Academic Org: Dept of Computer Sci & Engg – Subject: Computer Science

Course: CSCI4250   **Course ID:** 013404   **Eff Date:** 2022-07-01   **Crse Status:** Active   **Apprv. Status:** Approved   【Course Rev】

Online Algorithms for Machine Learning and Optimization 機器學習和優化的在線算法

This course aims to cover topics in online learning and online optimization. Typical topics include multi-armed bandit (MAB) problems in various settings, online convex optimization (OCO) problems such as online linear regression, online classification, and certain general reinforcement learning problems. Different algorithms will be introduced to solve these problems and analysis of the performance and efficiency will be provided.

本科旨在涵蓋在線學習和在線優化中的一些問題。典型的題目包括各類模型下的MAB問題，在線線性回歸等在線凸優化問題，在線分類問題，以及某些一般的增強學習問題。本科會介紹對這些問題的不同的算法，並提供其性能效率的分析。

Grade Descriptor: A

EXCELLENT － exceptionally good performance and far exceeding expectation in all or most of the course learning outcomes; demonstration of superior understanding of the subject matter, the ability to analyze problems and apply extensive knowledge, and skillful use of concepts and materials to derive proper solutions.

有關等級說明的資料，請參閱英文版本。

B

GOOD － good performance in course learning outcomes and exceeding expectation in some of them; demonstration of sufficient understanding of the subject matter and the ability to use proper concepts and materials to solve most of the problems encountered.

有關等級說明的資料，請參閱英文版本。

C

FAIR － adequate performance and meeting expectation in some course learning outcomes; demonstration of adequate understanding most of the subject matter and the ability to solve simple problems.

有關等級說明的資料，請參閱英文版本。

D

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MARGINAL – performance barely meets the expectation in the essential course learning outcomes; demonstration of partial understanding some of the subject matter and the ability to solve simple problems.

有關等級說明的資料，請參閱英文版本。

F

FAILURE – performance does not meet the expectation in the essential course learning outcomes; demonstration of serious deficiencies and the need to retake the course.

有關等級說明的資料，請參閱英文版本。

Equivalent Offering:
Units: 3 (Min) / 3 (Max) / 3 (Acad Progress)
Grading Basis: Graded
Repeat for Credit: N
Multiple Enroll: N
Course Attributes:

Topics:

COURSE OUTCOMES

Learning Outcomes:

At the end of the course of studies, students will have acquired the ability to
1. understand typical problems of online learning and online optimization and to model certain practical problems into them,
2. design effective algorithms to solve the problems in online learning and online optimization
3. analyse performance and efficiency of the algorithms

Course Syllabus:

This course aims to cover topics in online learning and online optimization. Typical topics include multi-armed bandit (MAB) problems in various settings, online convex optimization (OCO) problems such as online linear regression, online classification, and certain general reinforcement learning problems. Different algorithms will be introduced to solve these problems and analysis of the performance and efficiency will be provided.

Assessment Type:

Essay test or exam	：50%
Homework or assignment	：20%

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Project   : 30%

Feedback for Evaluation:

1. Quiz and examinations
2. Course evaluation and questionnaire
3. Question-and-answer sessions during class
4. Student consultation during office hours or online

Required Readings:

nil

Recommended Readings:

1. Online Learning and Online Convex Optimization, Shai Shalev-Shwartz, Foundations and Trends in Machine Learning, Vol. 4, No. 2, pages 107 – 194, 2011.
2. Regret Analysis of Stochastic and Nonstochastic Multi-armed Bandit Problems, Sebastien Bubeck and Nicolo Cesa-Bianchi, Foundations and Trends in Machine Learning, Vol. 5, No. 1, pages 1 – 122, 2012.
3. A Tutorial on Linear Function Approximators for Dynamic Programming and Reinforcement Learning, Alborz Geramifard, Thomas J. Walsh, Stefanie Tellex, Girish Chowdhary, Nicholas Roy, Jonathan P. How, Foundations and Trends in Machine Learning, Vol. 6, No. 4, pages 375 – 451, 2013.
4. Introduction to Online Convex Optimization, Elad Hazan, Foundations and Trends in Optimization, Vol. 2, No. 3-4, pages 157 – 325, 2015

OFFERINGS

1. CSCI4250	Acad Organization=CSD; Acad Career=UG

COMPONENTS

LEC : Size=30; Final Exam=Y; Contact=3
TUT : Size=30; Final Exam=N; Contact=1

ENROLMENT REQUIREMENTS

1. CSCI4250

Enrollment Requirement Group:
Not for students who have taken ESTR4122
Prerequisite: CSCI3160 and CSCI3320

New Enrollment Requirement(s):
Pre-requisite = no change

CAF

eLearning hrs for blended cls   0

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No. of micro-modules   0
Research components (UG)   0%

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