

110學年度第2學期 課程教學大綱

中文名稱	數據科學實務	課號	MATH604
英文名稱	DATA SCIENCE CAPSTONE PROJECT		
課程類別	講授類	必選修	選修
授課教師	鍾思齊	系所	應用數學系碩士班
		學分	3

因應嚴重特殊傳染性肺炎(武漢肺炎)，倘若後續需實施遠距授課，授課方式調整如下：

- 同步遠距【透過網路直播技術，同時進行線上教學，得採Microsoft Teams、Adobe connect等軟體進行】
- 同步遠距含錄影【透過網路直播技術，同時進行線上教學並同時錄影，課程內容可擇日再重播，得採Microsoft Teams、Adobe connect等軟體進行】
- 非同步遠距【課堂錄影或錄製數位教材放置網路供學生可非同時進行線上學習，得採EverCam、PPT簡報錄影、錄音方式進行】

★遠距教學軟體操作說明連結

因應嚴重特殊傳染性肺炎(武漢肺炎)，倘若後續需實施遠距授課，評分方式調整如下：Since COVID-19, if distance learning is necessary, the evaluation would adjust as follows:

- 1.Homework : 20%
- 2.Midterm Project : 40%
- 3.Final Project : 40%

課程大綱 Course syllabus

1. Data science pipeline
2. Neural networks and hyperparameter tuning
3. Data wrangling and SQL
4. Data cleaning and feature engineering
5. Gradient boosting and ensemble learning
6. Model serving

課程目標 Objectives

This Data Science Capstone aims to focus on the practical aspect of data science in the real world. In the capstone, students will learn to engage on a real-world project requiring them to apply skills from the entire data science pipeline: preparing, organizing, and transforming data, constructing a model, and evaluating results. Moreover, advanced modeling methods, including neural networks and gradient boosting, will also be covered.

授課方式 Teaching methods

- Lecture.
- (1) All class assignments and project will be in Python (we provide some tutorials for those who aren't as familiar with Python)
 - (2) You should know the basics of statistics and modeling
 - (3) Be sure to wear the mask in the class and follow the guidance of the school
 - (4) We will have a Facebook group for discussion. Please checkout in <https://cu.nsysu.edu.tw/mooc/index.php>

評分方式〔評分標準及比例〕Evaluation (Criteria and ratio)

- 1.Homework : 20%
- 2.Midterm Project : 40%
- 3.Final Project : 40%

參考書/教科書/閱讀文獻 Reference book/ textbook/ documents〔請遵守智慧財產權觀念，不可非法影印〕

序號	作者	書名	出版社	出版年	出版地	ISBN#
No.	Author	Title	Publisher	Year of publish	Publisher place	ISBN#
1	Aurélien Géron	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems. Second Edition	O'Reilly	2019		978-1492032649
2	Gareth	An Introduction to Statistical	Springer	2021		978-1071614174

James, Daniela Witten, Trevor Hastie and Robert Tibshirani
Learning with Applications in R. Second Edition
The Elements of Statistical Learning, Data Mining, Inference, and Prediction. Second Edition.

每週課程內容及預計進度 Weekly scheduled progress

週次	日期	授課內容及主題
Week	Date	Content and topic
1	2022/02/13~2022/02/19	The data science landscape
2	2022/02/20~2022/02/26	Neural network and its training
3	2022/02/27~2022/03/05	Convolutional neural networks
4	2022/03/06~2022/03/12	Recurrent neural networks
5	2022/03/13~2022/03/19	Finetuning and transfer learning
6	2022/03/20~2022/03/26	Hyperparameter search and meta-learning
7	2022/03/27~2022/04/02	Representation learning
8	2022/04/03~2022/04/09	Spring break
9	2022/04/10~2022/04/16	Midterm project
10	2022/04/17~2022/04/23	Framing the problem and constructing the dataset
11	2022/04/24~2022/04/30	Data cleaning and feature engineering
12	2022/05/01~2022/05/07	Data wrangling and relational database
13	2022/05/08~2022/05/14	Dimensional reduction and clustering
14	2022/05/15~2022/05/21	Gradient boosting and ensemble learning
15	2022/05/22~2022/05/28	Explainable AI
16	2022/05/29~2022/06/04	Model serving
17	2022/06/05~2022/06/11	Final project
18	2022/06/12~2022/06/18	Final project

課業討論時間 Office hours

時段1 Time period 1:
時間 Time : 星期一16:10~18:10
地點 Office/Laboratory : SC2002-4
時段2 Time period 2 :
時間 Time : 星期三16:10~18:10
地點 Office/Laboratory : SC2002-4

本課程欲培養之系所學生專業能力/全校學生基本素養與核心能力

系所學生專業能力/全校學生基本素養與核心能力 basic disciplines and core capabilities of the department and the university	課堂活動與評量方式 Class activities and evaluation										
	本課程欲培養之能力與素養 This course enables students to achieve.	紙筆考試或測驗 Test.	課堂討論(含個案討論) Group discussion (case analysis).	個人書面報告、作業、作品、實驗 Individual paper report/ assignment/ work or experiment.	群組書面報告、作業、作品、實驗 Group paper report/ assignment/ work or experiment.	個人口頭報告 Individual oral presentation.	群組口頭報告 Group oral presentation.	課程規劃之校外參訪及實習 Off-campus visit and intership.	證照/檢定 License.	參與課程規劃之校內外活動及競賽 Participate in off-campus/on-campus activities and competitions.	課外閱讀 Outside reading.
1.各組專業領域(統計、科學計算或數學)之完整知識。1. Professional knowledge in the major fields (statistics, scientific computing, mathematics).	√		√		√		√				
2.有從事研究	√		√		√		√				

※系所學生專業能力 Basic disciplines and core capabilities of the department

1.各組專業領域(統計、科學計算或數學)之完整知識。1. Professional knowledge in the major fields (statistics, scientific computing, mathematics).	√		√		√		√				
2.有從事研究	√		√		√		√				

工作之經驗。 2. Experience in doing research work.											
3.撰寫專題報告之能力。 3. Ability in writing special topics reports.	V		V			V			V		
4.公開演講之能力。 4. The ability of public speaking.	V		V			V			V		

※全校學生基本素養與核心能力 Basic disciplines and core capabilities of the university

1.表達與溝通能力。 1. Articulation and communication skills	V		V			V			V		
2.探究與批判思考能力。 2. Inquisitive and critical thinking abilities	V		V			V			V		
3.終身學習能力。 3. Lifelong learning	V		V			V			V		
4.倫理與社會責任。 4. Ethnics and social responsibility											
5.美感品味。 5. Aesthetic appreciation											
6.創造力。 6. Creativity											
7.全球視野。 7. Global perspective											
8.合作與領導能力。 8. Team work and leadership											
9.山海胸襟與自然情懷。 9. Broad-mindedness and the embrace of nature											

本課程與SDGs相關項目

- SDG1-消除貧窮(No Poverty)
- SDG2-消除飢餓 (Zero Hunger)
- SDG3-良好健康與福祉(Good Health and Well-being)
- SDG4-教育品質(Quality Education)
- SDG5-性別平等(Gender Equality)
- SDG6-乾淨水源與公共衛生(Clean Water and Sanitation)

- SDG7-可負擔乾淨能源(Affordable and Clean Energy)
- SDG8-優質工作與經濟成長(Decent Work and Economic Growth)
- SDG9-工業、創新和基礎建設(Industry,Innovation and Infrastructure)
- SDG10-減少不平等(Reduced Inequalities)
- SDG11-永續城市(Sustainable Cities and Communities)
- SDG12-責任消費與生產(Responsible Consumption and Production)
- SDG13-氣候行動(Climate Action)
- SDG14-海洋生態(Life Below Water)
- SDG15-陸域生態(Life on Land)
- SDG16-和平、正義和穩健的制度(Peace,Justice And Strong Institutions)
- SDG17-促進目標實現的全球夥伴關係(Partnership for the Goals)
- 本課程和SDGS無關

本課程校外實習資訊:

This course is relevant to internship:

- 本課程包含校外實習（本選項僅供統計使用，無校外實習者，得免勾記）
The course includes internship.(For statistical use only. If the course without internship, please ignore this item.)

實習定義：規劃具有學分或時數之必修或選修課程，且安排學生進行實務與理論課程實習，於實習終了取得考核證明繳回學校後，始得獲得學分；或滿足畢業條件者。（一般校內實習請勿勾選此欄位）

Internship: The required or elective courses should include credits and learning hours. Students should participate in the corporative company or institution to practice and learn the real skills. An internship certification must be handed in at the end of internship to get the credits or to fulfil the graduation requirements.

回課程列表