EE 610: ST: Machine Learning Fundamentals

Course Information

Contact

Instructor: Dr. W. David Pan
Office: ENG 263A
Email Address: pand@uah.edu
Phone Numbers: 256-824-6642
Availability/Office Hours: Tuesday and Thursday, 4:00 pm – 5:00 pm, or by appointment.

Details

Course Name: Selected Topics: Machine Learning Fundamentals
Mode of Delivery: Traditional Course
Credit Hours: 3
Semester/Year: Fall/2022
Meeting day, time, and location: Tuesday and Thursday, 1:00 PM – 2:20 PM, ENG 240
Prerequisites: N/A

Overview

This course covers the fundamental theory and algorithms for machine learning. Selected topics include: unsupervised learning, cluster analysis, principal component analysis and data reduction, supervised learning, Bayes classifiers, nearest neighbor classifiers, dataset partitioning and performance evaluation metrics, discriminant analysis, regression, neural networks, backpropagation method, and deep learning.

Objectives

Upon completion of this course, the student will be able to:

- Understand the foundational theory and algorithms for machine learning approaches.
- Implement and evaluate machine learning algorithms using tools based on Matlab and Python.

Materials

Required

- Matlab and toolboxes (Statistics and Machine Learning, Deep Learning Toolbox, Image Processing, etc.)
  http://chargerware.uah.edu/home/matlab

- Machine Learning in Python: https://scikit-learn.org/stable/.

References

- Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2006. ISBN: 978-1-4939-3843-8.
- Machine Learning: An Algorithmic Perspective, 2nd Edition, Chapman and Hall, ISBN 9781466583283.

Technology Statement

This course will use UAH's learning management system, Canvas, as well as other technology tools. Students will be expected to have access to a computer with internet capabilities in order to fully participate in this course.

Evaluation and Grading

The following grading scheme will apply in this course:

A = 90%–100%
B = 80%–89%
C = 70%–79%
D = 60%–69%
F = 0%–59%

Assignment Types You'll See in this Class	What to Expect	Percentage
Homework	A significant number of problems require programming using Matlab and/or Python.	50%

Midterm Exam **Oct. 4, 2022** **1:00 pm – 2:20 pm**	The Midterm Exam will be a comprehensive exam of all the material covered in about first half of the course.	25%
Final Exam **Dec. 8, 2022** **11:30 am – 2:00 pm**	The Final Exam will be a comprehensive final and will cover all of the topics and materials in this course.	25%

Homework Submission

Homework assignments will be posted on Canvas. Homework must be electronically submitted to Canvas. It is recommended that all homework should be typeset using a word processor. If your work is in handwriting, you must scan in the pages and convert the images to a single PDF file for submission to Canvas. You might also need to submit accompanying source codes. It is your responsibility to ensure the image quality is good enough in order for any scanned-in work to receive a fair and accurate grading.

Missed Assignments/Make-Ups/Extra Credit

The tests and final exam are very important for the course. There will be NO late exams arranged.

Timely submission of homework is also very important. After homework solutions are posted, NO late homework will be accepted.

If the solutions have not been discussed or posted, late homework submissions can be accepted with penalty within 48 hours after the due date/time.

The penalty is 10% for late submission with less than 24 hours past the due date/time, and 20% for late submission with more than 24 hours but less than 48 hours past the due date/time.

Any work submitted after 48 hours past the due date/time, or submitted after the solutions have been discussed or posted, will NOT be accepted. The work will get a permanent zero.

There will be NO extra credit being offered.

Attendance Policy

Regular class attendance is expected. If absence is necessary for health and safety reasons, you are responsible for staying on track with all course materials and lecture recordings posted on Canvas.

Communication & Instructional Continuity

In this class, the official mode of communication is through Canvas/UAH email. Students can expect a response from the instructor within a 24 -- 48 hour timeframe.

In the event a regular scheduled course is unexpectedly interrupted, course requirements, due dates, and grading policy are subject to change when necessitated by revised course delivery, semester calendar, or other instances. Information about changes in this course can be obtained from the Canvas course webpage or by contacting me. If I do not respond within 24 -- 48 hours, please contact my department at ece.@uah.edu or the college dean at coedean@uah.edu.

If our regular scheduled class meeting is interrupted or the campus should unexpectedly close, students should immediately log onto Canvas and read any course announcements. Students are encouraged to continue the readings and other assignments as outlined on the course syllabus until otherwise advised. Any student who does not could fall behind in the course.

Course Conduct

All students must treat others with civility and respect and conduct themselves in a way that does not unreasonably interfere with the opportunity of other students to learn. All communication between student/instructor and between student/student should be respectful and professional.

Academic Honesty

Your written assignments and examinations must be your own work. Academic misconduct will not be tolerated. Examples of unacceptable behavior include plagiarism/use of prior work/use of Chegg and other online problem-solving sites/etc. To ensure that you are aware of what is considered academic misconduct, you should review carefully the definitions and examples provided in the Student Handbook. If you have questions in this regard, please contact me without delay.

Copyright <David Pan> <2022>

All federal and state copyrights in my lectures and course materials are reserved by me. You are authorized to take notes in class for your own personal use and for no other purpose. You are not authorized to record my lectures or to make any commercial use of them or to provide them to anyone else other than students currently enrolled in this course, without my prior written permission. In addition to legal sanctions for violations of copyright law, students found in violation of these prohibitions may be subject to University disciplinary action under the Code of Student Conduct.

Discussion of Concerns

If you have difficulties or concerns related to this course, your first action should be to discuss them with your instructor. If such a discussion would be uncomfortable for you or fails to resolve your difficulties, you should contact the ECE Department Chairperson, Dr. Thomas Morris, at tommy.morris@uah.edu. If you are still unsatisfied, you should contact Dr. Jennifer English, Associate Dean of the College of Engineering, at jennifer.english@uah.edu.

College/Department Information

COE Laptop requirement:

https://www.uah.edu/images/colleges/engineering/CUE2%20Files/Forms/coelaptoprequirements_2022.pdf.

Course Outline (tentative)

- Introduction to Machine Learning
- Bayes Classifiers
- Nearest Neighbor Classifiers
- Dataset Partitioning and Performance Evaluation Metrics
- Cluster Analysis
- Principal Component Analysis and Data Reduction
- Discriminant Analysis
- Linear and Logistic Regression
- Neural Networks
- Selected topic on Deep Learning

University Information

Disability Statement

The University of Alabama in Huntsville will make reasonable accommodations for students with documented disabilities. If you need support or assistance due to a disability, you may be eligible for academic accommodations. Apply here or contact Disability Support Services (256.824.1997 or Wilson Hall 128) as soon as possible to coordinate accommodations.

Pertinent UAH Policies

- [UAH Student Handbook](#)
- [Academic Misconduct Policy](#)
- [Complete listing of UAH Policies and Procedures](#)

Campus Resources

The University of Alabama in Huntsville offers a range of student services to enhance the experience of students.

- [Academic Support Services](#)—ASAP, Student Success Center, Tutoring, PASS, Academic Support Centers by College
- [Student Support Services](#)—Counseling Center, Disability Support Services, Student Health Services, Office of International Services, Multicultural Affairs, etc.
- [UAlert](#)—Sign up for UAH's emergency notification system to receive urgent messages from the university
- [Registrar's Office](#)—Academic Calendars, Course Registration, Student Records, Commencement
- [M. Louis Salmon Library](#)—Printed and Online Resources, Reference Services, Group Study Rooms, AV Resources, Printing
- [Office of Diversity, Equity, and Inclusion](#)—Anti-racism resources, LGBTQ resources, lactation rooms, name change requests, internet access assistance, Title IX
- [Canvas Support](#)—Call 844-219-5802 to report an issue with Canvas.
- [OIT Help Desk](#)—For technical support, contact the OIT Help Desk (helpdesk@uah.edu; 256.824.3333)

NOTE: When submitting a support ticket include your name, your class, the element/assignment being affected, and a detailed description of the issue. Providing a [screenshot](#) is often very helpful in diagnosing an issue.

Important Dates

[Review the semester dates and deadlines and the academic calendar.](#)

Subject to Change

Every effort is made to follow the guidelines in the syllabus; however, if needed, the syllabus will be amended. You will be notified if changes are made.