

Impactful Innovations
創科實力

Research and knowledge transfer for the benefit of mankind

科研與知識轉移 造福人類

Our researchers develop new technologies and partner with the industry and global institutions to transfer knowledge for the betterment of society and the world.

我們的研究人員致力開發新技術，並與業界和世界各地的院校合作，推動知識轉移，裨益社會和全球。





Innovative research

創新科研

Total research funding
科研項目總資金

HK\$ 2,941 million
百萬元

Projects undertaken
資助項目總數

≈ 3,035

Advancing technologies 尖端科技

1 Historic Chang'e-4 lunar probe

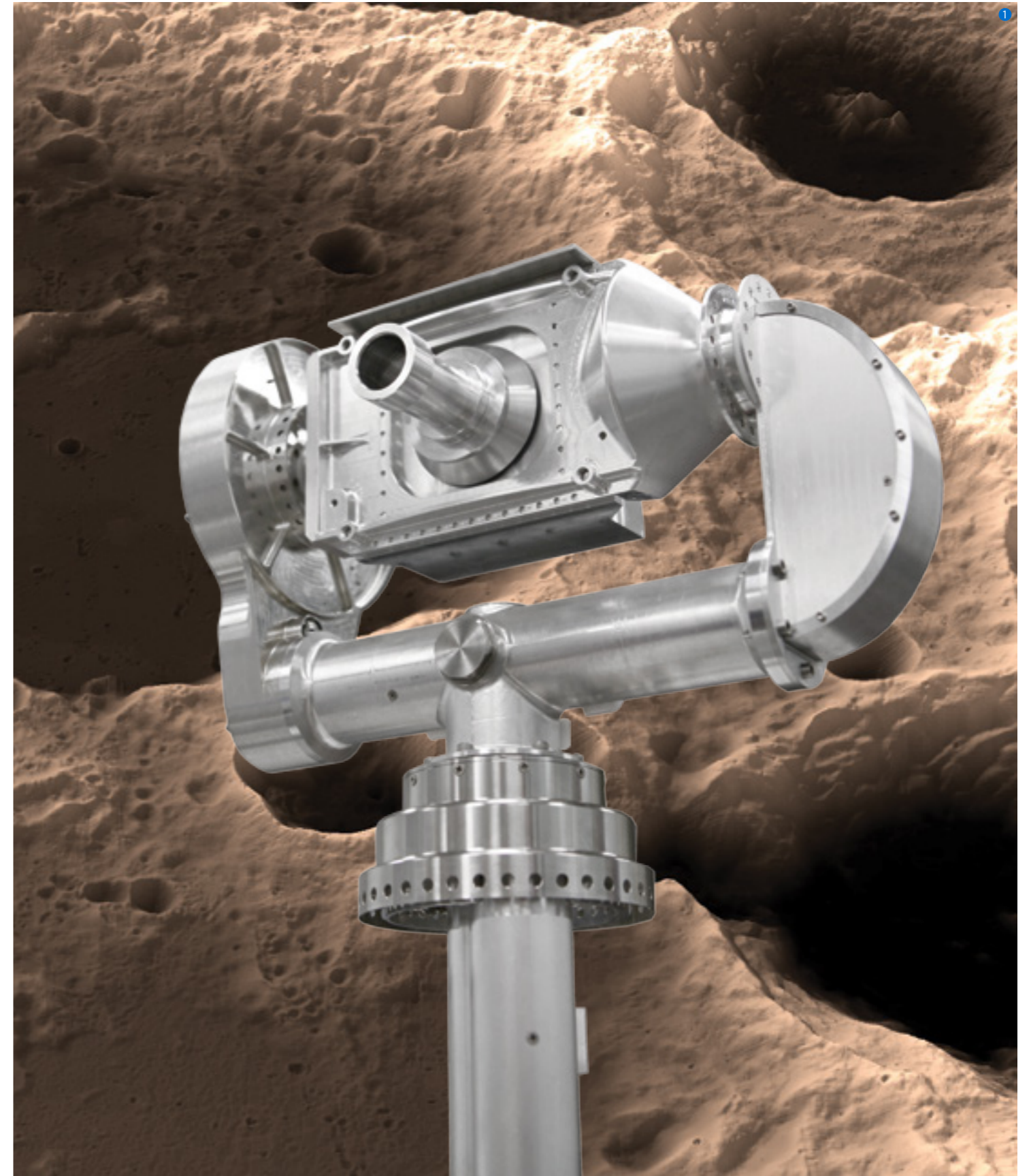
On 3 January 2019, China's Chang'e-4 lunar probe successfully landed on the far side of the moon—a first in the history of space exploration. To select a safe landing site with scientific value, Dr Wu Bo of the Department of Land Surveying and Geo-Informatics led a team with funding by the China Academy of Space Technology (CAST) to amass a large amount of lunar remote sensing data from multi-sources to create high-precision and high-resolution topographic models for two potential landing regions.

In addition, Prof. Yung Kai-leung of the Department of Industrial and Systems Engineering worked with the CAST to develop the Camera Pointing System placed on top of the lander of Chang'e-4. The system protected the camera in the harsh lunar environment, pointed the camera accurately at a position or an object and helped to monitor the descent and progression of the lunar rover. This system also helped to take 360 degree photos of the moon's surface.

歷史性「嫦娥四號」探月任務

中國「嫦娥四號」探測器於2019年1月3日成功登陸月球背面，創太空探索之先河。為了選取安全且具科學價值的著陸點，土地測量及地理資訊學系吳波博士在中國空間技術研究院（五院）的資助下，率領團隊收集和處理了大量的月球遙感數據，為兩個候選著陸區建立了具高精度和高解析度的地形模型。

此外，工業及系統工程學系容啟亮教授與五院共同研發安裝於「嫦娥四號」著陸器頂端的「相機指向系統」。系統能於月球嚴苛環境之下保護相機，並能協助相機準確地指向特定地點或特定物件，亦有助監察月球車降落過程和跟蹤其前進軌跡。它還能幫助拍攝月球表面三百六十度全景的相片。

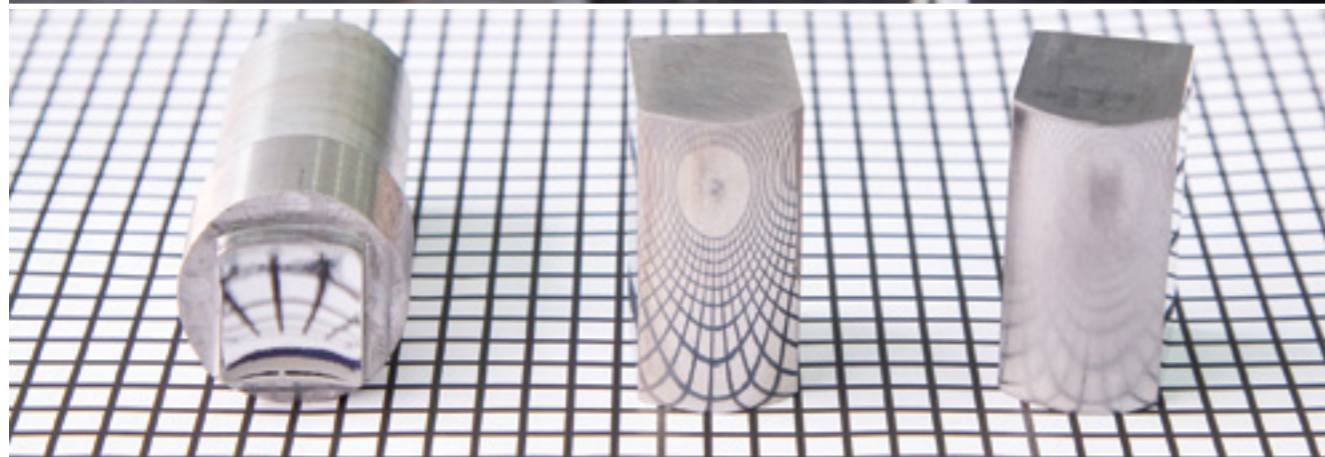
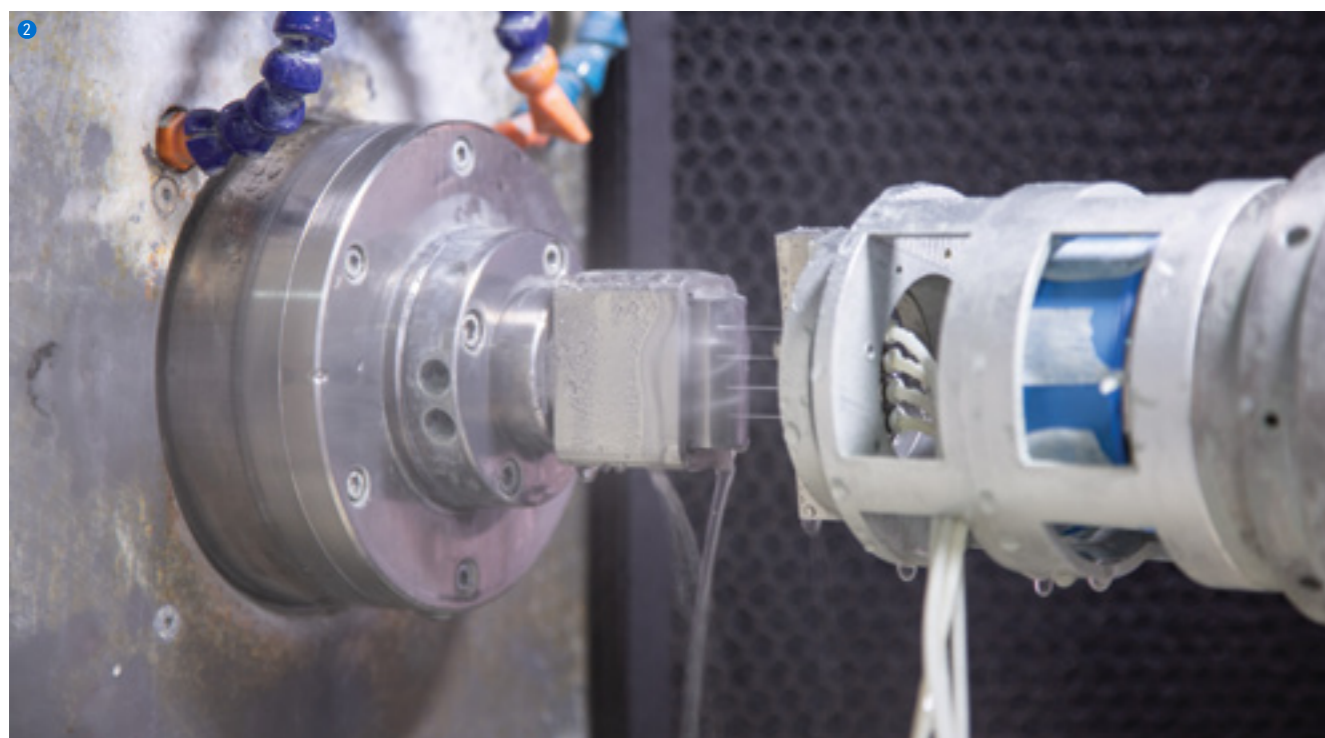


2 Precision non-contact system for freeform polishing

Prof. Benny Cheung of the State Key Laboratory of Ultra-precision Machining Technology has developed a high-efficiency, low-cost Curvature-adaptive Multi-jet Freeform Polishing System for Precision Manufacturing that can be integrated into polishing machines, robotic arms and production lines. Equipped with ultra-precision non-contact polishing technology, the system makes use of multi-jet nozzles and a computerised process to pump abrasive particles and water for polishing the surface of freeform products. The technology has since been transferred to Fudan University for developing an executor for fluid jet polishing.

精密非接觸式自由曲面拋光系統

超精密加工技術國家重點實驗室的張志輝教授研發出高效且低成本，用於精密製造工序的曲率自適應多射流自由曲面拋光系統，能安裝於拋光機、機器臂等設備，甚至整條生產線。該系統配備了超精密非接觸式拋光技術，利用多噴嘴和電腦程序，向自由曲面的工件噴射水和磨料顆粒，進行拋光加工。現時，該技術已轉移至復旦大學開發水射流拋光執行器。



Ultrasonic-assisted machining technology

A collaborative research agreement was signed by the State Key Laboratory of Ultra-precision Machining Technology and son-X company (Germany) for the development of the next generation of ultrasonic-assisted machining technology. In particular, the research team will focus on reducing the surface roughness of optical glass materials and other difficult-to-machine materials such as steel and tungsten carbide.

超聲波輔助加工技術

超精密加工技術國家重點實驗室與德國son-X公司簽署合作研究協議，開發新一代超聲波輔助加工技術。研究團隊將致力於減低光學玻璃物料的表面粗糙度，該項技術同時能應用於鋼和碳化鎢等難以加工的物料上。

Health monitoring for maglev train systems

To improve the reliability and safety of maglev transport systems, PolyU signed a technical agreement with Tongji University for carrying out the Parameter Detection Test for Low-speed Maglev Train-Suspension-Guideway Coupling System project. Since January 2019, the field tests are monitoring the dynamic characteristics and comfort of the Changsha medium-low maglev train and Lingang maglev test line.

磁浮軌道系統的健康監測

為了提高磁浮軌道交通的可靠性和安全性，理大與同濟大學就低速磁浮列車車軌和懸浮架振動的耦合參數檢測項目，簽訂了技術協議。自2019年1月起在長沙中低速磁浮和臨港磁浮試驗線進行實地試驗，以監測列車行駛時的振動特性和舒適度。

Aircraft damage inspection and assessment

Dr Stephen O'Brien at PolyU's Industrial Centre has undertaken a project that will help to identify and categorise damage to airframes, specifically lightning induced damage. His damage inspection and assessment approach incorporates a camera system capable of detecting damage from 35 metres; a surface scanner and flash thermography system for damage assessment; and a corrosion classification system.

飛機損壞的檢查與評估

理大工業中心區柏賢博士進行了一個研究項目，目的是對飛機機身損壞作出識別和分類，尤其是由閃電引起的損壞。他採用的損壞檢查和評估方法，包括結合了一個能從三十五米距離檢測損壞情況的攝像機系統、一台用於損壞評估的表面掃描器和閃光熱成像系統，以及一個腐蝕分類系統。

World's first fashion AI dataset

Through the use of artificial intelligence, Prof. Calvin Wong of the Institute of Textiles and Clothing collaborated with Alibaba Group to develop the world's first FashionAI Dataset for training a machine to recognise apparel key points (e.g. neckline, cuff, waistline) and classifying fashion attributes (e.g. sleeve length, collar type, skirt style). The research will help to increase the accuracy of online fashion image searching, improve cross-selling and up-selling and create a more innovative and personalised buying experience.

全球首個人工智能服飾圖像數據集

紡織及服裝學系黃偉強教授與阿里巴巴集團合作，運用人工智能研發出全球首個「FashionAI服飾圖像數據庫」，旨在訓練電腦辨認服飾圖像的關鍵定位點（例如頸線、袖口、腰線），並就服飾屬性作標籤分類（例如袖長、領子設計、裙型）。此研究有助提高網上搜尋服飾圖像的準確度，令交叉銷售和追加銷售更有效率，締造更創新及個人化的購物體驗。

Sustainable development 可持續發展

Sustainable materials for marine infrastructure

With funding from the Hong Kong Research Grants Council's Theme-based Research Scheme, President Prof. Jin-Guang Teng is leading a project to develop a new type of concrete for marine infrastructure. In collaboration with researchers from Hong Kong, mainland China, the United States, Europe and Japan, this project addresses severe deterioration in marine infrastructure caused by steel corrosion by replacing steel with fibre-reinforced polymer as the reinforcing material. Consequently, seawater and sea-sand can be used to make concrete, with less energy and environmental pollution, and give marine infrastructure a longer life span.

Platform for algal-based biofuel

Prof. Wong Wing-tak of the Department of Applied Biology and Chemical Technology is developing a platform for producing algal-based biofuel that comprises a system for removal of microalgae biomass from water. It also makes use of a mobile high-capacity-high-throughput centrifuge to remove algal biomass from algae-laden waters at a rate of 4000L per hour. Now in use at the Plover Cove reservoir, it is the first system of its kind in China.

Measuring the effects of atmospheric corrosivity on infrastructure

PolyU researchers have developed a comprehensive field test programme to measure the effects of atmospheric corrosivity on infrastructure in Hong Kong. The aim of this programme is to establish a corrosion map of the annual corrosion rates of existing and new structures for durability assessment. The programme serves as a pilot study for other areas of China, particularly maritime cities in the Pearl River Delta Region.

用於海洋基礎建設的可持續材料

校長滕錦光教授正領導一個由香港研究資助局的主題研究計劃資助的項目，該項目旨在研發用以建造海洋基礎設施的新型混凝土結構。其研究團隊與來自香港、中國內地、歐美和日本的科研人員合作，針對海洋基礎建設因鋼材鏽蝕而出現的嚴重老化問題，研究運用纖維增強複合材料代替鋼材作為混凝土結構的增強材料。這樣，海水及海砂便可直接用作配製混凝土，不但能減少建造過程中產生的能源消耗和環境污染，更可延長海洋基礎設施的壽命。

微藻生物燃料系統

應用生物及化學科技學系黃永德教授正研製生產微藻生物燃料的裝置，當中包括一個微藻生物分離系統。通過使用移動式的高容量兼高通量離心機，該裝置每小時可處理四千升水，從中把微藻類生物分離出來。它已在船灣淡水湖成功試用，是中國第一套微藻分離系統。

測量大氣腐蝕對基建結構的影響

理大研究人員研發出一套全面的現場測試方案，能有效測量大氣腐蝕對香港基建結構的影響。此測量方案的目的是建立一幅香港現有和新結構年腐蝕速率的地區圖，以評估結構的耐久性。該計劃也是一項試點研究，可推廣至中國其他地區，尤其是珠三角地區的沿岸城市。

Identification of hazardous air pollutants (HAPs)

Led by Prof. Guo Hai of the Department of Civil and Environmental Engineering, this project has identified more than 100 HAPs from thousands of samples in 18 cities across China. The ground-breaking work being done in this project will advance the understanding of China's HAPs, contribute to the building of a risk assessment and management system for these pollutants, and open the way for a new era of air pollution control in China.

Smart firefighting system

Under the Research Grants Council's Theme-based Research Scheme, Prof. Asif Sohail Usmani (left in photo) of the Department of Building Services Engineering will conduct a research project, SureFire: Smart Urban Resilience and Firefighting. Comprising a multi-disciplinary group of local and international researchers, a government agency and high-tech companies, his team will develop a smart firefighting system for densely populated urban environments.

識別有毒有害的大氣污染物

土木與環境工程學系郭海教授領導一項研究計劃，該計劃識別了來自中國十八個城市的數千份樣本中過百種有毒有害的大氣污染物。該突破性研究將有助拓展對國內有毒有害大氣污染物的認識，以期建立一個有毒有害大氣污染物的風險評估與管理系統，為中國的空氣污染控制機制揭開新一頁。

智慧消防系統

在研究資助局的主題研究計劃中，屋宇設備工程學系Asif Sohail Usmani教授（圖左）將進行「SureFire:智慧城市災害防控和火災應急研究」項目。Usmani教授所領導的跨業界團隊，包括本地和海外的研究人員、政府部門和高科技公司，將共同研發一套適用於高密度城市環境的智慧消防系統。



Healthy living 健康生活

3 New therapy for controlling myopic eye growth in schoolchildren

With funding from the Research Impact Fund under the Research Grants Council, Prof. To Chi-ho of the School of Optometry carried out a four-year project for controlling myopic eye growth in schoolchildren. Adopting a multi-arm randomised clinical trial approach, the research team has been researching the effectiveness of bright light therapy on hindering myopia progression and determining whether a blended therapy, including the use of bright light, myopic defocus and low-dose atropine, is more effective than monotherapy.

控制學童近視新療法

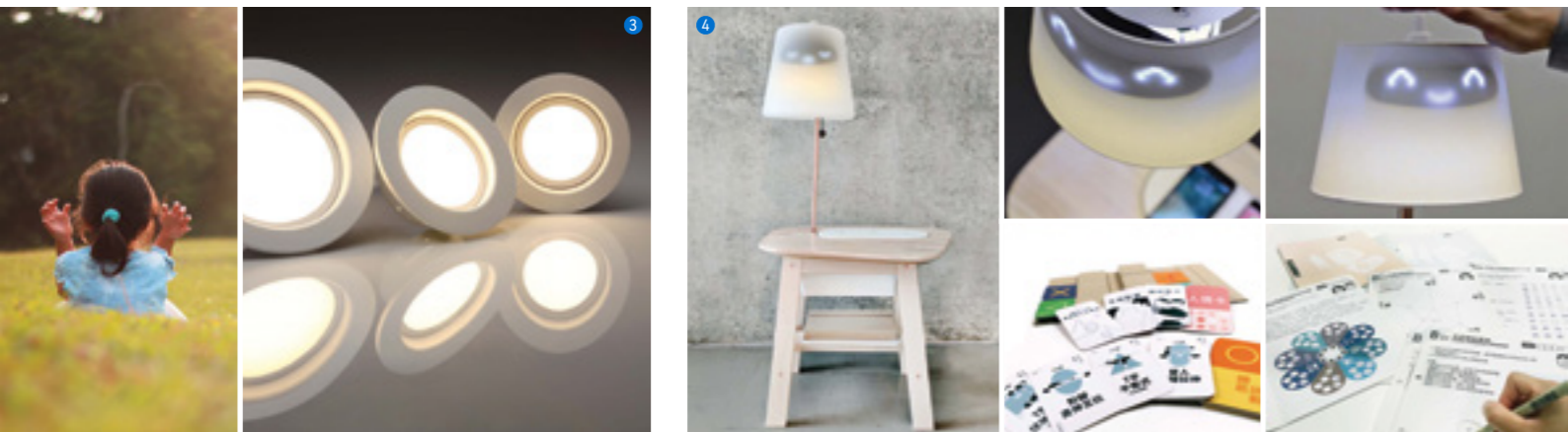
眼科視光學院杜嗣河教授獲研究資助局資助一項抑制學童近視加深之研究項目，為期四年。研究團隊以多組隨機臨床實驗，測試光照治療對延緩學童近視加深的成效，並研究使用光照治療、近視散焦、低劑量阿托品的綜合治療，是否比單一療法更為有效。

4 Interactive family game for treating phone-addicted teens

In a project mainly funded by the Hong Kong Jockey Club, Mr Benny Leong of the Asian Lifestyle Design Lab and the Interaction Design Lab of the School of Design worked in collaboration with the Integrated Centre on Addiction Prevention and Treatment of Tung Wah Group of Hospitals to pilot a novel family-focused gamification intervention that addresses adolescent phone-addiction. The award-winning platform, Lamb Lamp, integrates an interactive lamp with a mobile charging table. When family members place their smartphones on the table, the lamp lights up and proposes a game for participation by the whole family, thereby diverting attention away from their phones and improving supportive relationships.

為沉迷手機青少年而設的家庭互動遊戲

蒙香港賽馬會資助，設計學院轄下亞洲生活型態設計實驗室和互動設計實驗室的梁清河先生與東華三院心瑜軒合作，試行了一項以家庭為中心的新穎遊戲介入項目，以解決青少年手機成癮問題。該獲獎設施Lamb Lamp集互動檯燈與手機充電桌於一身。當家人將手機放在桌子上時，指示燈會亮起並向全家人提出一個可以一同參與的互動遊戲，從而將大家的注意力移離手機，透過遊戲增進彼此支持的關係。



Consultancy services benefiting society

顧問服務 造福社會

PolyU Technology and Consultancy Company Limited (PTeC), the wholly-owned commercial arm of the University, provides a platform for delivering innovative solutions that create a positive impact on industry and society. Emphasising service quality and partner satisfaction, PTeC has had ISO9001 certified quality management systems in place since 2005.

由理大全資擁有的理大科技及顧問有限公司，是大學以創新方案為業界和社會締造正向影響的一個平台。理大科技及顧問有限公司一直非常重視服務質素和夥伴的滿意度，自2005年起已獲得ISO9001認證。

New consultancy projects
新的顧問項目

578

Academic consultants
學術顧問

≈ 300



- Corporate/Industrial sector 工商業界 45%
- Government organisations 政府機構 48%
- NGO/Educational sector 非政府組織及教育界 7%

Project highlights 重點項目

Faculty/Department 院系	Partner 夥伴	Consultancy project objective 顧問項目主旨
Department of Building and Real Estate 建築及房地產學系	Construction Industry Council 建造業議會	To study quality supervision practices of the Hong Kong construction industry 研究香港建築業的質量監督作業手法
Department of Civil and Environmental Engineering 土木及環境工程學系	CCCC Third Harbour Consultants Macau Company Limited 中交三航院澳門有限公司	To design and build a structural health monitoring system for the flyover next to the Rotunda Da Piscina Olímpica 為澳門奧林匹克游泳館圓形地周邊之行車天橋設計並建立結構健康監測系統
Department of Civil and Environmental Engineering 土木及環境工程學系	Transport Department, HKSAR Government 香港特別行政區政府運輸署	To conduct a review of overseas seatbelt requirements and a cost-benefit analysis for seatbelts on buses, goods vehicles and student services vehicles 檢視海外不同地區的安全帶要求，並就巴士、貨車、學生服務車輛的安全帶要求進行成本效益分析
Department of Electrical Engineering 電機工程學系	CLP Power Hong Kong Limited 中華電力有限公司	To design, develop and install an integrated load management system for CLP's electric vehicle charging facilities 為中電的電動車充電設施設計、開發及安裝整合載荷管理系統
Department of Electronic and Information Engineering 電子及資訊工程學系	Highways Department, HKSAR Government 香港特別行政區政府路政署	To evaluate the performance and connectivity of different telecommunication technologies for a public lighting remote control and monitoring system 為各種應用於公共照明遙控及監察系統的電訊技術進行性能及連接能力的評估
Institute of Textiles and Clothing 紡織及服裝學系	The Hong Kong Research Institute of Textiles and Apparel 香港紡織及成衣研發中心	To develop a software system using augmented reality for quality inspections of fibre and yarn products in an automated warehouse 開發一套自動化倉庫的軟件系統，為纖維和紗線產品進行擴增實境品質檢測
Department of Land Surveying and Geo-Informatics 土地測量及地理資訊學系	Water Supplies Department, HKSAR Government 香港特別行政區政府水務署	To study the effectiveness of fibre reinforced plastic lining when rehabilitating underground water pipes 研究在地下水管修復工程中使用纖維強化塑膠襯層的有效程度
Department of Rehabilitation Sciences 康復治療科學系	Social Welfare Bureau, Macao SAR Government 澳門特別行政區政府社會工作局	To compare regional Assistive Technology policy systems and review the needs of people with different disabilities 比較不同地區的輔助技術政策制度，並檢討不同殘疾人士對輔具的需要
School of Design 設計學院	Agriculture, Fisheries and Conservation Department, HKSAR Government 香港特別行政區政府漁農自然護理署	To design and produce prototypes for rubbish bins, litter containers and refuse collection points that are resistant to wildlife, particularly wild pigs and monkeys 設計與生產能抵禦野生動物干擾的垃圾箱、垃圾桶和垃圾收集站的原型，以阻隔野豬或猴子的搜掠





Patenting and licensing for the common good

專利與技術授權 裨益各界

As of June 2019, PolyU staff and students had received 910 cumulative patents and filed 1,812 patents. In 2018/19, 135 patent and trademark applications were filed and 58 granted. During the year, the Institute for Entrepreneurship completed over 30 licensing agreements/non-disclosure agreements for PolyU's wide range of proprietary knowledge and technologies.

截至2019年6月，理大獲批的專利累計共九百一十項，專利申請有一千八百一十二項。在2018/19年度，大學提交了一百三十五項專利和商標申請，當中有五十八項獲批。年內，理大企業發展院就大學多個領域的專有知識與科技，與業界簽訂逾三十項授權協議/保密協議。

As of 截至 30.6.2019

Cumulative no. of patents granted
獲批專利累計

910

Patents filed
專利申請累計

1,812

2018/19

Patent and trademark applications
專利和商標申請

135

Patent and trademark granted
獲批專利和商標

58

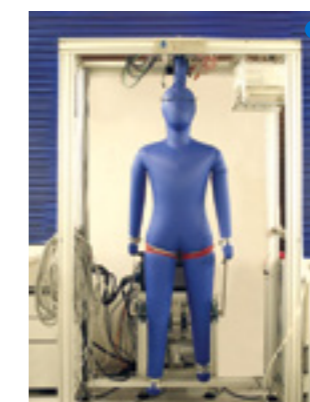
Licensing agreements/
Non-disclosure agreements
授權協議/保密協議

30+

Licensed technologies and designs 授權技術及設計

Projects licensed to industry 授權予業界的項目

Faculty/Department 院系	Inventor(s) 發明者	Technology/Design 科技/設計	Licensee 獲授權機構
5 Department of Biomedical Engineering 生物醫學工程學系	Prof. Zheng Yong-ping 鄭永平教授	3D Ultrasound Imaging System for Scoliosis Assessment 脊柱側彎評估三維超聲波成像系統	Telefield Medical Imaging Ltd. 中慧醫學成像有限公司
Department of Chinese and Bilingual Studies 中文及雙語學系	Prof. Huang Chu-ren 黃居仁教授	Linguistic Datasets 語言學數據集	Linguistic Data Consortium
Department of Electrical Engineering 電機工程學系	Prof. Eric Cheng Ka-wai 鄭家偉教授	Wireless Power Transfer (WPT) for Multiple Electrical Outputs 供多重電力輸出使用的無線電力傳送	Vicwood Prosperity Technology Ltd. 維德鴻興科技發展有限公司
Institute of Textiles and Clothing 紡織及服裝學系	Dr Allan Chan 陳志駒博士	One-size-fits-all Lifejacket 均一尺寸救生衣	Honour Marine Safety Equipment Company Ltd. 海安安全用品有限公司
6 Institute of Textiles and Clothing 紡織及服裝學系	Prof. Fan Jin-tu 范金土教授	Sweating Thermal Fabric Manikin "Walter" 出汗暖體布料人體模型「Walter」	Shanghai General Standard Testing Technical Co., Ltd. 上海泛標紡織品檢測技術有限公司
Institute of Textiles and Clothing 紡織及服裝學系	Prof. Calvin Wong Wai-keung 黃偉強教授	Fabric Defect Detection System (more on p.73) 布料瑕疵偵測系統 (詳見第73頁)	Guangdong Esquel Textiles Company Ltd. 廣東溢達紡織有限公司
7 Institute of Textiles and Clothing 紡織及服裝學系	Prof. Zheng Zi-jian 鄭子劍教授	Flexible Lithium Ion Battery 彈性鋰離子電池	EPRO Advance Technology Ltd. 盈保先進科技有限公司
Department of Land Surveying and Geo-Informatics 土地測量及地理資訊學系	Dr Lilian Pun Cheng Shuk-ching 潘鄭淑貞博士	Public Transport Enquiry System 公共交通查詢系統	Transport Department, HKSAR Government 香港特別行政區政府運輸署



Projects licensed to staff/alumni start-ups 授權予職員或校友的初創企業

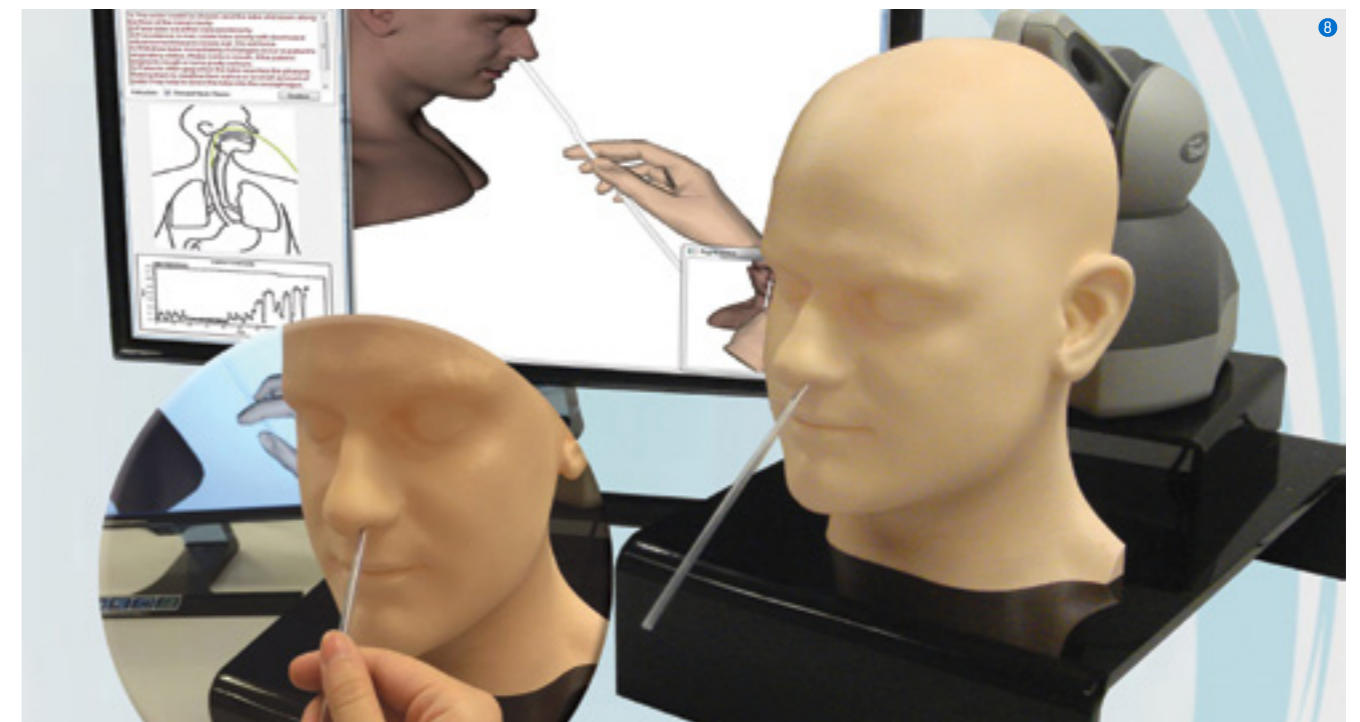
Faculty/Department 院系	Inventor(s) 發明者	Technology/Design 科技/設計	Licensee 獲授權機構
School of Design 設計學院	Mr Rony Kong 江嘉嶼先生	Horizon 地平說	Horizon Creative Ltd. 地平製作有限公司
8 School of Nursing 護理學院	Dr Thomas Choi Kup-sze 蔡及時博士	Intelligent Nursing Intubation Training Simulator 智能插管訓練模擬器	A local start-up company 某本地初創公司

Projects licensed to PolyU-supported start-ups 授權予理大支持的初創企業

Faculty/Department 院系	Inventor(s) 發明者	Technology/Design 科技/設計	Licensee 獲授權機構
Department of Applied Physics 應用物理學系	Dr Mak Chee-leung, Dr Leung Chi-wah and Mr Tony Yung Fai-ho 麥熾良博士、梁志華博士和 翁輝豪先生	Remotely Accessible Laboratory for STEM Education 為STEM教育而設的遙距實驗室	Labwork Technology Ltd.
Department of Computing 電子計算學系	Dr Abraham Lam Hang-yat 林恒一博士	An IoT-based Artificial Intelligence Thermal Comfort Control System for Indoor Environments 為室內環境而設，以物聯網為基 礎的人工智能冷熱舒適控制系統	MEGA Automation Ltd. 萬家智控有限公司
Department of Computing 電子計算學系	Mr Lau Shiu-fung 劉肇豐先生	Wheelman app for wheelchair users	Mr Lau Shiu-fung 劉肇豐先生
School of Design 設計學院	Miss Ashley Lam Hiu-ching 林曉晴小姐	Card Adventure 卡牌大冒險	Aco Studio Ltd.
School of Design 設計學院	Ms Yau Sau-mei 邱秀美女士	Typography System for Dyslexic Readers 讀寫障礙讀者排版系統	Easiread Ltd.
Department of Industrial and Systems Engineering 工業及系統工程學系	Mr Andre Hui 許岸然先生	Pokeguide MTR navigation guide	Pokeguide Ltd.
School of Nursing 護理學院	Dr Thomas Choi Kup-sze 蔡及時博士	Health Maid	Medmind Technology Ltd. 醫念科技有限公司
School of Optometry 眼科視光學院	Prof. To Chi-ho and Prof. Carly Lam Siu-yin 杜嗣河教授和林小燕教授	Defocus Incorporated Soft Contact Lens 光學離焦軟性隱形眼鏡	Vision Science and Technology Company Ltd. 視覺科技有限公司
Department of Rehabilitation Sciences 康復治療科學系	Prof. Cecilia Li 李曾慧平教授	Smart Scar-care Pad 平疤貼	HERCZ Rehabilitation Technology Ltd. 凱獅復康科技有限公司

Project licensed with educational purposes 授權予教育用途的項目

Faculty/Department 院系	Inventor(s) 發明者	Technology/Design 科技/設計	Licensee 獲授權機構
School of Design 設計學院	Ms Geraldine Borio and students of the School of Design Geraldine Borio女士及 設計學院學生	Design Package for promotion of The Nesbitt Centre 宣傳思拔中心的設計方案	The Nesbitt Centre Ltd. 思拔中心有限公司
School of Design 設計學院	Mr Michael Chan Cheung and students of the School of Design 陳翔先生及設計學院學生	Design for Junior Police Call Permanent Activity Centre and Integrated Youth Training Camp 為少年警訊永久活動中心暨 青少年綜合訓練營而設計	Hong Kong Police Force 香港警務處
School of Design 設計學院	Dr Cedric van Eenoo and students of the School of Design Cedric van Eenoo博士及 設計學院學生	Design Concept for Online Videos and Mobile App for The HKFYG Leadership Institute 香港青年協會領袖學院網上視頻 和手機應用程式的設計概念	The Hong Kong Federation of Youth Groups 香港青年協會
School of Design 設計學院	Mr Francis Hung and students of the School of Design 熊院霖先生及設計學院學生	Design Package for Promotion of Blood Donation Programme 宣傳捐血計劃的設計方案	Hong Kong Red Cross 香港紅十字會
School of Design 設計學院	Dr Tulio Maximo and students of the School of Design Tulio Maximo博士及 設計學院學生	Design for Rehabus Promotion Campaign 設計復康巴士宣傳計劃	The Hong Kong Society for Rehabilitation 香港復康會





Technologies transferred with profound impact

技術轉移 影響深遠

Knowledge transfer has long had strategic importance at PolyU, where our innovations and research technologies help to advance industry standards, solve problems, and create a better and more sustainable environment.

理大素來把知識轉移定為重要的發展策略之一，致力透過創新與研究技術提升業界標準、解決問題，從而建立更優越和更可持續發展的環境。

Innovations and technologies with artificial intelligence 人工智能的創新與技術

Mapping landslide hazards for a safer Hong Kong

Working with the Civil Engineering and Development Department of the HKSAR Government, PolyU researchers developed a model using deep learning and remote sensing techniques to map hillside rock outcrops. This efficient and cost-effective system provides vital information on the surface geology of Hong Kong's natural terrain to mitigate landslide hazards.

減低香港山泥傾瀉風險

理大科研人員與香港特別行政區政府土木工程拓展署合作，研發了一套高效率且具成本效益的模型系統，採用深度學習和遙距感應技術，繪製山坡上岩石露頭地質圖，提供有關香港天然地勢的表面地質的重要資料，有助當局監察及降低山泥傾瀉的風險。

Autonomous UAV system for E&M inspections

In conjunction with the Electrical and Mechanical Services Department of the HKSAR Government, PolyU researchers developed an autonomous unmanned aerial vehicle (UAV) for bridge and tunnel inspections. Powered by artificial intelligence, the UAV can detect electrical and mechanical installations such as road lamps, CCTV and lamp shades. It has an intelligent path-planning algorithm for determining precise locations, visualising obstacles and calculating distances. For tunnel inspections, the device is capable of operating in dark, dusty, humid conditions and scanning the environment in real-time.

用於機電安裝檢測的自動執行無人機系統

理大科研人員聯同香港特別行政區政府機電工程署，研發了一部為大橋與隧道進行自動檢測的無人機。這部無人機由人工智能驅動，能偵測路燈、閉路電視和燈罩等機電安裝的位置。系統採用一套智能路徑規劃演算法，確定準確位置，同時可顯示無人機周圍的障礙和計算距離。在隧道檢測方面，裝置可於黑暗、多塵及潮濕的情況下運作，即時掃描環境。

Fabric defect detection system

Prof. Calvin Wong of the Institute of Textiles and Clothing has developed an automatic fabric defect detection system—WiseEye—using specially designed firmware with advanced AI algorithms. Capable of detecting 40 common fabric defects, the WiseEye system has attained an accuracy rate of more than 90%, with a corresponding 90% reduction in loss and wastage in the manufacturing process when compared with human inspection. Licensed to Guangdong Esquel Textiles Co. Ltd., the system won two Grand Awards and a Gold Medal with the Congratulations of Jury in the 47th International Exhibition of Inventions of Geneva in 2019.

布料瑕疵偵測系統

紡織及服裝學系黃偉強教授開發了一套名為「聰明眼」的自動布料瑕疵偵測系統。這套系統由特別設計的固件和先進的人工智能演算法組成。「聰明眼」能偵測出四十種常見的布料瑕疵，偵測準確度超過百分之九十。與人眼目測相比，系統能把在製造過程中產生的損失和浪費減低百分之九十。該技術於2019年在第四十七屆日內瓦國際發明展上贏得兩項大獎和評判特別嘉許金獎，現時有關技術已授權予廣東溢達紡織有限公司。



Promoting urban sustainability 促進城市可持續發展

10 A real-time traffic information solution

In line with the Government's "smart mobility" initiative and Hong Kong Smart City Blueprint, traffic detectors will be installed to provide real-time traffic information for road users. Together with Autotoll Limited, PolyU researchers developed algorithms to collect road use data such as traffic speed, volume and accidents in order to analyse traffic conditions. The detectors will not only contribute to improved traffic management, but also assist the public to plan their journeys by selecting better route options or transport modes.

實時交通資訊方案

香港特別行政區政府提出「香港智慧城市藍圖」的「智慧出行」倡議，建議增設交通偵測器，為道路使用者提供實時交通資訊。為響應此倡議，大學的科研人員與快易通有限公司合作研發演算法，收集交通速度、流量和意外等道路使用的數據，以分析交通狀況。這些偵測器不但有助改善交通管理，也幫助公眾選擇不同的路線或交通工具，妥善規劃行程。

Risk management of buildings and carparks against natural disasters

Hong Kong and Macau's geographical position makes them susceptible to weather-related threats such as tropical cyclones, rainstorms and storm surges. For this reason, PolyU researchers were invited by the Civil Engineering Laboratory of Macau to review and develop flood prevention guidelines for basements and underground car parks, with the aim of reducing damage and injuries when natural disasters strike.

建築物與停車場應對天然災害的風險管理

香港與澳門因本身的地理位置而易受熱帶氣旋、暴雨和風暴潮等惡劣天氣威脅。理大科研人員應澳門土木工程實驗室邀請，檢視及制訂當地地庫和地下停車場的防洪指引，目的是減少因天然災害所引致的損害和傷亡。



Monitoring construction vibration impacts on hospitals

In collaboration with Chevalier (Construction) Co., Limited, PolyU researchers developed the first real-time vibration monitoring, assessment and alarm system in Hong Kong using recent advancements in sensing technology. The system, which is designed to protect sensitive laboratory equipment, has been implemented in a number of hospital expansion projects in Hong Kong.

監察建造工程對醫院造成的震動影響

理大科研人員與其士(建築)有限公司合作，以最新的傳感技術為基礎，研發了香港首個實時震動監察、評估和警示系統，藉以保護敏感的實驗室儀器，現時該系統已應用於香港多項醫院擴展工程。

Promoting healthy living and wellbeing 促進健康生活

Smart elderly home system with assistive technologies

PolyU researchers developed a smart elderly home system for the Jockey Club Care and Attention Home at Yan Chai Hospital. The project involved the design and installation of an innovative system that facilitates communication between the elderly and their family members and caregivers. In another project aimed at the elderly, PolyU design researchers were engaged by Eastcolight (Hong Kong) Limited to design an intelligent digital companion. Both projects are helping the elderly to improve their health outcomes and promote independent living.

為智能長者家居系統提供輔助科技

理大科研人員參與了仁濟醫院賽馬會護理安老院的智能長者家居系統項目，開發與安裝一個創新系統，用以改善長者、其家人與照顧者之間的溝通。在另一個以長者為對象的研發項目中，理大的設計科研人員獲怡高安迪(香港)有限公司委託設計智能數碼友伴。兩個項目均有助改善長者健康，並幫助他們提升獨立生活的能力。



A more effective treatment for scars

A PolyU researcher has developed a smart scar-care pad that combines medical-grade silicone gel with a unique chemical formula and silicone rubber stiffener to create hydration effect and at the same time reinforce evenly distributed pressure and occlusion for scar treatment. The pad is much more durable compared with pads made of polyethylene foam and can be used repeatedly with regular cleaning. It can also be placed underneath elastic bandages or pressure fabrics, including the Smart Pressure Monitored Suit also developed by the research team, for optimal therapeutic effect. Results of a clinical trial showed good performance on scar pigmentation, vascularity, elasticity and dehydration. This winning innovation has been licensed to HERCZ Rehabilitation Technology Limited.

更有效的疤痕治療方法

理大科研人員研發了一款平疤貼，結合了配備獨特化學配方的醫療級矽凝膠和矽強化墊，可同時製造濕潤效果，並加強壓力平均分佈，有助加快傷口癒合，治療疤痕。平疤貼較傳統的聚乙烯泡棉更耐用，經定期清潔後可重複使用多次，更可以直接用於膠繃帶或壓力布料下（包括由同一團隊研發的智能壓力衣）。臨床測試結果顯示，平疤貼在改善疤痕色澤、血管分佈、彈性及保持濕潤方面均有良好效果。現時，該獲獎技術已授權予凱獅復康科技有限公司。

12 One-size-fits-all lifejacket

The Marine Department of the HKSAR Government engaged the Institute of Textiles and Clothing at PolyU to develop a lifejacket that fits both adults and children while also fully conforming to international standards. To ensure children do not slip out of the jacket when in the water, special straps for the neck, waist and crotch were developed, making it a one-size-fits-all device. The technology has been licensed to two local companies specialising in marine safety equipment.

均一尺寸救生衣

香港特別行政區政府海事處委託理大紡織及服裝學系開發一款符合國際標準，適用於成人及兒童的均碼救生衣。為確保兒童在落水後不會從救生衣滑出，救生衣配備了專為通碼應用而研發的頸帶、腰帶和襠帶。此設計技術已授權予本地兩家專營海上安全設備的公司。



Entrepreneurship development 創業發展



Seeding young start-ups

PolyU has established different funding programmes for start-ups in collaboration with local and regional partners. A total of more than 270 start-up ventures so far have received funding, and over 70% of these are still in operation. The supported start-ups are highly regarded by start-up communities and their respective industry sectors, winning close to 200 international and regional awards and securing further funding and investment support in excess of HK\$370 million. Another funding programme, the Student Entrepreneurial Proof-of-Concept Fund, has supported more than 40 student innovation projects so far.

扶育年輕初創企業

理大聯同本地和區域夥伴成立了多項資助計劃，並資助超過二百七十間初創企業，當中超過百分之七十至今仍積極運作。獲支持的初創企業得到初創社群和相關業界的高度評價，取得近二百項國際及地區獎項，更成功獲得其他資金和投資者支持，投資總額超過三億七千萬港元。另外，學生創業概念驗證基金計劃，迄今已支持了逾四十個學生創新項目。

Promoting commercialisation and venturing

With the funding support from the Technology Start-up Support Scheme for Universities of the Innovation and Technology Commission of the HKSAR Government, PolyU's Tech Launchpad Fund has supported a total of 20 technology start-ups and helped to raise around \$136 million from angel investors and other funding/incubation sources.

推動商業化與創業

在香港特區政府創新科技署的大學科技初創企業資助計劃下，理大成立的科技領航基金至今已支援了共二十間技術初創企業，並透過天使投資者和其他資金/育才資源，籌得約一億三千六百萬港元的注資。

To promote the commercialisation of PolyU's research through entrepreneurial ventures, PolyU launched its Lean Launchpad Programme in 2018 with a pilot project on fashion and wearable technology by 10 research teams. The programme was expanded in 2018/19 by assisting 15 teams to explore health technology, smart cities and artificial intelligence.

理大於2018年推出「理大精益創業啟動計劃」的試行項目，藉著初創企業推動理大研究的商業化，項目共有十隊時裝與穿戴式科技的研究團隊參與其中。在2018/19年度，該計劃已擴展至健康科技、智慧城市和人工智能等領域，參與的團隊數目已增至十五隊。

13 Building a regional entrepreneurial community

Following the official opening of InnoHub (Hong Kong) in March 2017, 87 start-ups supported by PolyU and POC student project teams have been admitted. They have been benefiting from the infrastructure support, mentoring/consultation with entrepreneurs-in-residence and other community activities available at InnoHub, including joint events with local and regional partners and collaborators.

Some of the start-ups have since expanded to other markets in Greater China and ASEAN countries. Through the Greater Bay Area International Institute for Innovations, PolyU organised a series of international activities, including a seven-week Start-up Internship and Immersion Programme in May 2019 with workshops and internship at start-ups and technology companies in Shenzhen. Those taking part in the programme not only included students from PolyU and Shenzhen University but also 30 students from the University of Waterloo, University of Warwick, Technical University of Munich, Sydney School of Entrepreneurship, KAIST, Korea University and Kyoto University.

建立地區創業社群

InnoHub (香港)自2017年3月成立以來，已有八十七間獲理大支持的初創企業，以及概念驗證計劃下之學生項目團隊進駐。他們受惠於空間設施的支援、駐場創業家的輔導，還有其他InnoHub的社群活動，包括與本地及地區合作夥伴聯合舉辦的活動。

部分初創企業已把業務擴展至大中華及東盟國家等市場。理大透過大灣區國際創新學院舉辦了一系列國際活動，包括在2019年5月舉辦了為期七週的初創實習及體驗計劃。除了理大和深圳大學的學生，還有三十名來自滑鐵盧大學、華威大學、慕尼黑工業大學、悉尼創業學院、韓國科學技術院、高麗大學及京都大學的學生，參加了深圳初創企業及科技公司的工作坊，以及在這些公司進行實習。



Awards for innovation/inventions

創新發明獎項

Researcher 科研人員	Department 學系	Invention/Project 發明/項目	Award 獎項
Dr Ma Cong, PolyU 理大馬聰博士	PolyU's Department of Applied Biology and Chemical Technology	New Antibiotic Drug Candidates 全新抗生素候選藥物	Global Innovation Awards 全球創新獎
Dr Yang Xiao, CUHK 香港中文大學楊小博士	CUHK's Department of Microbiology, Faculty of Medicine 香港中文大學醫學院微生物學系		
Dr Nuruzzaman Noor Nuruzzaman Noor 博士	Institute of Textiles and Clothing 紡織及服裝學系	Seeded Sonochemical Coatings 超聲波化學晶種塗層	Global Innovation Awards 全球創新獎
Prof. Chetwyn Chan 陳智軒教授	Department of Rehabilitation Sciences 康復治療科學系	Clinical evaluation and intervention protocols for rehabilitation of post-stroke patients 為中風病人設計臨床康復評估和介入治療方案	First Class Award of the Chinese Association of Rehabilitation Medicine Award 中國康復醫學會科學技術獎一等獎
Prof. Cao Jian-nong and Dr Dan Wang 曹建農教授和王丹博士	Department of Computing 電子計算學系	Theoretical Models and Techniques of Distributed Computing in Wireless Network 無線網絡系統中的分佈式計算理論與方法	Second-Class Award in Natural Science in the Ministry of Education's 2018 Higher Education Outstanding Scientific Research Output Awards (Science and Technology) 國家教育部2018年「高等學校科學研究優秀成果獎(科學技術)」自然科學獎二等獎
Prof. Xia Yong 夏勇教授	Department of Civil and Environmental Engineering 土木及環境工程學系	Safety assessment and precise local damage detection technologies for long-span bridges 長大橋樑安全評估和區域性損耗探測技術	State Science and Technology Awards 2018 — State Technological Invention Award (Second Class Prize) 2018年國家科學技術獎——國家技術發明獎二等獎

Researcher 科研人員	Department 學系	Invention/Project 發明/項目	Award 獎項
Prof. Ding Xiao-li 丁曉利教授	Department of Land Surveying and Geo-Informatics 土地測量及地理資訊學系	Interferometric synthetic aperture radar (InSAR) 合成孔徑干涉雷達(InSAR)技術	State Science and Technology Awards 2018—State Scientific and Technological Progress Award (Second Class Prize) 2018年國家科學技術獎——國家科技進步獎二等獎
Dr Zhou Zhi 周知博士	Department of Applied Mathematics 應用數學系	Numerical Methods for Time-fractional Diffusion Equations with Non-smooth Solutions 非光滑時間分數階擴散方程的數值算法	Research Grants Council Early Career Award 研究資助局傑出青年學者獎
Prof. Sylvia Chen Xiao-hua 陳曉華教授	Department of Applied Social Sciences 應用社會科學系	Integrating and Extending Research on Social Axioms: A Systematic Review 整合和擴展社會通則的研究：系統綜述	Research Grants Council Humanities and Social Sciences Prestigious Fellowship 研究資助局人文學及社會科學傑出學者獎

47th International Exhibition of Inventions of Geneva 第四十七屆日內瓦國際發明展

Researcher 科研人員	Department 學系	Invention/Project 發明/項目	Award 獎項
Prof. Calvin Wong Wai-keung 黃偉強教授	Institute of Textiles and Clothing 紡織及服裝學系	WiseEye: AI-based Textile Material Inspection System (more on p.73) 聰明眼：人工智慧紡織品檢測系統(詳見第73頁)	2 Grand Awards (Prize of the Italian Delegation of the Exhibition, Prize of the Technical University of Cluj-Napoca of Romania), Gold Medal with the Congratulations of Jury, and Special Merit Award 兩項特別大獎(意大利代表團特別大獎、羅馬尼亞克盧日納波卡工業大學特別大獎)、評判特別嘉許金獎及優異獎

Researcher 科研人員	Department 學系	Invention/Project 發明/項目	Award 獎項
14 Ir Prof. Zheng Yong-ping 鄭永平教授工程師	Department of Biomedical Engineering 生物醫學工程學系	Palm-sized 3D Ultrasound Imaging System for Radiation-free Scoliosis Assessment 用於檢測脊柱側彎的無輻射可攜式三維超聲成像系統	Grand Award (Prize of the Legal Company "Gorodisky and Partners", Russia), Gold Medal with the Congratulations of Jury, and Special Merit Award 特別大獎(俄羅斯特別大獎)、評判特別嘉許金獎及優異獎
15 Dr Hu Xiao-ling 胡曉翎博士	Department of Biomedical Engineering 生物醫學工程學系	Mobile Exo-neuro-musculo-skeleton for Self-help Post-stroke Upper Limb Rehabilitation 移動式外神經肌骨系統	Grand Award (Prize of the Polish of Patents Office), Gold Medal, and Special Merit Award 特別大獎(波蘭專利局特別大獎)、金獎及優異獎
Prof. Zheng Zi-jian 鄭子劍教授	Institute of Textiles and Clothing 紡織及服裝學系	Flexible, Stable, High-energy Textile Lithium Batteries 高能量密度柔性織物鋰電池	Gold Medal, 2 Special Merit Awards 金獎及兩項優異獎
Prof. Yang Hong-xing 楊洪興教授	Department of Building Services Engineering 屋宇設備工程學系	Indirect Evaporative Cooler for Efficient Energy Recovery 高效熱能回收間接蒸發冷卻器	Gold Medal 金獎
Ir Prof. Benny Cheung Chi-fai 張志輝教授工程師	Department of Industrial and Systems Engineering 工業及系統工程學系	Curvature-adaptive Multi-jet Freeform Polishing System for Precision Manufacturing (more on p.60) 用於精密製造的曲率自我調整多射流不規則曲面拋光系統(詳見第60頁)	Silver Medal, 2 Special Merit Awards 銀獎及兩項優異獎
16 Dr Carman Lee Ka-man 李嘉敬博士	Department of Industrial and Systems Engineering 工業及系統工程學系	An Industrial IoT-based Smart Robotic Logistics Management System 基於工業物聯網技術的智慧型機器化倉庫管理系統	Silver Medal 銀獎



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Student 學生	Faculty/Department 院系	Invention/Project 發明/項目	Award 獎項
17 Tina Au Ka-sin 區嘉倩	Institute of Textiles and Clothing 紡織及服裝學系	Bee-Busy Exist Earth creation	18th Hong Kong Footwear Design Competition—Individual Overall Championship and Ladies' Fashion Shoes Collection Gold Award 第十八屆香港鞋款設計比賽——全場總冠軍及女裝時款(全身潮流造型)金獎
		Eternal Light design 永恆之光	DIY-3D Modeling Concept Design Gold Award 創+造成型概念設計金獎
		Deerland design 鹿遊仙境	Children's Shoes Bronze Award 童裝銅獎
Jenny Cheung Weng 張泳	Institute of Textiles and Clothing 紡織及服裝學系	Sirens and Memory design Sirens 和回憶	18th Hong Kong Footwear Design Competition—DIY-3D Modeling Concept Design Silver Award and Ladies' Boots Bronze Award 第十八屆香港鞋款設計比賽——創+造成型概念設計銀獎和女裝靴銅獎
18 Bao Qian-cheng 包乾成	School of Design 設計學院	Sneaker with an iconic silhouette and shoelaces 具標誌性輪廓的球鞋與鞋帶	Top prize at the 2018 Pensole World Sneaker Championship 2018年世界球鞋設計比賽冠軍
19 Stanley Go, Lam Kah-cheng and Cheung Lap-wing 張立穎和團隊	Department of Mechanical Engineering 機械工程學系	Remote-control robots that competed in a soccer game using offensive and defensive strategies 在足球比賽中三個遙控機械人攻守有法	First runner-up award of Student Design Competition organised by the American Society of Mechanical Engineers 美國機械工程師學會學生設計大賽亞軍
20 Dino Lee Leung-pong, Matthew Lo Cheuk-long, Afifah Har Wing-yiu and Sammi Tsang Sheung-man 李亮邦、盧卓朗、哈穎瑤和曾湘雯	Department of Rehabilitation Sciences 康復治療科學系	Cupensator drinking aid to help Parkinson's disease patients handle drinking cups 「補杯」水杯輔助器助柏金遜症患者握穩杯子	Silver Award (Design category) at the 12th Global Student Innovation Challenge for Assistive Technology, 1st runner-up at the 3rd Fourier Cup Chinese Rehabilitation Innovation Competition 第十二屆「世界大學生創新挑戰賽」設計組銀獎，第三屆「傅利葉」杯中國康復人創意大賽亞軍
21 Ma Ming-yu, Wang Shi and Chang Shu-hao 馬明宇、王適和常書豪	Department of Computing, Department of Electronic and Information Engineering 電子計算學系，電子及資訊工程學系	Sense+ mobile app for the visually impaired 專為視障人士設計的手機應用程式「Sense+」	Student Innovation (Tertiary or above) Silver Award at the Hong Kong ICT Awards 2018 2018 香港資訊及通訊科技獎學生創新(大專或以上)銀獎

