

CSE 6363

Machine Learning

Spring 2019 - TTh 3:30pm - 4:50pm, LS 122

Instructor: Manfred Huber (huber@cse.uta.edu)

Office Number: ERB 522

1 Course Description

Contents and Outcomes:

Machine learning techniques that allow computers to form representations, make predictions, or apply controls automatically from data have become increasingly prevalent in modern technologies and are opening up new approaches in a wide range of domains. This course provides an introduction to the field of Machine Learning and covers fundamental and state-of-the-art machine learning algorithms. It will cover unsupervised, supervised, semi-supervised, as well as reinforcement learning techniques with a focus on unsupervised and supervised learning. Students completing this course will gain an understanding of the area of machine learning and the ways in which different learning algorithms operate. They will also be able to apply the covered methods to real-world problems.

Prerequisites:

Many of the techniques covered in this course are based on statistics and linear algebra and knowledge in these areas is required. Prerequisite for this course is *Data Modeling (CSE 5301)*, an advanced (equivalent) statistics course, or consent of instructor. Prior knowledge of *Artificial Intelligence (CSE 5361)* and *Algorithms (CSE 5311)* is useful.

Course Materials:

The recommended textbook for this course is:

Pattern Recognition and Machine Learning, Christopher M. Bishop, 2006.

Additional readings in the form of book chapters or research papers will be made available either through the engineering library or on the course web site.

E-mail and WWW page:

There is a course web page at <http://www-cse.uta.edu/~huber/cse6363> as well as a Blackboard page. All changes and supplementary course materials will be made available through Blackboard and usually through the web site. In addition, necessary changes or important announcements will also be distributed by through Blackboard.

Tentative Office Hours:

Office hours for the course will be held by the instructor either in ERB 128 or in 522 ERB, TTh 5:00 - 6:00, and M 6:00 - 7:00. Times are subject to change and will be posted. If for some reason you can not make it to any of these office hours, please inform the instructor.

e-mail: huber@cse.uta.edu

Teaching Assistants:

There will be two Teaching Assistants for this course. Their details and Office Hours will be announced on Blackboard.

2 Course Work and Grading

Homework Assignments/Projects :

Three hands-on homework assignments will be given where learned techniques are applied to practical problems.

Projects:

Three small projects will be assigned where students implement and test some of the techniques.

Quizzes:

There will be 6 quizzes, each to be held in the class after an assignment or project was due. Quizzes will test knowledge of material taught in the course as well as of the assignment submitted.

Final Project:

In addition, every student will perform a final project that will be presented at the end of the course.

Late submission policy:

All assignments and Projects are graded out of 100 points. Assignments submitted late will be penalized, at a rate of 4 penalty points per hour. The submission time will be the time shown on Blackboard. Any assignment submitted more than 25 hours late will receive no credit for the assignment. To receive credit for the assignment portion of the corresponding quizz you will have to hand in an assignment before the quizz.

- Exceptions to late submission penalties will only be made for emergencies documented in writing, in strict adherence to UTA policy. For all such exception requests, the student must demonstrate that he or she made all efforts to notify the instructor as early as possible.
- Computer crashes, network crashes, software or hardware failure, temporary Blackboard failure, e-mail failure, will NOT be accepted as justification for late submissions. If you want to minimize chances of a late submission, aim to submit early. You can always revise your submission till the deadline.

Attendance:

At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I strongly encourage class attendance. Note that you are responsible for any course content covered in class irrespective of it being in the class notes.

Grading Policy:

The final grade will be calculated using the following policy:

Assignments	20 %
Projects	20 %
Quizzes	50 %
Final Project	10 %

3 Course Topics

Topics covered in this course include:

- Machine Learning Representations and Evaluation Metrics
 - Bayesian Learning Models
 - Support Vector Machines
 - Neural Networks
 - Classification
- Supervised Learning
 - Regression
 - Classification
- Unsupervised Learning
 - Clustering
 - Feature Learning
 - Structure Learning
- Semi-Supervised Learning
- Fundamentals of Reinforcement Learning
- Introduction to Deep Learning

4 Tentative Class Schedule

<p style="text-align: center;">CSE 6363 Machine Learning Tentative Lecture and Assignment Schedule Spring 2019 - TTh 3:30pm - 4:50pm</p>				
Class	Date	Readings	Lecture Topics	Assignments
1	01/15		Course Details and Overview	
2	01/17		Background: Probability, Information, utility	
3	01/22		Supervised Learning	
4	01/24		Supervised Learning	
5	01/29		Regression	
6	01/31		Regression	
7	02/05		Regression & Classification	
8	02/07		Classification	Homework 1 due
9	02/12		Neural Networks	Quizz 1
10	02/14		Neural Networks	
11	02/19		Support Vector Machines	
12	02/21		Decision Trees	Project 1 due
13	02/26		Ensemble Methods	Quizz 2
14	02/28		Unsupervised Learning	
15	03/05		Clustering	
16	03/07		Unsupervised Feature Learning	Homework 2 due
	03/12		<i>Spring Break - No Class</i>	
	03/14		<i>Spring Break - No Class</i>	
17	03/19		Regularization and Complexity	Quizz 3
18	03/21		Semi-Supervised learning	
19	03/26		Graphical Models	
20	03/28		Graphical Models	Project 2 due
21	04/02		Structure Learning	Quizz 4
22	04/04		Introduction to Reinforcement Learning	
23	04/09		MDPs and Reinforcement Learning	
24	04/11		Reinforcement Learning	Homework 3 due
25	04/16		Reinforcement Learning	Quizz 5
26	04/18		Deep Learning	
27	04/23		Deep Learning	
28	04/25		Advanced Learning Topics	Project 3 due
29	04/30		Advanced Learning Topics	Quizz 6
30	05/02		Advanced Learning Topics	
31	TBD		Final Project Presentations - During Finals Week	

¹ All information and dates tentative and subject to change.

5 University Policies and Services

Grade Grievances:

Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current undergraduate catalog.

Drop Policy:

Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aaofao/>).

Disability Accommodations:

UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA), and Section 504 of the Rehabilitation Act. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

Non-Discrimination Policy:

The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.

Title IX Policy:

The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the

Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. For information regarding Title IX, visit www.uta.edu/titleIX or contact Ms. Michelle Willbanks, Title IX Coordinator at (817) 272-4585 or titleix@uta.edu

Academic Integrity:

Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code: *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents Rule 50101, 2.2, suspected violations of university standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the students suspension or expulsion from the University. Additional information is available at <https://www.uta.edu/conduct/>.

Electronic Communication:

UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Campus Carry:

Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

Student Feedback Survey:

At the end of each term, students enrolled in face-to-face and online classes categorized as "lecture", "seminar", or "laboratory" are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback via the SFS database is aggregated with that of other students enrolled in the course. Students' anonymity will be

protected to the extent that the law allows. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week:

A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures:

Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is reached by turning left down the hallway outside the classroom and then turning right towards the staircase and exit out of the building. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Support Services:

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

The IDEAS Center

(2nd Floor of Central Library) offers FREE tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. Students can drop in, or check the schedule of available peer tutors at www.uta.edu/IDEAS, or call (817) 272-6593.

The English Writing Center

(411LIBR): The Writing Center offers FREE tutoring in 15-, 30-, 45-, and 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Register and make appointments online at <https://uta.mywconline.com>. Classroom visits, workshops, and specialized

services for graduate students and faculty are also available. Please see www.uta.edu/owl for detailed information on all our programs and services.

The Library's 2nd floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation. <http://library.uta.edu/academic-plaza>

6 Library - library.uta.edu

Resources for Students

Research or General Library Help

Academic Plaza Consultation Services: library.uta.edu/academic-plaza

Ask Us: ask.uta.edu/

Library Tutorials: library.uta.edu/how-to

Subject and Course Research Guides: libguides.uta.edu

Librarians by Subject: library.uta.edu/subject-librarians

Research Coaches: <http://libguides.uta.edu/researchcoach>

Resources

A to Z List of Library Databases: libguides.uta.edu/az.php

Course Reserves: pulse.uta.edu/vwebv/enterCourseReserve.do

Study Room Reservations: openroom.uta.edu/