[Course Title] Deep Learning

[Course Code] DSAA 2012

[No. of Credits] 3

[Any pre-/co-requisites] DSAA 2011 Machine Learning or AIAA 3111 Introduction to Data Mining

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Course Description

This course provides students with an extensive exposure to deep learning. Topics include shallow and deep neural networks, activation functions and rectified linear unit, construction of deep neural networks and matrix representations including deep convolutional neural networks and deep recursive neural networks, computational issues including backpropagation, automatic differentiation, stochastic gradient descent, complexity analysis, approximation analysis including universality of approximation, design of deep neural network architectures and programming according to various applications.

Intended Learning Outcomes (ILOs)

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

1. Understand the foundation of deep learning: models and optimization.

2. Train deep learning models.

3. Create/design deep learning models with other researchers.

4. Explain/present their results to others.

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:

 [List specific assessed tasks, exams, quizzes, their weightage, and due dates; perhaps, add a summary table as below, to precede the details for each assessment.]

Assessment Task	Contribution to Overall Course grade (%)	Due date
Project	50%	Will be announced in class.
Presentation	30%	Will be announced in class. *
Final Examination	20%	Will be announced in class.

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

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Project	ILO1, ILO2, ILO3, ILO4	This task assesses students' ability to understand and expound on deep learning fundamental concepts (ILO 1), execute training of deep learning models (ILO 2), design deep learning models for real-world problem-solving (ILO 3), and explain/present results (ILO 4).
Presentation	ILO1, ILO4	This task assesses students' ability to understand and expound on deep learning fundamental concepts (ILO 1) and explain/present results (ILO 4).
Examination	ILO1, ILO2, ILO3	This task assesses students' ability to understand and expound on deep learning fundamental concepts (ILO 1), execute training of deep learning models (ILO 2), and design deep learning models for real-world problem-solving (ILO 3).

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.

This course utilizes an absolute grading system as follows.

A: [100,85]; B: (85,70]; C: (70,55]; D: (55,40]; F: (40,0].

Subgrades (e.g., A-, B+, etc.) will be assigned for every 5 points within these ranges.

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

A. In quizzes and exams, calculators will possibly be allowed. On the other hand, use of any other tool (including, but not limited to, AI assistants, internet, mathematical software, etc.) is **strictly prohibited**.

B. In all the other parts of the course, using AI assistants is allowed. The policy for using AI assistants is identical to the policy for using human assistants. Imagine the AI as a human and apply the same norm as you would with a human.

Just like you can come to office hours and ask a human questions (about the lecture material, clarifications about assignments, tips for getting started, etc), you are very welcome to do the same with AI assistants. But, just like you are not allowed to ask an expert friend to do your homework for you, you also should not ask an expert AI.

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, e.g., strengths, areas for improvement]. 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

If a student has an unforeseen, uncontrollable, and unavoidable reason, resubmitting work or reassessment opportunity will be considered. In such a case, the student is expected to contact the instructor immediately, but no later than within five working days, for further details.

Required Texts and Materials

Lecture notes and reference materials will be provided by the instructor.

Optional Textbooks
- Deep Learning. By Ian Goodfellow, Yoshua Bengio, Aaron Courville. Online book, 2017.
- Foundations of Computer Vision. Antonio Torralba, Phillip Isola, and William Freeman. The MIT Press, 2024.
- Dive Into Deep Learning. By Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola. PDF, 2020.

Academic Integrity

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