

IEDA4000B Decision Making with Machine Learning

Instructor:	Prof. Xiaowei Zhang	Office hour:	By appointment
Email:	xiaoweiz@ust.hk	Office:	5541

Introduction

This course introduces students to the fundamental concepts, techniques, and applications of machine learning algorithms in the context of decision making. Through a combination of theoretical lectures, hands-on programming assignments, and real-world case studies, students will gain a comprehensive understanding of how machine learning can be leveraged to enhance decision-making in various domains. Topics covered include data-driven decision-making, integration of prediction and optimization, and reinforcement learning. Students will develop practical skills in implementing and evaluating machine learning models using popular frameworks and tools. By the end of the course, students will be equipped with the knowledge and skills to apply machine learning techniques to make informed decisions, optimize outcomes, and navigate the challenges associated with machine learning-enabled decision-making processes.

Tentative Topics

1. Transportation problems
2. Digital marketing optimization
3. Portfolio optimization
4. Stochastic optimization: Decision making under uncertainty
5. Stochastic optimization with covariates: The power of contextual information
6. Multi-armed bandit problems: Online decision making
7. Reinforcement learning: Sequential decision making in unknown environments

Programming

We will be using Python for instruction.

Assessment

- Homework assignments: 3 times in total (30%)
 - Missing deadline: 24-hour grace period, but 20% penalty
- Midterm exam (30%)
- Group project: no more than 3 persons per group (40%)

Logistics

- Lectures: Monday and Wednesday 12:00pm–1:20pm, G003, CYT Bldg
- Midterm exam: March 27 (7th week)
- Tutorials: Wednesday (once every two weeks, 6 times in total) 6:00pm–6:50pm, Room 3207 (Lift 21)
 - February 7, 21
 - March 6, 20
 - April 10, 24
- Project presentation: May 6 and 8

Reference Books

Materials are derived from research papers.