Introduction to Machine Learning (INF385T)
University of Texas at Austin School of Information

Class Meetings
Wednesdays 3-6pm
UTA 1.210A

Instructor
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Course Overview

Summary
This class will cover core and cutting edge concepts employed in machine learning to solve artificial intelligence problems. Students will learn the theory behind a range of machine learning tools and practice applying the tools to make predictions about textual data (natural language processing), visual data (computer vision), and the combination of both textual and visual data. The class format is split between reading and lab assignments for the first half of the semester followed by a research project the second half of the semester. Each class is split between a lecture and in-class lab tutorials.

Objectives
By the end of the course, the goals are for students to:

1. Understand the key concepts in machine learning, a critical precursor to effective collaborations in industry or academia. Towards this aim, students will:
    - Characterize the process to train and test machine learning algorithms
    - Recognize ways to evaluate machine learning systems
    - Critique core and cutting edge machine learning algorithms
    - Identify the challenges for designing modern machine learning systems that can harness today's "big" datasets
2. Apply machine learning systems to perform various artificial intelligence tasks. Towards this aim, students will:
    - Develop skills in programming in Python
    - Experiment with machine learning libraries, including scikit-learn and TensorFlow
    - Employ cloud computing resources to leverage modern hardware and software
    - Evaluate machine learning algorithms for tasks in various application domains, including to analyze text and analyze images

3. Conduct and communicate original research. Towards this aim, students will:
    - Propose a novel research idea (this will be an iterative process)
    - Design and execute experiments to support the proposed idea
    - Write a research paper about the project (and possibly submit it for publication)
    - Present the project to the class

Prerequisites
While there are no requirements, a background in programming is strongly recommended.

Website
https://www.ischool.utexas.edu/~dannag/Courses/IntroToMachineLearning/

Class Participation
Students are expected to attend every class. Every student should demonstrate ongoing engagement in class discussions and complete the material discussed in every lab session.

Reading Assignments
Students will have weekly assigned readings with associated questions to answer about the material. Each assignment description will be posted on Canvas before the due date. These assignments will offer training in thinking critically about machine learning concepts and brainstorming novel research ideas to fill existing gaps/problems. Each assignment must be submitted in Canvas by 11:59pm on its due date.

Lab Assignments
Four lab assignments will be assigned for the first half of the course. Each assignment description will be posted on Canvas before the due date. These lab assignments will develop students' skills to build systems similar to those described in the weekly readings. Each assignment must be submitted in Canvas by 11:59pm on its due date.

Final Project
Assignments contributing to the final project will be due during the second half of the course. Details about each assignment will be posted on Canvas prior to its deadline. The final project will develop students' skills in conducting and communicating original research.

Tentative Schedule

Week	**Lecture Topic(s)**	**Assignment Due**
1	Introduction	
2	Regression, Regularization	Problem Set 1
3	Classification: Decision Tree, Naive Bayes	Lab 1
4	Classification: Nearest Neighbor, Support Vector Machine	Problem Set 2
5	Feature Representation, Dimensionality Reduction	Lab 2
6	Ensemble Learning, Computer Vision, NLP	Problem Set 3
7	Artificial Neurons, Gradient Descent	Lab 3
8	Neural Network Architecture	Problem Set 4
9	Neural Network Training	Lab 4
10	Convolutional Neural Networks	Project Pre-Proposal
11	Recurrent Neural Networks	Project Proposal
12	Autoencoders, Unsupervised Learning	
13	Reinforcement Learning, Human-Machine Partnerships	Project Outline
14	Ethics, Course Review	
15	*Students' Project Presentations*	
16	No Class	*Final Project Due*

Grading

Final course scores will be calculated as follows:

	% of Final Class Grade
Class Participation	10%
Reading Assignments	20%
Lab Assignments	30%
Final Project	40%

Final course scores represent the following grades (scores are rounded to the nearest integer):

Grade	% of Final Class Grade
A	94-100%
A-	90-93%
B+	87-89%
B	84-86%
B-	80-83%
C+	77-79%
C	74-76%

For detailed information about what grade is required for you to receive credit for this class, please refer to UT's Graduate Catalog. For example, students in the School of Information (iSchool) are required to receive a grade of B or higher in order to include this course in their program of work toward graduation. In addition, the UT Graduate School requires a minimum grade of C or higher to count a course for credit.

Late Policy
Late submissions will be penalized 1% of the grade per hour up to 12 hours. After 12 hours, no credit will be given.

Resources

Links to required readings will be posted on the course website for each class meeting. They will draw heavily from three textbooks:

- Hands-on Machine Learning with Scikit-Learn & TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems by Aurelien Geron
- Make Your Own Neural Network by Tariq Rashid
- Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

Policies

Academic Honor Code
Students who violate University rules on academic dishonesty are subject to severe disciplinary penalties, such as automatically failing the course and potentially being dismissed from the University. Please do not take the risk. The following site offers more details: http://deanofstudents.utexas.edu/sjs.

Coping with Stress and Personal Hardships
Life can bring extreme challenges and unexpected, undesired surprises to each of us. If you are facing any personal difficulties in coping with your life experiences, please consider taking advantage of the services available to you from the Counseling and Mental Health Center. Having support and assistance can make a huge difference with handling life difficulties.

Accommodations for Disability
If you qualify for accommodations because of a disability, please submit a letter to me from the Division of Diversity and Community Engagement, Services for Students with Disabilities in a timely manner so I can plan accordingly. To determine if you qualify, please contact the Services for Students with Disabilities at 512-471-6259 (voice) or 512-471-4641 (TTY for users who are deaf or hard of hearing).

Excused Absences: Religious Observance and Military Service
A student will be given an opportunity to complete any work missed due to absences in observance of a religious holy day or military service. For a holy day, the student must notify me at least two weeks in advance of the absence. Please see the following link for more details: http://catalog.utexas.edu/general-information/academic-policies-and-procedures/attendance/. The student will not be penalized for excused absences, but must complete the missed material within a reasonable time after the excused absence.