主導課程二：機器學習 Machine Learning

課程基本資料

開設學校：台灣大學

開授教師：林軒田

班級人數：500人 (保留300人給台大，聯盟學校平均每校約10人)

開課級別：研究所(原則准許大三以上同學修習)

授課語言：英語授課

同步遠距上課時間：星期一 13:20~16:20

課程概述

Machine learning allows computational systems to adaptively improve their performance with experience accumulated from the data observed. This course introduces the basics of learning theories, the design and analysis of learning algorithms, and some applications of machine learning.

The course is designed to prepare junior graduate students with a solid background of machine learning and allow them to use machine learning techniques appropriately in their future research or industry projects.

課程內容大綱

Week	Date	syllabus	todo/done
1	2-Sep	course introduction; **topic 1: when can machines learn?** the learning problem	homework 0 announced
2	9-Sep	learning to answer yes/no; types of learning	homework 1 announced
3	16-Sep	feasibility of learning; **topic 2: why can machines**	

		learn? training versus testing	
4	23-Sep	the VC dimension; noise and error	homework 2 announced
5	30-Sep	**topic 3: how can machines learn?** linear regression; logistic regression	
6	7-Oct	linear models for classification; nonlinear transformation	homework 0 due; homework 1 due; homework 2 due; homework 3 announced
7	14-Oct	**topic 4: how can machines learn better?** hazard of overfitting; regularization	
8	21-Oct	validation; three learning principles	homework 3 due; homework 4 announced; final project announced
9	28-Oct	**topic 5: how can machines learn by embedding numerous features?** linear support vector machine; dual support vector machine	
10	4-Nov	kernel support vector machine; soft-margin support vector machine	homework 4 due; homework 5 announced
11	11-Nov	**topic 6: how can machines learn by combining predictive features?** blending and bagging; adaptive boosting	
12	18-Nov	decision tree; random forest; gradient boosted decision tree	homework 5 due; homework 6 announced
13	25-Nov	**topic 7: how can machines learn by distilling hidden**	

		features? neural network; (preliminary) deep learning	
14	2-Dec	modern deep learning	homework 6 due; homework 7 announced
15	9-Dec	**no class as instructor needs to attend ACML 2024 and NeurIPS 2024**; recording: machine learning for modern artificial intelligence	
16	16-Dec	finale	homework 7 due
17	23-Dec	**no class and winter vacation started (really?)**	final project due

參考書目

- Learning from Data, by Yaser Abu-Mostafa, Malik Magdon-Ismail and Hsuan-Tien Lin, Language: English teaching

成績評量方式

- 70% homework
- 30% project (tentative)