Data 3461: Machine Learning
Spring 2022

Instructor Information

Instructor
Amir Farbin

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CPB-340

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Faculty Profile
https://mentis.uta.edu/explore/profile/amir-farbin

Office Hours
I am generally available to students over Teams. If you need me, write me on Teams and we will find a time for a voice or video call.

Course Information

Section Information
DATA 3461

Time and Place of Class Meetings
• In-person: Lecture MW 4-5:20 PKH 113
• Virtual Only: Lab F 3-4:50

Description of Course Content

An Introduction to Machine Learning, including supervised, unsupervised, anomaly detection, deep learning, recommender systems, and reinforcement learning.

Required Textbooks and Other Course Materials

No required text books. Handwritten lecture notes will be provided.

Lectures
• Students are expected to attend lectures in person.
• Course material will be primarily presented on the board, with occasional coding examples on a computer.
• Students encouraged expected to take notes.

Course Communications
Course announcements will be made on Teams. I also encourage students to ask questions and interact with me via Teams.

Descriptions of major assignments and examinations
Students will be periodically assigned lab in form of Jupyter Notebooks via GitHub. Homework submission will be done via GitHub.

Grading Information

Grading
Your grade will be based 100% on your performance on course labs. Labs due on date/time will be communicated during lab and lecture sessions. Late labs, unless excused, will incur a 20% point reduction.

Expectations for Out-of-Class Study
You are expected to spend about 10 hours per week working on this course outside of "lecture" hours. Even though we won't meet often at the designated course time, I also expect you to be using that time to work specifically on the your projects. If possible, I suggest you setup this time for brief weekly meetings with your Capstone supervisor.

Help
Please contact me on Teams for any help or questions you have and I will arrange for a personal one-on-one virtual session.

Course Schedule

Supervised Machine Learning: Regression and Classification

- Introduction
    - Supervised vs Unsupervised
- Regression Model
    - Linear regression model
    - Cost function
    - Gradient descent
        - Learning rate
- Multiple Linear Regression
    - Multiple features
    - Vectorization
    - Gradient descent for multiple linear regression
- Gradient descent in practice
    - Feature scaling
    - Convergence
    - Choosing the learning rate
- Feature engineering
    - Polynomial regression
- Classification with logistic regression
    - Logistic regression
    - Sigmoid function
    - Decision boundary
    - Cost function for logistic regression
    - Gradient Descent for Logistic Regression
- The problem of overfitting
    - Cost function with regularization
    - Regularized linear regression
    - Regularized logistic regression
- Neurons and the brain
    - Demand Prediction
    - Neural networks

- Finding related items
- Collaborative filtering vs Content-based filtering
- Deep learning for content-based filterin
- Reinforcement Learning
    - Policies
    - State-action value function
    - Bellman Equations
    - Random (stochastic) environment
    - Improved neural network architecture
    - ϵ-greedy policy
    - Mini-batch and soft updates (optional)
    - The state of reinforcement learning

Institutional Information

UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the [Institutional Information](https://resources.uta.edu/provost/course-related-info/institutional-policies.php) page (https://resources.uta.edu/provost/course-related-info/institutional-policies.php) which includes the following policies among others:

- Drop Policy
- Disability Accommodations
- Title IX Policy
- Academic Integrity
- Student Feedback Survey
- Final Exam Schedule

Additional Information

Face Covering Policy
While the use of face coverings on campus is no longer mandatory, all students and instructional staff are strongly encouraged to wear face coverings while they are on campus. This is particularly true inside buildings and within classrooms and labs where social distancing is not possible due to limited space. If a student needs accommodations to ensure social distancing in the classroom due to being at high risk they are encouraged to work directly with the Student Access and Resource Center to assist in these accommodations. If students need masks, they may obtain them at the Central Library, the E.H. Hereford University Center's front desk or in their department.

Attendance
At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator of student success. 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 expect students to attend all lecture. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report must the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Canvas. This date is reported to the Department of Education for federal financial aid recipients.

Emergency Exit Procedures

Should we experience an emergency event that requires evacuation of the building, students should exit the room and move toward the nearest exit, which is located [insert a description of the nearest exit/emergency exit]. When exiting the building during an emergency, do not take an elevator but use the stairwells instead. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Academic Success Center
The Academic Success Center (ASC) includes a variety of resources and services to help you maximize your learning and succeed as a student at the University of Texas at Arlington. ASC services include supplemental instruction, peer-led team learning, tutoring, mentoring and TRIO SSS. Academic Success Center services are provided at no additional cost to UTA students. For additional information visit: Academic Success Center. To request disability accommodations for tutoring, please complete this form.

Emergency Phone Numbers

In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381