國立清華大學課程大綱

科號 Course Number			學分 Credit		人數限制 Class Size	
中文名稱 Course Title	運動大數據分析: 理論與實務					
英文名稱 Course English Title	Big data analytics in sports: theory and practice					
任課教師 Instructor	姚在府 (Zai-Fu Yao)					
上課時間 Time			上課教室 Room			

課程簡述(必填) (最多 500 個中文字) 本欄位資料會上傳教育部課程網
Brief Course Description (required) (50-200 words if possible, up to 1000 letters

本課程以實例討論應用預測實際運動賽場表現,綜合導覽現今國際研究文獻進行案例探培養大數據與運動分析管理人才，讓巨量運動資訊經過學術研究與資料分析加值，發展具應用性與實務性之資訊，並用於實際運動賽場上表現及分析。

This course is designed to apply case-studies and data taken from real sport and exercise settings to predict real-world athletic performance. Every week includes a range of features designed to help the student grasp the underlying concepts and relate each statistical procedure to their own research project, including definitions of key terms, practical exercises, worked examples and clear summaries. The goal of the sports analytics is to identify patterns from the data – to inform and optimize player and to predict future outcomes in athletic performance. Students will be provided with the theoretical concepts, tools, and methods of statistics as well as the opportunity to work through example problems.

請輸入課程內容「中文暨英文關鍵字」至少 5 個, 每個關鍵字至多 20 個中文, 以半形逗點分隔 (必填)
Please fill in at least 5 course keywords (up to 40 letters for each keyword) and use commas to separate them.(required)

中文關鍵字: 運動，數據分析，人工智慧，競技表現，預測

課程大綱 Detailed Course Syllabus

● 課程說明(Course Description)

當前而言,隨著科技的進步,業界和學界對於運動行為及運動員間的互動和競技表現之間的關聯越來越有興趣。尤其是電腦的發明、計算能力的演進及演算法的開發,促進運動與體育產業的蓬勃發展,提升兼具觀賞性及客觀性的評斷。對於職業隊伍的持有者而言,依靠數據來監控和提高運動員的場上績效,例如使用動作追蹤系統來增加他們對於賽事的判斷力。因此,從動態的競技運動表現中擷取深厚的數據成為重大國際體育賽的關鍵,從球評到觀眾,再到選材都是不可或缺的一環。其中最重要的關鍵是,使用智慧科技提取不同競技運動種類的成功表現的特徵。鑑於此,人工智慧 (AI) 演算方法的使用成為主流,人工智慧的本質是深厚的大數據所驅動的。基於以上觀點,本課程主要以介紹以數據為依據的決策過程,運動數據不同於其他專業領域,多數的數據都是公開透明且容易取得。因此,運動大數據分析成為許多數據科學家和分析專業人員的一個很好的切入點。

Practitioners rely on digital data to monitor and enhance performance. Officials use tracking systems to augment their judgment. Audiences use collective shared data purported to expand the places where sports can be watched and experienced. Extracting big data from the dynamics of sports performance is becoming a regular procedure in significant sports events. Currently, a fundamental challenge for sports practitioners and scientists is understanding the dynamic patterns of behavior and interaction among athletes that characterize successful performance in different sports. For this, using artificial intelligence (AI) methodologies is becoming increasingly popular. AI research has created and developed hardware and software systems that record, classify, analyze, and interpret large amounts of data. However, one risk of AI research is to be data-driven. This course argues that data-informed decision-making is needed to engage learners, coaches, and performers instead of data-driven approaches. Unlike medicine which requires significant subject-matter expertise, or business, where the data is proprietary in most cases, sports knowledge is relatively accessible, and the data and outcomes are public. As a result, sports analytics is a great entry point for many aspiring data scientists and analytics professionals. For the novice, this course demonstrates the many facets and uses of numerous techniques applicable outside of sports. It should have more than enough topics and examples to aid learning for general practice.

● 指定用書(Text Books)

● 參考書籍(References)

1. [書名 Title: Artificial Intelligence in Sport Performance Analysis; 作者 Author: Duarte Araújo, Micael S Couceiro, Ludovic Seifert, Hugo Sarmento, Keith Davids; 出版社 Publisher: Routledge; 年份 Year: 2021]

2. [書名 Title: Essentials of Performance Analysis in Sport 3th; 作者 Author: Mike Hughes, Ian M Franks, Mike Hughes, Ian M. Franks, Henriette Dancs, Mike Hughes, Ian M Franks, Mike Hughes, Ian M. Franks, Henriette Dancs; 出版社 Publisher: Routledge; 年份 Year: 2019]

3. [書名 Title: Sports Analytics in Practice with R; 作者 Author: Ted Kwartler; 出版社 Publisher: Wiley; 年份 Year: 2022]

● 教學方式(Teaching Method)

In this course, the student will study a scholarly paper every week on a designated topic with reading reflection or short answer questions to evaluate the understanding of the content. Instructors would deliver knowledge to students through lectures and direct instruction. There would be a final project for students to perform hands-on analysis on chosen topics.

● 教學進度(Syllabus)

週次 (Week)	課程大綱(Syllabus)	週次 (Week)	課程大綱(Syllabus)
1	導論 General Introduction	10	大數據和人工智慧用於分析和支持運動員和團隊的表現How Is Artificial Intelligence Being Used in the Sport Sciences to Analyze and Support Performance of Athletes and Teams?
2	分析和數據簡介: 情蒐 An introduction to analytics and data	11	運動表現的計算標誌 Computational Metrics to Inspect the Athletic Performance
3	數據遊戲：分析提高運動表現的方式 The data game: Analyzing ways to better sport performance	12	機器學習及運動模式辨認 Artificial Intelligence for Pattern Recognition in Sports: Classifying Actions and Performance Signatures
4	數據會說話: 不同運動科學領域的應用	13	從分類到預測 From Classification to Prediction

	Are the numbers telling the truth?		
5	表現分析的議題 Current Issues of Performance Analysis	14	運動數據分析的發展趨勢 Trends and development in Sports analytics
6	生物力學分析的應用 Application of Biomechanical Analysis in Sports	15	R運動數據分析I Sports Analytics in Practice with R I
7	選材 Profiling in Sport	16	R運動數據分析II Sports Analytics in Practice with R II
8	職涯軌跡分析 Careers in Performance Analysis	17	R運動數據分析III Sports Analytics in Practice with R III
9	運動表現中的大數據和人工智慧 Big Data and Artificial Intelligence in Sport Performance Preparation	18	Final project 期末報告

● 成績考核(Evaluation)

1. 課堂表現(attendance and performance)30%: 學生課堂出席及互動、邏輯思辯能力。每周課堂間進行指定閱讀反思作業(或簡答題)線上繳交。Interaction during class and constructive criticism in the way of logic. Reading reflections (short answer questions) are submitted online during each class and after completing a reading assignment.

2. 口頭報告(oral presentation)30%: 學生就相關文獻掌握程度、報告流暢度、結構嚴謹度及組織性進行綜合評量。Criteria include Structure, organization, fluency, and coherence of presentation.

3. 期末作業(final project)40%: 實際運動數據分析案例報告 A case study report with hands-on data analytics in real-world examples and data throughout.

* All assignments will be evaluated on the basis of content (completeness, correctness, depth, substance, relevance, logical conclusions, creativity, etc.) and format (in accordance with the assignment guidelines, including grammar, punctuation, and spelling).

● 可連結之網頁位址 相關網頁(Personal Website): N/A