CSCI 632 (Fall 2024) Machine Learning

(Cross listed as CSCI 492 section 2)

Course Overview

This course provides an introduction to machine learning. You will use as well as learn the theory behind a broad set of strategies. In this course you will start from the math necessary to understa d machine learning including a review of the relevant parts of linear algebra and vector calculus. We will then learn how to apply

- linear regression and logistic regression;
- unsupervised learning techniques such as k-means clustering;
- decision trees and random forest;
- neural networks, MLP, CNNs; and
- transformers to large language models such as employed with chat and code generation.

Aside: There will be a deep learning course in the Spring which goes into more depth of deep learning models.

Prerequisites

Basic knowledge of statistics and linear algebra; hands-on programming experience in C, C++, Python, Java, or Matlab.

At least one of the following:

- CSCI 112: Computer Science II
- CSCI 251: Programming for Engineering and Sciences
- CSCI 256: Programming in Python
- CSCI 356: Data Structures in Python

Both of the following:

- MATH 219: Linear Algebra
- MATH 375: Statistics (at least concurrent enrollment)

Instructor

David Harrison
Assistant Professor of Computer and Information Science

207 Weir Hall

harrison@cs.olemiss.edu

Office Hours: M 1-2 PM, W 3:30PM-4:30PM or by appointment

Class Source Code Repository

In this class we will use github

```
git@github.com:dosirrah/CSCI632_24F_MachineLearning.git
```

Ground Rules for Interaction/ Engagement

General Netiquette Guidelines for Online Communication

Netiquette is a set of guidelines for communicating properly online. Here are some guidelines for online communication in this course:

- Be sensitive to others' different cultural and linguistic backgrounds, as well as different political and religious beliefs.
- Be respectful of others' views and opinions. Avoid "flaming" (publicly attacking or insulting) others.
- Use good taste when composing your responses. Avoid swearing and profanity. Also consider that sarcasm, humor, and slang terms can be misunderstood or misinterpreted.
- Don't use all capital letters when composing your responses. This is interpreted as "shouting" and is regarded as impolite or aggressive.
- If you want to use an acronym, first write out the full term followed by its acronym in parentheses. For example, this is how you would write To Be Determined (TBD). Then you can use the acronym freely throughout the remainder of your message.
- Use good grammar and spelling, and avoid using text messaging shortcuts.

For Assignments, you will be allowed to discuss solutions with other students in the class, provided that you follow these guidelines:

1. **You may discuss *ideas* with your classmates.** You **cannot** collaborate on writing up the solution, pseudo-code or programming code. That is, you can talk about the problems and ideas for solving them, but you cannot write solutions with anyone else. You are, of course, prohibited from copying or seeing the written solution of another student, and are not allowed to show your work to anyone else.

2. **Accept help with care.** If you work too closely with another student, you might fool yourself into believing that you understand the concepts better than you actually do. Attempt to do as much as you can by yourself. Do not forget that the instructor has office hours and can probably give you hints or ideas to get you started.
3. **Give help with care.** Do not help anyone too much. When you have solved a problem, it is tempting to just tell other students how you solved it. But try to allow the other student to come to the solution on his or her own. Maybe give a hint to help get "over a hump". Remember, helping others too much will hurt them in the end when they cannot work through problems on the exams on their own. So avoid the temptation to do so. If you cannot help without giving away the whole solution, direct the student to see the instructor (who may or may not have a way to "edge" them toward the solution).
4. **You are not obligated to help anyone.** If you feel uncomfortable helping a student for any reason, please direct the student to see the instructor.
5. All work except as described above is covered by the Academic Misconduct Statement.

Required Materials

Textbook

Required, but can use the online version, which is free.

Deep Learning, Ian Goodfellow, Yoshua Bengio and Aaron Courville

https://www.deeplearningbook.org

Tech support

The **IT Helpdesk**, centrally located in Weir Hall, is open Monday through Friday, 8 a.m. to 5 p.m. The helpdesk offers assistance to Ole Miss students and employees with technology-related issues involving software, hardware and networking. It provides support for email, Wi-Fi, Microsoft Office and other campus-wide applications. Come by Weir Hall or call us at 662-915-5222. Email helpdesk@olemiss.edu or visit their website for more information.

Grading

- There will be several homework assignments designed to solve toy problems of sufficiently small scope to execute in a local computation environment.
- There will be one project. You will be able to select one from a small handful of Kaggle projects.

Categories Percentage

20% Homeworks + 20% Project + 30% Midterm + 30% Final = 100%

Grading Scale

A: >= 93%
A-: >= 90% and < 93% B+: >= 87% and < 90% B: >= 83% and < 87% B-: >= 80% and < 83% C+: >= 77% and < 80% C: >= 73% and < 77% C-: >= 70% and < 73% D: >= 60% and < 70% F: < 60%

Attendance Policy

Attendance will be tracked during the period of the Verification of Student Attendance requested by the university.

Late Work Policy

Unless with the consent from the instructor, late assignments will be accepted with a 10% penalty per day excluding weekends and holidays.

University of Mississippi Policies

Disability Access and Inclusion

The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, time limits, difficulty with the acquisition of lecture content, inaccessible web content or the use of non-captioned or non-transcribed video and audio files. Students must also contact Student Disability Services at 662-915-7128 or sds.olemiss.edu so that office can 1) explore if barrier removal is necessary; 2) provide you, if approved, with Instructor Notification forms; 3) facilitate the removal of curricular barriers; and 4) ensure you have equal access to the same opportunities for success that are available to all students.

Copyright Notice

Materials used in connection with this course may be subject to copyright protection under Title 17 of the United States Code. Under certain Fair Use circumstances specified by law, copies may be made for private study, scholarship, or research. Electronic copies should not be shared with unauthorized users. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability as well as disciplinary action under University policies.

IT Appropriate Use Policy

This policy sets forth the privileges of and restrictions on students, faculty, staff, and other users with respect to the computing and telecommunications systems offered by the University of Mississippi (UM). This policy is designed to protect the University community from illegal or damaging actions by individuals, either knowingly or unknowingly. Inappropriate use exposes the University to risks, including virus attacks, compromise of network systems and services, and legal issues. This policy directly addresses copyright issues related to illegal downloads and peer-to-peer file sharing. For Appropriate Use Policy questions, send an email to aup@olemiss.edu.

Academic integrity

The University of Mississippi is dedicated to supporting and sustaining a safe and scholarly community of learning dedicated to nurturing excellence inside and outside of the classroom. Each student has a duty to become familiar with University values and standards reflected in University policies, and each student has a duty to honor University values and standards reflected in University policies. These policies are outlined in the M Book. For a complete listing of policies, please visit the University Policy Directory.

Verification of Student Attendance Policy

The University must abide by federal guidelines to verify the participation of online students. For all course types, including thesis, internships, labs, online courses, etc., the instructor must verify your participation based on some type of participation. This may include submission of an online assignment or other course related contact with the instructor.

Student Identity Policy

Federal regulations, our accrediting agency (SACS) and university policies require that safeguards are used to ensure that the student who receives the academic course credit is actually the person doing the work. You will need to present your student ID before taking proctored exams and your instructor may verify your identity through live or virtual meetings, or by using an identity verification program.

Student Privacy Policy

The University of Mississippi protects the privacy of all students, including online and distance learning students, through adherence to the Family Educational Rights and Privacy Act of 1974 (FERPA) through compliance with other institutional policies and procedures governing the management and security of protected information of faculty, staff, and students, and by outlining the expectations of privacy for the university community as regards to electronic information. Student Privacy Policy