

Course Information

Course Number: CSCE 633-700
Course Title: Machine Learning
Time: Online, asynchronous
Location: Online
Credit Hours: 3

Instructor Details

Instructor: Dr. Bobak Mortazavi
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Office hours: by appointment

Course Description

Machine learning is a sub-field of Artificial Intelligence that gives computers the ability to learn and/or act without being explicitly programmed. Applications of machine learning have permeated many aspects of every-day life and can be found among others in self-driving cars, speech recognition, computer vision, and genomics. Topics include supervised and unsupervised learning (including parametric and non-parametric models, clustering, dimension reduction, deep learning), optimization procedures, and statistical inference.

Course Prerequisites

MATH 304 and STAT 211, and (CSCE 221 or STAT 404) or equivalent.

Course Learning Outcomes

The objective of this course is to teach fundamental methods of machine learning with focus on the theoretical underpinnings, practical implementations, and experimentation. Upon completion of the course students will:

1. Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
2. Gain an understanding of the strengths and weaknesses of many popular machine learning approaches.
3. Uncover the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and unsupervised learning.
4. Be able to design and implement various machine learning algorithms in a range of real-world applications.

Textbook and/or Resource Materials

Introduction to Machine Learning, 4th edition, MIT Press by Ethem Alpaydin
Learning from Data, by Yaser S. Abu-Mostafa, Malik Magdon-Ismail, and Hsuan-Tien Lin
Machine Learning Refined, 2nd Edition, Watt, Borhani, and Katsaggelos
Machine Learning and Deep Learning using Python and Tensorflow, Konsani and Kadre
Elements of Statistical Learning, 2nd Edition, Hastie, Tibshirani, and Friedman

Grading Policy

The cutoff for an 'A' will be at most 90% of total score, 80% for a 'B', 70% for a 'C', and 60% for a 'D'. Anything below 60% will an 'F'.

1. Seven homework assignments = 35%
2. One Final Project (including code and written report) = 35%
3. Ten quizzes = 30%

Late Work Policy

No Late Assignments will be accepted. Late assignments are any deliverables after the established deadline.

Course Schedule

Course Topics and Major Assignment Dates

Module	Topic	Assignments, and Due Dates
1	Introduction and Math Review	Quiz 1
2	Linear Perceptron	Quiz 2
3	Linear Regression	HW 1 Due, Quiz 3
4	Logistic Regression & Regularization & Feature Selection	HW 2 Due, Quiz 4
5	Decision trees & random forest & boosting	HW 3 Due, Quiz 5
6	Support Vector Machines	HW 4 Due, Quiz 6
7	Neural Networks & Deep Learning	HW 5 Due, Quiz 7
8	Dimension Reduction	HW 6 Due, Quiz 8
9	Unsupervised Learning	HW 7 Due, Quiz 9
10	Advanced Topics	Quiz 10 Final Project Due 12/5

Optional Course Information Items

1. Computer accounts: if you do not have a unix account, ask for one on the CS web page.
2. Programming languages permitted: Python and must be executable on CS unix hosts or other public systems in the department lab.
3. All written assignments must be implemented in Latex.

University Policies

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" ([Student Rule 7, Section 7.4.1](#)).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](#).)

Academic Integrity Statement and Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do."

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and

must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](#) (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

COVID-19 Temporary Amendment to Minimum Syllabus Requirements

To help protect Aggieland and stop the spread of COVID-19, Texas A&M University urges students to be vaccinated and to wear masks in classrooms and all other academic facilities on campus, including labs. Doing so exemplifies the Aggie Core Values of respect, leadership, integrity, and selfless service by putting community concerns above individual preferences. COVID-19 vaccines and masking — regardless of vaccination status — have been shown to be safe and effective at reducing spread to others, infection, hospitalization, and death.

Use of Generative AI

This course assumes that all work submitted by students will be generated by the students themselves. Students should not have another person/entity do the writing of any substantive portion of an assignment for them, which includes hiring a person or a company to write assignments and using artificial intelligence tools like ChatGPT.