The Hong Kong University of Science and Technology

UG Course Syllabus

Principles of Machine Learning

ELEC3350

Credits: 3

Prerequisite(s): (COMP 1021 OR COMP 1023) AND (ELEC 2600 OR MATH 2111 OR MATH 2121 OR MATH 2131)

Exclusion(s): COMP 4211, EMIA 4110, MATH 4432

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Course Description

An introductory course which provides a comprehensive overview of the fundamental concepts and techniques in machine learning, covering supervised learning, unsupervised learning, and reinforcement learning. Students will explore various algorithms and models, such as classification, regression, neural networks, clustering, dimensionality reduction, Markov decision processes, and reinforcement learning. The course emphasizes both theoretical understanding and practical applications, with hands-on programming assignments and a final project. By the end of the course, students will have a solid foundation in machine learning and be equipped with the skills to analyze and solve real-world problems using machine learning techniques.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Differentiate between supervised learning, unsupervised learning, and reinforcement learning, and understand their respective objectives and key characteristics.

2. Apply fundamental modeling techniques and algorithms in machine learning to solve real-world problems.

3. Implement machine learning algorithms using Python/Pytorch.

4. Evaluate the performance of machine learning models using appropriate metrics and validation techniques, and interpret the results to draw meaningful conclusions.

5. Recognize the potential applications of machine learning in various domains and appreciate the ethical considerations and limitations associated with these techniques.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Attendance	15%	04/05/2026
Homework	30%	19/04/2026
Lab	15%	11/05/2026
Exam	20%	27/04/2026
Proposal	20%	14/05/2026

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

[add to/delete table as appropriate]

Assessed Task	Mapped ILOs	Explanation
Homework	ILO1, ILO2, ILO4	This task assesses students' ability to differentiate between various machine learning paradigms (ILO 1), apply fundamental modeling techniques to solve given problems (ILO 2), and evaluate model performance using appropriate metrics (ILO 4).
Lab	ILO3, ILO4	Labs focus on hands-on practice, assessing students' proficiency in implementing machine learning algorithms using Python and PyTorch (ILO 3), and interpreting the experimental results (ILO 4).
Exam	ILO1, ILO2, ILO5	The exam evaluates students' comprehensive understanding of ML concepts (ILO 1), their ability to apply algorithms theoretically (ILO 2), and their awareness of the limitations and ethical considerations of ML techniques (ILO 5).
Proposal	ILO2, ILO5	The project proposal assesses students' capability to identify a real-world problem, propose a suitable ML-based solution (ILO 2), and recognize the potential applications and ethical impacts in a specific domain (ILO 5).

Grading Rubrics

Detailed rubrics for each assignment will be provided. These rubrics clearly outline the criteria used for evaluation. Students can refer to these rubrics to understand how their work will be assessed.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

Generative AI Policy: In this course, you are permitted to use Generative AI tools (e.g., ChatGPT, GitHub Copilot) as learning aids, such as for debugging code, understanding complex concepts, or brainstorming project ideas. However, all submitted work (code, reports, and proposals) must be your own original creation. You may not use AI to generate entire assignments or core algorithmic implementations.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include specific details regarding the grade. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

Late Submission Policy: Generally, resubmission of graded work for a higher score is not allowed. For Homework, Labs, and the Proposal, late submissions will incur a penalty of 10% deduction per day (24 hours) from the total possible score. Submissions delayed by more than 3 days (72 hours) will receive a grade of

zero. Extensions will only be granted under exceptional circumstances (e.g., medical emergencies) with official documentation provided prior to the deadline.

Required Texts and Materials

Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep learning. MIT press, 2016.

Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. MIT press, 2018.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

[Optional] Additional Resources

N/A