STAT 7620 Elements of Statistical Learning

Term: Spring 2022
Lectures: TR 12:45PM – 2:05PM in Hayes Hall 025

Instructor: Yoonkyung Lee
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Phone: 614-292-9495
Office Hours: F 9:30–11:30AM (Virtually via CarmenZoom) or by appointment
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Grader: Rui Zhang
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Course Website:
This course has a web site on Carmen: `https://carmen.osu.edu`. You will find class notes, homework assignments, solutions, references and other course announcements on the website. Please check out the website on a regular basis.

Text: *The Elements of Statistical Learning – Data Mining, Inference and Prediction*, Hastie, T., Tibshirani, R., and Friedman, J. (2009), 2nd edition, Springer.
The second edition (2009) is available as an eBook via the SpringerLink on the OSU library website. (See the course website on Carmen for access).

Prerequisites: Probability/Math/Statistics - STAT 6301/6302 or higher, or ECE 6001/7001, or equivalent, or permission of instructor. Familiarity with matrix algebra and linear regression analysis, and working knowledge of standard software packages such as R or Matlab.

Course Description: Statistical learning or machine learning methodology explores various ways of estimating functional dependencies between a response variable and possibly a large set of explanatory variables (features), when one is trying to find and understand an unknown, regular component within the realm of noisy, complex data. Modern regression and pattern recognition analyses fall in this framework. This course will provide an overview of supervised learning and discussions of statistical learning algorithms such as Discriminant Analysis, Classification Tree, Support Vector Machines, and Boosting, and illustrate practical uses of the algorithms. In addition, this course will cover cluster analysis and dimension reduction for unsupervised learning.

Tentative Course Schedule:

Week	Topics
1	Overview of Statistical Learning/Machine Learning (Chapter 1)
	Linear Methods for Regression (Chapter 3)
2-3	Penalized Regression (Chapter 3)
3-4	Linear Methods for Classification (Chapter 4)
5-6	Support Vector Machines (Chapter 12)
7-8	Basis Expansion and Regularization (Chapter 5)
	Kernel Smoothing Methods (Chapter 6)
9-10	Tree-Based Methods (Chapter 9)
	Bagging and Boosting (Chapter 10)
11	Model Assessment and Selection (Chapter 7)
12-13	Cluster Analysis, Dimension Reduction (Chapter 14)
14-15	Neural Networks (Chapter 11)

Class Attendance Policy: You are expected to attend all lectures.

Grading: Grades will be assigned on the basis of your performance on homework assignments (40%), a group project (50%), and participation (10%).

Homework Assignments: Homework will be assigned regularly (about every other week) throughout the semester. Homework will involve analytical exercises, computational work, and data analyses. Homework assignments and solutions will be posted on the course website. You should submit your work online. Due dates will be announced in class and on Carmen as well. No late homework will be accepted.

Project: A project will be a key component of the course, which will be completed in groups of about 3 to 4 students (depending on the enrollment size). Presentation and a project report are required for each group. Each group will be asked to choose a research article on advanced topics relevant to the course, provide a summary of the main idea, critically evaluate the idea with a simulation study or demonstrate its effectiveness with a novel application to real data.

Tentative Timeline for Project:

Week 10	Select a topic and form a group.
Week 11	Project proposal (1 page) due April 1
Week 13	Preliminary report (up to 5 pages) due April 15
Week 15	Project presentation video due April 29
Final Week	Final report (up to 10 pages) due May 2

Participation: In addition to regular class participation, there will be several activities requiring your participation for building connections with the instructor and other students or formulating potential projects (e.g., posting introduction video, proposing topics for project). These activities will be announced in class and on Carmen.

Academic Integrity Policy:
Please help us maintain an academic environment of mutual respect, fair treatment, and personal growth. Although students are encouraged to work together on homework assignments, all students must submit their own written work in their own words. Academic misconduct will not be tolerated and will be dealt with procedurally in accordance with university policy. 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 at `https://studentconduct.osu.edu/`.

Health and Safety Policy:
Guidelines and requirements for campus safety can be found at `https://safeandhealthy.osu.edu`. All students, faculty and staff are required to comply with and stay up to date on all university safety and health guidelines.

Accessibility accommodations for students with disabilities:
The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the universitys request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let the instructor know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; `http://slds.osu.edu`; 098 Baker Hall, 113 W. 12th Avenue.

Disclaimer:
This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.