The Hong Kong University of Science and Technology

UG Course Syllabus

Deep Learning for Decision Analytics

IEDA4000F

3 Credits

Prerequisite: A foundational knowledge of linear algebra, multivariable calculus, and programming with Python is required.

- IEDA 3560: Predictive Analytics

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Office Hours: Monday 12:00-13:00, Rm5559E (Tentative)

Course Description

This course introduces core deep learning techniques for predictive and prescriptive analytics in engineering and business contexts. Students will explore supervised learning with neural network architectures, including feedforward, convolutional, and recurrent neural networks, applied to problems like demand forecasting, resource allocation, and risk assessment. The course emphasizes hands-on experience with TensorFlow and PyTorch, focusing on structured data (numerical and image-based) and theoretical foundations such as optimization and regularization. Practical case studies highlight real-world applications, complementing generative AI techniques covered in other courses.

Intended Learning Outcomes (ILOs)

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

1. Understand the principles and architectures of supervised deep learning models.

2. Apply feedforward, convolutional, and recurrent neural networks to decision analytics problems.

3. Implement and optimize neural networks using TensorFlow and PyTorch.
4. Evaluate model performance and interpret results for structured data applications.
5. Analyze case studies to identify opportunities for deep learning in engineering and business.

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
Homework	40%	As assigned
Midterm	30%	To be announced
Final Project	30%	To be announced

* 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
Homework	ILO1, ILO2, ILO3	Assesses students' understanding and application of deep learning concepts and their ability to implement models.
Midterm	ILO1, ILO2, ILO4	Assesses theoretical understanding of neural network architectures, optimization techniques, and model evaluation.
Final Project	ILO1, ILO2, ILO3, ILO4, ILO 5	Assesses the understanding and ability to use deep learning for real-world decision analytics.

Grading Rubrics

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

Students should follow HKUST guidelines on the responsible use of generative artificial intelligence tools. Any use of AI tools in assessed work must be properly acknowledged and must not replace students' own learning and critical thinking.

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

No resubmission allowed.

Required Texts and Materials

Reference: Introduction to Machine Learning, Third Edition by Ethem Alpaydin. Additional lecture notes and programming materials will be provided.

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.