Class Project
This is a group project. Ideally, every group should have two students. If this is not possible, please discuss with the instructor.

The project proposal will describe the proposed dataset(s), the original research question(s), and the proposed method of solution. This will likely be the novel application of a regression or classification technique from class. It is at most one page in length.

The final project will carry out the research in the proposal. There will be a project proposal presentation describing the research question(s), dataset(s), method, and possibly the expected results. There will be a final project presentation describing the research question(s), dataset(s), method, and comparing the expected and actual results.

Incomplete Grades
An exceptional request for an incomplete grade is most often granted to students encountering a medical emergency or other extraordinary circumstances beyond their control. Students must request an incomplete grade from the instructor. The instructor and student will agree on a due date for completion of coursework. The student must submit an Incomplete Form signed by the student, the instructor, and the student's academic advisor to the front office: https://uofi.app.box.com/v/ISIncompleteForm
Please see the Student Code for full details: http://studentcode.illinois.edu/article3/part1/3-104/

Grading Scale

94-100 = A
90-93 = A-
87-89 = B+
83-86 = B
80-82 = B-
77-79 = C+
73-76 = C
70-72 = C-
67-69 = D+
63-66 = D
60-62 = D-
59 and below = F

Course Policies
Class readings must be done before the class meets.

Attendance/ Participation Policy
The iSchool expects students to attend all classes except in cases of emergency.
Student Code on Attendance: http://studentcode.illinois.edu/article1/part5/1-501/

Class discussion/participation grades must be based on the quality of what was said and how it added to the discussion, rather than the quantity of the participation by a student. Class discussion/participation should evaluate actual participation and not mere attendance.
If you have an emergency, communicate with the instructor as early as possible to prevent negatively impacting your grade. Students missing more than one class, or who regularly arrive late or leave early, will not pass the class unless alternate arrangements are made.
Enrollment in this course includes an expectation of regular attendance. If you find you must miss (or have missed) class, contact the instructor as soon as possible. Students may miss one class session with no penalty; thereafter, each unexcused absence will result in

your grade being lowered by one step (for example, an A- will become a B+). Repeated tardiness or leaving sessions early may be considered an unexcused absence unless alternate arrangements have been made with the instructor.

Students share some of the responsibility for fostering an inclusive classroom. Students are expected to be respectful of others' perspectives and lived experiences during class discussion. Students are expected to demonstrate respect for the ideas and opinions of all other members of the class at all times. Failure to observe this course requirement can result in a failing course participation grade and may result in a failing grade for the course.

Academic Integrity
The iSchool has the responsibility for maintaining academic integrity so as to protect the quality of education and research in our school and to protect those who depend on our integrity. Consequences of academic integrity infractions may be serious, ranging from a written warning to a failing grade for the course or dismissal from the University. See the student code for academic integrity requirements: http://studentcode.illinois.edu/article1/part4/1-401/

Please review and reflect on the academic integrity policy of the University of Illinois, http://studentcode.illinois.edu/article1_part4_1-401.html, to which we subscribe. By turning in materials for review, you certify that all work presented is your own and has been done by you independently, or as a member of a designated group for group assignments.

If, in the course of your writing, you use the words or ideas of another writer, proper acknowledgement must be given. Not to do so is to commit plagiarism, a form of academic dishonesty. Please be aware that the consequences for plagiarism or other forms of academic dishonesty will be severe. Students who violate university standards of academic integrity are subject to disciplinary action, including a reduced grade, failure in the course, and suspension or dismissal from the University.

Statement of Inclusion
http://www.inclusiveillinois.illinois.edu/mission.html
As the state's premier public university, the University of Illinois at Urbana-Champaign's core mission is to serve the interests of the diverse people of the state of Illinois and beyond. The institution thus values inclusion and a pluralistic learning and research environment, one in which we respect the varied perspectives and lived experiences of a diverse community and global workforce. We support diversity of worldviews, histories, and cultural knowledge across a range of social groups, including race, ethnicity, gender identity, sexual orientation, abilities, economic class, religion, and their intersections.

Religious Observances
In keeping with our Statement of Inclusion and Illinois law, the University is required to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements.
If you anticipate the need for an accommodation, please communicate with your instructor in the **first two weeks** of class. If you are an undergraduate student and your instructor requires an absence letter, you must fill out the Religious Observance Accommodation Request form:

http://odos.illinois.edu/community-of-care/resources/docs/Religious-Observance-Accommodation-Request-Form.pdf. Other accommodations may also be available.

Accessibility Statement
To ensure accessibility-related needs are properly addressed from the beginning of the semester, I request that students with disabilities who require assistance to participate in this class contact me as soon as possible to discuss their needs and any concerns they may have. The University of Illinois may be able to provide additional resources to assist you in your studies through the Office of Disability Resources and Educational Services (DRES). This office can assist you with disability-related academic adjustments and/or auxiliary aids. Please contact them as soon as possible by visiting the office in person: 1207 S. Oak St., Champaign; visiting the website: http://disability.illinois.edu; calling (217) 333-4603 (V/TTY); or via e-mail disability@illinois.edu. NOTE: I do not require a letter from DRES in order to discuss your requested accommodations.

Land Acknowledgement Statement
Adopted by the University of Illinois in 2018
More information: https://chancellor.illinois.edu/land_acknowledgement.html
As a land-grant institution, the University of Illinois at Urbana-Champaign has a responsibility to acknowledge the historical context in which it exists. In order to remind ourselves and our community, we will begin this event with the following statement. We are currently on the lands of the Peoria, Kaskaskia, Peankashaw, Wea, Miami, Mascoutin, Odawa, Sauk, Mesquaki, Kickapoo, Potawatomi, Ojibwe, and Chickasaw Nations. It is necessary for us to acknowledge these Native Nations and for us to work with them as we move forward as an institution. Over the next 150 years, we will be a vibrant community inclusive of all our differences, with Native peoples at the core of our efforts.

Useful Resources

Library Resources
https://www.library.illinois.edu/infosci/

Writing and Bibliographic Style Resources
The campus-wide Writers Workshop provides free consultations. For more information, see http://www.cws.illinois.edu/workshop/

The iSchool sponsors a Writing Resources Moodle site:
https://courses.ischool.illinois.edu/course/view.php?id=3389

And it provides access to writing coaches who offer free consultations here:
https://publish.illinois.edu/ischoolwritingresources/

Schedule (subject to revision)

Week 1:	Syllabus + Data Science Intro
Week 2:	Statistical Learning Foundations and Review (ISL chapter 2)
Week 3:	Linear Regression (ISL chapter 3)
Week 4:	Classification (ISL chapter 4)
Week 5:	Resampling (ISL chapter 5)
Week 6:	Linear Model Selection and Regularization (ISL chapter 6)
Week 7:	Splines / Generalized Additive Models (ISL chapter 7)
Week 8:	**Project Proposal + Slides Due / Project Proposal Presentation**
Week 9:	Tree Based Methods (ISL chapter 8)
Week 10:	Support Vector Machines (ISL chapter 9)
Week 11:	Unsupervised Learning (ISL chapter 10)
Week 12:	**Final Presentation Slides Due / Final Project Presentations**
Week 13:	**Final Project Presentations**
Week 14:	**Final Project Report Due**