108 學年度 第 1 學期 機器學習之訊號處理應用(英文授課) Machine Learning for Signal Processing 課程綱要

課程名稱： （中文）機器學習之訊號處理應用(英文授課) （英文）Machine Learning for Signal Processing				開課單位：	資科工碩
				永久課號：	IOC5207
授課教師： 黃敬群					
學分數：	3.00	必 / 選修：	選修	開課年級：	*
先修科目或先備能力： Signals and systems, Linear algebra, Probability, Programming skills					
課程概述與目標： In this course, we would discuss the connection between signal processing and machine learning. Specifically, we would focus on applying machine learning methods for signal processing. Note that signals can be many kinds, such as wireless signals, sensor signals, images, videos, speeches. The major tasks of signal processing are to discuss the ways for extracting useful/meaningful information from signals for practical engineering problems. There are two main aspects of processing. One is the signal representation, modeling, and characterization; the other is signal categorization, estimation, and prediction. Specifically, we would discuss the learning algorithms for these signal processing aspects upon data. Students will learn contemporary techniques for processing signals, enhancing signals, classifying signals, and learning from signals. The topics include (statistic, data-driven) representation, signal detection classification and prediction, and signal modeling. With time, we may illustrate some advanced applications related to compressed sensing and deep learning at the end of the course. After this course, you should be able to (1) Recognize and identify the technical terms of the taught learning algorithms for signal processing. (2) Explain the fundamental concept and function of these learning algorithms. (3) Apply these learning algorithms to solve the provided exercise sets. (4) Design a system to solve/provide a practical signal-processing issue/service based on some learning algorithms.					

教科書（請註明書名、作者、出版社、出版年等資訊）：	1. “Machine Learning: A Probabilistic Perspective”, Kevin P. Murphy, MIT Press, 2012/08/24 2. “The Elements of Statistical Learning: Data Mining, Inference, and Prediction”, Trevor Hastie, Robert Tibshirani, and Jerome Friedman, Springer, 2008 3. "Machine Learning for Signal Processing Data Science, Algorithms, and Computational Statistics", Max A. Little, Oxford University Press, 2019

課程大綱		分配時數				備註
單元主題	內容綱要	講授	示範	習作	其他	

教學要點概述：

1.學期作業、考試、評量

(1)Homework 40%, Midterm/Proposal 30%, Final Exam/Project/Paper Format Report 30%.

2.教學方法及教學相關配合事項（如助教、網站或圖書及資料庫等）

Course Lectures with programming/paper exercises.

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每週進度表

週次	上課日期	課程進度、內容、主題
1	9/9 9/12	Introduction

2	9/16 9/19	Statistic Signal Presentation
3	9/23 9/26	Time Signal Presentation、Features
4	9/30 10/3	Data-driven representations
5	10/7 10/10	Data-driven representations
6	10/14 10/17	Signal Detection
7	10/21 10/24	Signal Detection
8	10/28 10/31	Signal Regression/Prediction
9	11/4 11/7	Midterm
10	11/11 11/14	Signal Regression/Prediction
11	11/18 11/21	Signal Classification
12	11/25 11/28	Signal Classification
13	12/2 12/5	Signal Modelling
14	12/9 12/12	Signal Separation
15	12/16 12/19	Signal Separation
16	12/23 12/26	Advanced Topics (Compressive Sensing)
17	12/30 1/2 12/30 1/2	Advanced Topics (Deep Learning)
18	1/6 1/9	Final exam

備註：

1.請遵守智慧財產權觀念及勿使用不法影印教科書。

2.其他欄包含參訪、專題演講等活動。