

CS 4361: Machine Learning

Syllabus: (Topics)

Non-parametric Models

Decision Trees

Nearest Neighbors

Parametric Models

Perceptron

SVM

Kernel methods to introduce non-linearity

Regression (Linear and Logistic)

Gradient Descent

Neural Networks

Neural Networks for Text

If Time Permits (one among)

CNN

Introduction to Large Language Models

Special Topic

Math Prerequisites:

This is a math-heavy course. You do not need to be a math-wiz, but you need to have an active interest in math. Specifically, you need to know -

(1) logarithms (2) matrix algebra (3) calculus. There are other vector algebra topics that you need to conceptually understand, but they will be covered in class. If you need more help, please consult with the TA/ Instructor.

Coding Prerequisites:

Python coding is a prerequisite. Unfortunately, we will not be able to go over the data processing coding examples in class (pandas, numpy, etc.). If you are unaware, please seek help from the TA or the Instructor.

Course Outcomes: (1) Understanding the core of machine learning algorithms, (2) coding machine learning models, (3) understanding the basic math behind the models, (4) applying machine learning to an area of personal interest

Use of Large language models (ChatGPT) for coding: It is permissible in projects. You can treat it like Google while working on your assignments, but you should always cite it when you use it. It is strictly advised that you do not use it to generate code. If you still happen to use it, submit the screenshot of the prompt you used and the response you received.

Textbooks you may use:

“A Course in Machine Learning” by Hal DauméIII– (ignore the http warning)
<http://ciml.info/>(till **perceptrons and SVMs**)

“Elements of Statistical Learning”: (various topics)
https://web.stanford.edu/~hastie/ElemStatLearn/printings/ESLII_print12.pdf

“Deep Learning”
<https://www.deeplearningbook.org/> (**neural networks onwards**)

Other than this, **class notes** and slides are extremely important. Slides **may not** always contain the desired level of detail of worked-out examples. If you do not understand something, please follow up with the TA or the instructor and **actively take notes** while the examples are worked out in class.

Academic Integrity:

You must submit your original work, properly cite any external sources, and avoid copying or sharing detailed solutions with others. While discussing general ideas with classmates is allowed, each student must complete their assignments independently. Cheating during exams or using unauthorized resources is strictly forbidden. Violations will result in penalties, including failing the assignment or course. If you notice any dishonesty, report it confidentially. By taking this course, you agree to these rules and understand the consequences of breaking them.

Some key rules:

1. Assignments are to be completed ONLY by the person submitting them.
2. ALWAYS cite your sources. If you use ChatGPT (you are advised not to) you are required to submit the prompt and the response along with your assignment. This is mainly to help you.
3. You CANNOT use any external sources during in-class quizzes unless specified.
4. For the first offense of academic misconduct you will be graded 0 on the assignment or the exam. For the subsequent offense, you will be reported and it may result in further disciplinary action.

Grading:

Homeworks: 25%, Project: 25%, Midterm: 20%, Final: 25%, Quizzes and In-class participation: 5%. Up-to 5 points in Extra credits (derived from quizzes).

You are guaranteed an

Grade	Final Cumulative Score
A	90+
B	80-89
C	70-79
D	60-69

Projects:

To be done in groups of 3. If you want to have another member, you need to seek permission from the instructor. You can work on any relevant topic that you want and you are free to use all the resources. You are, however, required to cite the resources you have used.

What happens if a member drops out?: This can unfortunately happen. You will however be graded appropriately and held to a lesser standard.

What happens if 2 members drop out?: You will be given an option. (A) Join another project team that is working on a similar topic. (B) Continue working on the project you chose, but be graded appropriately because only one person is working on it.

What happens if a member is not contributing/responding? You can let the instructor know. I will help you contact the other team member. If the team member is responding but not contributing, that team member will be graded appropriately. You are required to mention in your project report the contributions of each team member.