Extended Syllabus

(2024 Spring)

Course Title	Basic Machine Learning	Course Number	CSE4130-02
Credit	3	Enrollment Eligibility	Junior
Class Time	Tue/Thurs, 09:00-10:15	Classroom	TBA

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Ⅰ. Course Overview

1. Description

We will study basic machine learning techniques such as linear regression, dimensionality reduction, density estimation, and classification. For the comprehensive understanding of such machine learning topics, we will also study basic mathematics including linear algebra, analytic geometry, matrix decomposition, vector calculus, probability distributions, and continuous optimization. This course will help you build a good foundation for studying machine learning related topics such as computer vision and natural language processing.

2. Prerequisites

Minimum: Calculus

Preferred: Calculus, Linear Algebra, Probability, Statistics

3. Course Format (%)

Lecture	Discussion	Experiment/Practicum	Field study	Presentations	Other
100 %	%	%	%	%	%

4. Evaluation (%)

mid-term Exam	Final exam	Quizzes	Presentations	Projects	Assignments	Participation	Other
40 %	40 %	%	%	%	20 %	%	%

Ⅱ. Course Objectives

- Understanding four basic machine learning topics.
- Understanding basic mathematics for comprehensive understanding of machine learning topics.

Ⅲ. Course Format

(* In detail)

Modality:
In-person.

Language:
The lecture will be given in English.

Ⅳ. Course Requirements and Grading Criteria

Midterm : 40%
Final : 40%
Assignments : 20%

This course will have zero tolerance with any cheating activities. All source codes submitted will be copy-checked.

Ⅴ. Course Policies

Attendance and Work: All students should attend class unless discussed with the instructor.

Honor code: Students are encouraged to discuss assignments with other students or professor. However, plagiarism and exam cheating are unacceptable in any academic environment. If your assignment or exam is identified as plagiarism, it will get 0 point.

Ⅵ. Materials and References

Textbook.
Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong. Mathematics for machine learning. Cambridge University Press, 2020.

References.
Kevin P. Murphy, Probabilistic machine learning: an introduction. MIT press, 2022.
Christopher M. Bishop, and Nasser M. Nasrabadi. *Pattern recognition and machine learning*. Springer, 2006.

Ⅶ. Course Schedule (Subject to change)

Week 1	**Learning Objectives**	Understand linear algebra (1)
	Topics	Linear algebra
	Class Work	Lecture

	(Methods)	
	Materials (Required Readings)	PPT
	Assignments	None
Week 2	Learning Objectives	Understand linear algebra (2)
	Topics	Linear algebra
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 3	Learning Objectives	Understand analytic geometry
	Topics	Analytic geometry
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 4	Learning Objectives	Understand matrix decomposition
	Topics	Matrix decompisition
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 5	Learning Objectives	Understand vector calculus
	Topics	Vector Calculus
	Class Work (Methods)	Lecture

	Materials (Required Readings)	PPT
	Assignments	
Week 6	Learning Objectives	Understand probability and distributions (1)
	Topics	Probability and Distributions
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 7	Learning Objectives	Understand probability and distributions (2)
	Topics	Probability and Distributions
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 8	Learning Objectives	Midterm Exam
	Topics	
	Class Work (Methods)	
	Materials (Required Readings)	
	Assignments	
Week 9	Learning Objectives	Understand optimization (1)
	Topics	Optimization
	Class Work (Methods)	Lecture

	Materials (Required Readings)	PPT
	Assignments	
Week 10	Learning Objectives	Understand optimization (2)
	Topics	Optimization
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 11	Learning Objectives	Understand basic concept of machine learning
	Topics	When Models Meet Data
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 12	Learning Objectives	Understand dimensionality reduction
	Topics	Dimensionality Reduction
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 13	Learning Objectives	Understand density estimiation
	Topics	Density Estimation
	Class Work (Methods)	Lecture

	Materials (Required Readings)	PPT
	Assignments	
Week 14	Learning Objectives	Understand classification
	Topics	Classification with Support Vector Machines
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 15	Learning Objectives	Understand machine learning
	Topics	Remaining topics in the textbook
	Class Work (Methods)	Lecture
	Materials (Required Readings)	PPT
	Assignments	
Week 16	Learning Objectives	Final exam
	Topics	
	Class Work (Methods)	
	Materials (Required Readings)	
	Assignments	

Ⅷ. Aid for the Challenged Students

Challenged students are encouraged to make an individual meeting at the beginning of the semester with the instructor to request any help during the course.