

Academic Org: Div of Computer Science & Engg – Subject: Computer Science

Course: CSCI5150 **Course ID:** 002620 **Eff Date:** 2023-07-01 **Crse Status:** Active **Apprv. Status:** Approved **【Course Rev】**
Machine Learning Algorithms and Applications 機器學習算法與應用

This course introduces a dozen of machine learning algorithms and typical applications in business intelligence, natural language processing, computer vision, and sensor-based data analyses, including four topics that consist of (1) supervised learning algorithms induced by structural risk minimization for classification and regression problems (decision trees, logistic regression, support vector machines, regularized linear regression, kernel machines, etc.), and their applications in sensor-based indoor localization, business intelligence; (2) supervised learning algorithms based on deep learning (CNN, RNN, etc.), and their applications to natural language processing and computer vision; (3) unsupervised learning algorithms for clustering and representation learning (K-means, spectral clustering, autoencoder, etc.); (4) introductions of other learning algorithms and applications, such as transfer learning, recommender systems, sensor-based activity recognition, etc.

本科以四個主題介紹機器學習在商業智能、自然語言處理、計算機視覺和基於傳感器的數據分析中的典型應用，四個主題包括（1）分類和結構風險最小化誘導的監督學習算法和回歸問題（決策樹、邏輯回歸、支持向量機、正則化線性回歸、核機等）及其在基於傳感器的室內定位、商業智能中的應用；（2）基於深度學習（CNN、RNN等）的監督學習算法，及其在自然語言處理和計算機視覺中的應用；（3）用於聚類和表示學習的非監督學習算法（K-means、譜聚類、自動編碼器等）；（4）其他學習算法和應用的介紹，如遷移學習、推薦系統、基於傳感器的活動識別等。

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 all course learning outcomes and exceeding expectation in some of them; demonstration of good 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 all course learning outcomes; demonstration of adequate understanding 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

MARGINAL – performance barely meets the expectation in the essential course learning outcomes; demonstration of partial understanding 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: MSc Computer Science
MPhil-PhD Computer Sci & Erg

Topics:

COURSE OUTCOMES

Learning Outcomes:

At the end of the course of studies, students will be able to:

1. Apply appropriate machine learning algorithms to solve specific real-world applications.
2. Revise or design new machine learning algorithms based on specific requirements.

Course Syllabus:

Week 1: Introduction of machine learning and supervised learning algorithms induced by structural risk minimization I
Week 2: Introduction of machine learning and supervised learning algorithms induced by structural risk minimization II
Week 3: Introduction of machine learning and supervised learning algorithms induced by structural risk minimization III
Week 4: Introduction of machine learning and supervised learning algorithms induced by structural risk minimization IV
Week 5: Supervised learning algorithms based on deep learning I

Week 6: Supervised learning algorithms based on deep learning II
Week 7: Supervised learning algorithms based on deep learning III
Week 8: Supervised learning algorithms based on deep learning IV
Week 9: Unsupervised learning algorithms I
Week 10: Unsupervised learning algorithms II
Week 11: Unsupervised learning algorithms III
Week 12: Other topics I
Week 13: Other topics II

Assessment Type:

Homework or assignment	: 40%
Presentation	: 10%
Project	: 50%

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:

To be provided by course teacher.

Recommended Readings:

1. Introduction to Machine Learning (2nd Ed.), by Ethem Alpaydin, The MIT Press, 2010.
2. Introduction to Data Mining, by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Addison Wesley, 2005.
3. Deep Learning, by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, The MIT Press, 2016. <https://www.deeplearningbook.org/>
4. Learning with Kernel, by Bernhard Scholkopf and Alex Smola, The MIT Press, 2002.

OFFERINGS

1. CSCI5150 Acad Organization=CSEGV; Acad Career=RPG

COMPONENTS

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

ENROLMENT REQUIREMENTS

1. CSCI5150 **Enrollment Requirement Group:**

For students in MSc Computer Science; or
For students in MPhil-PhD Computer Science & Engineering; or
For students in UG Computer Science; or
For students in UG Computer Engineering;
Exclusion: FTEC5580

New Enrollment Requirement(s):
Exclusion = FTEC5580

CAF

< E N D O F R E P O R T >