The Hong Kong University of Science and Technology

Course Syllabus

Generative AI and LLMs for Operations Research

IEDA 4000I

3 Credits

Pre-requisites: Intro level of python COMP1021 or COMP1023.

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Lectures: We&Fr 16:30AM - 17:50AM, LG426

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Tutorials: Tu 18:00PM - 18:50PM, 3207

Teaching Assistant: TBA

Course Description

This course explores how **Generative AI and Large Language Models (LLMs)** are transforming **Operations Research (OR)**. Students will learn both the theoretical foundations of modern LLMs and their practical applications in optimization, simulation, and decision analytics. The course begins with an introduction to transformer architectures, prompting, and API-based integration, followed by hands-on fine-tuning on open models such as DeepSeek and Llama 2. Subsequent modules investigate how LLMs can enhance OR tasks—including recommendation systems, supply chain management, and intelligent scheduling—while the final segment examines how OR methods improve LLM efficiency through scheduling, queueing, and resource allocation. Students will complete coding-based homework, fine-tuning labs, and a group project that integrates OR modeling and AI system design. Guest lectures from industry leaders will bridge academic theory with practical deployment of large-scale AI systems.

Intended Learning Outcomes (ILOs)

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

- Understand transformer architectures and generative AI foundations.
- Apply LLMs to OR-style optimization, recommendation, and supply-chain tasks.
- Fine-tune and serve LLMs efficiently using OR principles (queueing, scheduling, resource allocation).
- Connect theoretical OR constructs to modern AI systems — a rare and powerful linkage.

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:

- There are 3 assignments. Each of them has the same weight.
- There are 4 bi-weekly quizzes. Each of them has the same weight.
- There is a final (group) project. The score is based on the quality of the report and the final presentation.
- Grade percentage: Attendance 15%; Assignment 30%; Quiz 20%; Final project 35%.

Summary Table:

Assessment Task	Contribution to Overall Course grade (%)
Attendance	15%
Assignments	30%
Quiz	20%
Final project & presentation	35%

Required Texts and Materials

No Textbook.

As LLM is a very new topic, there does not exist any well-written textbooks. Therefore, I will share blogs, articles, youtube/Blibli videos for different topics.

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.