

CMSC 472 - Introduction to Deep Learning

Syllabus

Instructor

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Welcome

This course is an elementary introduction to a machine learning technique called deep learning, as well as its applications to a variety of domains. Along the way, the course also provides an intuitive introduction to machine learning such as simple models, learning paradigms, optimization, overfitting, importance of data, training caveats, etc. The assignments explore key concepts and simple applications, and the project(s) allows an in-depth exploration of a particular application area. By the end of the course, you will have an overview on the deep learning landscape and its applications. You will also have a working knowledge of several types of neural networks, be able to implement and train them, and have a basic understanding of their inner workings.

Textbook

The course should be self contained, but if you need additional reading material, you can consult the following:

- [Deep learning](#), Goodfellow, Bengio and Courville, 2016 (book)
- [Recent Advances in Convolutional Neural Networks](#), Gu et al., 2015 (review paper)

If you need reference/additional readings for statistical learning, you can consult the following:

- [An Introduction to Statistical Learning](#), James, Witten, Hastie, Tibshirani, 7th edition (book)
- [Pattern Recognition and Machine Learning](#), Bishop, 2006 (book)

Topics

This course provides a broad introduction to deep learning and statistical inference. We will attempt to cover the following tentative list of topics:

- **Supervised Learning**
 - Statistical Learning
 - Neural Networks
 - Optimization basics
 - Training Neural Networks

- Training Caveats (Neural Networks and ML models)
- ConvNets & their architecture
- Recurrent Networks
- Transformers
- Vision + Language (models, tasks, training)
- Image and Text Generative Models

Note that this is a tentative list and we may add or remove some topics as it fits.

Prerequisites

Minimum grade of C- in CMSC330 and CMSC351; and 1 course with a minimum grade of C- from (MATH240, MATH461); and permission of CMNS-Computer Science department. We will work extensively with probability, statistics, mathematical functions such as logarithms and differentiation, and linear algebra concepts such as vectors and matrices. You should be comfortable manipulating these concepts. We will use of the Python programming language. It is assumed that you know or will quickly learn how to program in Python. The programming assignments will be oriented toward Unix-like operating systems. While it is possible to complete the course using other operating systems, you will be solely responsible for troubleshooting any issues you encounter. If you are unsure that you have the required prerequisites, consult with the instructor.

Course Discussions

Ask and answer questions, participate in discussions and surveys, contact the instructors, and everything else on Piazza.

Course Requirements and grading

- Assignments
 - Assignments will provide you an opportunity to think about the material presented in lectures. You are allowed and encouraged to work in groups but you must prepare and submit your solutions independently.
 - Assignments should be submitted through Canvas or Gradescope as described in the description. Late assignments are not allowed.
- Exams
 - We will have one midterm and one final exam. Exams will cover material in the previous lectures and will be open notes (but closed book). All notes must be on one sheet of paper (double sided) of size A4 or 8.5×11 in, either printed or handwritten.
- Grading (weightage may change)
 - Assignments 20%
 - Programming project(s) 20%
 - Midterm exam 30% (Thursday, March 12 in lecture)
 - Final exam 30% (Thursday, May 14, 10:30 a.m. - 12:30 p.m. loc: TBA)

Grading Policy

Your final grade in class has TWO requirements:

1. Requirement 1: Overall Course Performance

- A+ (96.6% or above), A (93.3% or above), A- (90% or above)
- B+ (86.6% or above), B (83.3% or above), B- (80% or above)
- C+ (76.6% or above), C (73.3% or above), C- (70% or above)
- D+ (66.6% or above), D (63.3% or above), D- (60% or above)
- F (Below 60%)

2. Requirement 2: Midterm and Final Exam Minimum

- You must score **at least an average of 60%** on these two exams.

How it works:

To earn your grade, you must meet BOTH requirements.

Examples:

- Overall score: 85% + Exams: 70% = Grade B
- Overall score: 78% + Exams: 59% = Grade F
- Overall score: 68% + Exams: 75% = Grade D+

In summary, your overall performance determines your grade level (A/B/C), but you must prove your knowledge on exams (60%+ average score) to earn that grade.

Online Posting of Homework Solutions, projects and exam questions Not Allowed

- Do not post your homework solutions, projects and exams online (e.g., GitHub, PasteBin) where they can be seen by others. Making your solutions accessible to others can lead to academic integrity violations.
- Even if the course is over, do not make these documents available to others.
- Notice we constantly monitor online sources.

Academic Honesty

Note that academic dishonesty includes not only cheating, fabrication, and plagiarism, but also includes helping other students commit acts of academic dishonesty by allowing them to obtain copies of your work. You are allowed to use the Web for reference purposes, but you may not copy straight from any website or any other source. In short, all submitted work must be your own.

Cases of academic dishonesty will be pursued to the fullest extent possible as stipulated by the [Office of Student Conduct](#). Without exception every case of suspected academic dishonesty will be referred to the Office. If the student is found to be responsible of academic dishonesty, the typical sanction results in a special grade "XF", indicating that the course was failed due to academic dishonesty. More serious instances can result in expulsion from the university. If you have any doubt as to whether an act of yours might constitute academic dishonesty, please contact your TA or the course coordinator.

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <https://www.studentconduct.umd.edu/>.

Examples of Academic Integrity Violations

The following are examples of academic integrity violations:

- Hardcoding of results in a project assignment. Hardcoding refers to attempting to make a solution appear as if it works correctly (e.g., printing expected results).
- Using any material available on the internet/web or any other source.
- Hiring any online service to complete an assignment for you.
- **You may not post the implementation of your assignments, materials related to the class (e.g., project description), or any other material associated with this course. Even if the class is over and you have graduated, you may NOT post any material.**
- Sharing your homework solutions with any student.
- Providing ideas/suggestions on how to solve/implement an assignment.
- Using online forums to ask for help regarding our assignments.

AI Tools

The use of AI tools like Chat GPT, Claude, Grok, Llama etc. are permitted in this class, however, you are expected to adhere to the following guidelines to avoid any academic integrity violations:

- Cite any line(s) of code that you use directly from an AI tool.
- Do not use the output of a piece of code directly from an AI tool, you are expected to run the line(s) of code yourself to generate an output and report that.
- You are still expected to explain the output of any code and comment it to explain what the line(s) of code are doing whether written by you or generated by an AI tool.
- Also report whether you are using line(s) of code verbatim from an AI tool or you have modified the code, clearly identifying the modifications.
- Do not post the contents of this class including assignments (prose or code) verbatim into any AI tool or any external website.

Class Announcements

You are responsible for reading the class announcements that are posted on the webpage, ELMS and class Piazza. Please check them often (at least once a day). Important information about the course (e.g., deadlines, assignment updates, etc.) will be posted there.

Excused Absence and Academic Accommodations

1. Any student who needs to be excused for an absence from a single class session , due to a medically necessitated absence shall:
 - **Make a reasonable attempt to inform the instructor of his/her illness prior to the class.** If you are going to miss an in-class assignment then we expect to hear from you (either email or telephone message) before the class session begins.
 - Upon returning to the class, present their instructor with a self-signed note attesting to the date of their illness. The note must contain an acknowledgment by the student that the information provided is true and correct. Providing false information to University officials is prohibited under Part 9(h) of the Code of Student Conduct (V-1.00(B) University of Maryland Code of Student Conduct) and may result in disciplinary action.
 - **This self-documentation may not be used for the Major Scheduled Grading Events as defined below and it may only be used for one class meeting during the semester.**
2. Any student who needs to be excused for more than one absence, or for a “Major Scheduled Grading Event”, must provide written documentation of the illness from the Health Center or from an outside health care provider. This documentation must verify dates of treatment and indicate the timeframe that the student was unable to meet academic responsibilities. The documentation should be given to the instructor, not the TA. **We will not accept a “self-signed” note for “major scheduled grading events”, as defined below. The note must be signed by a health care professional.**

The Major Scheduled Grading Events for this course include:

- Midterm
- Final Exam
- Homeworks / Assignments

It is also the student’s responsibility to inform the instructor of any intended absences from exams for religious observances **in advance**. Notice should be provided as soon as possible but no later than one week prior to the exam.

Accessibility and Disability Support

Any student eligible for and requesting reasonable academic accommodations due to a disability is requested to provide, to the instructor in office hours, a letter of accommodation from the Office of Disability Support Services (DSS) within the first two weeks of the semester.

Course Evaluations

The Department of Computer Science takes the student course evaluations very seriously. Evaluations will usually be open during the last few weeks of the course. Students can go to <https://courseevalum.umd.edu/> to complete their evaluations.

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