



課 綱 Course Outline
資訊工程學系資工組

中文課程名稱 Course Name in Chinese	前瞻機器學習原理與技術				
英文課程名稱 Course Name in English	Advanced Machine Learning Principles and Technology				
科目代碼 Course Code	CSIE62170	班 別 Degree	學士班 Bachelor' s		
修別 Type	學程 Program	學分數 Credit(s)	3.0	時 數 Hour(s)	3.0
先修課程 Prerequisite					
課程目標 Course Objectives					
1. 本課程將為學生提供當代用於感知、生成、推理的機器學習方法背後的想法和直覺，以及這些方法底下的理論。 The course will give the students the ideas and intuition behind contemporary machine learning methods for perception, generation, and inference tasks as well as the underlying theory of these methods.					
2. 課程還將討論機器學習的新近研究，例如自我監督學習、注意力機制、對抗學習等 The course will also discuss cutting-edge research in machine learning, such as self-supervised learning, attention mechanism, adversarial learning and so on.					
系教育目標 Dept.' s Education Objectives					
1	具備學科知識、養成專業技能 Acquire academic knowledge, develop professional skills				
2	學習創新思考，分析解決問題 Inspire innovative thinking, increase analytical problem solving ability				
3	培養團隊精神，學習溝通合作 Promote teamwork spirit, encourage coordination and cooperation				
4	提昇專業倫理、承擔社會責任 Sublimate professional ethics, engage social responsibility				
5	涵育人文素養、開拓國際視野 Cultivate humanities, broaden global perspectives				
系專業能力 Basic Learning Outcomes				課程目標與系專業能力相關性 Correlation between Course Objectives and Dept.' s Education Objectives	

A	資訊專業終身學習能力 Ability of lifetime learning in information profession	○
B	實驗驗證資訊科學能力 Ability of validate experimental result validation in information science field	●
C	資訊工具整合運用能力 Ability of integrated applications of information technology	●
D	資訊系統應用設計開發能力 Ability of information application system design and development	●
E	團隊合作溝通協調能力 Ability of teamwork, communication, and coordination	○
F	資通訊科技問題解決能力 Ability of problem solving regarding information and communication technology	○
G	瞭解資訊科技多元影響能力 Ability to understand information technology' s multiple influences	
H	肩負資訊人社會責任能力 Ability of bearing the social responsibilities being among information professionals	

圖示說明Illustration：● 高度相關 Highly correlated ○ 中度相關 Moderately correlated

課程大綱 Course Outline

1. 課程介紹 Course introduction
2. 深度學習的數學基礎 Mathematical foundations for Machine Learning
3. 數值計算 Numerical Computation
4. 機器學習概念 Machine Learning Concepts
5. 表示學習 Representation Learning
6. 深度網路架構與訓練 Deep Network Architecture and Training
7. 深度學習的正則化 Regularization for Deep Learning
8. 深度學習的最佳化 Optimization for Training Deep Models
9. 典型神經網路模型 Typical Neural Network Models
10. 注意力架構 Attention Mechanisms
11. 對抗學習 Adversarial Learning
12. 自我監督學習 Self-supervised Learning
13. 擴散模型 Diffusion Models
14. 量子機器學習 Quantum Machine Learning

資源需求評估（師資專長之聘任、儀器設備的配合．．．等）
Resources Required (e.g. qualifications and expertise, instrument and equipment, etc.)

師資以具備 機器與 深度學習教與研究經驗為佳。 Teachers with deep learning teaching and research experience are preferred.

課程要求和教學方式之建議 Course Requirements and Suggested Teaching Methods

學生最好有 Python 程式經驗。 課程以面授為主程式經驗。 Students preferably have experience with Python programming. Courses are taught face-to-face.

其他 Miscellaneous