CSE575 Statistical Machine Learning

General Information

Time & Location

Monday/Wednesday - 7:30 PM - 8:45 PM (Virtual classroom on Zoom)

Note: The instructor runs a pre-packaged course developed by Professor Baoxin Li, with all lectures pre-recorded and delivered on-line. The above class times are for face-to-face interaction with the instructor.

Every Monday, we may revisit the major topics covered in the video lectures or go through more examples; Wednesday lectures will be mostly be used for Q&A and discussion of the assignments.

Contact Information & Office Hours

Instructor: Nupur Thakur

Email: nsthaku1@asu.edu (Please reserve email only for individual, non-technical matters (like grade appeal, requesting meetings, etc.); Use Discussions on the Canvas course page for asking technical questions related to assignments etc.)

Office Hours: TBD

Textbooks/References

This CSE 575 class does not have a required textbook. However, you may use the following book as a primary reference book:
  1. Pattern Recognition and Machine Learning, Christopher M. Bishop, 2006.

Additionally, following books are good reference books too:
  1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2nd Edition). Trevor Hastie, Robert Tibshirani and Jerome Friedman. Springer-Verlag. (https://web.stanford.edu/~hastie/Papers/ESLII.pdf)
  2. Pattern Classification (2nd edition). Richard Duda, Peter Hart, and David Stork. Wiley, 2000.

Course Description

Deriving generalizable models from some given training data is central to statistical machine learning. Statistical machine learning has found wide applications in many fields including artificial intelligence, computer vision, natural language processing, finance, bioinformatics, and etc. This course provides a systematic introduction to common learning paradigms in statistical machine learning, accompanied by an exploration of a set of foundational algorithms. Main topics covered include supervised learning, unsupervised learning, and deep learning.

Specific topics covered include:

- Mathematical foundations for machine learning
- Maximum likelihood estimation
- Naive Bayes classification
- Logistic regression
- Support vector machines
- Probabilistic graphical models
- Mixture models
- K-means clustering
- Spectral clustering
- Dimensionality reduction
- Principal component analysis
- Neural networks and deep learning
- Convolutional neural networks

Course Objectives & Expected Learning Outcomes

The objective of this course is to introduce to the students a systematic study of basic statistical learning paradigms and their applications.

Learners completing this course will be able to:
- Distinguish between supervised learning and unsupervised learning
- Apply common probability distributions in machine learning applications
- Use cross validation to select parameters
- Use maximum likelihood estimate (MLE) for parameter estimation
- Implement fundamental learning algorithms such as logistic regression and kmeans clustering
- Implement more advanced learning algorithms such as support vector machines and convolutional neural networks
- Design a deep network using an exemplar application to solve a specific problem

Prerequisites

Students should have good working knowledge of college-level calculus, linear algebra and basic probability theory & statistics.

In addition, proficiency in Python programming is needed for doing the course project and/or homework assignments. You may need to use external libraries written in Python.

Email Policy

Email has become an important means of communication, but due to the size of the class and the volume of daily emails the instructors typically need to deal with, the preferred way of interaction is through the Discussions forum on the Canvas course site, where the students and the instructor/TAs can share Q&As benefiting the entire class.

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Emails should be used only for matters where privacy of individual students may be of a concern (like grade appeals). Such emails should have CSE575 in the subject line (or your email might not be diverted to the right place).

Grading Policies

Your course work will contribute to the final grade according to the following percentages:

Course Work	Percentage of Grade
Graded discussion	5%
Module quizzes	15%
Mini- assignments	10%
Project	30%
Midterm exam	15%
Final exam	25%

The final grading scheme for producing the letter grades will be like this:

Grade	Percentage
A+	>=95%
A	>=90%
A-	>=85%
B+	>= 80%
B	>=75%
B-	>=70%
C+	>=65%
C	>=60%
D	>=50%
E	0-49%

Absence & Make-up Policies

All lectures in this hybrid course are to be delivered on-line and thus there will not be tracking of physical presence/absence, except for the midterm exam and final exam.

As the assignments are supposed to be done online and ample time will be given to complete the assignments, you should plan far ahead to make the submission on time, if you foresee you may have conflicts on the final day of submission. No make-up will be given if you missed the submission deadline.

Note that, medical emergency/conditions may qualify you for special considerations like late withdrawal, incomplete grade, etc., but will not automatically earn you any extension of the submission deadlines.

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The University has established guidelines on "Accommodation for Religious Practices" (ACD 304–04) and on "Missed Classes Due to University-Sanctioned Activities" (ACD 304–02). These guidelines will be followed.

Classroom Behavior

Cell phones and pagers must be turned off during classroom time (i.e., exams in this course) to avoid causing distractions. The use of recording devices is not permitted during classroom time. Any violent or threatening conduct by an ASU student in this class will be reported to the ASU Police Department and the Office of the Dean of Students.

Academic Integrity

Students in this class must adhere to ASU's academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policy). Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. In addition, all engineering students are expected to adhere to both the ASU Academic Integrity Honor Code and the Fulton Schools of Engineering Honor Code. All academic integrity violations will be reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

All the assignments, quizzes/exams are individual work except stated otherwise.

Copyright

Course content, including lectures (videos and notes) and assignments, are copyrighted materials and students may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course (see ACD 304–06, "Commercial Note Taking Services" and ABOR Policy 5-308 F.14 for more information).

You must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

Policy against threatening behavior, per the Student Services Manual, SSM 104–02

Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services. Interfering with the peaceful conduct of universityrelated business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

Disability Accommodations

Suitable accommodations will be made for students having disabilities. Students needing accommodations must register with the ASU disabilities resource Center and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in sufficient time for it to be properly arranged.

Harassment and Sexual Discrimination

Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

Mandated sexual harassment reporter: As an employee of the University I am considered a mandated reporter and therefore obligated to report any information regarding alleged acts of sexual discrimination that I am informed of or have a reasonable basis to believe occurred.

ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish to discuss any concerns confidentially and privately.

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