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NYCU CCS MAGAZINE

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繼往開來　不斷超越

回顧過去一年，全球疫情依舊嚴峻，面對與病毒共存的新課題，數位化轉型成為社會新常態與挑戰。位於資通訊產業前沿之資訊學院，本院責無旁貸，教學要與時俱進，培育國家產業需要的全球人才；研發要前瞻、基礎要扎根，支持台灣推動下一世代的科技創新與經濟發展。感謝全院師生群策群力，在各方面締造斐然佳績。

本院長期重視產學創新精神，令人振奮的，去年度本校有 18 個團隊獲「2021 年未來科技獎」，獲獎居全國之冠，本院師生參與其中有 6 個研究團，亦為全校之冠。本期收錄得獎技術，包括易志偉教授研究團隊創造新世代的練球方式「教練盒子」，透過動作分析的數據與影像，帶來智慧運動創新。洪瑞鴻教授團隊首創支援完整次世代定序識別基因變體之系統，技術運用廣泛可謂基因工程發展之重要里程碑。吳毅成教授團隊的深度強化式學習技術應用於自駕模型賽車技術，是深度強化式學習具體應用的實踐與突破。

本院師生傑出的獲獎表現亦是本期焦點。恭喜吳毅成教授與「智能點雲技術」研究團隊榮獲 2021 年全球百大科技研發獎，肯定吳教授前期投入前　性研究。而謝續平教授獲選為國際知名

刊期 IEEE Transactions on Reliability (TRel) 總編輯，謝教授在資安領域深具國際影響力。另外，本院年輕教授林彥宇、邱維辰、高孟駿、顏安孜等多位老師也囊括各項學術獎項肯定。

國際化為本院推動之重點工作，逐步地提升學生的英語學習環境為重點之一，目前英語授課比例已成長至 30%。本期收錄師生參與英語教學、移地研究及各項國際學術活動，在在都展現我們在推動國際化的努力。當然，隨著疫苗的普及，進入疫後新生活，未來可望逐步開放國際交流之實體活動，本院國際交流活動會更加活絡蓬勃。

111 年 2 月 1 日是陽明交大合校週年，首次的校慶活動以「融合」作為主軸格外有意義。如同合校紀念歌《超越》，飲水思源、繼往開來，能不斷超越。面對未來，除了延續既有的良好學風與傳統下，我們更期盼能開拓出高等教育更多融合的新樣貌及特色。

資訊學院院長

陳志成

2022.06

Drawing the Future from the Past We will Continue to Go Beyond

As we look back at this past year, the global COVID-19 pandemic is still severe. The new issue of coexistence with the virus makes digital transformation a new norm and challenge for society. As a college of Computer Science at the forefront of the information and communication industry, our college has an unshirkable responsibility. Regarding our teaching, we must keep abreast with a constantly changing world to cultivate global talents for domestic industries. Meanwhile, we must keep our research staying on the cutting edge while building a solid foundation of techniques to support Taiwan to promote technological innovation and economic development for the next generation. Thanks to all the students, faculty, and staff for their collective efforts to make outstanding achievements in all aspects.

For a long time, our college has attached great importance to industry-academia innovation. It is so encouraging that 18 teams from our university won the "2021 Future Technology Award" last year, ranking first in the country. Among these teams, six research groups came from our college, which was the highest number of the award in the university. This issue reports award-winning technologies. First of all, Professor Chih-Wei Yi's research team conducts the movement analysis of video and associated data to create a new generation of training methods, CoachBox, which brings intelligent sports innovation. Next, Professor Jui-Hung Hung and his team develop the first complete fast NGS data analysis platform in the world. The widespread usability of such technology would be an important milestone in the development of genetic engineering. Finally, the deep reinforcement learning technology of Professor I-Chen Wu and his team was used to train autonomous driving for miniature racing cars, which illustrates the breakthrough and achievement of deep reinforcement learning.

The outstanding performance of our faculty and students would also be the focus of this issue. Congratulations to Professor I-Chen Wu and his team, who develop "Cloud-based Smart Point Cloud Processing (CSPCP)," on winning the 2021 R&D 100 Awards, which endorses professor Wu's forward-looking achievement. Professor Shiuhpyng Shieh was elected as the Editor-in-Chief of the internationally renowned IEEE Transactions on Reliability (TRel). He has a strong international impact in the field of information security. Furthermore, many young professors of our college, including Yen-Yu Lin, Wei-Chen Chiu, Mong-Jen Kao, and An-Zi Yen, have also been recognized with various academic awards.

Academic internationalization is also a major task that our college promotes. One of our priorities is to level up the English learning environment for our students gradually. Currently, the ratio of English as a Medium of Instruction (EMI) courses already stands at 30%. This issue includes reports of faculty members and students involved in EMI courses, off-site research, and various international academic activities, all of which illustrate our efforts to promote internationalization. Of course, with the increase in immunization coverage, people begin a new life after the pandemic. When the physical activities for international exchange are gradually granted in the future, we sincerely expect that our inter-university collaboration will become more vigorous.

February 1, 2022 is the first anniversary of National Yang Ming Chiao Tung University, and the celebration of the university with the "Fusion" theme is particularly meaningful. Just like the lyric of the commemorating song of the merger, "Beyond," *When we drink water, think of its source. Drawing the future from the past, we will continue to go beyond.* In addition to continuing the excellent academic culture and tradition, we are looking forward to developing more new fusion forms and features in higher education in the future.

Dean of the College of Computer Science

2022.06

CoachAI 團隊
打造智慧羽球「教練盒子」

文／翁健棋

一年一度的科技盛會「臺灣創新技術博覽會——未來科技館」在嚴峻疫情考驗下圓滿落幕，透過線上與實體雙軌並行模式，展出高達350項前瞻技術應用成果。本院資訊科學與工程研究所易志偉教授所組建的「CoachAI：金準羽球團隊」，透過結合電腦視覺、深度學習等技術，所開發的羽球擊球動作分析輔助工具「教練盒子」亦在超過500件申請案中突破重圍，經科技部評選為「未來科技獎」得主，於實體博覽會中大放異采，獲得眾多媒體報導。

「教練盒子」的概念發想，除了源於易志偉教授自身對羽球運動的熱忱和深度觀察外，主要技術應用是衍生自科技部「精準運科」專案的「CoachAI：金準羽球」計畫成果，結合用於偵測擊球動作和分析擊球點位、姿勢是否正確的電腦視覺、深度學習、機器學習技術，搭配上大數據分析，以及物聯網、穿戴式應用、自動化設備等產業趨勢技術。以上述整合技術為核心，開發出比賽拍拍情蒐系統、CoachAI技戰術分析和視覺化系統、智慧球拍及智聯發球機等科技輔助工具。希望能藉由將運動科學和前瞻科技技術結合，提供運動員專業羽球訓練輔助的同時，推廣羽球運動以促進運動人口增長，進一步提升羽球產業競爭力。

「教練盒子」的具體應用方式可搭配上羽球發球機，當學員在教練指引下完成一系列擊球動作，攝影機將記錄下擊球姿態、揮拍動作、羽球球速及擊球落點等資訊，透過電腦影像處理及深度學習等技術轉化為可視化的3D建模影像，同時以擴增實境的方式加註各項數據。透過動作數據與影像的分析結果，使教練能快速評估學員學習狀況，覺察擊球姿勢、控球穩定度等顯在和潛在的問題，作為兩者有效溝通的媒介，精簡並精實訓練曲線，大幅提升學習效率與成效。

具備前國手身份的王志全教練在校隊暑期集訓後，便以此輔助工具對集訓成果進行評估。用羽球發球機餵球讓學員進行十次殺球，並以「教練盒子」錄影，截取殺球時的影像資訊進行分析。分析結果提供可從各種角度觀察的殺球動作3D建模、學員關節點位置、肢體角度、殺球球速及殺球落點等數據，從中可看出學員動作正確一致程度為何，及控球穩定性是否達標。可見「教練盒子」不單可用以評估學員的球力、學習進度和各項優劣勢，亦可做為教練對學員授課說明的具體素材。

「教練盒子」目前將目標市場鎖定於教學領域，除用以推廣學校的體育課程外，亦可作為校隊、夏令營等訓練導向的社團和活動的教學輔具，提供雙向師生溝通，高效達成學習成效。此外，「教練盒子」亦可作為球力分級檢測工具，用以提供業餘學員因材施教教程和專業選手培養篩選。同時，待未來虛擬實境與擴增實境技術發展成熟，與之結合將能跨足電競娛樂市場。

本院易志偉教授與其團隊成員，透過純熟技術應用與深入觀察，將所學與所愛相結合，放眼未來，以產學合作模式開發出「教練盒子」分析輔助工具，將為羽球運動推廣、選手培養帶來創新高效的革新。
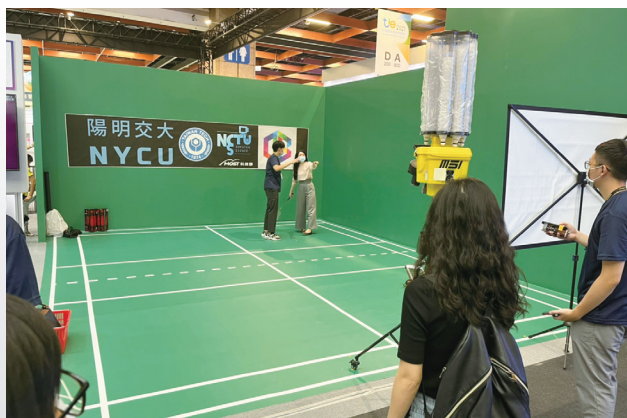
CoachAI Creates "CoachBox" for Smart Badminton Training

The 2021 "Taiwan Innotech Expo - Future Tech Pavilion" came to a successful end during the COVID-19 pandemic. The Expo integrated both virtual and physical environments to present up to 350 innovative solutions online and offline. The "CoachAI: Precision Badminton Team" advised by Dr. Chih-Wei Yi, Professor of Institute of Computer Science and Engineering from NYCU, developed a badminton stroke analysis auxiliary tool "CoachBox" with the combination of computer vision, deep learning, and other technologies. "CoachBox", the winner of the "Future Technology Award", was selected from more than 500 applications by the Ministry of Science and Technology as well as won acclaim in physical exhibition and attracted considerable attention in media reports.

Apart from the concept of "CoachBox" originating from Professor Chih-Wei Yi's enthusiasm and in-depth observation in badminton, the key technology is derived from the "CoachAI" project of the Ministry of Science and Technology. The integrated technologies of "CoachBox", including computer vision, deep learning, machine learning, IoT, wearable applications, automation equipment, and big data, are used for hitting action detection and posture analysis. With the core technology mentioned above, diverse auxiliary tools have been developed, such as badminton game analysis system, CoachAI tactical analysis and data visualization, smart racket and intelligent badminton shooting machine. As the integration of sports science and emerging technology provides athletes with professional badminton training assistance, we hoped that promoting playing badminton would increase the sports population to further enhance the competitiveness of the badminton industry.

One application scenario of "CoachBox" is to work with a badminton shooting machine. When a player completes a series of hitting actions under the guidance of a coach, the player's actions such as hitting posture, swing motion, shuttlecock speed, and end point of shuttlecock trajectory will be recorded. While a visual 3D modeling image is created with computer vision processing and deep learning, various related information is overlaid in augmented reality. Through activity data analysis and image analysis, coaches can quickly assess players' learning performance, and perceive any explicit and potential problems such as hitting posture and stroke performance to greatly improve learning efficiency and effectiveness.

Coach Chih-Chuan Wang, who was a former member of Chinese Taipei national badminton team, used this auxiliary tool to analyze the data collected from the school team's summer training camp. Each player performed 10 smash strokes with a badminton serving machine. He used "CoachBox" to do video recording and analyze the motion of each player during the smash stroke. The system built the 3D model of the smash stroke that supported different viewing angles associated with the player's data such as joint position, angle of the limbs, smash speed, and placement for a smash shot. Simultaneously, it can be used to examine movement accuracy and stability as well as stroke performance of each player. Therefore, "CoachBox" can be used for not only each player's evaluation such as performance, learning progress, advantages and disadvantages, but also a medium of coach's instructions to the players.

Currently, the target market of "CoachBox" is in the education sector. In addition to the promotion of physical education in schools, it can be used as a teaching aid for training-oriented clubs and activities such as school teams and summer camps to provide two-way communication between instructors and students to achieve efficient and effective learning. In addition, "CoachBox", as a performance evaluation tool, helps amateur players choose the proper courses in accordance with their aptitude and facilitate the training plan design and screening process for professional players. At the same time, when virtual reality and augmented reality technologies mature in the future, the further integration will expand to the eSports market.

With proficient technical application experience and in-depth observation, Professor Chih-Wei Yi and his team exploit their knowledge with enthusiasm and look towards the future to create a badminton stroke analysis auxiliary tool "CoachBox" in industry-academia collaboration. We all expected that "CoachBox" would bring an innovative revolution to badminton promotion and player training.

世界首創支援完整次世代定序識別基因變體之系統

文／翁健棋

自 1975 年，諾貝爾獎得主桑格發明了雙脫氧鏈終止法，也就是第一代的 DNA 定序技術，為 DNA 定序研究領域打下紮實基礎後，讓人類得以跳脫巨觀角度，轉而從微觀的 DNA 序列切入，分析生物體的化學表現。然而桑格測序法測序成本高、通量低與耗時長等缺點，使得相關應用難以普及；在各國龐大的資金與資源投入下，催生了次世代定序（Next Generation Sequencing, NGS）的出現，不單降低定序所需的成本，也讓定序檢測不再受限於基因大小與多寡。

本院資訊工程學系洪瑞鴻教授，專業研究領域即為與之相關的次世代定序演算法、生物資訊分析等範疇。去年九月，洪瑞鴻教授與指導團隊以可應用在高速疾病檢測、生物醫療診斷、生物資訊分析、物種偵測等多元領域的「適用於次世代定序識別基因變體之系統晶片」作品，榮獲以「科學突破性」及「產業應用性」兩大指標作為評選重點，科技部所授予之 2021 未來科技獎。該獲獎作品為全世界第一個支援完整次世代定序識別基因變體之系統，搭配團隊所設計與下線之系統單晶片與客製化電路板、周邊電路，可以達到全世界最快的運算速度，相較於高階顯卡有 66 倍之加速幅度。同時，系統單晶片可支援四種運算，包括：資料前處理、短片段回貼、半倍體搜尋與變體識別。本成果後續在今年一月舉辦的 2022 年消費性電子展（CES）展出。

透過設計團隊所開發之 sBWT 演算法，搭配上現有的基因組分析套件，獲獎作品之精準度可與軟體平台一致。此外，該系統晶片透過臺積電 28nm 製程下線，可操作在最高 400MHz，功耗為 0.975W，在 37 分鐘內便可以完成完整基因資料分析。與高階顯卡相比，不僅速度有顯著提升，於能量效率與面積效率上，亦有數個量級以上的增益。同時配合高度平行、硬體共享、複雜度化簡等硬體優化技巧，使設計作品得以達到高效能、低功耗之特性。此晶片亦設計了「多工排序引擎」與「動態規劃處理引擎」兩個主要運算單元，用來支援整個基因定序資料分析的複雜運算。不單如此，設計系統內整合一顆 Synopsys ARC 處理器，可用於檔案傳輸介面、記憶體資料與 IP 控制等等，以增加系統彈性。此系統除經由 FDA 之標準測資完成驗證，可達到 99.6% 精確度外，所設計之客製化 GUI 亦可滿足即時判讀之需求。

原先受限於運算能力上限，使用一般之 DNA 資料分析工具，就算搭配上高端的 GPU，也需要超過三天的時間才能分析完整的人類 DNA 序列。獲獎作品「適用於次世代定序識別基因變體之系統晶片」的出現，透過短序列回貼、串連各組回貼好的 DNA、與 DNA 資料庫對比三步驟，識別出變異位置，有效率地在 40 分鐘內提供完整分析，保持高準確性的同時，大幅降低測序時間。快速辨識出的基因變體不單可應用於疾病診斷，亦可用於病毒基因演化追蹤、胎兒基因檢測等各層面，可謂基因工程發展之重要里程碑，也再次恭賀獲獎的洪瑞鴻教授與指導團隊！

World's First Complete Next-generation Sequencing System to Identify Genetic Variants

In 1975, Frederic Sanger, a Nobel Laureate, invented the Dideoxy termination method, which was adopted as a primary technique in the "first generation" of DNA sequencing applications. Laying a solid foundation for DNA sequencing research, Sanger's discovery leads human beings to move beyond macroscopic perspective to microscopic DNA sequence to analyze chemical interactions of organisms. However, the disadvantages of Sanger sequencing, such as high cost, low throughput, and time consuming, make related applications difficult to popularize. Therefore, with huge contributions in various countries, the emergence of Next Generation Sequencing (NGS) not only reduces sequencing cost, but also allows multiple genes to be analyzed at once and can detect all types of variants.

Professor Jui-Hung Hung of the Department of Computer Science at NYCU specialized in next-generation sequencing algorithms and Bioinformatics. Last September Professor Hung and his team won the 2021 FUTEX Future Tech Award from the Ministry of Science and Technology, which was evaluated by two criteria: scientific breakthrough and industrial practicability, for their work "Genetic variant discovery SoC for analyzing Next-generation sequencing data'' that can be widely used in high-speed disease detection, biomedical diagnosis, bioinformatics analysis, and species detection, etc. The award-winning work is the first complete NGS data analysis system in the world. Integrating with a SoC, a customized circuit board and peripheral circuits which were designed by the team, the system can reach the fastest computing speed in the world. Their work achieved 66 times speed-up compared to existing high-level GPU platforms. Meanwhile, the SoC supports four kinds of operations: data preprocessing, short reads mapping, haplotype search, and genome variations detection. This work was also exhibited in the Consumer Electronics Show (CES) in January 2022.

Integrating the sBWT algorithm developed by the team with the existing genome analysis suite, the winning work achieved an accuracy as consistent as the software platform. In addition, the SoC, manufactured by TSMC's 28nm process, can run at a maximum of 400MHz with a power consumption of 0.975W, and completes an entire genetic data analysis in 37 minutes. Compared to existing high-level GPU platforms, the system not only significantly accelerated the analysis, but also increased energy efficiency and area efficiency by several orders of magnitude. Meanwhile, combining high parallelism, hardware sharing, complexity reduction, and other hardware optimization techniques, the work achieved high performance and low power consumption. The SoC comprised two main computing units, "multiplex sequencing engine" and "dynamic programming processing engine", to handle the complicated operations of the entire sequencing data analysis. Furthermore, the system integrated a Synopsys ARC processor, which could be used for file transfer interface, memory data and IP control, etc., to increase system flexibility. In addition to the system accuracy of 99.6 validated on standard test data of FDA, the customized GUI of the system could also offer real-time interpretation.

Because of the limits of computing power in the past, it would take more than three days to analyze a complete sequence of the human genome using common DNA data analysis tools even with a high-end GPU. The award-winning work "Genetic variant discovery SoC for analyzing Next-generation sequencing data" adopts a workflow with short reads mapping, haplotypes reconstruction using de Bruijn graph for sequence assembly, and comparison with the DNA database to efficiently identify the variant position and deliver a complete analysis in 40 minutes. It significantly reduces the time of genome sequencing while maintaining high accuracy. The technique of rapidly identifying gene variants can be used not only for disease diagnosis, but also for virus gene evolution tracking and fetal genetic testing, etc. Therefore, it can be seen as an important milestone in the development of genetic engineering. Once again, congratulate Professor Jui-Hung Hung and his team on their success!

未來科技
深度強化式學習技術應用於自駕模型賽車

文／翁健棋

自 2016 年人工智慧圍棋軟體 AlphaGo 展現驚人學習力與精湛棋藝，擊敗韓國棋王李世乭後，在各大媒體宣傳報導下，人工智慧一詞登上網路熱搜，成為家喻戶曉的科技產業新趨勢；也同時象徵著深度強化式學習（Deep Reinforcement Learning）的應用在未來，將徹底改變人類社會「食衣住行育樂」等各面向既定模式的趨勢。本院吳毅成教授與其所率領的團隊，以「應用於自駕模型賽車之深度強化式學習技術」獲得 2021 未來科技獎殊榮，便是深度強化式學習具體應用的實踐與突破。

深度強化式學習為獲獎展品的核心技術，近年來不單被廣泛用於棋類、電腦遊戲開發，需要精準控制的物件夾取、無人機操作等任務範圍也可發現其應用蹤跡。吳毅成教授與團隊希望將過去團隊在棋類及電腦遊戲上成功的技術與經驗，擴展應用範圍到「自駕模型賽車」。受限於真實世界中蒐集資料的困難度與可行性，團隊選擇先在模擬環境中進行訓練，再於真實世界中籌備測試。然而，考量到模擬環境並無法將光線、背景各項因素完美複製，進而可能產生誤差，導致應用效果不佳，設計團隊發展出一套基於影像的虛實轉移技術（sim-to-real transfer），搭配上深度強化式學習，提升神經網路模型在真實環境中的表現。

有關於此技術應用之科學突破性，吳毅成教授與團隊以 PPO 作為核心演算法，提出 teacher model 與 student model 的架構，並將其應用在自駕模型賽車上，首開運用此概念來解決虛實環境差異的先例。透過訓練「老師模型」來學習最佳路徑，再藉由老師模型與隨機化（randomization）訓練「學生模型」，使其適應真實與模擬環境中的差異，提升在真實環境中的行駛速度及穩定性，同時有效減少模型轉移所產生的附帶成本。相較於使用光達（LiDAR）作為主要感測器的多數自駕模型賽車，設計團隊選擇高性價比的相機作為感測器，更適合大規模部署的同時，不被有牆壁構造的賽道所限制。

團隊不單將應用成果發表於國際頂尖會議 IROS 2020 的 Workshop，同時多次於 AWS DeepRacer 自駕模型賽車競賽中脫穎而出，取得亮眼成績，甚至打破官方最快完賽的時間紀錄，佐證此技術之應用突破性與可行性。團隊獲獎學生也受邀前往北京青少年無人車俱樂部、逢甲大學、新加坡星展銀行等單位進行演講，分享開發構想與經驗。目前團隊已與雷虎科技合作，研究如何使用自駕技術以提升模型賽車比賽的精彩度。例如應用自駕技術於國際模型賽車聯合會主辦的世界無線電遙控汽車錦標賽上，藉由人類與機器的競賽，增進觀賞性。

就產業應用性角度來看，設計團隊其許可將技術應用於固定環境的機器人巡邏程式，如工廠內的無人搬運車，使用一般相機搭配開發技術，取代價格昂貴的光達和舖設導引線的繁瑣程序，達到低成本、快速部署、高效率的目的。此外，自駕技術也可以應用於探勘高風險環境，減少手動控制的失誤機率和人員訓練成本，在避免救難人員承擔安全風險的同時，提高搜救效率及範圍。可以肯定，在不久的將來，吳毅成教授與團隊所開發之深度強化式學習技術，將透過其泛用性和高度發展性，改變並造福人類社會。
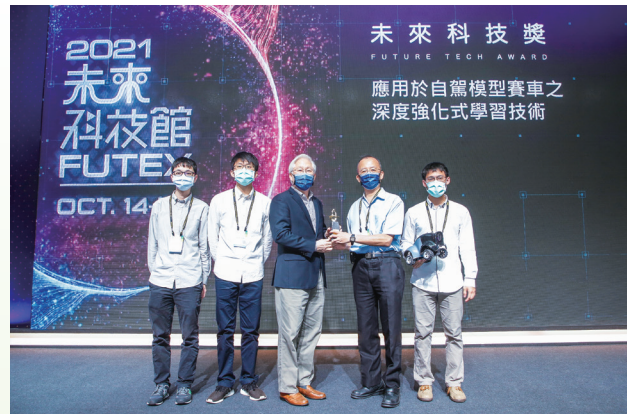
Future Technology:
Autonomous Miniature Car Racing Based on Deep Reinforcement Learning

Since AlphaGo, the artificial intelligence Go software with incredible learning ability and impressive chess skills, defeated South Korean Go master Lee Sedol in 2016, artificial intelligence has become a top trending topic on the Internet and a well-known new trend transforming technology industry. Moreover, AlphaGo symbolizes the trend that the applications of Deep Reinforcement Learning will completely revolutionize the established patterns in human society in terms of "food, clothing, housing, transportation, education and entertainment" in the future. Dr. I-Chen Wu, professor of College of Computer Science at NYCU, and his team received the 2021 Future Technology Award for "Deep Reinforcement Learning for Autonomous Miniature Car Racing'', which illustrates the breakthrough and achievement of deep reinforcement learning.

Deep reinforcement learning is the core technology of the award-winning exhibit. In recent years, it has been widely used not only in chess-like games and video games, but also in control tasks such as object grasping and quadrotor flying. Professor I-Chen Wu and his team hope to extend their great success and experience from chess-like games and video games to autonomous miniature car racing. Because of the difficulty and infeasibility of collecting data from the real world, the team decided to conduct training in a simulated environment first, and then deployed the model into the real world. However, since the simulated environment will not perfectly replicate the light and background factors, which may cause the simulator-trained model to perform poorly in the real world, the team developed an image-based sim-to-real transfer technology to integrate with deep reinforcement learning to improve the performance of neural network models in real environments.

Regarding the scientific breakthrough of this applied technology, Professor I-Chen Wu and his team used PPO as the core algorithm and proposed the technique comprising "teacher model" and "student model". They applied this technique to autonomous miniature car racing, which was the precedent of a new methodology to reduce the gap between virtual and real environments. First, they train a teacher model to move along a near optimal path and then use this model to teach the student model the correct actions along with randomization. The technique bridges the sim-to-real gap, improving the driving speed and robustness of the simulator-trained student model in the real world. Unlike the most autonomous miniature racing cars that use LiDAR sensors, the team chose a cost-effective camera as a sensor, which afforded large-scale deployments and overcame the obstacle of track walls.

The team not only presented the results in the workshop of IROS 2020, the top international conference, but also stood out from the AWS DeepRacer competition multiple times and achieved outstanding results. Moreover, the team even broke the official record for fastest completion time. All these achievements have proved the breakthrough and feasibility of the technology in the application. The team's award-winning members were also invited to give speeches at Beijing Youth Unmanned Vehicle Club, Feng Chia University, Singapore DBS Bank to share their ideas and experiences on development. The team, at present, is working with Thunder Tiger Corp to increase the racing excitement of model cars by utilizing autonomous-driving technology. For example, using autonomous miniature racing cars in The IFMAR World Championship hosted by the International Federation of Model Auto Racing (IFMAR) will make the competition more attractive through the race between humans and artificial intelligence agents.

From the perspective of industrial application, the team expects to apply the technology to robot patrol programs in specific environments, such as unmanned trucks in factories. They use common cameras with their technology to replace expensive LiDAR and tedious procedures for laying guide wires to achieve low cost, rapid deployment, and high efficiency. In addition, when applied to exploration in high-risk environments, autonomous-driving technology can reduce personnel training cost and the probability of manual errors, as well as maximize the search efficiency and broaden the search scope while avoiding risks in rescue operations. We all believe that the deep reinforcement learning technology developed by Professor I-Chen Wu's team will make a difference and benefit human society through its versatility and high extensibility in the near future.

葉宗泰老師：
好奇心、恆毅力與勇於探索

文／翁健棋

本次特別邀請到資訊工程學系葉宗泰老師進行人物專訪，分享自身投身研究工作契機、國外求學經驗與對資工系同學們的期許與建議。葉宗泰老師專精於計算機結構、圖形處理器、AI 晶片系統等領域，回想自身的求學歷程，在就讀研究所時便有「深入領域做研究」的想法，而推進自己追夢的持續動力便在於「好奇心」，且不僅限於知識層面，於後續出國求學、接觸生活新事物的過程中亦發揮極大效用。

「在求學與研究的階段，對各個事物要有好奇心。」探尋主動求知探索的本質，葉宗泰老師點出「好奇心」的重要性。最初選擇投身研究工作的契機，便是自身傾向不受教科書限制，自由探索發想，享受解決問題所獲得的成就感，後續亦是因「想接觸不同的文化和人」之探索動力，選擇前往美國攻讀博士學位，拓展自身眼界。求學期間，特別令葉老師印象深刻的是「教學方式」的差異，不單是教學的模式，教學的內容也兼顧深度及廣度，欲融入並適應在地教學方式，最核心的關鍵要素便在於「溝通」，吸收與表達是知識交流、討論研究時必要且重要環節。單純「意會」不足以落實雙向溝通的學習要旨，如何將所學融會貫通吸收後，與同儕、師長闡述自身的見解，是身為一名外國籍研究者所需面臨的不小挑戰。

葉宗泰老師憶起某次課堂上，曾被授課老師問為何都不發問，對此問題感到疑惑之際，老師便向其闡述提問的重要性。「因為你問『為什麼？』你才會把這個東西做的了解，做的深入。」這是國外教學模式最大的特點，自發問中審視不足之處，察覺學習盲點，透過持續不斷的問與答激發思考，進而越發接近研究領域的知識核心，達到深度、廣度皆具備的學習成效。此外，身處各國菁英匯聚、競爭激烈的學習環境中，葉老師認為能讓自身脫穎而出的關鍵是「動手做」與「解決問題」的能力。「不是你厲害才可以開始，而是你開始才會變厲害。」動手實踐為第一步，過程中遇到問題除了勇於發問，嘗試尋找解方也是非常重要的一環。勇於發問並非單純當伸手牌求解，有時經過多嘗試和思考之後再發問，可以降低溝通成本，也能讓詢問者感受到自身做足功課；再者，反覆嘗試過程中的經驗能加深學習記憶，達到知識與應用層面雙重磨練的效果。

或許求學與求職的路上不乏各種挫折與阻礙，葉宗泰老師以熱情（passion）與毅力（perseverance）兩字勉勵各位學子，對於各式目標要具備熱情跟毅力，堅持下去才會成功。葉老師舉了自身攻讀博士學位的過程為例，或許過程是艱辛、漫長的，當一旦目標達成，回首望去，踏實的成就感滿溢而出。面對可能遭遇的困難與挑戰，千萬不要畫地自限，要記住「The sky is the limit.」天高沒有界限，勇敢探索、追夢並實踐它吧！

Professor Tsung–Tai Yeh:
Curiosity, Perseverance and Courage to Explore

Professor Tsung-Tai Yeh from the department of Computer Science, specially invited for an exclusive interview, shared the opportunity to ignite his research passion, the experience of studying abroad, as well as his expectations and suggestions for the students of the Department of Computer Science. Professor Yeh specializes in computer architecture, graphics processing unit, and AI chip system, etc. Looking back on his past learning experiences, Professor Yeh rooted the idea of "deeply dedicated to research" in his mind as early as he was a graduate student. And "curiosity" became the driving force behind his dream. Furthermore, curiosity plays a significant role not only in pursuing knowledge but also in adapting to the new life of study overseas.

"Keep curious about things in learning and research." Professor Yeh highlighted the importance of "curiosity", the desire for knowledge and the exploration for the unknown. The original momentum for devoting himself to research was Professor Yeh's thought that is not restricted by textbooks. He likes to explore ideas freely and enjoys the sense of achievement in solving problems. Later, because of the exploratory drive of "eager to meet people from different cultures", he decided to study for a PhD program in the United States to expand his horizons. During his days in school abroad, Professor Yeh was particularly impressed by the difference in "teaching styles". In addition to the teaching strategies, the course materials responded to the depth and breadth of learning at the same time. Meanwhile, he recognized that "communication" was the key factor to mingle with fellow classmates and adapt to the local teaching method. The absorptive capacity and expression ability were both necessary and important for knowledge exchange, discussion and research. "Understanding message" alone is not a bidirectional communication. How to integrate and assimilate what he has learned, and then share his own opinions with fellow students and instructors would be a big challenge for a foreign researcher.

Professor Yeh recalled that once in a class, he was asked by an instructor "Why don't you ask any questions?" He was puzzled by this question, so the instructor explained to him about the importance of asking questions, "Once you ask 'why', you will try to understand the subject better, and conduct an in-depth study." This is the most important feature of foreign teaching styles: perceive the deficiency and identify blind spots in learning using spontaneous questions, stimulate thinking by constantly asking and answering questions, and thus get closer to the core knowledge in the field of research to expand the depth and breadth of learning. In addition, studying in the highly competitive learning environment with strongly motivated students from all over the world, Professor Yeh believes that the key to make him stand out from his peers is his "hands-on" ability and "problem-solving" skills. His motto is "It's not because you're good enough to start research; rather, you may get better after you start research." Hands-on practice is the first stepping stone, and secondly trying to find solutions is as important as asking questions bravely when encountering problems in the research process. Taking the courage to ask questions is not merely "raising issues"; on the contrary, asking questions after a lot of thinking and trying can reduce communication costs and make the inquirer feel well-prepared. Furthermore, repetition of attempts enhances learning and memory to achieve the effects of dual-task training on knowledge and application.

At times, unexpected frustrations and obstacles may get in the way of study and career. Professor Yeh encouraged students to retain passion and perseverance, because passion enables us to focus on the goal for long and perseverance motivates ourselves to continue pursuing success. Professor Yeh took his own experience of pursuing a PhD degree as an example. It might be a long and arduous process; however, we may look back and see what we've accomplished, filled with a solid sense of achievement. Do not limit yourself when you face many of the research challenges. The phrase "the sky is the limit" really tells us that no boundaries exist and everything is possible. Let's explore bravely, pursue our dreams and realize them.

GARMIN 林哲民經理：
你可能沒想過的資工路

文／翁健棋

於 2021 年九月下旬，本院資訊工程系系學會特別邀請到資工系友林哲民學長返校分享。具備資訊工程系 95 級、網路工程所 99 級系友及大學長的雙重身份，目前任職於 GARMIN 亞洲研發中心，擔任產品企劃部經理一職的林哲民學長，不單回來與大家分享他的大學生活，同時以「你可能沒想過的資工路」為題，帶出自身探索職場的心路歷程。希望透過此次經驗分享，傳達「多元資工路」的核心理念。

「多管閒事」無形中的經驗累積

自交大網工所畢業後，林哲民學長以一個軟體工程師的身分加入 GARMIN 這間公司，最初公司規模其實沒有現今這麼大，林哲民學長是公司地圖團隊中的第十號工程師。在公司接手的第一個 3D 實景圖的案子時，此專案需依賴了公司內外各團隊之間的協作來完成，但各單位角色與職責的不同，有時會不可避免的產生一些責任或溝通的間隙，而造成無人負責或是較晚發現問題的狀況。然而，在團隊運作過程中，林哲民學長卻做了很多身為一個軟體工程師工作分外的事情，也就是他所笑稱的「多管閒事」。包括因工作指派溝通上出現的認知差異，所產生的缺漏事項；或是對於整體協作效率提升的追求與協調，林哲民學長總是避免以「自掃門前雪」心態應對，以團隊考量為第一優先，在能力許可前提下自願挺身給予助力。

「其實那時候我還蠻多機會去接觸到團隊裡面不同人在做的不同事情，就是所謂的多管閒事，相關的一些經驗讓我有機會走到下一步，我人生中的下一步。」林哲民學長鼓勵與會的各位能挑戰「去展現你不一樣的能力跟做到一些不一樣的事情」，作為自我經驗的昇華與實力的累積。

公司轉型 人也要轉型

談及第一次在公司提案的經驗，當時團隊所進行的相關項目，由於公司發展重心的轉移，而面臨團隊轉型需求，林哲民學長考量到團隊未來的出路與發展，希望能讓團隊有機會能接觸未來較有發展的產品，能夠扮演更重要的角色。運用對於客戶痛點的精準洞察，同時利用到美國出差的機會，林哲民學長向運動攝影機所相關的事業群負責人提案，希望能合作解決「影片整理程序繁雜」的問題，同時主打「自動辨識亮點片段產出影片」特色，滿足市場需求。儘管就結果來説，運動攝影機品項沒有一躍成為公司發展重心，但林哲民學長與團隊於專案執行過程中所培養的默契與經驗，對於後續智慧手錶提案有著顯著的正面助益。

有關系列專案中團隊成員的工作分配，林哲民學長分享了幾個對於「爽缺」與「苦工」兩對立性質職責的觀察心得。「不要覺得苦工就是不好的事情，其實苦工讓你有機會磨煉出不一樣的一些能力跟經驗。」林哲民學長發現，許多後續成為公司骨幹的員工，便是透過承擔常人認知的「苦工」，在過程中磨煉團隊溝通、協作的能力，在相對高壓的環境中刺激自己成長，解放潛能，方能在關鍵時刻挺身而出，展露自己的才能並獲得賞識，承擔關鍵要角，協助公司營運。

不務正業的資工人生

林哲民學長於分享專案經理的工作內容時，再次強調「溝通能力」的重要性。「溝通最重要的就是達成目的，溝通只是你的手段。你需要很清楚知道你溝通的對象他在意什麼？他想要什麼？不想要什麼？怎樣子容易説動他？才能夠達到你的目的。」同時，為了確保專案從開始到順利結束，一個好的管理者必須做好資源掌控，知悉風險並加以管理，以及妥善規劃時程。或許這與原先「軟體工程師」所具備的資訊工程專長存在一定跨度，但在職場上，具備多元經驗與專長，同時善於溝通協作的管理者，才是高價值、具備不可替代性的人才。

「跨域人才」趨勢 多元選修增廣見聞

於分享會最後，林哲民學長給予與會的學弟妹們幾點修課建議，包括「語言跟通識課程」以及「外系課程」的重要性，修習日文、外文系的法文，自學粵語，不單協助自己增廣視野，同時在與日本東京地鐵「西瓜卡」的合作專案中發揮重要溝通功能，有效降低語言轉譯成本，使整體合作更具效率。「不管是課內或課外，系內或系外的一些機會，可能都會不知不覺的變成你人生後面工作中的一些幫助，變成你的養分。」若能知道自己有興趣的事物為何，放膽去追求，深入並廣泛地學習，便是成就自我，實現目標，化平凡為不凡的關鍵。

GARMIN's Manager, Cu Lin: Career Paths in Computer Science You Never Thought about

Invited by the Computer Science Student Association, Cu Lin gave a talk in September 2021. Graduated from the Department of Computer Science with bachelor's (class year, 95) and master's degrees (class year, 99), Cu Lin is now a manager at the Product Management Department at Garmin Asia R & D Center. With the topic "career paths in Computer Science", he came back and shared his college life and experiences in the industry to encourage students to try different career development with the Computer Science degrees.

Accumulating experiences by minding other people's businesses

Cu Lin joined Garmin and worked as a software engineer after graduating from the Institute of Network Engineering. The size of the team was small, and he was the 10th engineer. To conduct the 3D real scene interchange picture case, many teams needed to collaborate with each other. However, some confusion may be caused by different duties or miscommunication among different departments. This could cause some issues later on. While working in the team, Cu Lin did more than his duty required. For instance, he not only does the development work but also coordinates between teams to improve the work efficiency to achieve the goal. In his opinion, a team should be the first priority in a company rather than individual work. With this kind of mindset, he thought everyone should devote themselves to work and provide help to each other with their abilities. "Actually I was able to interact with a lot of people in between different teams which I was able to gain some experiences for my career path and my life. Cu Lin encouraged every student to try different things with their own abilities to accumulate necessary skills in the workplace.

When company transform, we also need to transform

When he talked about his first proposal experience in the company, due to the shift of the company's development focus and the need for transformation, his team was also at this dynamic phase. Cu Lin considered the future prospects and development of his team and hoped that they could have access to products with more development in the future and be able to play an important role. On a business trip to the U.S., Cu Lin proposed to the head of Outdoor Segment which owns action camera business, hoping to use his insight to solve customer's problems such as the complex procedure of video post-editing. Also, at the same time, he would like to provide the feature of "automatic video creation by recognizing highlight clips" to the market. Although the action camera business did not become the focus of the company, good teamwork and experiences cultivated by Cu Lin and his team during the execution of the project had a significant impact on the smartwatch proposal, which was the follow-up project. Regarding the distribution of work among team members working on a series of projects, Cu. Lin shared several observations on "easy work" and "hard work". "Don't think that hard work is a bad thing; in fact, hard work gives you the opportunity to sharpen your skills and experiences in different ways. Cu Lin found that many of the employees eventually became the key person in the company because they were able to take on hard work. They enhanced abilities such as communication and collaboration skills, and strategies to cope with stress. Thus, they could step forward at critical moments to take on crucial roles in the company.

Not a regular CS student

In sharing the job description of a project manager, Cu. Lin once again emphasized the importance of communication skills. "The most important thing in communication is to achieve the goal because communication is only a means to an end. You need to know exactly what the person you are communicating cares about. What does the person want? What doesn't not? How to convince the person? Only then can you achieve your goal." To monitor a project from start to the end, a good project manager must have good control of resources, know the risks and manage them, and plan the timeline properly. There may be a gap between this and the expertise of the software engineer, but in the workplace, a manager with diverse experience and expertise, as well as good communication and collaboration, is viewed as important, irreplaceable talent.

The trend of "interdisciplinary talents" and diversified elective courses to broaden your horizons

At the end of the sharing session, Cu Lin gave several suggestions to the students, including the importance of "language and general studies courses" and "courses from other departments". For example, he took Japanese lectures from Language Center and French courses from Foreign Language Department and learnt Cantonese on his own. It not only helped him to broaden his horizon, but also played an important role in the cooperation project with the Tokyo Metro "Suica Card". He was able to reduce the cost of language translation and made the overall cooperation more efficient without language barriers. "The opportunities, whether in or out of the classroom, may become some help and nourishment for your later life at the workplace." If you know what you are interested in, please go for it and learn about it profoundly. This is the key to achieving your goal.

從 CRT 到 AR 的智慧顯示器

文／林一平 講座教授

林一平手繪之羅辛與蘇德蘭。

最近我們利用 AR 眼鏡，接上 5G 手機，在白草莓園溫室進行智慧農業教學，成效非常好。運用場域包括中華電信的板橋羅丹農場、新竹寶山農場，並在彰化縣農業處的「智慧農業推廣中心」揭牌正式啟用時展示。

致詞時我說，非常感謝彰化縣讓我們有機會將產官學的相關技術能夠在彰化落地，也感覺彰化縣的青農們都非常有意願要試行，覺得有機會可以做的非常好，於是請廣達量產智慧感測器及 AI 平台，整個物聯網的部分以及 AR 眼鏡技術經由中華電信導入，將全國最好的組合整合一起，希望讓彰化縣在智慧農業上變成一個世界的楷模。

AR/VR 眼鏡是智慧顯示器。電腦或手機最重要的輸出裝置是顯示器螢幕 (Screen)，其技術由早期的 CRT(Cathode Ray Tube) 演進到 LCD(Liquid Crystal Display)、LED(Light-Emitting Diode)、氣體電漿顯示 (Gas Plasma) 或其他影像投射技術。隨著 5G 網路及工業 4.0 的發展，智慧穿戴技術的發展將成為消費電子的下一個殺手級應用。經由智慧穿戴技術發展智慧眼鏡的研發技術，成為最有潛力的顯示器螢幕。

早期 CRT 的技術是德國物理學家布勞恩 (Ferdinand Braun) 於 1897 年的發明，亦稱為布勞恩管 (Braun tube)，最早用於示波器的顯示。在德國，CRT 被稱為 Braunsche R hre，而日本則稱為 Buraun-kan。這個技術應用了 100 餘年才被平面顯示技術取代。

布勞恩在發明 CRT 技術的期間也研究二極體 (Crystal Diode Rectifier)，並在 1898 年發明了我們俗稱的貓鬚 (Cat's Whisker Diode)。在無線通訊的研究上，馬可尼 (Guglielmo Marconi)「借用」了不少布勞恩的成果，後來兩個人於 1909 年共同獲頒諾貝爾物理獎。

1907 年，俄國科學家羅辛 (Boris Lvovich Rosing) 將 CRT 用來接收並顯示影像訊號，發明了電視機。羅辛持續改進電視機的技術直到 1931 年。這一年他因為反革命被放逐到科特拉斯 (Kotlas)，政府不准他再做研究。他於 1933 年因為腦溢血死於放逐流離之時。

羅辛的發明其實是延伸了德國科學家尼波隆 (Paul Julius Gottlieb Nipkow) 設計的旋轉鏡片及鏡子的機械系統。羅辛使用機械式的攝影機拍攝影像，再以 CRT 接收。在 1970 年代初期，CRT 開始用於電腦螢幕來顯示文字。1981 年，IBM 推出 4 種顏色的彩色顯示器 (Color Graphics Adapter；CGA)，並於 1984 年將顏色增加到 16 種。到了 1990 年就有全彩的高解析度螢幕。

關於顯示器技術，早在 1968 年就很先進，由美國 ARPA 信息處理技術辦公室主任蘇德蘭 (Ivan Edward Sutherland) 建立了「達摩克裏斯之劍」頭盔顯示器，被公認為是世界上第一個頭盔顯示器，能顯現 2D 圖像。今日 iPhone 及其他智慧型手機，皆採用先進的平面觸控螢幕；3D 的顯示螢幕亦已有產品；今日更有穿戴式擴增實境 (AR) 眼鏡。最好的 AR 眼鏡是台灣的產品，我們用來展示 5G 智慧農業，真正是台灣之光。

Smart Displays: From CRT to AR

We recently used AR glasses and 5G mobile phones to conduct smart agriculture teaching in the White Strawberry Garden Greenhouse, and the results were very impressive. Then the application fields extended to Banqiao Rodin Smart Farm of Chunghwa Telecom and Hsinchu Baoshan Farm. They were demonstrated in the official opening ceremony of the "Smart Agriculture Promotion Center" of the Changhua County Agriculture Department.

During the speech, I said, "I am very grateful to Changhua County for granting us the opportunity to deploy related technologies through collaborations of industry, government and education in Changhua. I can feel that many young farmers in Changhua County are willing to try new approaches and have the confidence to get things done well. Therefore, we are cooperating with Quanta Computer to mass-produce smart sensors and set up the AI platform, as well as with Chunghwa Telecom to introduce the technology of the Internet of Things and AR glasses. We hope this integration, the best nation-wide, can build up a world-class smart agriculture model in Changhua County.

AR/VR glasses are smart displays. The traditional main output device of a computer or mobile phone is the display screen, which has evolved from the early CRT (Cathode Ray Tube) to LCD (Liquid Crystal Display), LED (Light-Emitting Diode), Gas Plasma Display (Gas Plasma Display), and recent other image projection technology. Along with the development of the 5G network and Industry 4.0, smart wearable technology will become the next killer application of consumer electronics. Based on smart wearable technology, smart glasses would become the most potential display screen.

In 1897, German Physicist Karl Ferdinand Braun invented the earliest version of CRT technology. The CRT is also known as the Braun tube, which was initially applied to an oscilloscope. It is still called Braunsche Röhre in German and Buraun-kan in Japanese. CRT technology was in use for more than 100 years before it was supplanted by flat-panel display technologies.

Aside from inventing CRT technology, Braun also researched the Crystal Diode Rectifier and created the so-called cat's whisker diode in 1898. In wireless communications development, Guglielmo Marconi leveraged quite a few Braun's achievements so later they jointly received the Nobel Prize in Physics in 1909.

In 1907, Russian scientist Boris Lvovich Rosing used CRT to receive and display video signals in the creation of a television system. Rosing continued enhancing his television until 1931, when he was exiled as a counter-revolutionary to Kotlas and prohibited from conducting research. He died of a cerebral hemorrhage in exile in 1933.

Rosing's invention is actually an extension of the mechanical system of rotating lenses and mirrors designed by German scientist Paul Julius Gottlieb Nipkow. Rosing adopted a mechanical camera to capture images and a CRT to receive signals. In the early 1970s, CRTs began to be used to design computer screens for displaying text. In 1981, IBM introduced a 4-color Color Graphics Adapter (CGA) and increased its color depth to support 16 colors in 1984. By 1990, full-color high-resolution screens were introduced to the public.

Display technology was quite advanced as early as 1968. Ivan Edward Sutherland, the head of the US ARPA Information Processing Technology Office, created the "Sword of Damocles" a head-mounted display with two-dimensional tracking capabilities, which is widely considered to be the first virtual reality headset in the world. Nowadays iPhones and other smart phones have advanced flat-panel touch screens; even 3D display screens are available. Moreover, wearable augmented reality (AR) glasses are on the market and the best AR glasses are products from Taiwan. We use them to demonstrate 5G smart agriculture, and they truly are the light of Taiwan.

「教堂」的蘭達

文／林一平 講座教授
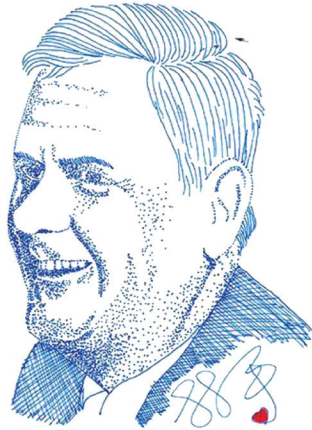
林一平手繪之邱奇 (Alonzo Church)。林一平提供

我實作物聯網平台 IoTtalk，設計一個機制，很適合執行蘭達函式（λ-function）。對於「蘭達」，我一直情有獨鍾。

在 1986 年 9 月，我在西雅圖的華盛頓大學接觸到第一堂計算機理論課。授課教授 Paul Yang 一直提到「教堂的蘭達、圖靈的機」，彷彿是江湖黑話，幫派切口。左顧右盼，四周的白人同學聽得津津有味，談笑有鴻儒，頻頻點頭，我則是一頭霧水，猶如雞立鶴群之白丁，也不敢發問，怕鬧笑話。

下課後衝到圖書館翻書，想搞懂啥是教堂的蘭達。最後搞懂，教堂 (Church) 是人名，翻譯為「邱奇」。邱奇 (Alonzo Church) 是數學家，也是圖靈 (Alan Mathison Turing) 的指導教授。1930 年，邱奇以數學邏輯為基礎，提出蘭達演算法（λ-calculus），以變數綁定和替換的規則，發展出基於函式 (function) 以及遞迴機制的形式系統。λ-calculus 是一個通用的計算模型，強調函式變換規則的運用，而非實現它們的具體機器。

邱奇的學生圖靈也發表了一個簡單形式的抽象裝置，後人稱為「圖靈機」(Turing Machine)，是能力和蘭達演算法能力相同的計算模型。圖靈機的執行龜速，沒有實際用途，但引導後人想像，這種機器能解決運算問題。

圖靈嚴謹的證明出，我們不可能用一個演算法來決定一部指定的圖靈機是否會停機。邱奇在 λ-calculus 方面相等的證明比圖靈的發表早了幾個月（老師還是比較厲害）。不過圖靈的做法比邱奇直觀，更易於理解。

當年被認為不直觀的 λ-calculus 衍生出 λ-function，反而實際應用於現代程式語言如 Java、C# 及 Python。原因是 λ-calculus 清晰地定義何謂「可計算函式」。任何可計算函式都能以 λ-function 表達並據以求值，相當於單一磁帶圖靈機的計算過程。λ-function 是匿名函式，不需要定義名稱，只有一行運算式，語法非常簡潔，功能強大，適用於小型的運算。

我設計的 IoTtalk 物聯網平台以 Python 實作，並以圖形化使用者介面將物聯網設備（感測器與制動器）以圖符 (icon) 形式呈現。IoT 圖符間可連線，我在連線間畫了一個小圈圈。當初設計這個小圈圈，是一個產生 λ-function 的機制，藉此寫出優雅的函式。只可惜部分 IoTtalk 使用者不曉得我的苦心，老是寫馮紐曼 (von Neumann) 架構的駑鈍函式，我的俏媚眼做給瞎子看，只能徒呼負負。

林一平
國立陽明交通大學資工系終身講座教授暨華邦電子講座

現為國立陽明交通大學資工系終身講座 教授暨華邦電子講座，曾任科技部次長，為 ACM Fellow、IEEE Fellow、AAAS Fellow 及 IET Fellow。研究興趣為物聯網、行動計算及系統模擬，發展出一套物聯網系統 IoTtalk，廣泛應用於智慧農業、智慧教育、智慧校園等領域／場域。興趣多元，喜好藝術、繪畫、寫作，遨遊於科技與人文間自得其樂，著有＜閃文集＞、＜大橋驟雨＞。

Church's Lambda

While implementing an IoT platform called IoTtalk, I once designed a mechanism most suitable for executing a lambda function (λ-function). I have always had a soft spot for "lambda".

I took my first computer theory course at the University of Washington in Seattle in September 1986. Professor Paul Yang always mentioned "Church's lambda, Turing's machine" during class. These terms seemed like gangster slang or gang signs to me. When I looked around, my white classmates sitting nearby listened with relish, nodded frequently, and laughed and chattered as if they actually understood. I, on the other hand, was totally lost and felt like an insignificant chicken standing among a flock of superior cranes. I was afraid to ask questions for fear of being laughed at by others.

Rushing into the library right after class, I flipped through books to figure out what Church's lambda was. At last, I realized that Church was the surname of Alonzo Church, a mathematician and the advisor to Alan Mathison Turing. In 1930, on the basis of mathematical logic, Church proposed the λ-calculus, which defined the rules of variable binding and substitution to develop a formal system based on functions and recursion. The λ-calculus is a general computational model that emphasizes the usage of functional transformation rules rather than the specific machines that implement them.

Church's student Turing also introduced a simple abstract machine, later known as the "Turing machine," that expresses another computational model equivalent in power to the lambda algorithm. A Turing machine is not a computation model for practical problems because of its extremely low execution efficiency. Nevertheless, it inspired future generations to imagine that such devices could solve computing problems.

Turing proves rigorously that there is no algorithm that will determine whether a given Turing machine will halt. Even though Church's equivalence proof in the λ-calculus was published a few months earlier than Turing, Turing's approach is much more intuitive, and easier for readers to understand.

Although the λ-calculus was considered unintuitive at the time, a λ-function, derived from the λ-calculus, is widely used in modern programming languages such as Java, C#, and Python. The λ-calculus clearly defines what a "computable function" is. Any computable function can be expressed and evaluated using a λ-function, which is equivalent to the calculation process of a single-tape Turing machine. A λ-function is an anonymous function with no need for a user-defined name. A single-line expression of a λ-function with concise syntax can carry out powerful functionality. Therefore, a λ-function is quite suitable for simple logical operations.

Being implemented in Python, the IoTtalk I developed presented IoT devices (sensors and actuators) as icons with a graphical user interface. These IoT icons could be connected, and I placed small clickable circles on the links between icons. The original design of this small circle was to provide a mechanism to embed a λ-function so as to generate elegant functions. It was a pity that some IoTtalk users did not even know my ingenuity and always wrote blunt functions based on von Neumann's architecture. All my efforts were in vain, just as a smiley beauty winked at a blind. I could do nothing but murmur, "What a waste!"

Dr. Jason Yi-Bing Lin

Lifetime Chair Professor of the Department of Computer Science at National Yang Ming Chiao Tung University and Winbond Chair Professor

Dr. Lin is currently a lifetime chair professor of the Department of Computer Science at National Yang Ming Chiao Tung University and Winbond chair professor. He is an ACM Fellow, IEEE Fellow, AAAS Fellow and IET Fellow. His research interests include Internet of Things, mobile computing, and system simulation. He has developed an Internet of Things system called IoTtalk, which is widely used in smart agriculture, smart education, smart campus, and other fields. He has a variety of interests, such as art, painting, and writing, as well as voyaging through science, technology, and humanities.

馬里蘭大學黃嘉斌教授演講：
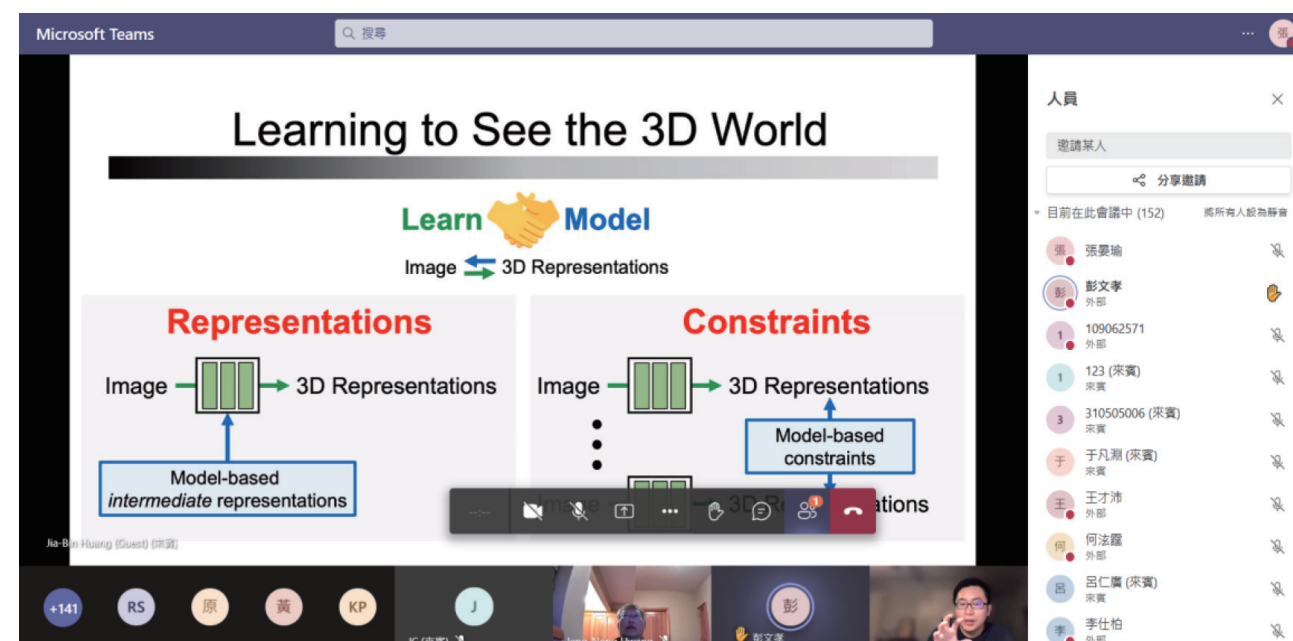# Learning to See the 3D World

文／謝宏笙　資訊科學與工程研究所甲組

　　黃嘉斌教授在交通大學取得學士學位，並在伊利諾大學厄巴納－香檳分校 (University of Illinois Urbana-Champaign, USA) 取得碩士學位及博士學位，目前在馬里蘭大學帕克分校 (University of Maryland College Park, USA) 擔任助理教授一職，並在 Facebook Reality Labs (FRL) 擔任 Research Scientist 一職。

　　黃嘉斌教授的研究領域涵蓋了電腦視覺、電腦圖學、機器學習。近年來發表超過 100 篇研究論文，其中不乏許多頂級會議論文，並且獲得超過 10000 次的引用數，除此之外，也受到了許多獎項的肯定，在學術領域中表現非常活躍。

　　黃嘉斌教授於 2021 年 10 月 14 日受人工智能普適中心邀請進行線上演講，演講主題為 "Learning to see the 3D world"。雖然以現今 computer vision 的技術已經能夠很好地處理 2D 圖像，但這對於實際上的應用是不夠的，生活在 3D 世界的我們，所需面對的大多為 3D 動態場景，但現今的技術在構建 3D 場景上仍充滿挑戰，在此次演講中，黃嘉斌教授分享了其在此方面的研究成果。

　　在演講中，黃嘉斌教授分享了他們如何讓圖片中的人像換裝換姿勢，這個問題的困難點在於如何從 2D 圖像取得 3D 場景資訊，對於 2D 圖像我們通常只能看到某個特定角度及特定姿勢的畫面，所以如何從 2D 圖像取得 3D 場景資訊是個關鍵，雖然已經有相關研究能做出不錯的結果，但所生成的圖像難以保留原始圖像中的細節且會產生明顯的偽影，在黃嘉斌教授的研究中，他們透過 pose-conditioned StyleGAN network 生成不同角度的圖像，並將 surface-based method 整合於其中以達到保留圖像細節的目的，使得他們的方法所生成的圖片更為擬真，相較於先前的研究，更為適合應用於現實之中。

Dr. Jia-Bin Huang (UMD) delivered a speech:
# Learning to See the 3D World

Professor Jia-Bin Huang earned a bachelor's degree in electronics engineering from National Chiao Tung University in Taiwan, as well as a Master's degree and a PhD degree in electrical and computer engineering at the University of Illinois at Urbana-Champaign. Dr. Huang is an assistant professor at the University of Maryland at College Park and a Research Scientist at Facebook Reality Labs (FRL).

Dr. Huang's research interests cover the areas of computer vision, computer graphics, and machine learning. He has published more than 100 research papers these years, which include top-tier conference papers, and has exceeded 10,000 citations. In addition, he has been recognized with numerous awards while being active in academic society.

Dr. Huang was invited by the Pervasive Artificial Intelligence Research Center at NYCU to give an online speech on the topic of "Learning to see the 3D world" on October 14, 2021. Although existing computer vision technology nowadays is able to process 2D images intelligently, it cannot meet the practical requirement of daily life. Living in a 3D world, we constantly encounter 3D dynamic scenes; However, the construction of 3D scenes is still full of challenges for today's technology. In this speech, Professor Huang shared his research achievements in this regard.

During the speech, Professor Huang illustrated their approach to change the clothes and poses of the portraits in pictures. The real difficulty lies in retrieving the corresponding 3D models from 2D images. A 2D image only comprises the information of objects with certain angles and specific poses; therefore, the core technology is to reconstruct a 3D scene from 2D images. Although many related researches have obtained good results, the reconstructed images may lose some details of the original images and leave obvious reconstruction artifacts. In Professor Huang's research, they constructed images from different angles through the pose-conditioned StyleGAN network that also integrates the surface-based method to preserve image details so that the images generated by their method would be more realistic and applicable to the real scenarios than other research.
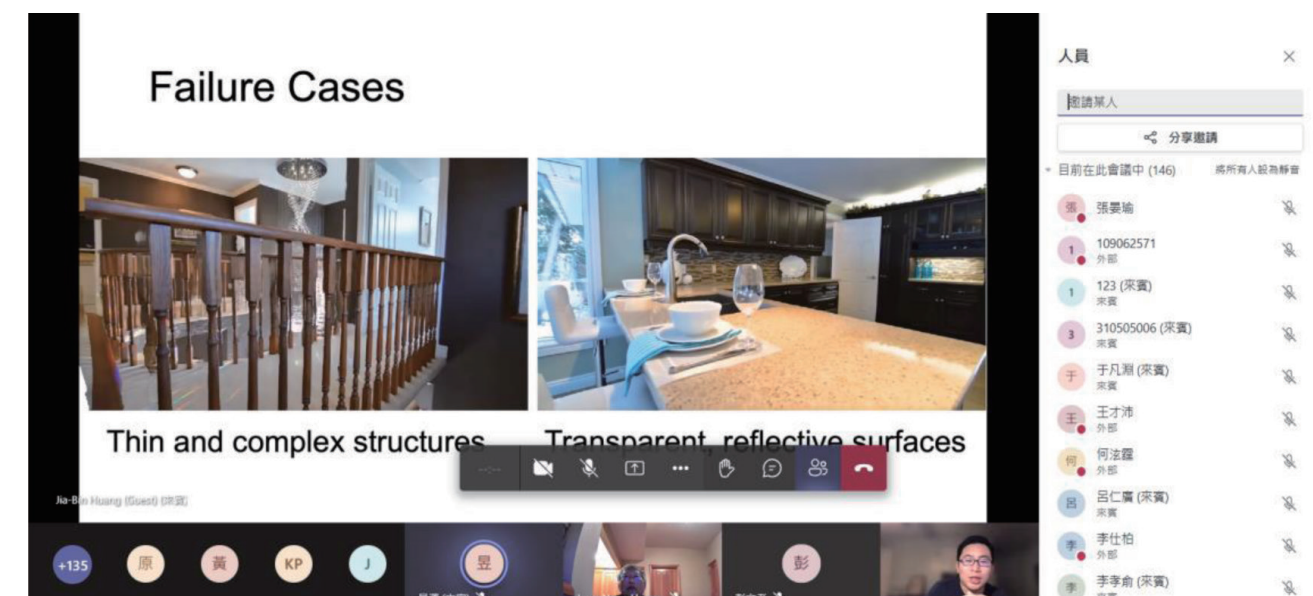
南加州大學 孫紹華先生演講
Program-Guided Framework for Interpreting and Acquiring Complex Skills with Learning Robots

文／洪偉　資科工碩士生

孫紹華先生於南加州大學攻讀博士學位，也同時於南加州大學資訊科學系擔任 Annenberg Fellow，目前在 Joseph J. Lim 教授所指導的 Cognitive Learning for Vision and Robotics Lab (CLVR)。研究的領域甚廣，其中涵蓋深度學習、機器人學習、強化學習、meta-learning、program synthesis 和電腦視覺。

孫紹華先生先於 NeurIPS Taipei Meetup 分享了自己機器人學習領域的相關研究成果，並應邀蒞臨資訊學院演講。主題是 Program-Guided Framework for Interpreting and Acquiring Complex Skills with Learning Robots，本次演講探討機器人學習結合傳統的強化學習所會面臨的問題，透過討論不同專案的相關理論基礎及研究成果，將這些專案整合，並提出一套完整的機器人學習框架。

隨著現今人工智慧和機器學習的技術逐漸普及，電腦能做到辨識圖片或影像，也能理解聲音或自然語言，甚至在一些複雜的棋類遊戲打敗人類。然而，在真實世界中，訓練一個機器人去完成我們預期的任務，並進一步讓它自行去學習新的技能，是一件困難且具有挑戰性的工作。常見的問題主要會包含以下四種，第一，傳統的強化學習能幫助機器人學習一個策略來完成我們設定的目標，然而使用者卻無法輕易地去理解這個策略背後的執行原理，第二，在不重新學習的情況下，機器人無法將簡單的策略套用到相關且規模

較龐大的任務，第三，強化學習往往僅能處理一些時效性較短的任務，第四，電腦無法善用經驗，透過整合一些學到的簡易技能，去完成一項複雜的任務。因此，孫紹華先生的目標是設計一個可解釋、可概括、分層和模組化的機器人學習框架。

這次講座孫先生分享了許多他的團隊在機器人學習領域的研究與成果。我們在學習機器學習的過程中，往往都會在一些簡易且可控的環境去實作我們的演算法，然而，真實環境卻不會像訓練環境這麼理想，當環境有些微的變化，機器人就需要重新去學習對應的策略，這是很不方便且耗成本的。因此，這個完整的機器人學習框架確實能有效地去幫助機器人學習，將整個策略程式化後，可以讓使用者更加清楚整個策略的流程，甚至可以透過簡易的編程去改善整個策略，這不論在機器人學習或是使用者回饋都很有幫助。這些研究讓機器人有辦法勝任且複雜的工作，奠定了未來機器人學習領域的基石。

會後，孫先生也憑藉著自己多年的研究和投稿眾多國際會議論文的經驗，和我們分享論文該如何去準備和撰寫。我們往往對研究有一套不錯的想法，然而，該如何呈現與表達才是論文是否被接受的關鍵。平時除了廣泛地閱讀其他人的論文外，我們也需要花費一些時間在查閱審查者的評論，以了解論文審查的重點。除此之外，針對每個研究階段，我們都應該具備隨時能夠演講的能力，可以明確地向其他人傳達自己想做什麼，在講解自己的研究時，除了可以獲得別人的回饋以外，也能幫助自己重整思緒，確定自己接下的研究方向。不論是在學期間的研究或是未來工作上的專案，都能使自己不會無所適從，面對問題也都能迎刃而解。

最後，很感謝這次能聆聽孫紹華先生的演講，並能與孫先生經驗交流，除了對於機器學習在現實世界的運用有更加一層的認識以外，對於研究的進行和論文的撰寫也有明確的想法。

The Speech of Mr. Shao-Hua Sun
Program-Guided Framework for Interpreting and Acquiring Complex Skills with Learning Robots

Shao-Hua Sun is the Ph.D. candidate and the Annenberg Fellow in the Department of Computer Science at the University of Southern California (USC) as well as a member of the Cognitive Learning for Vision and Robotics Lab (CLVR), advised by Professor Joseph J. Lim. His research interests span over the fields of deep learning, robot learning, reinforcement learning, meta-learning, program synthesis, and computer vision.

Mr. Sun was invited to give a speech at the College of Computer Science at NYCU after he shared his research results in the field of robot learning at the NeurIPS Taipei Meetup. The topic of his speech was "Program-Guided Framework for Interpreting and Acquiring Complex Skills with Learning Robots'', in which he discussed the problems raised by robot learning combined with traditional reinforcement learning. While surveying the theoretical bases and research results of different projects, he leveraged the merits of these projects and proposed a complete robot learning framework.

Recent development in artificial intelligence and machine learning has remarkably advanced machines' capability to analyze images and videos, comprehend natural languages and speech, and even outperform professional players in complex board games. However, it still remains a challenge to build intelligent robots that can execute tasks we expected and autonomously acquire novel skills. Most problems fall into four main categories: First, traditional reinforcement learning enables robots to learn its optimal behavioral strategy in order to achieve the desired goal. But the execution principle behind the strategy is obscure to users. Second, robots cannot apply basic policies to related and large tasks without retraining. Third, reinforcement learning is usually able to handle tasks within a short period of time. Fourth, computers are lack of the ability to make good use of experience or combine existing fundamental skills to complete a sophisticated task. Therefore, the goal of Sun's research is to develop a robot learning framework which is interpretable, generalizable, hierarchical, and modularized.

Mr. Sun shared a number of his team's researches

and achievements in the field of robot learning during the speech. While studying machine learning, we usually implement algorithms in a simplified and well-controlled environment. However, the real world is far from ideal as laboratory environments. Any slight change in the environment would force the robot to adapt itself and relearn the updated strategies at hand, which is inconvenient and resource-consuming. On top of that, this complete robot learning framework can help robots learn skills effectively. After programming a complete strategy, users would better understand the process of the strategy, and may even improve the strategy through the low-code development, which is of great help to both robot learning and user feedback. These studies do equip robots with the ability to perform long-run and complex tasks to lay the solid foundation of robot learning in the future.

After the speech, Mr. Sun chatted with us about how to prepare and write papers on the basis of his experience in conducting research and submitting papers to many international conferences for many years. We usually have good ideas for our research; however, the clear expression of our concept in the article would be the key aspect regarding whether the papers get accepted or rejected. Apart from reading research papers extensively, we need to spend some time on checking the reviewers' comments to realize the focus of paper review. In addition, for each stage in research, we should prepare ourselves to give a speech at any time, and communicate our ideas and opinions clearly. When describing our research, we will not only receive feedback but also reorganize our thoughts, thereby determining the following research direction. No matter whether the project is for school or for a future career, we will not stray far from the goal and work out the solution well whatever problem happens to us.

Finally, I would like to express my thankfulness to Mr. Shao-Hua Sun for his speech, and for the exchange of experience with him. In addition to having a better understanding of the application of machine learning in the real world, I have gained a clear idea how to conduct research and compose papers.

Google Brain 研發工程師 李冠輝先生演講
Learn Representations That Generalize for Vision and RL

文／高黃江 電機資訊國際學位學程博士生、李頤 機器人學位學程碩士生

講者李冠輝先生是來自 Google Brain 的研究人員。主要研究領域為強化學習 (Reinforcement Learning)、資訊理論 (information theory) 和表徵學習於感知及決策之應用 (representation learning for perception and decision making)。講者近年參與多項由 Google 所主導之深度學習機器人計畫。曾在 2016 至 2019 年間，擔任微軟電腦視覺及相關產品的研發工程師。畢業於國立臺灣大學，並於卡內基美隆大學取得資訊科學碩士學歷。

幾乎在所有機器學習應用的相關領域裡，使用適當的神經網路模型和明確的學習目標，去提取大量且多樣化數據所內藏之資訊，已成為泛用且有效的方法。在本次演講中，講者李冠輝從資料和目標（objective）的角度來切入並探索電腦視覺與強化學習領域。內容包括自督導式學習 (self-supervised representation learning)、如何更有效的利用模擬器所取得的經驗、虛實轉換 (sim-to-real) 方法以及一些尚未克服的難題。講者希望可以透過本次的內容拋磚引玉，讓相關領域的研究人員可以從全新的角度去思考如何利用現有的資料與目標，為電腦視覺與強化學習領域帶來下一次的重大突破。

演講內容主要分為三個主題：自督導式學習（self-supervised representation learning）、預測性表徵（predictive representation）、以及如何更有效的提取並利用學習經驗 (agent experience)。

提到自督導式學習，講者首先提出在面對不同機器學習任務時，此方法最根本的問題：如何在沒有人為監督下，去學習泛用且有效的視覺表徵 (visual representation)?

現今自督導式學習的方法為嘗試找出一個表徵，使經過不同轉換影像之間的相互關聯資訊得

以最大化。因為這些資訊概括影像背後共享的訊息，所以提取出的表徵也有利於後續的應用。透過重構 SimCLR，一個目前位於 state-of-the-art 的對比學習方法 （contrastive learning）和新的目標函數 Conditional Entropy Bottleneck-CEB，即便面臨不同情境下所引發的域遷移問題 (domain shift)，仍然可以大幅提升神經網路的準確度與穩定性。

強化學習也可以使用與自督導式學習的相近的概念。預測性資訊 (Predictive Information) 為聯繫起過去與未來的相互關聯資訊，同時也代表著對未來的掌握程度。講者提出一個構想，認為強化學習在面對不同的任務時，成敗的關鍵取決於機器學習模型否能有效地抓取這些預測性資訊，並準確的判斷即將發生的事件。在他的研究中可以看到，相較於未壓縮過的表徵，壓縮過後的表徵更有效的去概括未見過的任務。

講者也提到，強化學習距離解決任務移轉（transferring tasks）、多任務（multitask）等真實世界裡的開放性問題仍然有許多努力空間。在特定領域內，電腦視覺、自然語言處理和強化學習均可以找到有效解決相對映問題的方法，例如 2016 年 AlphaGo，一個基於強化學習的電腦程式，已經能超越人類表現，勝過頂尖圍棋手李世。在任務繁多且複雜的的真實世界裡，電腦視覺與自然語言處理已經找出使用大型資料集的演算法，例如電腦視覺的監督式學習與自監督式學習，或是在自然語言處理的 GTP、BERT 等神經網路模型，相較於前者，強化學習則尚未找到一個有效的模型來解決問題。

最後，面對如何為強化學習領域帶來下一次的重大突破， 講者提出三個方向，第一：如何收集大量且多樣的資料讓強化學習可以進行離線訓練，第二：如何擴大並提升多任務，非監督試線上訓練資料的蒐集規模與效率。第三：如何開創出全新的強化學習演算法，使學習資料能更有效的被利用。

演講結束後，講者與 CGI Lab 的 DeepRacer 團隊與 Robotics 團隊做了一場深度的對談，並對目前團隊研究上面臨的挑戰提出了一些建議。我們非常感謝有這個機會，聆聽來自 Google Brain 的研發工程師李冠輝所帶給我們的寶貴研究經驗。

Research Engineer from Google Brain Kuang-Huei Lee Delivered a Speech:
Learn Representations That Generalize for Vision and RL

Kuang-Huei Lee is a research engineer at Google Brain. His research focuses on reinforcement learning, information theory, and representation learning for perception and decision making. He has been involved in various robot learning projects at Google. From 2016 to 2019, he was a research engineer at Microsoft where he works on computer vision related products. He received his Masters degree in computer science from Carnegie Mellon University and his Bachelor's degree from National Taiwan University.

In almost all machine learning application domains, using capable models and expressive learning objectives to absorb large amounts of diverse data has now become a common narrative of generalization success. In this talk, Kuang-Huei will explore the data and objective aspects of this narrative for vision and reinforcement learning. He will discuss several ideas for self-supervised representation learning, improving uses of agent experience and simulator, the sim-to-real problem, as well as future challenges. The goal of the presentation is to motivate scientists to make the next major breakthrough by rethinking the data and objectives that they used for learning vision and reinforcement learning models.

His talk mainly focused on three topics: self-supervised visual representation learning, how to build better reinforcement learning with predictive representation, and how to collect and use agent experience efficiently.

Discussing self-supervised representation learning, Mr.Lee said that Learning effective visual representations that generalizes well without human supervision is a fundamental problem to apply machine learning to a wide variety of tasks.

The current self-supervised learning approach attempts to find a representation that maximizes the mutual information between features extracted from multiple images.The mutual information comprising a general shared context is assumed to be effective for various downstream tasks. By reformulating SimCLR, the state-of-the-art contrastive representation method, and adding a new objective function (Conditional Entropy Bottleneck-CEB), the proposed model yields significant improvements in accuracy and robustness

to domain shifts across a number of scenarios.

Reinforcement learning is similar to self-supervised learning. Predictive Information, the mutual information between the past and the future, measures how much our observations of the past can tell us about the future. Lee's work hypothesized that capturing the predictive information is useful in reinforcement learning since the ability to model what will happen next is necessary for success on many tasks. Moreover, he showed that compressed representation outperformed uncompressed representation in generalizing to unseen tasks.

Mr.Lee pointed out that reinforcement learning still has a long way to go with real-world problems such as transferring tasks and multi-task.Computer vision (CV), natural language processing (NLP), and reinforcement learning (RL) have been used for solving specific problems. For example, in 2016, AlphaGo, a computer program with the use of a reinforcement learning algorithm, defeated Lee Sedol, the best Go player in the world. For the transferring task and multi-task in the real world,CV and NLP have developed algorithms for large-scale dataset, such as supervised/self-supervised learning in CV, and GTP, BERT models in NLP. Compared with the above mentioned, RL methods have not yet found an effective model to solve them.

At the end of the talk, Mr. Lee raised three research questions, which may lead to the next major breakthrough in reinforcement learning. First, how to collect large and diverse offline data for offline reinforcement learning. Second, how to expand the scale and and improve efficiency of collecting multi-task and unsupervised dataset. And third, how to develop a novel reinforcement learning algorithm in which data can be used more efficiently.

After the talk, Mr. Lee had a deep discussion with DeepRacer and the Robotic group from CGI Lab and gave some comments on the problems that we are dealing with. We are very grateful for such a great opportunity to meet a research engineer from Google Brain, and we appreciate him taking the time to share his valuable research experiences with us.

跨域新視界 XR Showcase

文稿整理／林珮雯

跨域，是這個時代的新態度，也是在陽明交大學習的一種新選擇。由資工系莊榮宏教授、傳科系張宏宇教授、應藝所謝啟民教授及墨匠科技王銓彰執行長四位老師共同開設「XR 跨域專題」，亦為本校「創新科技」跨界力微學程計畫重點課程之一。

「XR 跨域專題」課程，結合了故事、虛擬與擴增實境技術、美術場景設計、音樂製作等領域，發展虛實整合之遊戲與互動應用。在課程結束後，為分享學習成果，於 110 年 10 月 6 日辦理期末 XR Showcase。由二十多個專題作品中，精選八組實作專案，開放予全校師生互動體驗。活動當天也請邀來自業界與學界的重量級評審講評，帶給學生更多實務上回饋，透過體驗交流，跨域實作課程的教育意義更為加豐富完整。以下是作品介紹：

最佳 XR 獎：SplitXR

成員：陳君杰 (CHEN,JUN-JIE)、邱兆國 (QIU,ZHAO-GUO)、鄭棨元 (ZHENG,QI-YUAN)、吳灃晉 (WU,FENG-JIN)、謝唯安 (XIE,WEI-AN)

在 AI 全面控制人類的時代，世界近全部領土已經被機器人給攻佔，一名瘋狂科學家鄧肯博士鑽研靈魂合體實驗，聲稱這是人類解藥，目前已有數千名實驗者不幸罹難。

勇於挑戰獎：不便夫妻

成員：江佳霖 (JIANG,JIA-LIN)、崔靖翔 (CUI,JING-XIANG)、林沂蓁 (LIN,YI-ZHEN)、梁卓然 (LIANG,ZHUO-RAN)、王崇銘 (WANG,CHONG-MING)

遊戲需要兩名玩家，一名玩家扮演四肢癱瘓的老婆，另外一名扮演失明的老公，本遊戲由老婆戴上 VR 頭盔，老公手拿 vive 控制器，在遊戲中兩位玩家需要互相配合，完成諸如走路回家、吃東西的任務。

最佳創意獎：石虎媽媽與小跟班

成員：謝唯安 (XIE,WEI-AN)、邱兆國 (QIU,ZHAO-GUO)、鄭棨元 (ZHENG,QI-YUAN)、吳灃晉 (WU,FENG-JIN)、楊宗穎 (YANG,ZONG-YING)

人類的開發對自然環境產生不少破壞，在陰錯陽差之下，石虎媽媽跟他的孩子竟然被載到了陌生的人類城市之中。他們必須想辦法在城市中活下去，然而在充滿污染的都市環境，他們有辦法安然渡過難關嗎？

最佳呈現獎：Vantasy

成員：崔靖翔 (CUI,JING-XIANG)、陳宇柔 (CHEN,YU-ROU)、李欣儒 (LI,XIN-RU)、林沂蓁 (LIN,YI-ZHEN)、陳彥云 (CHEN,YAN-YUN)

突然其來的一場風暴，城市一夕之間失去了顏色，生活在無色的環境之中的人們經歷著難以習慣的巨大變化，想像著過去的生活。在無數工作者幾年的努力下，人們終於重製出能產生色彩的工具，然而，大量的灰白生活空間無法只在少數人的努力下快速自癒。因此，我們想邀請你／妳加入我們，用你／妳喜歡的方式重塑這座城市的過去和未來可能的樣子，讓我們共同孕育這座城市，醞釀城市的嶄新顏色。

在過去的一年裡，疫情猝不及防的來到生活中，我們盡可能的待在家裡，被正在發生的全球疾病影響生活。隨著疫情的存在成為習以為常，人們回到實體生活中，雖然有些事已必然不能回歸到最初的狀態，但或許我們依然能夠做一些特別的小事，創造新的美好日常。

最佳人氣獎：遊樂園歷險記

成員：仲謙 (TU,ZHONG-QIAN)、楊祐維 (YANG,YOU-WEI)、李欣儒 (LI,XIN-RU)、吳學亮 (WU,XUE-LIANG)

城堡、小丑、海盜船，自由落體、摩天輪！熟悉的旋轉木馬音樂你聽到了嗎？

期待的暑假終於到了，遊樂園也再度開啟，歡迎各位小朋友們來到＜挖屋遊樂園＞！你們將作為一對兄妹到遊樂園玩耍，在這裡你們可以玩到刺激的遊樂設施，探索遊樂園的景點，通過挑戰收集遊園點數，兌換豪華大禮！如果你想帶走禮物回家，請找上一個你最有默契的夥伴，一起展開精采的遊樂園冒險旅程吧！

Showcase 展入圍：For The Cookie!

成員：陳君杰 (CHEN,JUN-JIE)、吳學亮 (WU,XUE-LIANG)、梁卓然 (LIANG,ZHUO-RAN)、江佳霖 (JIANG,JIA-LIN)

本遊戲為 2 對 2 的 VR 連線對戰遊戲，兩方人馬必須設法跑到終點獲得終點的大餅乾，背景則是設定在有法師以及騎士的中古世紀。

每一組玩家一人會遊玩 VR、另一位則是操縱鍵盤滑鼠以及看電腦的畫面，玩 VR 的玩家擔任騎士，要負責控制角色的左右以及跑步並把法師丟向餅乾，PC 玩家則是擔任法師，負責用滑鼠瞄準來施放法術，來阻撓對手或是加強我方。

值得一提的是本遊戲的法術皆是時間法術，讓玩家在射出法術後可以體驗操縱時間的快感！

Showcase 展入圍：Rewind

成員：曾奕淳 (ZENG,YI-CHUN)、郭光祥 (GUO,GUANG-XIANG)、曾冠儒 (ZENG,GUAN-RU)、許鎮宇 (XU,ZHEN-YU)、王崇銘 (WANG,CHONG-MING)

這是一個恐怖輪迴探索的單人遊戲，玩家需要在不停輪迴的場景中找尋主角在故事究竟發生了什麼事。過程中會一直有未知的旁白向玩家說話，彷彿他在描述玩家 (你) 在故事中的行為。玩家可以照著自己的想法選擇是否聽從這個旁白做出不一樣的行為，玩家的舉動會影響著故事還有路線的進行。

XR Showcase Presents New Vision

Having cross-domain skills is considered important and a new choice for students nowadays. At National Yang Ming Chiao Tung University (NYCU), we offer courses to cultivate students with such abilities. "XR Cross-Disciplinary Project'', provided and collaborated by a teaching team including Dr. Jung-Hong Chuang at the Computer Science Department, Dr. Hong-Yu Chang at the Department of Communication and Technology, Dr. Chi-Min Hsieh at the Institute of Applied Arts, and Chuan-Chang Wang, the executive director of Blacksmith Technology Ltd. The course also is one of the major courses in the Interdisciplinary Program.

The "XR Cross-Disciplinary Project" course combines storytelling, virtual and augmented reality technologies, art scene design, and music production to develop virtual-reality integrated games and interactive applications. At the end of the course, the XR Showcase was held on October 6, 2021, to share the results of the learning outcome. 8 groups of projects were selected from more than 20 projects and opened to all students and professors for the interactive experience. On the day of the event, we also invited well-known judges from the industry and academia to give feedback to the students. Through the event, students demonstrated their meaningful learning journey gained from the course and the following are students' projects.

Best XR Award: SplitXR

Members: Jun-Jie Chen, Zhao-Guo Qiu, Qi-Yuan Zheng, Feng-Jin Wu, and Wei-An Xie.

In the era when AI takes complete control of human life, a crazy scientist named Dr. Duncan devoted himself to soul-mixing experiments. He claimed it was the solution for humans. However, thousands of participants have died due to the experiments.

Challenge Award: Inconvenient couple

Members: Jia-Lin Jiang, Jing-Xiang Cui, Yi-Zhen Lin, Zhuo-Ran, Liang, and Chong-Ming Wang

This game requires two players. One will play as a disabled wife, another as

a blind husband. In this game, the wife needs to put on a VR helmet while the husband controls the vive remote control. They need to collaborate to complete daily tasks such as walking home and eating meals.

Most Creative Award: Leopard cats and the kids

Members: Wei-An Xie, Zhao-Guo Qiu, Qi-Yuan Zheng, Feng-Jin Wu, and Zong-Ying Yang.

Human development has caused damage to our natural environment. By accident, leopard cats and her kids were taken to an unfamiliar human city, and they had to find ways to survive in the urban city. In this game, players need to help them to overcome challenges in the polluted environment.

Best Presentation Award: Vantasy

Member: Jing-Xiang Cui, Yu-Rou Chen, Xin-Ru Li, Yi-Zhen Lin & Yan-Yun Chen

A city lost its colors overnight after a sudden storm, and citizens living in the colorless environment experienced a huge change that was hard to get used to. Many of them imagine they could go back to the past. After years of efforts, people finally recreated the tools to produce color. However, it was difficult to recover all colors with limited efforts among a few people. Therefore, we would like to invite you to join us to reshape the past and the possible future of this city in the way you like, so that we can nurture this city together and brew a new color for the city.

Over the past year, life has changed a lot due to the Covid-19 pandemic, and we had to stay at home most of the time. Although life cannot go back to the time when there was no pandemic, perhaps we could do something to make our daily lives better.

The Popularity Award: Amusement Park Adventure

Members: Zhong-Qian Tu, You-Wei Yang, Xin-Ru Li, Xue-Liang Wu

Castle, clown, pirate ship, free fall, Ferries wheel! Can you hear the music of the carousel? The long-awaited summer vacation is finally here, and "WOW Amusement Park" welcomes you all. You will be playing as a brother and sister in this game, and you will have a good time in our amusement park by playing exciting rides, exploring different attractions, and winning prizes by overcoming challenges. Please bring your best partner to go on this adventure with you.

Showcase Exhibition Finalists: For the Cookies!

Members: Jun-Jie Chen, Xue-Liang Wu, Zhuo-Ran Liang, Lia-Lin Jiang

The VR games take place in the middle ages which had wizards and knights showing up. Played by two players against two players, each team has to think of ways to arrive at the final spot to earn a large cookie for the game. During the game, one of the players needs to play the VR machine. Another player needs to control the keyboard and the mouse while watching the monitor. The VR player will be the knight who needs to move around and throw cookies at the wizard (PC player). The PC player will be the wizard to spell magic by using the mouse. It is worth mentioning that the spells in this game are all time spells, allowing players to experience the thrill of manipulating time after shooting spells!

Showcase Exhibition Finalists: Rewind

Members: Yi-Chun Zeng, Guang-Xiang Guo, Guan-Ru Zeng, Zhen-Yu Xu & Chong-Ming Wang.

This is a single-player game of horror exploration, where the player needs to find out what has happened to the protagonist in the story in a constantly rotating scenario. An unknown narrator speaks to the player all the time as if he is describing the player's (your) behavior in the story. The player can choose whether to listen to this narrator to make a different behavior according to their ideas. Different decisions will lead to different story endings in the game.

林一平教授：
How to Enhance Your Research Career?

文／翁健棋

　　本院資訊與工程學系於 2021 年 10 月份例行舉辦的「Coffee time」，邀請到林一平教授分享主題「How to enhance your research career?」。講述進行資訊科技專業領域研究時，思考「如何增加對社會的實質影響力」與其重要性，透過與相異領域人才跨域合作，產生更廣闊的技術應用範圍和未來發展可能性，提升技術能見度的同時，實質回饋並改變人類社會。希望經由本場線上與實體並行的講座內容分享，提供資工系的老師們更多的交流與學習機會。

　　在講座前半部，林一平教授以自身經驗談及發展 research career 的不同階段。專業領域研究並非僅能侷限於學術領域的貢獻，思索如何將成果、知識與經驗的累積實際應用於生活場域，將是「學以致用」層次提升的關鍵要素。而擴大研究應用影響力的核心思維便是「跨出舒適圈」，尋找不同領域的合作夥伴進行應用發想。林一平教授舉了自身參與智慧農業計畫的經驗為例，如土壤的溫度、濕度、導電度和 PH 值等特性，各式農藥的選擇，研究和有線通訊相關的「通訊人」對於這類專業並不具備知識架構，但具備生物科學專長的合作夥伴卻能給予關鍵協助，提供注意要點引導。使得人工智慧、物聯網、大數據等各項前瞻技術得以發揮所長，精準實踐「智慧農業」發展初衷，以及其所追求的減輕農場作業負擔、減少人工勞動力需求等特色目標。透過跨領域的人才協作，攜手擴大專業技術的應用層面與影響力，達成有效率之經營管理模式的同時，生產符合市場消費者需求的農產品。

　　林一平教授於分享過程中亦鼓勵教師積極申請獎項，增加交流機會。申請獎項存在著眾多優點，一來可以作為鑑定標準，知悉得獎要求與實際研究成果所存在的差距。此外，除去得獎目的，一節一節攀登如階梯般的獎項目標，研究者可以此機制來檢驗自己的研究，不同的獎項象徵「達到某特定水平」的判斷標準。再者，獎項的目標設定可以作為做研究時的推進動力，除了先前提及可用以評估研究成果，以及未來努力方向的特性，若有得獎之企圖心，研究者需要將研究結果以系統性的方式進行包裝，多方思考實際應用的面向，不論得獎與否，能夠「放下高度集中的精力，停下來仔細思考」的過程是必須且重要的；同時可以檢定自身「是否有將力氣花在正確的地方」，避免陷入事倍功半的困境而不自覺。「找一個獎項當作你的目標，然後認真往前走，是否得到並不是重點。在這個過程當中看看研究是不是有很好的改進，力氣有沒有花在正確的地方，這才是最重要的部分。」林一平教授以此勉勵在座與線上的參與者們。

　　或許發展 research career 的不同階段有著不同的目標，但只要能掌握「貢獻實質影響力」的核心要旨；搭配上資訊科技研究者擁有知識與技術的優勢，無懼跨出舒適圈，尋找跨域合作夥伴，多接觸專業領域外的世界；同時積極申請獎項，定期檢定並精進研究成果，與領域翹楚交流，拓展自身視野。定能將理論帶入生活場域，為人類社會帶來極具深度及廣度的貢獻和影響。

Professor Jason Yi-Bing Lin:
How to Enhance Your Research Career?

The "Coffee time" held by the Department of Computer Science, NYCU in October 2021 invited Professor Yi-Bing Lin to talk about "How to enhance your research career?" During the speech, Professor Lin indicated the importance of keeping "How to substantially increase impact on society" in mind while we proceed with the research in the IT field. It really means that we should consider what we can give back to the society to make it better, while we work together with talents coming from various fields through interdisciplinary collaboration to innovate a wider range of applications and future development possibilities as well as level up technology visibility. We hope that faculty of the Department of Computer Science will have more opportunities to communicate with others and learn from each other via the speech held physically and online today.

In the first half of his speech, Professor Lin talked about the different career stages for researchers on the basis of his own experience. The contributions of professional research can be demonstrated in a variety of forms and should not be restricted to an academic achievement. In other words, thinking about applying the accumulation of achievements, knowledge, and experience to daily life would be the key factor in progressing to the next level of "Applying what you learn to your work". The core idea of expanding the influence of research and applications is "Getting out of your comfort zone" and searching for innovative ideas with partners in different fields. Professor Lin took his own experience in participating in smart agriculture projects as an example: soil properties such as temperature, humidity, conductivity and pH value, as well as the selection of pesticides, are Greek to "communications people", who are specialized in wired communication. However, those partners with biological science expertise provide critical support and guidance with key points. The integration enables various emerging technologies such as artificial intelligence, Internet of Things, and big data to perform at their best to accurately achieve the original intention of the development of "smart agriculture", as well as its specific goals such as reducing farm operating costs and labor demand. Moreover, the collaboration of cross-disciplinary professionals would broaden the applications and the impact of professional technology to not only create an efficient business management model but also produce agricultural products that meet the demands of consumer markets.

During his speech, Professor Lin also encouraged faculty to actively apply for awards to increase academic exchange opportunities. There are many benefits of applying for awards. First of all, it can be a good evaluation criterion to realize the gap between the award requirements and the actual research deliverables. In addition, apart from winning awards, researchers may use a number of ladderlike awards with different difficulty to investigate their research. Each award represents the evaluation criteria of "reaching a certain level". Moreover, setting target awards can become the driving force behind research. In addition to the properties such as evaluation results and driving force which we mentioned above, awards can push researchers to systematically package their research deliverables and think through the practical aspects related to the research if they have an ambition to win. It is mandatory and important to be able to conduct the review process in the middle to suspend a heightened state of concentration and then rethink carefully no matter whether you win or not. Meanwhile, researchers can do the self-check, "whether you have managed your energy well," to avoid getting caught up in the resource-wasting situation without knowing it. Furthermore, Professor Lin encouraged the participants offline and online: "Aim at an award as your target, and then move forward seriously no matter whether you get it or not. During this process, the most important thing would be examining whether the research has been improved and whether your energy has been spent in the right place."

Different stages of research career development may lead to various focuses. Nevertheless, commit yourself to keeping "the impact of substantial contribution" a core tenet and fully utilizing the IT knowledge and skills so as to fearlessly get out of the comfort zone and seek cross-domain partners to collaborate with, while proactively exploring the fields outside your expertise. At the same time, actively apply for awards, regularly evaluate and improve research results, communicate with leaders in the field, as well as broaden your horizons. All the efforts will definitely bring theory to practice and eventually have profound impacts and contributions on human society.

雙語標竿學院，
透過英語增能課程培育國際人才

文稿整理／劉美君

本學院在 110 年度被教育部列為雙語標竿學院，為了提升本院學生的英語能力，晉升為國際人才，資訊學院開設了專屬於資工學生的英語課程，旨在輔助本院碩、博班生增進一般聽力與口說英語能力及學術閱讀及寫作英語能力，學生可依據學習需求彈性選擇課程。本學期共有四種課程讓同學們參與：英語溝通與表達、英文寫作邏輯與概念、論文篇章邏輯與概念和學術文獻閱讀技巧解析。課程豐富，訓練紮實，以下是學生參與課程的心得：

陳志祥 (曾建超老師實驗室)

在英語增能寫作課程裡，你會學到如何在文章中安排你的邏輯，引導讀者一步一步理解你想傳達的事情。除了加強寫作能力外，會推薦寫作課的額外原因有兩個：認真的講師與貼近生活的教材。每堂課裡，老師會讓你練習課堂上所學的寫作技巧，老師也會對你所寫的字句給一些點評。在點評的過程中，老師的語氣都是鼓勵式的，給人的感覺完全不具有壓迫感。除此之外，課堂中教材也會從指導老師發過的論文來當範例。這樣的好處在於不只是驗證在課程所學確實能應用到學術界，也能學習到自己的指導老師常用的單字與句型。

李善新 (謝續平教授實驗室)

「準備好一場演講，最重要的是瞭解他的聽眾。」論文寫作也是一樣，但聽眾的角色成了指導教授、審稿學者及編輯。這些角色根據徵稿的主題審視論文，然而，各個主題及專業領域中的詞彙、用語、形容事物的方法大相徑庭，使得不論是授業的一方或學習的一方，科技論文寫作的門檻及挑戰都極為艱鉅。為此，英語增能課程的老師根據不同主題、專業領域、甚至對應不同投稿類型（研討論文、期刊論文、研究型、調查型、長篇、短篇等）分析文章結構及作方法，並透過高度專一的教學模式，將同實驗室的同學集合成小班，讓同學們從指導教授的文章開始分析、臨摹，進而學習正確的寫作方法，有效提升寫作能力。可期待的，下次寫作來臨，面對的不再是一分空白的文件，而是腦海中早已有所輪廓了。

黃柏勳 (蕭子健教授實驗室)

大家好，我是資科工所蕭子健老師實驗室的博士生黃柏勳，上兩個學期很榮幸可以上到 Willy 老師的英文論文寫作課，我本身多年前也有修過科技英文的論文寫作課，然而經過時光和年紀的摧殘，雖仍能把握大方向的原則撰寫論文，但細節的部份卻已大多無法掌握，導致撰寫論文的品質遲遲維持在雖可接受，但又不夠好的瓶頸，而透過這兩個學期 Willy 老師深入淺出教學中，又讓我重新回憶起那些被忘記的過去，此外 Willy 老師的課程也提供了許多撰寫論文時不同的思考面相，相信結合過去所學，能將自己撰寫論文的能力更上一層樓。

這兩個學期的課程中主要著重在 Introduction 的部分，從將文章分小區塊進行分析到大區塊的探討邏輯問題，Willy 老師也都手把手的一一示範給我們看，同時也有提出一些不同的想法可供我們思考，或是如何修改可以使文章更流暢等等，其中 Willy 老師也對我們撰寫的文章給予許多建議，使我們有更直接的回饋，進而改善我們一些撰寫論文時的壞習慣。除此之外，Willy 老師會根據實驗室性質挑選示範用的論文，更能讓同實驗室一起上課的夥伴，尤其是尚未寫過論文的碩士生，更好的理解為什麼我們的領域要這麼寫，甚至也會挑選實驗室學長姐或指導教授已發表的論文，偷偷的學習他們的撰寫習慣，可以讓論文風格更符合指導教授習慣，減少未來可能的衝突。

Willy 老師的課整體而言難度適中，對於撰寫論文經驗的學生來說是很好的複習與檢討自己過去文章的機會，對於沒有撰寫論文經驗的學生來說是很好的入門學習，且不只是學習如何撰寫論文，Willy 老師教如何撰寫 Introduction 的方法其實和做研究的流程類似，就是從背景，動機，限制到發想的過程，撰寫 Introduction 時將這中間的邏輯前因後果串接清楚，也能幫助我們更了解自己的研究，不管在未來是為了課業，為了畢業，亦或是為了工作，這些邏輯思考的技巧都能派上很大的用場！

杜葳葳 (彭文志教授實驗室)

在六週的課程中，每週會深入探討一個主題，除了輪流上台用英文演說和同學分組練習英文對話，老師也向我們講授一些英文提問和回答的技巧，還特別在課程中設計有趣的小遊戲，讓我們可以更自然的沈浸在英文的世界。碩班的生活較為單一、多數時間都埋首在自己的研究領域，能有每週三小時的時間上英文口說課，不但超抒壓，同時也可以加強英文口說能力。每次三小時的課程都覺得時間過得超快，下課時總覺得意猶未盡，真的是從小時候開始學英文以來，第一次每週都這麼期待上英文課。很感謝 Selina 老師這麼用心的設計和講授課程，超級推薦給每個覺得英文只是一門枯燥乏味的學科的同學，六週的時間也許無法讓你的英文有大幅進步，但能讓你覺得開口說英文是件有趣好玩的事。

張瑜捷 (彭文志教授實驗室)

不同於以往接觸到的英文課程，本課程將團隊分成小組，以小組為單位帶領大家進行不同主題的討論，內容豐富且生活化，涵蓋電影、科技、心理學等等，Selina 老師會補充主題式單字，也會拋出不同的開放式問題，鼓勵大家分享自己的想法，在這樣有趣的課程設計與老師活潑的引導下，我們可以用比較放鬆的狀態去表達！非常推薦想要增進英語聽說能力的學生們來參與此課程，跟熟悉的團隊在輕鬆的氛圍下一起學習，是相當幸福的體驗！

王威堯 (彭文志教授實驗室)

我和我實驗室的成員在這學期一起參與了資訊學院所提供的英語溝通與表達課程。本課程主要介紹一些對於公共演說和溝通所需的英語技能，而這些對我的口說能力是有幫助的。舉例來說，課堂上介紹在研討會時所需的答問技巧，而我剛好對這個部分非常有興趣，且可以直接應用在我近期的兩場研討會上。課堂上的氣氛是輕鬆舒適，一開始對於在公共場合講英文這件事我是比較緊張的，但 Selina 老師會鼓勵我們用英文針對不同主題來表達想法。我認為培養良好的英語能力對與資工系學生是非常重要的，除了我們系上有許多外籍學生需要溝通和合作之外，未來也是有機會在國外攻讀資工相關學業或就業。因此，推薦您報名這樣的課程來提升自身的英語能力。

Cultivating International Talents through English Enhancement Courses as a Bilingual Benchmark College

The college of Computer Science was selected as one of the benchmark bilingual colleges by MOE. To enhance the English language ability of the Computer Science students and to promote them as international talents, the Department of Computer Science of National Yang Ming Chiao Tung University (NYCU) offers English enhancement courses to improve their general English and academic English abilities. Students can select the courses according to their learning needs for English. Four types of courses were provided during this semester, including English Communication and Delivery, The Introduction to English Writing and English Logic 1, The Introduction to English Writing and English Logic 2, and Academic Reading Course for Graduate Beginners. The following are students' reflections after joining these courses.

Jack Chen (Wireless Internet Laboratory)

In this writing course of the CS English Enhancement Program, you will learn how to organize the logic in the messages that you want to deliver to your target readers step by step. In addition to strengthening your writing skills, this course is highly recommended for two reasons: A Hard-working instructor and very useful learning materials. In each class, the instructor

will let you practice the writing skills you learned in class, and he will also give you a few comments on writing. However, our instructor's tone during the critique is often encouraging and he does not put too much pressure on students at all. Besides, the materials in the classroom will also include examples from papers written by our advisors. The advantage of this is not only to verify that what you have learned in the course can be practically applied to academia but also to learn the vocabulary and sentence patterns commonly used by your advisors.

Andrew Lee (TWISC Lab)

"The most important thing in preparing a speech is to understand your audience." The same is also true for academic writing, but the role of the audience becomes your professor, a reviewer, or an editor. However, the vocabulary, terminology, and ways of describing things vary greatly among different topics and fields, which can be challenging to have an effective learning result for instructors and students. Thus, the writing instructor of the CS English Enhancement Program helped the CS students develop their academic writing skills by analyzing the structure of writings according to different fields and

even different types of submissions, including research papers and journal articles in Computer Science. Students from the same lab are organized in small classes and the instructor uses their advisor's writings for students to learn professional academic writings. In this way, students will be able to learn to improve their writing skills effectively by having a clearer picture in their minds.

Po-Hsun Huang (Virtual Biomedical Management Lab)

Hi. I am Po-Hsun Huang, and I am a Ph.D. student from VBM lab. It was my pleasure to be able to join Willy Wang's writing courses for 2 semesters. I had taken some writing courses before, but I forgot most of the important details in writing. As a result, my research papers' quality was at an acceptable level but was not good enough for a Ph.D. student. Through Willy's instruction, I was able to review what I learned and also apply new concepts in writing. I believe this will take my academic writing skills to the next level. During these two semesters, the course focused mainly on the Introduction section. Our instructor guided us and showed the logic in writing from analyzing the texts into smaller sections. He also provided some suggestions to make those writings better, or encouraged us to think about how we could revise the writings. During the class, Willy also provides some feedback about our own essays, so that we can have more clues about some of the bad habits when writing academic papers. In addition, the learning materials in the class were chosen according to the field of our lab, which helped us to better understand the writing styles of our fields or the examples written by previous students or our advisor, and learn from them. It was very useful, especially for the master's students who have not written academic writings before. The difficulty of Willy's course can be applied to students across different levels. It was a good opportunity for experienced students to review their past work, and also a good introductory course for beginners to learn. Willy also taught us that writing an introduction chapter was very similar to conducting research, which requires you to critically think about background, motivation, and limitations of your own writing. Training the logic in writing does not only help writing research, it is also beneficial for taking courses, graduation, and your future work.

Wei-Wei Du (ADSL Lab)

During this 6-week course, we focused on one topic each time. In addition to taking turns to speak in English on stage and practicing English conversations in groups, our instructor taught us some strategies for answering and asking questions in English. In addition, some interactive games that helped us to immerse

ourselves in the world of English more naturally. The life of a master's program is rather monotonous because most of the time we need to do our research. Having some time to speak in English could enhance our English ability as well as reduce some stress from our routine. Overall, I had a great time during the courses, and it always felt like the time flew very quickly which made me look forward to the class each time. I'd like to show my appreciation to our course instructor, Selina. Her course is highly recommended for students who want to practice using English as a skill, rather than just a subject at school. Certainly 6 weeks is too short to have a great improvement, but you will be more motivated to learn English after joining this course.

Jessie Chang (ADSL Lab)

Unlike the English courses we took before, in this course, we were divided into small groups to do discussion across different topics. For example, we talked about movies, technology, psychology, etc. Our instructor, Selina, would give us some additional information about the weekly vocabulary and ask some questions related to the topics to encourage us to share some ideas. In this way, we could express ourselves in a more relaxed vibe with such an interesting course design and lively guidance from our instructor. Students who want to improve their English listening and speaking skills are highly recommended to take this course. Overall it was quite a pleasant learning experience to be able to learn with my lab members.

Wei-Yao Wang (ADSL lab)

My lab members and I joined English for Communication and Delivery Course this semester. The course introduced some methods and skills for presenting in public and English communication, which helped me to enhance my speaking ability. For example, I was interested in the tips for presenting at a conference because I had two presentations coming up recently and I could apply those skills to my presentations. Besides, the atmosphere during the course was quite relaxing for me to practice my speaking. In the beginning, I was afraid of speaking in English publicly, but our instructor, Selina, encouraged us to express our opinions about different topics in English. I think speaking English is quite important for Computer Science major students not only because there are many foreign students in our department, but also you could increase your chances to further study or work abroad in the future in the computer science domains. Thus, I strongly recommend students in our department participate in these courses to improve the necessary English skills.

資訊學院陳志成教授團隊運用磁力進行隧道內定位榮登國際頂尖會議 MobiCom 2021

文／秘書處公共關係組

資訊學院陳志成教授師生團隊運用磁力進行隧道內定位的研究，近期於國際頂尖會議 ACM International Conference on Mobile Computing and Networking (MobiCom) 2021 發表論文。該會議每年接受率約 10%，為世界各國頂尖團隊競相發表之殿堂。自 MobiCom 1995 年開辦以來，陳教授團隊論文為第二篇所有作者皆為台灣團隊人員發表至該頂尖國際會議之長篇論文。同時團隊亦榮獲 MobiCom 2020 Student Research Competition 研究所組第一名，為全台首度於此國際知名競賽締造佳績。

陳志成教授表示，自駕車是世界未來的趨勢，目前自動駕駛系統所遇到的難題為進入隧道、多層道路等衛星定位失效的區域，則無法有效定位，沒辦法讓駕駛安心信任自駕系統。本研究利用磁場在衛星定位失效的區域進行定位，研究成果「MVP: Magnetic Vehicular Positioning System for GNSS-Denied Environments」於 MobiCom 2021 發表。

定位在自駕車上為不可或缺的功能，車子需要依靠它來辨認自己的位置，但衛星定位系統在隧道、停車場、地下道等地無法接收到衛星訊號，在這些場域中失去了自動駕駛的能力。此外，在有多層結構的道路中，衛星定位亦無法確定車子目前是位於高架道路上或是平面道路上，駕駛有可能接受到錯誤的指令，也讓車子的自動駕駛增添了很多風險。陳教授團隊研究中，使用車輛搭載磁力計量測磁場，並將測量的磁場與磁場地圖藉由該團隊所開發的演算法進行比較，可以在沒有衛星訊號的情況下進行定位，且能提供 5.14 公尺的定位精度。目前研究團隊已在兩個國家、56 座隧道和 23 座橋樑進行了 36 個月的大規模實際道路實驗，用 5,943 筆資料驗證了此系統的有效性，成功對這些場域提供正確的定位。此外，此系統可在智慧型手機上使用，不須高價格之定位設備，大大的降低了在無法使用衛星定位的情境下，精確定位的成本，是第一個使用磁場實現車輛於衛星失效區域精確定位的研究，也讓自動駕駛系統更加的完整與安全。

MobiCom 自 1995 年開辦以來，只有不到十篇論文有台灣研究機構作者在列，且大多數為與國外大學合作；陳教授團隊為第二篇所有作者皆為台灣團隊人員之研究，距前一篇 1999 年之發表研究，迄今已 22 年。此篇論文陳教授指導之王嘉誠博士生為第一作者，其餘作者為陳教授與陳教授指導之碩士班研究生。王嘉誠同學亦獲得 ACM MobiCom 2020 Student Research Competition 研究所組第一名，從 2005 年該比賽開辦以來，王嘉誠同學為台灣的大學第一次於此國際知名競賽中獲得研究所組前三名。

陳教授團隊表示希望這次的研究成果能讓自駕車於任何環境具備定位能力，讓自駕車系統更加完善，也讓用路人可以更加安心。陳教授團隊並開放所有資料於 http://wire.cs.nctu.edu.tw/mvp，供其他研究人員免費使用。

Professor Jyh–Cheng Chen and Team at CCS Positioning inside Tunnels via the Use of Magnetic Fields, Published on MobiCom 2021

Professor Jyh-Cheng Chen and his team conducted research on positioning inside tunnels via magnetic fields, which was published on MobiCom 2021 - The 27th Annual ACM International Conference on Mobile Computing and Networking, a prestigious international conference. The acceptance rate of MobiCom is typically around 10%. MobiCom is firmly established as the premier international forum for research in all areas of mobile computing and wireless and mobile networking. This was the second time that a full paper of all authors affiliated with Taiwanese organizations was published on MobiCom since its establishment in 1995. At the same time, the team took first place in the MobiCom 2020 Student Research Competition (Graduate category), marking the first time the Taiwanese team has ever won in this internationally renowned competition.

According to Professor Chen, self-driving cars will be the future of the automotive industry. One of the current challenges of the self-driving system is that it cannot effectively position where satellite positioning fails, such as tunnels and multi-level roads, thereby hindering drivers from trusting the self-driving cars. Therefore, this study used magnetic fields to position areas where satellite positioning fails. The achievement, "MVP: Magnetic Vehicular Positioning System for GNSS-Denied Environments," was published on MobiCom 2021 as a full paper.

Positioning is essential for self-driving cars because cars rely on it to identify their locations. However, cars cannot receive satellite signals to perform self-driving in areas such as tunnels, parking lots, and underpasses. In addition, on multi-level roads, satellite positioning cannot determine whether the car is currently on an elevated road or a ground road. Drivers may receive wrong driving instructions. Besides, it will be risky when operating self-driving vehicles. Professor Chen's team used magnetometers to measure magnetic fields and compare the measured magnetic fields with the magnetic field map using an algorithm developed by the team. The results showed that the system could enable positioning without satellite signals and reach a positioning accuracy of 5.14 meters. The research team conducted large-scale road experiments in 56 tunnels and 23 bridges in two countries for 36 months and confirmed the system's effectiveness with 5,943 datasets, successfully providing precise positioning for these fields. Moreover, the system can execute on smartphones without expensive positioning equipment, significantly reducing the cost of precise positioning when satellite positioning is unavailable. It is the first research to use magnetic fields to achieve precise vehicle positioning in satellite failure areas, making the self-driving system safer.

Since the inauguration of MobiCom in 1995, less than ten full papers have listed authors from Taiwan research institutions. Most of them were collaborating with foreign universities. Professor Chen's paper is the second full paper with all Taiwanese authors published on MobiCom. Twenty-two years have passed since the first one of all authors affiliated with Taiwanese organizations was accepted in 1999. In this paper, Chia-Cheng Wang, a Ph.D. student advised by Professor Chen, is the first author and the other authors are Professor Chen and his master's students. Furthermore, Mr. Chia-Cheng Wang won first place in the graduate category in MobiCom 2020 Student Research Competition. Since the competition was launched in 2005, Mr. Wang has been the first student from a university in Taiwan to have won the top three in this internationally renowned competition.

Professor Chen's team hopes that the research achievement may enable self-driving cars to retain positioning capabilities in any environment, make the self-driving car system more complete, and reassure road users about safety. The materials of Professor Chen's team are freely accessible to all at http://wire.cs.nctu.edu.tw/mvp.

李仕柏學長經驗談
UW-NCTU AI Labs 移地研究

文／翁健棋

為了增強美國華盛頓大學與國立陽明交通大學的學術研究合作關係，同時預期能為兩校之共同學術論文發表產生貢獻，於本校畢業後，任職華仁人工智慧實驗室（UW-NCTU AI Labs）的研究助理李仕柏同學，由「華仁全球講座」贊助至美國華盛頓大學黃正能教授實驗室，以「運用深度學習模型針對毫米波雷達對人體進行三維關節點偵測」為研究主題進行移地研究。

談及本次出國短期交換的動機，李仕柏同學提到，從進入大學校園求學至研究所，一直以來便有著「出國工作」的夢想，但如果想要到美國工作，則需要先取得碩士或博士學位。此行的目的主要希望能在申請之前先體驗國外的生活，增廣見聞的同時，在自己的履歷上留下出國交換的記錄，做為未來申請入學、求職的加分項目。自2021 年九月開始到受訪時，李仕柏同學已在美國待了五個月有餘，除了新冠疫情所帶來的部分影響，位於西雅圖的華盛頓大學不論是天氣、交通或是治安，皆令身為異鄉遊子的李仕柏十分滿意。華盛頓大學因地處美國西岸，氣候受鄰近海洋影響，全年氣溫變化和緩，適宜人居；同時因身繫輔助西雅圖地區經濟建設與發展之重任，華盛頓大學附近有著眾多公車路線經過，亦可選擇搭乘輕軌前往市區。

疫情之下，各式長短期出國交換意願明顯受其影響，激增的新冠肺炎確診案例不單使眾學子望之卻步，甚至打亂長期求學規劃。李仕柏憶起最初抵達美國時，疫情初有趨緩趨勢，恰逢當地為時近兩年的封鎖結束，處處人山人海，令他印象十分深刻。聊到授課方式差異，李仕柏認為差異不大，不必過於擔心會不適應。另一方面，有關移地研究之實驗室的工作環境和氛圍，李仕柏舉了實驗室內與自己共事的中國學生為例，據他觀察發現，中國學生們很積極主動，受在地學風影響，想法也比較多。而教授研究風格方面，較傾向於「提供研究方向」，配合學生的想法後進行產出，過程中不會過度拘束，給予較大的自由度與操作空間，於特定時機才會適時提出建議進行修正。「照著老師的意思，但是用其他的方式表達，再加上自己的想法進來。」李仕柏認為不論身為一名學生抑或研究者，「主動思考」為兩者皆須具備的能力。

對於尚在思索未來方向的學弟妹們，李仕柏給出了幾點建議。「我認為蠻多學生或許現在都會感到焦慮，苦思怎樣讓自己變得比較國際化。我覺得在此之前，應該要先想好自己到底要從事什麼工作。」具體來說，可以自「目前就讀的科系是否有興趣」此一簡單的問題開始思考，加上現實條件納入考量，權衡是否有繼續攻讀更高學歷的動力。此外「累積自己的履歷」亦十分重要，如其自身選擇嘗試之短期交換，有機會便要把握，積極申請，趁年輕時多積攢經驗，開拓視野，對於升學或求職都有極大幫助。

感謝李仕柏同學撥空受訪，分享交換心得。目前林一平教授和黃正能教授與本校、華大校友、華邦董事長焦佑鈞，已為二校學生募得互訪獎學金，再次鼓勵眾學子提出博碩士申請，體驗並開拓人生經驗與視野。

Off-Site Research at UW-NYCU Lab by Shih-Po Lee

In order to strengthen the academic research partnership between the University of Washington and National Yang Ming Chiao Tung University (NYCU), UW-NYCU AI Lab offers opportunities for students to conduct off-site research after graduation. Shih-Po Lee, a research assistant at UW-NYCU AI Lab was sponsored to conduct a research project in Dr. Jenq-Neng Hwang's lab on 3D Human Pose Estimation Using Millimeter Wave Radar.

Speaking about the motivation for this short-term exchange experience, Shih-Po Lee mentioned that he had always desired to work abroad since college. However, if he wants to work in the United States, he would need to obtain a master's or doctoral degree first. The purpose of this trip was to experience life abroad, broaden his horizons, and enrich his resume for future admissions and jobs. At the time of this interview, Shih-Po Lee had been in the United States for more than five months since September 2021. Although everything was slightly affected by the Covid-19 pandemic, he found attending school at the University of Washington very satisfying for him in terms of the weather, transportation, and security. The school is located on the west coast and is near the ocean, so the gentle temperate is often pretty comforting to live in. Besides, the school is near the center of economic development in Seattle with numerous bus routes and light rail transit options available to get to the city center.

The pandemic has had an impact on the willingness of students to apply for oversea exchange opportunities. Moreover, many students' long-term study plans were disrupted. However, he was very surprised to see crowds of people everywhere when he first arrived at the U.S. because the time was coincidentally the end of a two-year lockdown with fewer confirmed Covid cases. When it comes to the differences in professors' teaching methods between Taiwan and America, Shih-Po Lee thinks that there is no need to worry too much about not being able to fit in the environment.

Regarding the working environment and atmosphere in the laboratory for off-site research, he recalled that students from mainland China he worked with were very hard-working and proactive with lots of innovative ideas.

In terms of research style, the professors are not overly too restrictive with more freedom toward students' ideas. Usually, they will provide some brooder direction first, then provide their suggestions later on. Shih-Po Lee said, "we would do what professors' said, but we also integrate our ideas." He believes that active thinking is necessary for both students or researchers. For students who are frustrated about their future direction, Shih-Po Lee offers a few suggestions. "I think a lot of students are probably feeling anxious right now, thinking about how exactly they can develop their abilities as an international talent. To that question, I think it's important to consider what kind of job you would be interested in before you start doing it.

Specifically, you can ask yourself a simple question of whether or not you are interested in your current field of study, and then take into account the realities of the situation to see if you have the motivation to pursue a higher degree. In addition, it is also important to accumulate your resume. For example, seize your opportunity to apply for a short-term exchange position by taking action actively. Also, try to gain more experience in any domain and broaden your horizons at your age. These will be of great help in further education or job hunting.

We really appreciate Shih-Po Lee's time to share his experience through this interview. The funding for this exchange program is kindly raised by Dr. Jason Yi-Bing Lin, Dr. Jenq-Neng Hwang, and Arthur Chiao, the chairman of the Broad of Winbond (alumni of NYCU and UW). Students are welcome to apply to this exchange program to gain a different life experience.

參與國際頂尖會議 促進學術交流

文稿整理／林珮雯

為擴展青年國際視野，本院鼓勵師生參與國際會議等學術活動，以瞭解國外學術現況，進而提升本院研究水準。本院邀請幾位參與其中同學分享心得如下：

發表論文：ShuttleNet: Position-aware Fusion of Rally Progress and Player Styles for Stroke Forecasting in Badminton

作者：Wei-Yao Wang, Hong-Han Shuai, Kai-Shiang Chang, Wen-Chih Peng

指導教授：彭文志老師 帥宏翰老師

國際會議名稱：第三十六屆 AAAI Conference on Aritificial Intelligence (AAAI 2022)

該會議重要性：AAAI 為人工智慧中頂尖的國際會議之一，今年一共有約 9020 篇有效投稿，其中有 1349 篇論文被接受，接受率約為 15%。此會議有多種類型的主題，包含電腦視覺、自然語言處理與資料探勘分析等。

王威堯同學心得分享：

這篇是我第一篇被 A 級國際會議的論文，本來是我的碩論，但因為投稿上也促使我決定要申請逕博攻讀博士學位。此研究為根據羽球選手過去的賽事資料，設計兩個考慮球種與位置關聯性的編碼器 - 解碼器架構，分別提取回合進展與球員風格，並在每一拍動態地考慮這些資訊的重要性，以預測選手們接下來可能會打的球種及位置分布。很開心能在 2021 年發表兩篇成果，將羽球分析的成果推廣給世界看到。

發表論文：Reinforced Few-Shot Acquisition Function Learning for Bayesian Optimization

作者：Bing-Jing Hsieh, Ping-Chun Hsieh, Xi Liu

會議名稱：Neural Information Processing Systems (NeurIPS), 2021

會議重要性：NeurIPS 於 1987 年首次舉辦於加拿大，為機器學習領域中最重要的會議之一，在 Neurips 2021 中共有 9122 篇論文投稿，其中有 2344 篇被接受，接受率約為 26%。

謝秉瑾同學心得：

十分感謝老師在論文寫作和技術方面的指導與幫忙，這次是我第一次投稿國際會議，在寫作上遇到許多瓶頸，老師也不厭其煩地告訴我要如何更好的描述我們的論點；研究過程中也遇到許多挫折，多虧有老師熱心的指導下引導我解決了

許多難題；在論文被審查時，接受了許多審查人專業的建議讓我們的論文更加完整，最後使得我們的論文能夠被國際頂尖的會議接受，也讓我學習到許多事物。

發表論文：Exploring the Long Short-Term Dependencies to Infer Shot Influence in Badminton Matches

作者：Wei-Yao Wang, Teng-Fong Chan, Hui-Kuo Yang, Chih-Chuan Wang, Yao-Chung Fan, Wen-Chih Peng

指導教授：彭文志老師

國際會議名稱：第二十一屆 IEEE International Conference on Data Mining (ICDM 2021)

該會議重要性：ICDM 為資料探勘中頂尖的國際會議之一，今年一共有約 990 篇有效投稿，其中有 198 篇論文被接受，接受率為 20%。此會議有多種類型的資料探勘主題，包含深度學習、資料庫、圖形識別等。

王威堯同學心得分享：

這是我第一篇成功投稿的一作國際頂級會議論文，收到錄取通知的時候也感到非常興奮。本來以為可以前往紐西蘭參加會議，結果因為疫情的影響改成線上舉辦，無法實際與其他學者面對面交流。報告也因此改成先錄影再現場進行問答，但因為我剛好是該會議時段的最後一組，輪到我的報告時人就比較少，所以也少了可以跟很多人交流的機會。但是我有去聽其他學者的成果分享，第一次提問讓我覺得滿緊張也滿開心的。

發表論文：Unsupervised Point Cloud Object Co-segmentation by Co-Contrastive learning and Mutual Attention Sampling

發表作者：Cheng-Kun Yang, Yung-Yu Chuang and Yen-Yu Lin

指導教授：莊永裕教授, 林彥宇教授

國際會議名稱：IEEE International Conference on Computer Vision (ICCV 2021)

該會議重要性：IEEE ICCV 是電腦視覺領域的國際頂尖會議的其中之一，與 CVPR、ECCV 並列國際三大頂尖電腦視覺會議，ICCV 這次總共收到

了 6,236 篇論文投稿，僅錄取了 1,617 篇論文，錄取率約 25%。ICCV 審稿的要求極高，也因此收錄的論文具有頂尖的水準。

楊証琨同學心得分享：

ICCV 2021 主要議程分成口頭報告 (oral) 與海報報告 (poster)。很榮幸我們的研究被 Area chair 推薦 oral 的形式進行報告（僅有 3% 投稿的 paper 獲選為 oral）。此篇論文探討無監督式的 3D 點雲分割任務，3D 點雲分割任務在模型學習的過程需要大量的標註資料，造成應用落地時的困難。我們嘗試利用跨點雲之間的異同性質，並運用現今流行的注意力機制，成功的在沒有任何標注的資料情況下，將若干個點雲中，相同類別的點分割出來。參加 ICCV 2021 的過程中，我學習到了如何與國際的頂尖學者互動、提問與交流，並試著從現有的文獻來探討具有潛力的研究課題。

發表論文：Exploring Cross-Video and Cross-Modality Signals for Weakly-Supervised Audio-Visual Video Parsing

發表作者：Yan-Bo Lin, Hung-Yu Tseng, Hsin-Ying Lee, Yen-Yu Lin, Ming-Hsuan Yang

指導教授：林彥宇教授

國際會議名稱：Thirty-fifth Conference on Neural Information Processing Systems, (NeurIPS 2021)

該會議重要性：NeurIPS（前稱 NIPS）為人工智慧與機器學習之頂尖會議，近年來因人工智慧相關領域蓬勃發展，例如，電腦視覺、文字語音處理⋯等。使其會議在所有電腦科學相關會議中影響力排名在第二名。 本年度共有 9122 篇論文提交，其中有 2344 篇被接受，接受率為 26%。

林彥伯同學心得分享：

很高興可以參加 AI/ML 的頂級會議，雖然很可惜這次依然是線上開會，但也有不少篇有趣的論文報告可以觀賞。其中，也有不少機器學習理論與非電腦視覺相關的論文，可以讓平常都以閱讀電腦視覺的論文為主的我有不少開眼界的機會。雖然有時候作者不一定會在自己的海報區，但預錄的影片也多少有一點幫助，可以快速地知道現在其他領域的重要發展，或許有一天可以應用在自己的研究領域。

Communicating with Experts at Top Conferences

To broaden our college's horizon and improve the quality of the publications of research, we encourage our faculty members and students to participate in international conferences to understand the current Computer Science academia. We invited several students to share their experiences of joining international conferences as follows.

Paper: ShuttleNet: Position-aware Fusion of Rally Progress and Player Styles for Stroke Forecasting in Badminton

Authors: Wei-Yao Wang, Hong-Han Shuai, Kai-Shiang Chang, Wen-Chih Peng

Advisors: Wen-Chih Peng, Hong-Han Shuai

Conference: Conference on Artificial Intelligence (AAAI 2022)

The importance of this conference: The purpose of the AAAI conference is to promote research in artificial intelligence (AI) and scientific exchange among AI researchers, practitioners, scientists, and engineers in affiliated disciplines. This year, 9020 papers were reviewed and only 1349 papers were accepted, with an overall acceptance rate of 15%.

Reflection from Wei-Yao Wang:

This is my first paper that got accepted for a tier 1 international conference. It was originally my master's thesis, but the submission also prompted me

to apply for a Ph.D. degree. My research is to forecast what players will return the stroke based on the given strokes. We proposed ShuttleNet with two encoder-decoder architectures to extract rally conditions and players' styles respectively. Afterward, we fused these contexts by considering the importance of this informational dynamically on every beat. I was thrilled to publish two papers at international conferences in 2021 to bring the results of badminton analysis to the world.

Paper: Reinforced Few-Shot Acquisition Function Learning for Bayesian Optimization

Authors: Bing-Jing Hsieh, Ping-Chun Hsieh, Xi Liu

Conference: Neural Information Processing Systems (NeurIPS), 2021

The importance of this conference: NeurIPS was first held in Canada in 1987 and is one of the most important conferences in the field of machine learning. 9122 papers were submitted to Neurips 2021 and 2344 of them were accepted, with an acceptance rate of about 26%.

Reflection from Bing-Jing Hsieh:

I am very grateful to my professor. With his enthusiastic guidance, I was able to solve many problems since it was my first time to submit a paper to an international conference. For example,

I encountered many problems in writing, and my professor taught me how to better describe our arguments. When the paper was reviewed, I received many suggestions from reviewers, and finally our paper was accepted by a top international conference. Overall, I learned a lot through this process.

Paper: Exploring the Long Short-Term Dependencies to Infer Shot Influence in Badminton Matches

Authors: Wei-Yao Wang, Teng-Fong Chan, Hui-Kuo Yang, Chih-Chuan Wang, Yao-Chung Fan, Wen-Chih Peng

Advisor: Wen-Chih Peng

Conference: IEEE International Conference on Data Mining (ICDM 2021)

The importance of this conference: The IEEE International Conference on Data Mining (ICDM) has established itself as the world's premier research conference in data mining. This year, 990 papers were reviewed and only 198 papers were accepted, with an overall acceptance rate of 20%.

Reflection from Wei-Yao Wang:

I was very excited to receive the acceptance notice because this was the first paper I ever submitted successfully to a top international conference as the first author. However, I missed the chance to attend the conference and discuss with other scholars face to face in New Zealand since ICDM decided to hold online due to the ongoing COVID-19 circumstances around the world. The format of presentation has also changed to playing video recordings first, then conducting synchronized Q & A sections later. However, since I was in the last group in the session, there were fewer people attending my presentation. Nevertheless, I did listen to the results of other scholars, and I was very excited and happy to ask questions for the first time.

Paper: Unsupervised Point Cloud Object Co-segmentation by Co-Contrastive learning and Mutual Attention Sampling

Authors: Cheng-Kun Yang, Yung-Yu Chuang and Yen-Yu Lin

Advisors: Yung-Yu Chuang, Yen-Yu Lin

Conference: EEE International Conference on Computer Vision (ICCV 2021)

The importance of this conference: IEEE ICCV is one of the top international conferences in the field of computer vision, along with CVPR and ECCV. ICCV received a total of 6,236 paper submissions and only 1,617 papers were accepted. The acceptance rate is about 25%.

Reflection from Cheng-Kun Yang

The main program of ICCV 2021 was divided into oral and poster presentations. We were honored to have our research nominated for oral presentations by the Area chair (only 3% of submitted papers are selected as oral presentation). This paper presents a new task, point cloud object cosegmentation, aiming to segment the common 3D objects in a set of point clouds. We formulate this task as an object point sampling problem, and develop two techniques, the mutual attention module, and co-contrastive learning, to enable it. Our method works on point clouds of an arbitrary object class. It is end-to-end trainable and does not need point-level annotations. During my participation in ICCV 2021, I learned how to interact, ask questions, communicate with leading international scholars, and try to explore potential research topics from the existing related work.

Paper: Exploring Cross-Video and Cross-Modality Signals for Weakly-Supervised Audio-Visual Video Parsing

Authors: Yan-Bo Lin, Hung-Yu Tseng, Hsin-Ying Lee, Yen-Yu Lin, Ming-Hsuan Yang

Advisor: Yen-Yu Lin

Conference: Thirty-fifth Conference on Neural Information Processing Systems, (NeurIPS 2021)

Reflection from Yan-Bo Lin

I am glad to attend this AI/ML conference. Although it was still held online, there were many interesting paper presentations. A lot of topics presented on that day related to machine learning theory and some of them were not related to computer vision fields. I was able to broaden my horizon because I usually read papers related to computer vision only. Although sometimes the authors were not in their own poster section, the pre-recorded videos were also quite helpful to quickly learn about the important developments in their fields. I hope I can apply this knowledge in my research one day.

本刊每學期發刊一期，做為本院師生與系友、家長、院友的溝通橋樑。每期報導本院近期研究現況，內容包括人事動態、國際交流、師生 獲獎等。期能經由本刊使讀者掌握資訊學院最 新動態，促進彼此互動。

Published twice per year, this periodical, as a bridge between faculty, students, alumni, parents and friends of the college, is dedicated to the latest research updates, including personnel changes, international collaboration, faculty & students honors, etc., in order to assist readers to keep update of the latest developments of the College of Computer Science (CCS) and encourage mutual interaction.

一、人事動態
◇ 本院資訊工程學系林正中副教授於 111 年 2 月退休。感謝林老師長久以來培育英才孜孜不倦，希望老師能常回系上傳承智慧和經驗。

二、國際交流
◇ 德國多特蒙德工業大學（Technical University Dortmund）Fang-Jing Wu 教授於 2021 年 10 月 6 日至本系演講，講題為：「Crowd Footprints: Location-less Crowd Mobility Analytics using Wireless Traces of Mobile Devices」。
◇ 美國馬里蘭大學 (University of Maryland) 黃嘉斌教授於 2021 年 10 月 14 日至本校人工智慧普適研究中心學術交流及演講。
◇ 美國俄亥俄州立大學（The Ohio State University）Herman Shen 教授於 2021 年 11 月 10 日至本系演講，講題為：「Deep Learning Driven Digital Twin Technology for Engineer ing, Manufacturing, and Healthcare Application」。
◇ 美國休士頓大學 (University of Houston) Zhu Han 教授於 2021 年 11 月 19 日至本校演講，講題為：「Three Classes Related To Machine Learning」。
◇ 美國俄亥俄州立大學（The Ohio State University）Wei-Lun (Harry) Chao 教授於 2021 年 12 月 8 日至本院演講。
◇ 美國明尼蘇達大學 (University of Minnesota)Hung-Chang Du 教授於 2021 年 12 月 15 日至本系演講。
◇ 美國南加州大學（University of Southern California）Shao-Hua Sun 先生於 2021 年 12 月 20 日至本系演講，講題為：「Program-Guided Framework for Interpreting and Acquiring Complex Skills with Learning Robots」。
◇ 美國 Google Brain Kuang-Huei Lee 先生於 2022 年 1 月 16 日至本系演講，講題為：「Learn representations that generalize for vision and RL」。
◇ 印尼駐台北經濟貿易代表團於 2022 年 2 月 18 日至本院參訪交流。

三．教師榮譽
◇ 吳毅成教授與國研院國網中心、東海大學共同開發之「智能點雲技術」榮獲 2021 年全球百大科技研發獎！
◇ 邱維辰教授榮獲中國電機工程學會 110 年度優秀青年電機工程師獎！
◇ 高孟駿教授榮獲中央研究院 2021 年「年輕學者研究成果獎」！
◇ 林一平教授榮獲中國電機工程學會 110 年度會士！
◇ 彭文孝教授獲選為 IEEE Circuits and Systems Society Distinguished Lecturer for 2022-2023!

◇ 顏安孜教授榮獲 110 年度科技部博士後研究人員學術研究獎！
◇ 林彥宇教授榮獲 110 年度科技部傑出研究獎！
◇ 謝續平教授獲選為 IEEE Transactions on Reliability (TRel) Editor-in-Chief for 2022-2025!

四、學生榮譽
◇ 袁賢銘教授指導廖家鴻、鄭人豪、閻俊宇、韓覩同學榮獲 21 全國大專校院智慧創新暨跨域整合創作競賽第二名！
◇ 邱維辰教授指導蔡孟勳同學榮獲中華民國人工智慧學會 110 年度碩士論文佳作獎！
◇ 王威堯、杜葳葳、楊蕙涵、魏麗容同學榮獲 2021 法律科技黑客松銅獎、國民法官獎、卓騰技術應用獎！
◇ 陳作源同學、鄭文皇教授、帥宏翰教授、黃敬群教授榮獲 CVGIP 2021 論文優等獎！
◇ 蔡孟勳、江沛澤同學、蔡易軒、邱維辰教授榮獲 CVGIP 2021 論文優等獎！
◇ 呂佳倪、張雅筑同學、邱維辰教授榮獲 CVGIP 2021 論文佳作獎！
◇ 邱維辰教授指導葉鈺萱同學榮獲 IPPR 第十四屆碩士論文優等獎！
◇ 邱維辰教授指導呂佳倪同學榮獲 IPPR 第十四屆碩士論文佳作獎！
◇ 邱維辰教授指導陳殿善同學榮獲台灣管理學會第十四屆崇越論文大賞優等論文獎（碩士組－AI 資訊類)!
◇ 林一平教授指導廖俊凱、陳長韋同學榮獲 2021 年通訊大賽聯網未來挑戰賽「校園菁英獎」！
◇ 林一平教授、曾聖凱教授指導廖俊凱、陳長韋同學榮獲第十四屆「創意狂想 巢向未來」智慧化居住空間創意競賽佳作！
◇ 嚴力行教授指導王人右、吳思蓓同學榮獲 APNOMS 2021 Best Paper Award!
◇ 陳健教授、曾建超教授指導鍾旺偉同學榮獲 APNOMS 2021 Best Student Paper Award!
◇ 曾建超教授指導歐任鈞、許郁彬、王辰旭同學榮獲 the 25th Mobile Computing Workshop 最佳實作獎！
◇ 曾建超教授指導劉育伸、陳柏帆、陳彥瑋、胡閔智同學榮獲 the 25th Mobile Computing Workshop 優良實作獎！
◇ 曾建超教授指導黃怡瑄同學榮獲 the 25th Mobile Computing Workshop Best Paper Award!
◇ 蔡錫鈞、謝旻錚教授指導盛宇航、吳仲昇、虞樸同學於延賽一年之第 44 屆國際大學程式設計競賽（ICPC）線上世界大賽中，榮獲第五名（銅牌獎），為台灣參

賽隊伍排名第一，本校參賽 20 多年來最佳成績！
◇ 黃克崴、林栢緯、郭軒語同學獲得 110 學年度全國大專電腦軟體設計競賽第二名，並於第 46 屆國際大學程式設計競賽亞洲區台北站獲得金獎！
◇ 彭文志教授指導王威堯同學參與 De-Factify Challenge@ AAAI Workshop 2022 獲得競賽第五名，比賽研究成果論文獲選為最佳論文獎！
◇ 彭文志教授指導王威堯、杜葳葳、唐宇謙同學參與 DepSign-LT-EDI@ACL-2022 Task 4: Detecting Signs of Depression from Social Media Text 獲得競賽第二名！

1. Personnel Changes
· Dr. Cheng-Chung Lin has retired from active faculty status as of February, 2022, after a productive career. We greatly appreciate your dedicated years of service and hope you will come back and share your wisdom and knowledge with us.

2. International Collaboration
· Professor Fang-Jing Wu (Technical University Dortmund, Germany) delivered a speech, "Crowd Footprints: Location-less Crowd Mobility Analytics using Wireless Traces of Mobile Devices", for the department of Computer Science at NYCU on Oct. 6, 2021.
· Professor Jia-Bin Huang (University of Maryland at College Park) delivered a speech, "Learning to See the 3D World", for the Pervasive Artificial Intelligence Research Labs at NYCU on Oct. 14, 2021.
· Professor Herman Shen (The Ohio State University) delivered a speech, "Deep Learning Driven Digital Twin Technology for Engineering, Manufacturing, and Healthcare Application '', for the department of Computer Science at NYCU on Nov. 10, 2021.
· Professor Zhu Han (University of Houston) delivered a speech, "Three Classes Related to Machine Learning", at NYCU on Nov. 19, 2021.
· Professor Wei-Lun (Harry) Chao (The Ohio State University) delivered a speech for the college of Computer Science at NYCU on Dec. 8, 2021.
· Professor Hung-Chang Du (University of Minnesota) delivered a speech for the department of Computer Science at NYCU on Dec. 15, 2021.
· Mr. Shao-Hua Sun (University of Southern California) delivered a speech, "Program-Guided Framework for Interpreting and Acquiring Complex Skills with Learning Robots", for the department of Computer Science at NYCU on Dec. 20, 2021.
· Mr. Kuang-Huei Lee (Google Brain, USA) delivered a speech, "Learn representations that generalize for vision and RL", for the department of Computer Science at NYCU on Jan. 16, 2022.
· Indonesian Economic and Trade Office to Taipei visited the department of Computer Science at NYCU on Feb. 18, 2022 for educational and cultural exchange.

3. Faculty Honors
· "Cloud-based Smart Point Cloud Processing (CSPCP)", developed by Professor I-Chen Wu at NYCU, National Center for High-performance Computing, and Tunghai University, has been selected as a winner of the 2021 R&D 100 Awards.
· Professor Wei-Chen Chiu received the 2011 Outstanding Young Electrical Engineer Award from the Chinese Institute of Electrical Engineering.
· Professor Mong-Jen Kao received the 2021 Academia Sinica Early-Career Investigator Research Achievement Award.
· Professor Yi-Bing Lin has been named a 2021 honorary fellow of the Chinese Institute of Electrical Engineering.
· Professor Wen-Hsiao Peng is appointed IEEE Distinguished Lecturer (DL) for the IEEE Circuits and Systems Society in 2022-2023.

· Professor An-Zi Yen received the 2021 Most Outstanding Award in Postdoctoral Research.
· Professor Yen-Yu Lin received the 2021 MOST Outstanding Research Award.
· Professor Shiuhpyng Shieh is appointed as Editor-in-Chief (EIC) of IEEE Transactions on Reliability (TRel), 2022-2025.

4. Students Honors
· Chia-Hung Liao, ,Jen-Hao Cheng, Jun-Yu Yan, Chin Han, advised by Professor Shyan-Ming Yuan, took second place in 2021 NIICC competition.
· Meng-Hsun Tsai, advised by Professor Wei-Chen Chiu, won the 2021 TAAI Master's Thesis Honorable Mention Award.
· Wei-Yao Wang, Wei-Wei Du, Yi-Han Yang, and Li-Rong Weireceived bronze award for the 2021 Taiwan Legal and Compliance Technology Hackathon, Citizen Judge Award, and Droidtown technical application award.
· Tso-Yuan Chen, Professor Wen-Huang Cheng, Professor Hong-Han Shuai, and Professor Ching-Chun Huang received the 2021 CVGIP Excellent Article Awards.
· Meng-Hsun Tsai, Pei-Tse Chiang, Yi-Hsuan Tsai, and Professor Wei-Chen Chiu received the 2021 CVGIP Excellence Paper Award.
· Chia-Ni Lu, Ya-Chu Chang, and Professor Wei-Chen Chiu received the 2021 CVGIP Honorable Mention Paper Award.
· Chia-Ni Lu, advised by Professor Wei-Chen Chiu, received the IPPR 2021 Master's Thesis Honorable Mention Award.
· Dian-Shan Chen, advised by Professor Wei-Chen Chiu, received the 2021 TSC Master's Thesis Excellence Award (AI Informatics).
· Yu-Hsuan Yeh, advised by Professor Wei-Chen Chiu, received the IPPR 2021 Master's Thesis Excellence Award.
· Jyun-Kai Liao and Chang-Wei Chen, advised by Professor Yi-Bing Lin, received Campus Elite Award in 2021 Mobileheroes.
· Jyun-Kai Liao and Chang-Wei Chen, advised by Professor Yi-Bing Lin and Professor Sheng-Kai Tseng, received excellent work award in 2021 Intelligent Living Space Design Competition.
· Jen-Yu Wang and Juliana Liman, both advised by Professor Li-Hsing Yen, received APNOMS 2021 Best Paper Award.
· Wang-Wei Chung, advised by Professor Chien Chen and Professor Chien-Chao Tseng, received APNOMS 2021 Best Student Paper Award.
· Jen-Chun Ou, Yu-Bin Hsu, and Chenxu Wang, advised by Professor Chien-Chao Tseng, received the 25th Mobile Computing Workshop Best Practice Award.
· Yu-Shen Liu, Bo-Fan Chen, Yan-Wei Chen, Min-Zhi Wu, advised by Professor Chien-Chao Tseng, received the 25th Mobile Computing Workshop Outstanding Practice Award.
· Yihsuan Huang, advised by Professor Chien-Chao Tseng, received the 25th Mobile Computing Workshop Best Paper Award.
· Yu-Hang Sheng,Chung-Sheng Wu, and Pu Yu, advised by Professor Shi-Chun Tsai and Professor Min-Zheng Shieh, received Bronze award in the 44th International Collegiate Programming Contest (ICPC), which was postponed for one year. The team ranked No. 1 among teams from Taiwan, marking the best result for NYCU over the past 20 years.
· Ke-Wei Huang,Po-Wei Lin, and Dave Kuo took second place in the National Collegiate Programming Contest 2021, and won the Gold award in 46th International Collegiate Programming Contest (ICPC), Taipei.
· Wei-Yao Wang, advised by Professor Wen-Chih Peng, took 5th place in the competition and received Best Paper Award in De-Factify Challenge@ AAAI Workshop 2022.
· Wei-Yao Wang, Wei-Wei Du and Yu-Chien Tang, advised by Professor Wen-Chih Peng, took second place in DepSign-LT-EDI@ACL-2022 Task 4: Detecting Signs of Depression from Social Media Text.

捐款意願書

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□資工系學務發展：贊助學生所舉辦之社團活動、獎助學金、急難救助、興建館舍、講座教授酬金、整建計算機中心機房、更新網路與設備以及整修教室館舍。(Q888)</td>
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<td>□銀行電匯/
ATM 轉帳</td>
<td>戶名：國立陽明交通大學，匯款銀行：玉山商業銀行新竹分行(代號 **"808"**)
帳號：**9550-016-0500-551**
煩請學長匯款後，提供匯款帳號後 5 碼，以利帳務作業。</td>
</tr>
<tr>
<td rowspan="4">信用卡捐款</td>
<td colspan="2">**請填寫下欄信用卡資料(目前接受 Master/Visa/JCB 卡) ※由校方負擔 1.85%手續費**</td>
</tr>
<tr>
<td colspan="2">□定期定額方式：本人願意從西元_____年_____月至西元_____年_____月期間，共_____次， 固定每月扣款新台幣_____元整，預計扣款總額新台幣_____元整。
□單筆捐款方式：本次捐款新台幣_____元整。</td>
</tr>
<tr>
<td>卡號</td>
<td>____-____-____-____   卡片背面後三碼 _____</td>
</tr>
<tr>
<td>有效期限</td>
<td>西元   年   月   持卡人簽名 _____</td>
</tr>
<tr>
<td>徵信</td>
<td colspan="2">是否同意將捐款紀錄刊登於本校相關網站或刊物
□同意刊登姓名與畢業系級
□不同意刊登姓名，但同意刊登畢業系級
□不同意刊登姓名與畢業系級</td>
</tr>
<tr>
<td>收據</td>
<td colspan="2">□寄發單筆收據 □每年1月底前彙寄前年度收據   收據抬頭 _____</td>
</tr>
</table>

捐款專線：（03）5712121 轉 54701-54703   傳真：(03)5729880   Email:ccs@cs.nycu.edu.tw

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資心專案 海外實習生/交換生募款計畫

我們誠摯邀請學長姊們共襄盛舉，一同支持本院所發起的募款活動，協助培育學弟妹們為未來產業之棟樑。

計畫目的
● 帶動本院學生出國交換學習風氣，把國際經驗與競爭刺激帶回交大
● 培養具國際觀的人才

運作方式
● 補助金額以交換一年 20 萬元、一學期 10 萬元為上限
● 在獎學金甄選上，學院會加強對學生修課計畫之要求，定期提供學生出國交換進度及成果報告。

捐款方式
● 單次性小額捐款（自由認捐）
● 單次性大額捐款（以十萬元為單位）
● 信用卡定期定額捐款（如每月三千元）

線上捐款網址

歡迎線上捐款，或填妥捐款同意書後，請傳真至 03-5729880 或 email 至 peiwen@cs.nycu.edu.tw，或郵寄至如下地址：30010 新竹市大學路 1001 號 國立陽明交通大學工程三館 410 室 資訊學院

選擇 捐款方式 → **填妥捐款同意書** 傳真至資訊學院 → **專人與您聯絡** 確認捐款 → **寄發收據** 與感謝函

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