國立中山大學 112學年度第1學期 課程教學大綱

National Sun Yat-sen University 112Academic year1st Semester Course syllabus

中文名稱 Course name(Chinese)	統計學習與資料探勘			課號 Course Code	MATH524
英文名稱 Course name(English)	STATISTICAL LEARNING AND DATA MINING				
課程類別 Type of the course	講授類	必選修 Required/Selected	選修	系所 Dept./faculty	應用數學系碩士班
授課教師 Instructor	鍾思齊			學分 Credit	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】
☐ 實作類課程，經評估無法採遠距課程教學，後續復課後密集補課

★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：

1.Homework：35%
2.Midterm exam：35%
3.Final project：30%

課程大綱 Course syllabus

1. Introduction and exploratory data analysis
2. Statistical Learning
3. Linear Regression
4. Classification
5. Resampling Methods
6. Linear Model Selection and Regularization
7. Moving Beyond Linearity
8. Tree-Based Methods
9. Support Vector Machines
10. Unsupervised Learning

課程目標 Objectives

Statistical learning is about using tools to understand complex datasets. It is a new area that combines statistics and computer science, including machine learning. In this course, we will learn how to use statistics and machine learning to draw conclusions from data. We will explore methods like exploratory data analysis, regression, classification, regression trees, boosting, support vector machines, clustering, and dimension reduction. In addition, we will focus on the basic ideas and intuitions behind each method and apply them to synthetic and real datasets.

授課方式 Teaching methods

課堂講授：
投影片為主，板書為輔。
修課注意事項:
(1)成績計算可能會因課程進度做調整, 如有更改將於課堂上公佈。
(2)本課程作業及考試實作部分將要求以Python做實現。
(3)本課程有建立臉書社團，請登入網路大學 https://cu.nsysu.edu.tw/mooc/index.php 查看網址。
(4)課程網站網址 https://phonchi.github.io/nsysu-math524/

評分方式〔評分標準及比例〕Evaluation (Criteria and ratio)等第制單科成績對照表 letter grading reference

1.Homework：35%
2.Midterm exam：35%
3.Final project：30%

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。教師所提供之教材供學生本人自修學習使用,不得散播及做為商業用途〕
No copies for intellectual property rights. Textbooks provided by the instructor used only for self-study, can not broadcast or commercial use

序號 No.	作者 Auther	書名 Title	出版社 Publisher	出版年 Year of publish	出版地 Publisher place	ISBN# ISBN#
1	Gareth James, Daniela Witten,	An Introduction to Statistical Learning with Applications in Python.	Springer	2023		978-3031387463

	Trevor Hastie and Robert Tibshirani			
2	Trevor Hastie, Robert Tibshirani and Jerome Friedman	The Elements of Statistical Learning, Data Mining, Inference, and Prediction. Second Edition.	Springer	2009	978-0387848570
3	Peter Bruce, Andrew Bruce and Peter Gedeck	Practical Statistics for Data Scientists 50+ Essential Concepts Using R and Python Second Edition.	O'Reilly	2020	978-1492072942

每週課程內容及預計進度 Weekly scheduled progress

週次 Week	日期 Date	授課內容及主題 Content and topic
1	2023/09/03~2023/09/09	Introduction and exploratory data analysis
2	2023/09/10~2023/09/16	Statistical Learning
3	2023/09/17~2023/09/23	Regression
4	2023/09/24~2023/09/30	Classification
5	2023/10/01~2023/10/07	Resampling Methods
6	2023/10/08~2023/10/14	國慶日放假
7	2023/10/15~2023/10/21	Linear Model Selection and Regularization
8	2023/10/22~2023/10/28	Linear Model Selection and Regularization
9	2023/10/29~2023/11/04	期中考
10	2023/11/05~2023/11/11	Moving Beyond Linearity
11	2023/11/12~2023/11/18	Tree-Based Methods
12	2023/11/19~2023/11/25	Tree-Based Methods
13	2023/11/26~2023/12/02	Support Vector Machines
14	2023/12/03~2023/12/09	Unsupervised Learning
15	2023/12/10~2023/12/16	Unsupervised Learning
16	2023/12/17~2023/12/23	期末專題
17	2023/12/24~2023/12/30	期末專題
18	2023/12/31~2024/01/06	元旦放假

課業討論時間 Office hours

時段1 Time period 1:
時間 Time：星期一16:00~18:00
地點 Office/Laboratory：理2002-4
時段2 Time period 2：
時間 Time：星期三16:00~18:00
地點 Office/Laboratory：理2002-4

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 dcpartment and the university

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 Indivisual 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 Indivisual 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.
※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).	V	V		V	V		V				
2.有從事研究工作之經驗。 2. Experience in doing research work.											

能力											
3.撰寫專題報告之能力。 3. Ability in writing special topics reports.	V	V		V	V		V				
4.公開演講之能力。 4. The ability of public speaking.	V	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

能力											
1.表達與溝通能力。 1. Articulation and communication skills	V			V			V				
2.探究與批判思考能力。 2. Inquisitive and critical thinking abilities	V	V		V							
3.終身學習能力。 3. Lifelong learning	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	V			V			V				
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：The course relates to SDGs items:

- [ ] 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.

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