# Excel X Impact

## Going Global: Bringing Home New Perspectives

Flying High in the Emerging Low-Altitude Economy

Leading the Tech Wave to Teach Digital Natives

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2025 Issue 16

# President's Message



Jin-Guang Teng
// President
The Hong Kong Polytechnic University

The Hong Kong Polytechnic University (PolyU) has an unwavering commitment to being a key player in shaping the future of Hong Kong as we align with the Hong Kong SAR Government's vision to transform the city into an international hub for post-secondary education, an international innovation and technology centre, and a global hub for high-calibre talent. Our rise to 57th place in the QS World University Rankings 2025 also demonstrates our growing international reputation for academic and research excellence that makes a real difference.

At PolyU, internationalisation is a cornerstone of our educational and research endeavours. We are committed to fostering international collaboration, promoting cultural diversity on campus, and nurturing students' global perspectives. Our goal is for every undergraduate to participate in at least one non-local learning experience by the 2027/28 academic year. Through initiatives like the Government's Global STEM Professorship Scheme, we continue to attract world-class talent to drive impactful research and innovation for the benefit of society.

PolyU's growth is intricately aligned with the evolving needs of society and industry. For instance, as the only UGC-funded university in Hong Kong offering undergraduate degree programmes in shipping and maritime studies, we play a crucial role in enhancing the city's status as an international shipping hub. Additionally, we have contributed to the development of the healthcare sector for over 45 years by training more than 52,000 healthcare professionals across various disciplines. To support Hong Kong's future development, we have launched the Research Centre for Low-Altitude Economy, pioneering technologies that will position Hong Kong at the forefront of this emerging industry. Furthermore, we have established the Faculty of Computer and Mathematical Sciences, and the PolyU Academy for Artificial Intelligence (PAAI), solidifying PolyU's leadership in sustainable and inclusive AI research and elevating Hong Kong as a global centre for generative AI development.

PolyU will remain a steadfast partner and contributor to the advancement of Hong Kong, the Nation and the world.

# Going Global: Bringing Home New Perspectives

Championing international collaboration, promoting cultural diversity on campus, cultivating students' global perspectives—PolyU is embracing internationalisation for societal benefits

The Hong Kong Polytechnic University (PolyU) embraces internationalisation as a core principle guiding its educational and research efforts, benefiting not only the University itself, but also its students and society. The University has been ranked third in the Times Higher Education Most International University in the World Rankings 2025, scoring high in criteria including international student and staff ratios, international collaboration, and global reputation.

At PolyU today, renowned scholars from around the world are actively engaged in research with their teams in specialised labs (see p.8 and p.12), while international students interact with local peers both in and out of class (see p.16). Additionally, every student graduating in or after 2027/28 will have at least one international learning experience before graduation, as the University aims to broaden their perspectives and prepare them for a globalised workforce (see p.18).

## Strategic moves towards internationalisation

In the University's latest Strategic Plan for 2025/26 to 2030/31, internationalisation is outlined as a strategic objective, focusing on increasing student and staff diversity, fostering a global and inclusive mindset through non-local learning opportunities, and expanding global partnerships and collaborations, as well as enhancing engagement with Mainland China.

The internationalisation strategy aligns with the Hong Kong SAR Government's commitment to developing Hong Kong into an international hub for post-secondary education and high-calibre professionals of varying backgrounds.

### A diverse body of staff and students

As far as diversity is concerned, in 2024, over 50% of the University's newly recruited academic staff members came from outside Hong Kong, and over 2,000 non-local students from over 40 countries and regions arrived on campus either as an undergraduate freshman or on an exchange basis. PolyU's academic environment is being shaped by an integration of diverse perspectives and a multicultural campus that promotes understanding and collaboration.

Meanwhile, more and more PolyU students are gaining non-local learning experiences, bringing home new perspectives and a global mindset to not only get themselves ready for a globalised workplace, but also contribute to making PolyU a vibrant centre of cultural exchange and academic excellence.

## International and Mainland China collaborations

PolyU's internationalisation is also characterised by its strength in international collaborations in education, research and other areas. In fact, PolyU has expanded its network of partnerships with universities and research institutions in Mainland China and around the world to boost its national and international presence. These collaborations will drive continuous innovation and development for the benefit of local communities, enhancing the global impact of the University's efforts. (see p.4).

❮❮ Internationalisation is the pathway to a more sustainable and inclusive society. ❯❯

Professor Geoffrey Shen, Associate Vice President (Global Partnerships)

### For a better world

Striving to address pressing global issues, such as climate change, ageing populations, and sustainable development through education, research and knowledge transfer, PolyU seeks to contribute to the Sustainable Development Goals (SDGs) set by the United Nations and works towards a more sustainable, equitable, and prosperous future for all.

For PolyU, internationalisation makes sense only when it positively impacts students and society. Internationalisation is thus in line with the University's mission to nurture socially responsible leaders and professionals with a strong sense of national pride and a global perspective and to pursue world-leading research and innovation for societal benefits. Through internationalisation efforts directed towards these ends, the University reinforces its status as an innovative world-class university.

# International Collaborations with Impacts

Forging a global network of educational and research partners to bolster the University's impact on both international and local challenges

A key element of internationalisation involves establishing partnerships with global entities in education and research to create meaningful societal contributions. For years, PolyU has actively engaged with businesses and academic institutions worldwide, aiming not only to pave the way for its students' development, but also to harness its expertise for the benefit of a better world.

## Boosting research impacts

To leverage research expertise for tackling both global and local challenges, PolyU is building collaborations with numerous international and Mainland organisations and enterprises.

One such collaboration with the China Academy of Space Technology led to the creation of a series of space instruments, which have played a pivotal role in China's space exploration missions, including to the Moon and to Mars.

Meanwhile, its joint research endeavours with HOYA Vision Care and ZEISS Vision Care have resulted in ground-breaking lenses designed to effectively slow the progression of myopia in children. This innovation is particularly crucial, as projections suggest that by 2050, myopia could affect half of the global population, underscoring the urgent need for solutions.

Moreover, PolyU's collaborative spirit has been instrumental in establishing three world-class research centres at the Hong Kong Science Park, as part of the government-funded InnoHK initiative. In collaboration with the Royal College of Art, the U.K., PolyU established the AiDLab to integrate innovative AI technologies into design to address society's needs for creativity, efficiency and customisation of products and services.

In collaboration with the University of Maryland (UMD), PolyU initiated the Centre for Advances in Reliability and Safety to develop new approaches using AI methodologies to ensure the reliability and safety of products and systems used in a broad range of advanced manufacturing applications.

Jointly with Canada's University of Waterloo (UW), PolyU founded the Centre for Eye and Vision Research (CEVR), the world's first international hub for vision science to promote eye health with clinical, basic and applied research and to develop ground-breaking technologies to prevent vision loss and preserve sight among the ageing population.

In 2024, PolyU further collaborated with UW's Waterloo Institute for Nanotechnology, Canada's largest nanotechnology institute, to establish the Research Centre for Nanoscience and Nanotechnology. This Centre serves as a unique research platform that harnesses international research expertise to develop novel approaches and technologies in nanoscience for diverse applications, ultimately enhancing human life.

## Making changes with collaborations in education

PolyU is also building a robust international network in education. One recent initiative is the Dual PhD Degree Programmes in collaboration with more than 20 overseas and Mainland universities, including Queensland University of Technology, Korea University, University of Surrey, and Zhejiang University. Furthermore, the School of Hotel and Tourism Management has recently signed agreements with Institut Lyfe in France, as well as University of Ljubljana and University of Primorska in Slovenia, on cooperation in research and education.

For student exchange, the University has formed a strong network of partnerships covering more than 80 universities spanning 25 countries. Meanwhile, its overseas Work-Integrated Education (WIE) supporters include the Shanghai Silk Group in Mainland China, edison.ai in Japan, Rider Levett Bucknall Limited in New Zealand, Mitacs in Canada, and Cathay Pacific Airways in Thailand, among many others. Both initiatives foster students' non-local learning experience for the development of a globalised perspective that is much needed in today's inter-connected world.



PolyU formed partnership with the University of Waterloo in education as well as research.

In a journey marked by dedication and global support, PolyU has pioneered the integration of social responsibility and civic engagement into its undergraduate curriculum, becoming the first local university to do so. Since 2012, this visionary approach has inspired over 42,400 students to embark on Service-Learning (SL) adventures, collectively contributing more than 1.69 million hours of service. These students have touched lives and communities not only in Hong Kong, Mainland China, and Taiwan, but also internationally, such as in Asia (Cambodia, Vietnam, Myanmar, Indonesia, Thailand, and Japan) and further abroad (Rwanda, South Africa, and Tanzania).

Take SL in Rwanda as an example. PolyU has built up a programme dedicated to social responsibility education since 2013, with student teams contributing their classroom-learned knowledge and skills to address multifaceted community challenges. The programme has a dual impact on the local community. Over 1,000 households have been provided with clean electricity, energy-efficient cooking stoves, kitchen gardens for nutrition. Furthermore, local tailors have been empowered to improve their livelihood through the integration of modern fashion. This programme was recognised with a QS Reimagine Education Award in the Sustainability Education Action category.

## Mainland and beyond

Supporting the development of Mainland China not only contributes to improving the well-being of the people, but also integrates Hong Kong into the technological and scientific advancement of the Nation. PolyU's collaborative network in Mainland China is extensive as well as extended over time. In 1997, PolyU became the first university from Hong Kong approved by the Ministry of Education for cross-border collaboration in offering a higher education programme in the Mainland.

In a recent strategic initiative, the University has started to set up a series of Mainland Translational Research Institutes (MTRIs) in selected cities to align PolyU's research capacities and outcomes with local industrial and societal needs, enhancing the impact of its research and strengthening the socioeconomic development of those cities and the Nation.

In weaving a rich tapestry of international connections, PolyU has set its sights on the Belt and Road (B&R) countries, aligning with the Nation's initiatives to spur regional development. With a determined spirit, PolyU seeks to cultivate academic exchanges, research collaborations, and partnerships with institutions across the B&R regions.

The University co-founded the University Alliance of the Silk Road with the Xi'an Jiaotong University in 2015 and was appointed its Rotating President in 2023. The Alliance brings together over 150 universities from 37 countries and regions to promote higher education collaborations and exchanges in the Silk Road region. In 2024, a Presidents' Forum was held at PolyU, fostering the exchange of insights in support of the B&R Initiative.

It has also joined other B&R alliances to build robust partnerships with institutions worldwide and to increase the impact of its education, research and knowledge transfer activities. They include:

- Association of Sino-Russian Technical Universities
- Alliance of International Science Organisations for the Belt and Road Regions
- The China-Pakistan Economic Corridor Consortium of Universities
- University Consortium of the 21st Century Maritime Silk Road
- ASEAN-China Network for Cooperation and Exchanges among Engineering and Technology Universities

For the seventh consecutive year, PolyU joined forces with Xi'an Jiaotong University, the State Grid Corporation of China and The Hongkong Electric Company, Limited to host the "Belt and Road Advanced Programme in Power and Energy". Themed "Low Carbon Transition: Latest Development of Green Energy", the latest programme attracted 26 participants from seven B&R countries and regions, including Chile, Mainland China, Hong Kong, the Philippines, Portugal, Russia, and Zimbabwe, all coming together to explore advancements in green energy.

## Taking the lead in international collaborations

PolyU also played a pivotal role in co-founding two other international networks. In 2015, it spearheaded the creation of the University Social Responsibility Network (USRN), a global alliance promoting social responsibility as a core mission of universities. Today, USRN boasts 21 member institutions spanning six continents, with PolyU proudly serving as the chair of the Executive Committee.

In 1995, PolyU invited renowned universities with proven records in technology transfer to form an "International Strategic Technology Alliance". The alliance now has 26 institutional members from the Mainland, the U.K. and the U.S. and they are committed to promoting applied research and consultancy services on an international scale that benefit both the institutions and society at large.

Separately, PolyU is a member of more than ten international networks including the European Association for International Education and National Association of Foreign Student Advisers.

PolyU's international presence and partnerships are key elements that contribute to its success as a global university, enhancing its worldwide reputation and enabling it to make significant contributions to communities both locally and internationally.

## International collaborations

As of February 2025, PolyU has signed more than 580 international collaboration agreements with over 350 overseas institutions spanning more than 40 countries and regions. Apart from Mainland China, Taiwan and Macao, they include Australia, Belgium, Canada, Denmark, France, Germany, Japan, Latvia, Poland, Singapore, Switzerland, The Netherlands, the U.K. and the U.S.

# 580
Agreements signed

# >350
Global institutions

# >40
Countries and regions
As of February 2025

## Diversity on campus

In the academic year 2024/25, PolyU has enrolled 214 non-local, non-Mainland students from countries including Australia, France, Hungary, Indonesia, Kazakhstan, Malaysia, Nigeria, South Korea, Spain, and Uganda, among others, representing approximately 15% of the total non-local undergraduate population. The University targets to maintain the non-local undergraduate intake to around 1,000, with the ratio of non-local, non-Mainland students maintained at 30%.

In support of the Government's "Study in Hong Kong" initiative, the University hosted over 330 recruitment events in about 40 countries during the 2023/24 academic year, which led to a 50% increase in non-local undergraduate applications.

## Student exchange

Each year, more than 600 students arrive at PolyU on an exchange basis, while over 500 PolyU students go outbound. In the academic year 2023/24, the top three outbound exchange destinations were the U.K., Mainland China and Sweden.

# >600
Inbound

# >500
Outbound
Each year



Participants from seven Belt and Road countries and regions joined the Graduation Ceremony of the "Belt and Road Advanced Programme in Power and Energy 2024".

Effective from the academic year 2025/26, a new exchange scholarship of HK$30,000 will be awarded to first-year students who are recipients of an academic entry scholarship to support their participation in the student exchange programmes.

## Non-local learning experience

In 2023/24, 802 students participated in non-local Work-Integrated Education, with Canada, Japan, and Spain, apart from Mainland China, being the major destinations. The internships were offered by over 500 partnering companies and organisations.

To nurture students into socially responsible global citizens, the University provides a subsidy of up to HK$10,000 to all undergraduates enrolling in a Service-Learning (SL) subject with a non-local project in support of their expenses incurred in the project. In 2023/24, almost 1,500 students participated in non-local SL. It is targeted that by 2027/28, 50% of PolyU students will gain a non-local learning experience through SL.



In a Service-Learning project held in Rwanda, PolyU students help install solar panels to generate electricity for rural households.

# Leading PolyU's School of Nursing into a New Era of Innovation and Excellence

Meet the pioneer who seamlessly incorporates digital technologies into healthcare

At the forefront of digital health innovation to enhance patient outcomes and clinical practice is Professor Janelle Yorke, an internationally renowned nursing expert and visionary leader. With a distinguished career that spans Australia, the U.K., and now Hong Kong, Professor Yorke has been a trailblazer in integrating digital technologies into healthcare, particularly through her pioneering work on electronic Patient-Reported Outcome Measures (ePROMs).

### Professor Janelle Yorke
⫽ Angel S.P. Chan Lau Professor in Health and Longevity
⫽ Head and Chair Professor of Nursing, School of Nursing
⫽ HK Global STEM Scholar, Director of JC STEM Lab of Digital Oncology Care Enhancement

Professor Yorke assumed the role of Head of the School of Nursing at PolyU in January 2024. Reflecting on her decision to lead the School, Professor Yorke notes, "Hong Kong is a vibrant, exciting city, and PolyU is a world-class institution. I knew I was joining a supportive environment committed to excellence." Her appointment marks an exciting new chapter for one of the world's top nursing schools.

### Elevating cancer patient care through ePROMs
A cornerstone of Professor Yorke's career is her pioneering work on ePROMs. At The Christie NHS Foundation Trust Hospital in the U.K., one of the largest single-site cancer centre in Europe, she led efforts to integrate ePROMs into routine cancer care, demonstrating their transformative potential. This digital initiative enables patients to report their symptoms and treatment experiences electronically on a regular basis which are automatically transferred into the hospital electronic health records, allowing clinicians to respond promptly and effectively.

"The ePROMs platform helps us pick up problems sooner rather than later, so we can put the appropriate care in place more quickly and ideally improve patient outcomes," explains Professor Yorke. In fact, the use of ePROMs has been shown to enhance patient-clinician communication, engage patients more actively in their care, increase health service efficiencies, and even predict cancer treatment completion and survival rates.

Building on her U.K. experience, Professor Yorke is now exploring introducing ePROMs to Hong Kong's healthcare system for cancer patients. She believes Hong Kong's electronic health system is already quite well-developed and integrated, offering a solid foundation for implementing ePROMs.

### Breaking barriers as a Global STEM Professor in nursing
In 2024, Professor Yorke was awarded the prestigious Global STEM Professorship by the Hong Kong Government, making her the only nurse to receive this honour. The professorship is a testament to her pioneering work and illustrates the potential for nursing to be at the forefront of STEM-related research.

"I am very proud of the award, which sends a strong message that nursing is a highly valued profession in Hong Kong and can be a key player in healthcare innovation. Our discipline has always been scientific and highly rigorous, and this award is a recognition of that," Professor Yorke remarks.

As part of her STEM professorship, she will lead the Jockey Club STEM Lab of Digital Oncology Care Enhancement at PolyU. This lab will explore real-time cancer patient symptom monitoring as well as digital interventions to support the self-management of symptoms and facilitate effective clinical decision-making.

## An internationally renowned school

Professor Yorke highlights that PolyU's School of Nursing is a "global School of Nursing", with a diverse student body from many different countries and nationalities, particularly at the postgraduate level. Moreover, she is actively seeking to expand the School's collaboration with institutions in Mainland China and overseas.

"The internationalisation of the School is very important. By having students and staff from different parts of the world, they all bring different perspectives to healthcare challenges and we all learn from each other, enriching the School. We can also learn a great deal from other healthcare systems and academic institutions from around the world", she states.

In addition, the School is internationally renowned for its academic and research excellence, with Nursing at PolyU ranking 16th in the QS World University Rankings by Subject 2025. She is proud that the stellar reputation and excellence of the School contribute to a very high success rate with regard to the immediate employment of its graduates.

## Future-focused nursing education

In today's world, artificial intelligence (AI) is rapidly transforming many fields, and nursing is no exception. Professor Yorke believes that AI will be applied to big data sets to better understand the consequences of healthcare for patients, enabling predictive models that can help clinicians better understand a patient's journey, leading to better decision-making. This is the work she is doing with ePROMs in oncology.

She points out that the Centre for Smart Health at the School of Nursing, led by Professor Harry Qin, is leveraging the power of artificial intelligence, machine learning, and big data analytics to transform patient care. Furthermore, many PhD students at the School are working on projects including the application of AI and machine learning in their research projects. The School is therefore well-positioned to make significant contributions to the use of AI in healthcare, supporting Hong Kong's development as a health and medical innovation hub.

The Jockey Club STEM Lab of Digital Oncology Care Enhancement steered by Professor Yorke is developing a platform for real-time monitoring of cancer patients' symptoms.

**//** Think outside the box, explore how technology and AI can enhance your clinical expertise, improve care and bring efficiencies to the health care system, but never lose sight of individual patient needs. **//**

Professor Janelle Yorke

Under her leadership, Professor Yorke is committed to upholding the School of Nursing's status as one of the best globally and to nurturing future nursing leaders. This involves continuously modernising the curriculum to meet evolving healthcare demands. A key focus will be on enhancing nursing education to better prepare nursing graduates for roles in community and primary health care, including expanding community-based placements in response to the Hong Kong Government's expectations and community needs.

Professor Yorke points out that the School already has a strong teaching and research focus in primary health care, spearheaded by Professor Frances Wong, Chair Professor of Advanced Nursing Practice. Additionally, the School will equip nursing graduates with the skills necessary for elderly care, in response to the rapidly ageing population on a global level.

### Championing nurse-led care and technology

For Professor Yorke, the essence of effective and impactful nursing lies in its patient-centred approach. She therefore encourages aspiring nurses and nursing academics to embrace innovation and new technologies while staying true to the foundational principle of patient-centred care.

"Think outside the box, explore how technology and AI can enhance your clinical expertise, improve care and bring efficiencies to the health care system, but never lose sight of individual patient needs," she advises the next generation of nursing graduates.
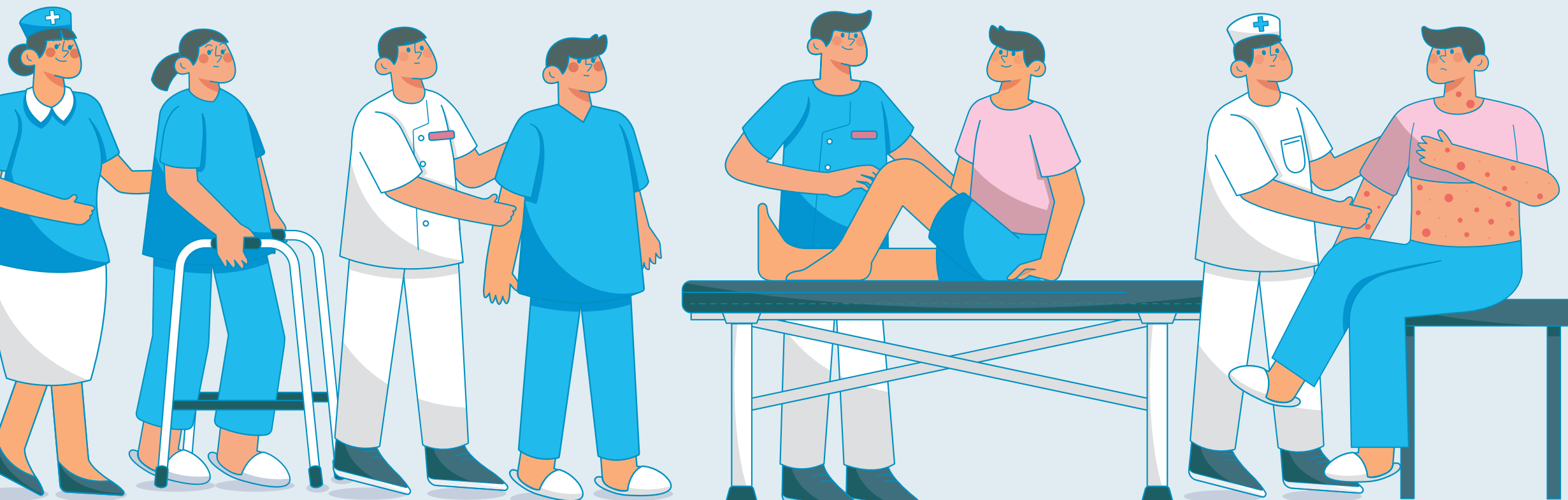
# Cracking the Code of Complex Diseases

When medical problems become the target of a computer scientist's long-term aspirations and ambitions

**Professor Zhang Weixiong**
// Chair Professor of Systems Biology and Artificial Intelligence, Department of Health Technology and Informatics
// Associate Director of the PolyU Academy for Interdisciplinary Research
// HK Global STEM Scholar, Director of JC STEM Lab of Genomics in Healthcare

The medical field swiftly addressed the global COVID-19 pandemic. But tackling "complex diseases" like Alzheimer's, cancer, and various autoimmune and mental disorders that impact millions globally presents greater challenges. These conditions arise from genetic, environmental, and lifestyle factors, many of which remain poorly understood. Additionally, researchers have faced significant limitations in terms of the tools available. At PolyU, Global STEM Scholar Professor Zhang Weixiong believes the solution to many intractable illnesses lies in turning multifaceted medical problems into computer science challenges.

Professor Zhang joined PolyU at the end of 2021 under the HKSAR's Global STEM Professorship Scheme, after spending more than 20 years at Washington University in St. Louis in the United States. Bringing decades of US-born dreams to PolyU, he assumed the role of Chair Professor of Systems Biology and Artificial Intelligence at the Department of Health Technology and Informatics, and leads a 20-strong research team harnessing artificial intelligence (AI) technologies to decode the myriad genetic and biological systems that underlie human disorders.

## Driving opportunities in interdisciplinary research

More recently he took on an additional role as Associate Director of the PolyU Academy for Interdisciplinary Research. He regards this new chapter at PolyU as an opportunity to do something he has long dreamed of—turning inspired innovations into practical clinical applications.

"Before, my research work was strongly focused on the computational side. I never got the chance to get my feet wet in real biology research as I did not have my own molecular biology laboratory for bench work," he stated.

With resources provided by PolyU, and additional support from the Hong Kong Jockey Club and the Hong Kong Global STEM Professorship, the professor has now set up an integrated interdisciplinary Genomics and AI research laboratory.

The facility is one of eight new Jockey Club STEM Labs which PolyU has established to attract and support distinguished scholars and advance research in key fields to benefit the world. Funded through a generous HK$74 million donation from the Hong Kong Jockey Club Charities Trust, the STEM labs focus on machine learning and computer vision, healthy built environment, innovative light therapy for eye diseases, quantum technology, 2D quantum materials, earth observations, digital oncology care enhancement and genomics in healthcare.
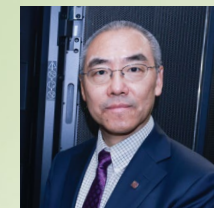
## Managing the mental health crisis

Professor Zhang is currently engaged in a research project that aims to improve diagnosis and treatment options for major psychiatric disorders (MPDs). The initiative has secured an impressive HK$37 million plus in funding from the Research Grants Council, marking it as the top award in the 2023/24 cycle of Strategic Topics Grants, and rightly so. In Hong Kong, the rate of MPDs such as depression, schizophrenia, and bipolar disorder stands at a concerning 13.3%. Presently, fewer than 40% of patients manage to attain full symptom control following their initial treatment.

"Psychiatric disorders like depression and schizophrenia, for example, are complex diseases. The diagnoses are based on clinicians' judgements of the patients' symptoms, including mood, social interaction, behaviours and other self-descriptive information that may be signs of hallucination or self-harming thoughts. The judgement and reporting can be subjective. This can make diagnosis very difficult and inaccurate," said Professor Zhang.

"Instead of looking at and focusing on symptom, there is a need for objective tools, like a lab test when we have the flu. In the case of psychiatric disorders such as depression, I want to develop tools that resemble blood tests or brain imaging to find some biomarkers that are indicative of depression development," he explained.

Professor Zhang at work in his state-of-the-art JC STEM Lab of Genomics in Healthcare
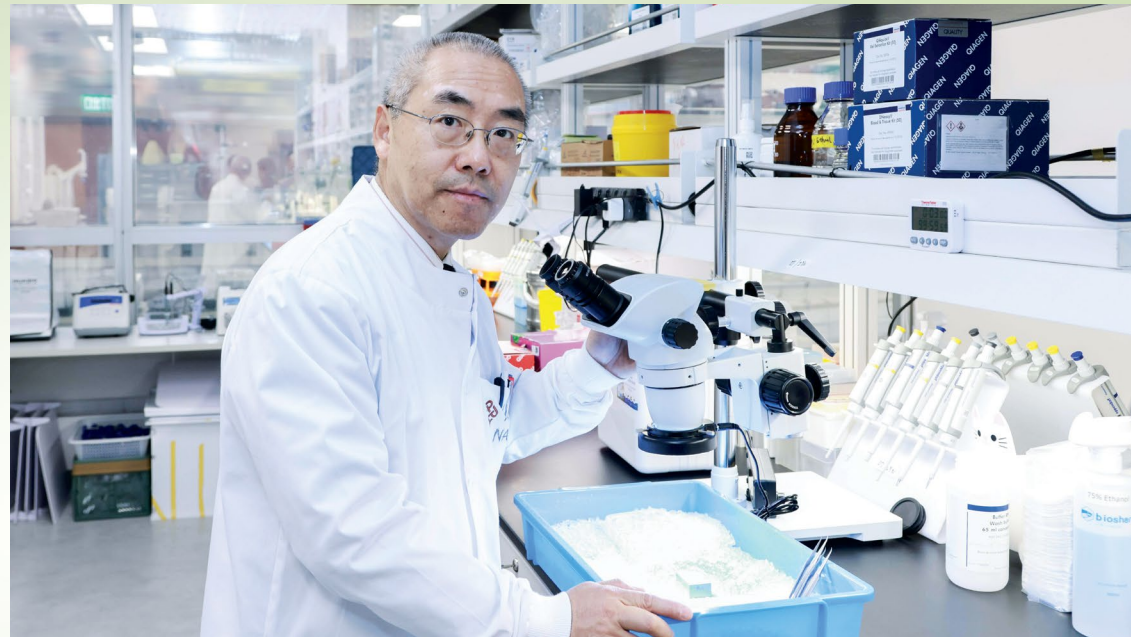
The HKSAR Government established the

# Global STEM Professorship Scheme

in 2021 to attract top-notch scholars in Science, Technology, Engineering, and Mathematics from around the world to Hong Kong.

## Global clinical and commercial potential

The PolyU programme plans to shift the paradigm away from symptom-based diagnosis, and towards AI-based data-driven diagnosis and a personalised approach to therapy. By integrating AI, genomics and biomedical technologies, Professor Zhang hopes to create an explainable AI-enabled treatment planning system that can support reliable diagnosis and guide personalised, repetitive transcranial magnetic stimulation therapy (rTMS).

The broad scope of the project includes picking out patterns in huge volumes of DNA data and brain imagery. The results will help clinicians perform more accurate diagnoses. On the therapy front, the team is working on an AI-based system that can generate recommendations for personalised rTMS therapy.

The project involves 20 investigators and collaborators from eight institutions in Hong Kong, Mainland China, and the United States. They will run clinical trials in collaboration with local and Mainland hospitals.

While the new system has strong commercial and clinical potential that could transform mental healthcare in Hong Kong and beyond, Professor Zhang is adamant that this kind of AI system will not and should not replace human doctors.

"The system we are trying to build basically looks at brain images, picks up the subtle differences that doctors may miss or overlook, and circles the particular brain regions that require doctor's special attention," he said.

"In my view, AI plays a fundamental role in research. Almost all fields of research involve collecting data, and conducting research really boils down to data science—how we analyse data and unveil the real story underneath," he concluded.
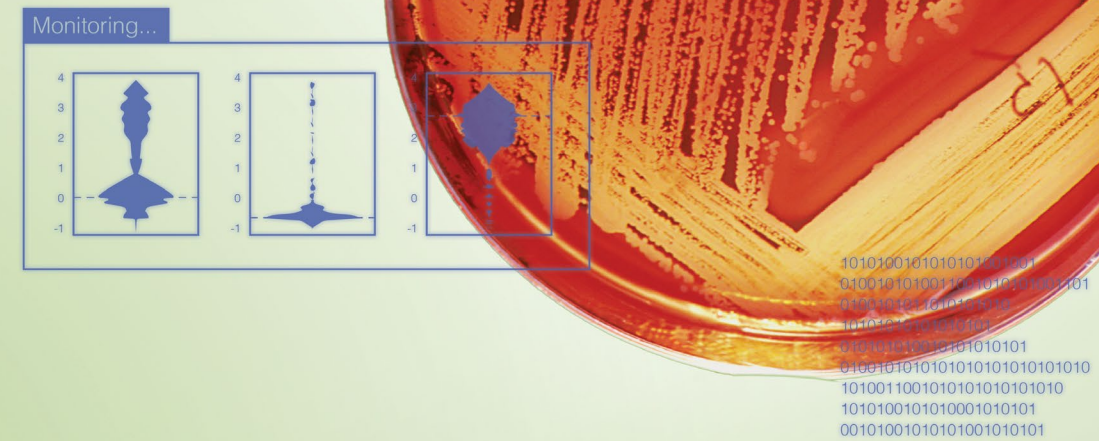
# Embracing an Inclusive and Enriching Educational Environment

PolyU brings together diverse talent from various cultural backgrounds, fostering innovativeness and enhancing educational excellence

A diverse and inclusive campus fosters students' international exposure and intercultural communication skills, as well as enabling the University to stay innovative. At PolyU, more than 2,000 non-local students from over 40 countries and regions arrive each academic year, creating a lively mix that enriches learning and transforms the campus experience into a vibrant tapestry of cultures and stories.

## Inspiring and transformative experiences

On a typical day at PolyU, you might find Faith, a confident Indonesian student in her final year at the School of Fashion and Textiles (SFT), sharing her insights on fashion trends with classmates. Passionate about finding inspiration in Hong Kong's industry, she aims for professional growth post-graduation. Her competitive edge lies in her sustainability and design skills. University internships have improved her adaptability, while exchange programmes have expanded her global outlook. Scholarships and competitions bolster her development, making her a strong candidate in the fashion world.

> My experience here has been nothing short of transformative. The curriculum's blend of theoretical knowledge and hands-on experience stands out, promising a holistic education that allows students to dabble not only in the artistic aspect of fashion but also its business side.
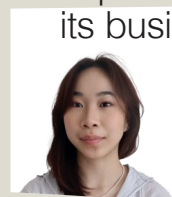
**Faith Makmurputri**
// Year-4 Retail and Marketing student at SFT

> The professors have been friendly and helpful to me, and they have given a lot of support with my desired courses. They even took me to events that I showed an interest in—not just at the University.

**Erik Eimterbaeumer**
// Exchange student from Germany at SD

Erik, a German exchange student at the School of Design (SD), always enjoys the sight of the Jockey Club Innovation Tower, a Zaha Hadid creation and home to SD. Captivated by its magnificence since his arrival, he has been impressed not just by the building itself but also the on-course teaching, facilities and subjects SD offers. Eager to share the inspiration he gained from visits to various hackathons, founder events, talks and pitches with his classmates, he is excited to find there is always something going on in the founder and maker community in the region.

## Finding community through kindness

Down in the red-brick academic building, Lingjun, an exchange student from the Mainland at the Department of Applied Social Sciences who was born blind, finds ease in navigating her way to her class in the barrier-free campus with thoughtful support systems and facilities. Lingjun has embraced her journey at PolyU with the disability-friendly campus and the compassionate community. She is living proof of the University's commitment to inclusivity.

> Most importantly, it was the people I met who made my study journey here at PolyU so enjoyable. They were all caring, helpful and full of compassion, from the academics to the staff serving food in the cafeterias, and from the students to the tutors in the student halls of residence. They all helped to make my experience at PolyU warm and memorable.

**Zhu Lingjun**
// Exchange student from East China Normal University

## Building a global talent hub

Spanning from the stunning outback of Australia to the vibrant landscapes of Kenya and the rich cultural heritage of Hungary, PolyU's overseas students hail from different corners of the globe, reflecting the University's dedication to creating a diverse and inclusive international learning environment, aligning with the Hong Kong SAR Government's vision to make Hong Kong a top destination for foreign students.

The International Summer School offers good opportunities for undergraduate students with diverse cultural backgrounds to make friends with one another.

## Promoting cultural dialogues among students

To enhance campus life for both local and overseas students, PolyU has implemented several initiatives, including the International Cultural Festival, which inspires a deep appreciation for cultural diversity through various cultural and artistic activities. Additionally, global outreach programmes such as the International Summer School for undergraduates and the Summer Institute for high-school students provide opportunities to experience PolyU's academic excellence while immersing themselves in Hong Kong's vibrant culture. Through peer support schemes at institutional, departmental or hostel levels, local students are trained to mentor non-local peers. These initiatives foster cultural exchanges among students and a sense of inclusivity on campus.

# Cultivating Students' Global Perspectives

**All PolyU undergraduate students will receive support from the University to go offshore at least once to gain invaluable learning experiences**

Participating in a semester of study abroad, engaging in an overseas summer internship, or applying classroom knowledge to community service in a foreign country are all precious and exciting opportunities for PolyU students to engage in immersive learning experiences. These experiences not only expand students' perspectives, but also nurture a global and inclusive mindset, which is essential for preparing them to become global-minded professionals and leaders who can thrive in the international economy, contribute effectively to society, and leverage discovery and innovation to address societal challenges both locally and globally.

## WIE Work-Integrated Education

PolyU was the first university in Hong Kong to offer a mandatory WIE programme for undergraduates to broaden their practical experience and global perspective through internships in Hong Kong, the Mainland and overseas.

Non-local learning at PolyU can come in the forms of exchange study, Work-Integrated Education (WIE), Service-Learning (SL) and others. In addition to gaining cultural exposure and understanding, students will learn how to navigate new environments, solve problems independently and build resilience, which boosts their confidence and self-reliance.

### Journeys of self-discovery

❝ My exchange semester in France was transformative, teaching me resilience, adaptability, and confidence. The lessons I learned and the memories I gained will stay with me forever. I wholeheartedly encourage anyone contemplating an exchange programme to take the leap and explore the world beyond their borders. ❞

**Fung Sum-sheung**
⫽ School of Hotel and Tourism Management
⫽ Studied at Ecole Supérieure Internationale de Savignac, France through an exchange programme

❝ Living and immersing myself in a foreign country has been a fascinating journey of self-discovery. Working in a Japanese company with mostly American colleagues created a unique environment where I could share and appreciate our diverse cultural backgrounds. ❞

**Kobe Hon Hoi-hung**
⫽ Bachelor of Engineering programme in Product Analysis and Engineering Design
⫽ Enjoyed his internship working at edison.ai in Tokyo, Japan

❝ During my internship at Riot Secure, I had the opportunity to take on a variety of responsibilities that allowed me to apply my academic knowledge in a practical setting. I actively participated in technical discussions and decision-making processes within the team contributing my ideas and feedback on various projects. ❞

**He Yiyang**
⫽ Bachelor of Engineering programme in Financial Technology and Artificial Intelligence
⫽ Joined an international WIE programme to work at Riot Secure in Stockholm, Sweden
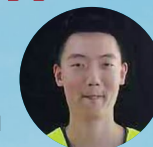
❝ This Service-Learning trip was an enlightening experience and has changed me a lot as a person. Apart from fulfilling the mandatory SL requirement, serving others has become something close to my heart, and I am determined to pass on the same spirit to others. ❞

**Michelle Sandhika**
⫽ Department of Computing
⫽ Spent two weeks in Kampong Speu, Cambodia, teaching local children STEM concepts

## SL Service-Learning

PolyU was the first local university to make academic SL a graduation requirement for all undergraduate students. SL is an experiential pedagogical approach that encourages students to apply their own professional knowledge and skills to support communities in need.

❝ The exchange programme was a transformative experience to me, contributing to my personal growth in terms of independence and intercultural communication. The challenges I encountered served as stepping stones towards a more enriching experience. This journey has broadened my horizons and deepened my appreciation for cultural diversity. ❞

**Lau Yat-nam**
⫽ Department of Applied Social Sciences
⫽ Went to University of Stuttgart in Germany for a summer exchange

### Non-local learning experience for all

The University targets to offer all undergraduates at least one non-local learning experience upon graduation by the academic year 2027/28. By engaging with diverse subjects, cultures, and experiences, PolyU students will recognise and appreciate the impact they can make on their communities and society at large.
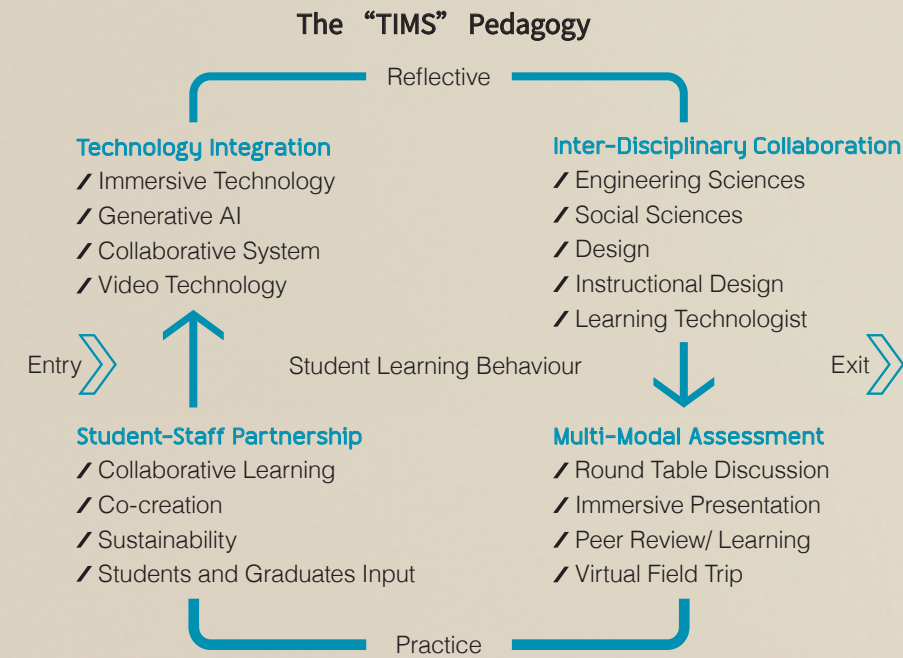
# Leading the Tech Wave to Teach Digital Natives

An award-winning PolyU project is transforming education into a dynamic, learner-centred experience that fits the way this new generation thinks

Digital natives—millennials and the generations to come—grow up with modern technologies such as smartphones, computers and social media. How these "native speakers" of the digital language learn, and how to teach them, is becoming a special challenge to educators who might not speak the language as fluently.

At PolyU, a team of scholars has come up with a pedagogy, creatively mediated by technology, to engage and empower these digital natives for effective teaching and learning outcomes. They have embraced innovative tools, such as AI and instant messaging, to develop teaching approaches that fit the way this new generation thinks and processes information.

## The "TIMS" Pedagogy

Reflective

**Technology Integration**
⁄ Immersive Technology
⁄ Generative AI
⁄ Collaborative System
⁄ Video Technology

**Inter-Disciplinary Collaboration**
⁄ Engineering Sciences
⁄ Social Sciences
⁄ Design
⁄ Instructional Design
⁄ Learning Technologist

Entry → Student Learning Behaviour → Exit

**Student-Staff Partnership**
⁄ Collaborative Learning
⁄ Co-creation
⁄ Sustainability
⁄ Students and Graduates Input

**Multi-Modal Assessment**
⁄ Round Table Discussion
⁄ Immersive Presentation
⁄ Peer Review/ Learning
⁄ Virtual Field Trip

Practice

### Creating a smart omni-campus

One example is the PolyU Smart Campus Innovation project. Dr Rodney Chu, Senior Lecturer of the Department of Applied Social Sciences, and an interdisciplinary team of PolyU educators are exploring omnichannel solutions that integrate various methods of interaction with students.

Based on the three E's—Engage, Empower, and Excel—the project addresses student expectations for instant feedback, visual engagement, and multi-tasking support. The goal is to enhance learning satisfaction and engagement by offering real-time experiences across digital resources.

The aim of this approach is to create a smart omni-campus that enables students to learn whenever and wherever. Embracing the TIMS framework—a novel pedagogy that consists of Technology Integration, Interdisciplinary Collaboration, Multi-Model Assessment, and Student Staff Partnership—it supports both enhanced and existing digital communications and learning tools. The result is a flexible, flipped classroom model that sustains the interest of students outside the traditional classroom setting.

❮❮ As educators, our primary focus is our students. Through this project, we strive to enhance collaboration with them to co-create an inclusive and impactful learning experience that drives strong learning outcomes. ❯❯

Dr Rodney Chu

## An AI-driven learning partner

To empower students to learn anytime and anywhere, it's essential to understand and adapt to their learning habits. Digital resources and platforms, including Generative AI (Gen AI), podcasts and WhatsApp, have all been seamlessly integrated into teaching, learning and assessment experiences. This adaptive approach effectively meets the unique needs of each learner.

The Smart Campus Innovation project began with the creation of a GenAI chatbot called Virtual Assistant TIMS (VAT). It provides immediate responses through WhatsApp, allowing students to leave enquiries and access learning resources instantly. When necessary, they are redirected to one-to-one chatrooms with teachers. Teachers use course materials and video lectures to train the AI and ensure it remains relevant.

The project also includes an AI-generated audio podcast system. It provides an engaging learning experience by leveraging advanced natural language processing technology to transform academic content into informative dialogues. The podcasts help students with lesson preparation and revision by distilling handouts and video content into captivating episodes. The content not only supports students in their studies, but also sparks interest by providing complementary examples that enrich the lecture experience.

### Virtual Assistant TIMS (VAT)

Scan for WhatsApp demonstration

### Features

/ Real-time lecture summaries and knowledge assistance
/ Podcast
/ Rubric-based assessment feedback
/ Video presentation assessments
/ Photo search
/ Verbal search

### Benefits

/ Teachers can upload teaching materials
/ Students can ask questions anytime, anywhere
/ Flexible, efficient, and engaging learning environment

Scan to try the podcast demo

A built-in AI-assisted review assessment tool known as AIReAS, further enhances learning by enabling students to revise assignments based on immediate feedback. Such prompt insight, typically within one minute, fosters continuous improvement and motivates students to assess the AI's suggestions, thereby cultivating their critical thinking skills. As a result, students submit more polished and refined assignments for evaluation, while simultaneously reducing the workload of their teachers.

## Interact, evolve and excel

The unconventional learning framework empowers students by enhancing engagement, boosting attention spans, and providing rapid feedback that deepens understanding. Students are encouraged to share their feedback and ideas, cultivating a collaborative environment that enriches teaching and learning experiences.

In this setting, teachers can harness AI as a dynamic learning partner, working alongside students to co-create knowledge and ignite stimulating discussions. Ultimately, this partnership among students, teachers, and staff will evolve into a thriving ecosystem where students and graduates play vital roles in the operation, enhancement, and sustainability of the framework.

## International recognition

The project's success has won international recognition, including the Gold Award in the Smart Omnichannel Campus category in the QS Reimagine Education Awards, which is known worldwide as the "Oscars of Education" to be held once a year. PolyU was not only the local institution in Hong Kong to receive a Gold Award in 2024. What is more, the same project also won the prestigious Global Education Award of the Year 2024, which was the first time for HK participants to win the highest level of award among 1,300 global submissions. Such achievements underscores PolyU's commitment to transforming the teaching and learning experience and exemplify its status as an innovative world-class university.

Until now, TIMS as a framework has been applied to 17 subjects offered by the School of Design, the Department of Applied Social Sciences, the Department of Building Environment and Energy Engineering, and the Department of Electrical and Electronic Engineering. The number will continue to expand in the coming years. Collaborations with other higher education institutions in the U.K. and Canada are now underway to enhance its impact and reach.

Scan to discover more

### The winning team *from right*

/ Dr Mark Kai-Pan, Senior Educational Development Manager, Education Development Centre
/ Prof. Jeffrey Ho, Associate Professor, School of Design
/ Dr Rodney Chu, Senior Lecturer, Department of Applied Social Sciences (APSS)
/ Dr Pauli Lai, Senior Lecturer, Department of Electrical and Electronic Engineering
/ Dr Hilda Cheung, Lecturer, Department of Building Environment and Energy Engineering
/ Miss Kathy Lam, Project Associate, APSS CAVE-cum-Studio Device member
/ Mr Charles Woo, Project Fellow, APSS CAVE-cum-Studio Device member [not in photo]
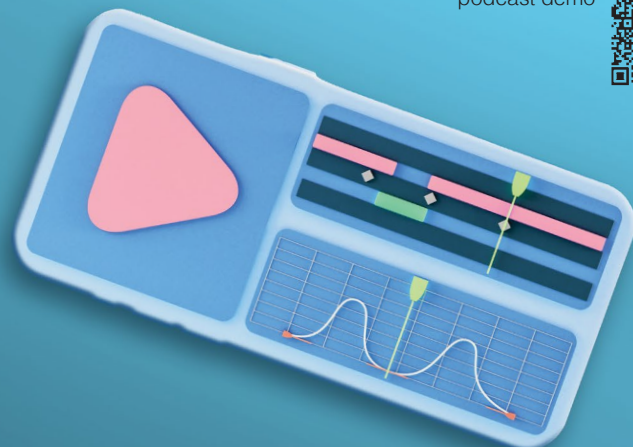
# PhD Programmes Offer Multiple Merits

Joining hands with global partners to support PhD students with joint supervision, scholarships, research funding

Prospective PhD students will find it appealing to enroll on Dual PhD Degree Programmes jointly offered by PolyU and its prestigious global partner universities. The initiative provides students with access to the academic and research excellence of both institutions, presenting a unique opportunity for aspiring scholars to leverage the strengths of two universities and earn two PhD degrees simultaneously.

In the 2023/24 academic year, PolyU's research postgraduate population

~3,500

17%↑

from 2022/23

**Earning two PhD degrees**

The Dual PhD Degree Programmes benefit PolyU full-time PhD students with shared research excellence from PolyU and its partner institutions. This initiative features an equally split study pattern over three or four years, with students receiving stipends or scholarships from both universities. Joint supervision is provided by two chief supervisors, one from each university, ensuring comprehensive academic guidance. Upon completion of their study, students obtain two PhD degrees—one conferred by PolyU and the other by the partner university.

PolyU's strategic partnerships for the Dual PhD Degree Programmes include over 20 overseas and Mainland universities. Overseas universities include Queensland University of Technology in Australia, Korea University and Seoul National University in Korea, and Loughborough University and University of Surrey in the United Kingdom. Mainland universities include Nanjing University, Tongji University, University of Science and Technology of China, Wuhan University, Zhejiang University, and more.

Ranked third in the "World's Most International Universities 2025" by Times Higher Education, PolyU collaborates with over 30 eminent partner institutions from Mainland China and overseas on research postgraduate study, covering a range of collaborative PhD programmes besides the Dual PhD Degree Programmes.

These collaborative PhD programmes include Joint PhD Supervision Programmes Leading to a PolyU Degree, Joint PhD Supervision Programmes, and Joint PhD Supervision Schemes, offering prospective and current PhD students with various PhD study pathways. Among these, the Joint PhD Supervision Scheme with Leading Universities is specifically designed to support PhD students from top universities worldwide to conduct research at PolyU as research assistants.

PhD students can further consider embarking on research visits through the Research Student Attachment Programme, which supports both PolyU and incoming PhD students in undertaking attachment studies. Outstanding PolyU PhD students are also eligible for the PolyU PhD Scholars International Collaborative Research Fellowship, a competitive grant offered by the University's Graduate School to support research visits at top-notch universities. These initiatives foster students' development in acquiring an expanded network and a broadened perspective.

By partnering with renowned institutions worldwide, we can leverage our combined strengths to achieve mutual benefits that drive innovative research outcomes. Through various collaborative PhD programmes, we enhance our research capacities, provide students with enriched experiences, and attract high-quality PhD candidates globally, thereby increasing the diversity of the University.

Professor Cao Jiannong,
Dean of Graduate School

**The first-in-Hong Kong PhD student internship initiative**

Starting in the 2024/25 academic year, PhD students at PolyU can benefit from full-time internship opportunities under the PhD Student Internship Scheme, specially designed to enable them to integrate research skills and knowledge in real-world contexts, gain practical experience, and enhance their professional competencies. Students can pursue research internships at reputable companies or research startups of their choice, either in Hong Kong or abroad.

As the first initiative of its kind at the university level among Hong Kong's tertiary institutions, the Scheme not only boosts students' professional development but also reinforces PolyU's reputation as a leader in innovative research education.

# Sailing Ahead: Promoting Maritime Excellence in Hong Kong

As Hong Kong is strengthening its status as an international maritime centre, PolyU has been building the foundation by nurturing the much-needed professionals

When Alex, a 2024 graduate of the Department of Logistics and Maritime Studies (LMS) at PolyU, reflected on his transformative four-year journey at the University, he credited the comprehensive knowledge and practical skills he gained, which have strengthened his ability to build a promising career in the dynamic and ever-expanding shipping industry.

Alex Chiu Ka-chun who graduated in 2024 with a Bachelor of Business Administration (Honours) degree in International Shipping and Transport Logistics, is setting sail for a promising career in the shipping industry, a sector that has been a cornerstone of Hong Kong's economy for nearly two centuries.

Additionally, experiences such as study tours to Singapore, internships at major shipping companies, site visits to Container Terminal Eight, and other enriching opportunities provided him with invaluable exposure and the confidence to go above and beyond in his pursuit of success.

## Thriving as an international shipping hub

Alex is among a new generation of talents who would steer and propel Hong Kong's maritime sector to new heights. For over 180 years, this coastal city on the South China Sea has been a crucial gateway for international trade with China. With its naturally sheltered deep-water harbour, world-class port infrastructure, and strong shipping tradition, Hong Kong has long established itself as a pivotal hub for the global shipping industry. According to the 2024 Xinhua-Baltic: International Shipping Centers Development Index Report, Hong Kong ranked fourth globally. As one of the world's premier ports, Hong Kong excels in shipping tonnage, cargo handling, and passenger transportation.

Further to the endorsement by the Central Government's National 14th Five-Year Plan, the Chief Executive, in the 2024 Policy Address, outlined the Hong Kong SAR Government's commitment to enhancing the maritime sector through a comprehensive strategy aimed at reinforcing Hong Kong's status as a global shipping hub. The contribution of young professionals is vital to achieving this vision.

## Maritime education moving with the times

From its beginnings as a fishing village, Hong Kong has become one of the busiest maritime centres worldwide, driving demand for skilled professionals to meet the industry's changing needs.

Over the decades, PolyU's programmes have evolved to align with industry developments. As early as 1937, the Government Trade School—PolyU's predecessor—pioneered maritime education with training in marine wireless operations. Initially focused on vocational training for deck and electronic officers, PolyU, since 1989, has expanded its curricula to include ship management education for aspiring onshore managers.

In 2008, LMS introduced academic programmes from sub-degree to PhD levels, benchmarked against international standards and meeting the criteria set by major professional associations and global accrediting bodies.

The University consistently updates its curricula by gathering input from international scholars, shipping experts, and alumni, enhancing the relevance of its programmes, aligning them with industry demands, and equipping graduates with essential skills.

Professor Mike Lai, Chair Professor and Interim Head, LMS, said, "Today, the global port industry is undergoing a digital transformation, with the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) at the forefront of smart ports development." Professor Lai believes that equipping talents with the necessary knowledge in the latest technology is critical to driving this development.

Currently, as the sole provider of maritime education at the tertiary level in Hong Kong, PolyU will continue to nurture generations of professionals to navigate in an ever-evolving global shipping industry, contributing to the development and prosperity of the city as an international shipping centre.

## AI-empowered maritime education

Artificial intelligence (AI) is transforming industries, including maritime. LMS integrates big data and AI into its educational programmes, with initiatives like the PolyU Maritime Data and Sustainable Development Centre (PMDC). This AI-driven research centre analyses datasets such as ship positions, satellite imagery, and port data for research and education. Students can access this data for academic work and participate in research projects. They are also encouraged to join AI-related competitions, such as the AIS Hackathon by the United Nations, in which a team from LMS and Tsinghua University won third place in 2020.

LMS engages in maritime projects for government entities, including the Marine Department, the Tourism Commission, and the Agriculture, Fisheries, and Conservation Department, allowing students to join research teams and experience AI's impact on the industry, enriching their learning journey.

## Onboard ocean-going vessels

LMS students have the opportunity to enjoy the annual Ocean-going Experience Programme (OGEP) in which they will not only gain valuable maritime knowledge in a practical setting, but also be able to receive essential seafarer certificates.

# PhD Students Win First Prize for Sustainable Transportation Simulation Solution

Dynamic digital twin technology promises to overcome hurdles in designing a blueprint for transport electrification

Transport electrification means more than the adoption of electric vehicles (EV). It also requires holistic policies and careful planning to drive the development of infrastructures, technologies and the market. However, the rapid growth in EV numbers, the dynamic evolution of modern cities, and population fluctuations are making such planning more complex and difficult.

A team of three PhD students from PolyU's Department of Building Environment and Energy Engineering (BEEE) has proposed a solution to overcome the hurdles in drafting an electrification blueprint. The idea has already won Zhang Junxiang, Zhu Shibo, and Chan Dayin, in collaboration with another student teammate, Chen Haolan from Shanghai Jiao Tong University, the first prize in the Northeast Asia division in the 2024 ISETS-ESCAP Youth Voice Competition. They went on to win the Global First Prize in the finals held in Chengdu.

## Leveraging digital twin technology

Operating under the International Centre of Urban Energy Nexus at PolyU, the "Energy Victory" team is supervised by Professor Jerry Yan Jinyue, Chair Professor of Energy and Buildings at BEEE, and Dr Du Ying, Postdoctoral Fellow at BEEE. The project, titled "Drawing the Blueprint of Traffic Electrification with Digital Twin," leverages software-driven simulations to promote sustainable transportation solutions aligned with the United Nation's Sustainable Development Goals (SDGs).

A digital twin is a virtual representation of an object or system designed to reflect a physical object accurately. It spans the object's lifecycle, is updated from real-time data, and uses simulation to mirror and predict performance. By simulating complex systems, the technology can enable better planning. Digital twins can also provide predictive analytics for proactive decision-making and enhance collaboration across sectors.

In the case of transport electrification, the technology can enhance decision making in areas such as traffic flow optimisation and clean energy integration. According to the prize-winning team, it can also improve power grid load management, logistics management, market demand forecasting, infrastructure placement and urban redevelopment.

This winning project aims to foster the following United Nation's SDGs in the transportation sector:

## Promoting sustainable energy solution talent

The ISETS-ESCAP Youth Voice Competition, organised by the International Society for Energy Transition Studies (ISETS) and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), attracted approximately 300 submissions from 77 teams across 37 countries and regions. The competition serves as a platform for young leaders worldwide to showcase innovations that contribute to sustainable energy systems.

In addition to their competition success, the PolyU team was honoured to attend the 13th International Forum on Energy for Sustainable Development at the UN Conference Centre in Bangkok. The event enables leading experts to present research and discuss strategies for sustainable energy transformation, engaging youth with policymakers and international organisations to accelerate the global energy transition.

The achievements of these enthusiastic PhD students underscore PolyU's commitment to fostering emerging researchers and its leadership in promoting sustainable energy solutions.

Did you know that transport—including road travel, aviation, shipping and rail—accounts for around one-fifth of global carbon dioxide emissions? Given the growing concern over climate change, the electrification of transportation appears inevitable.
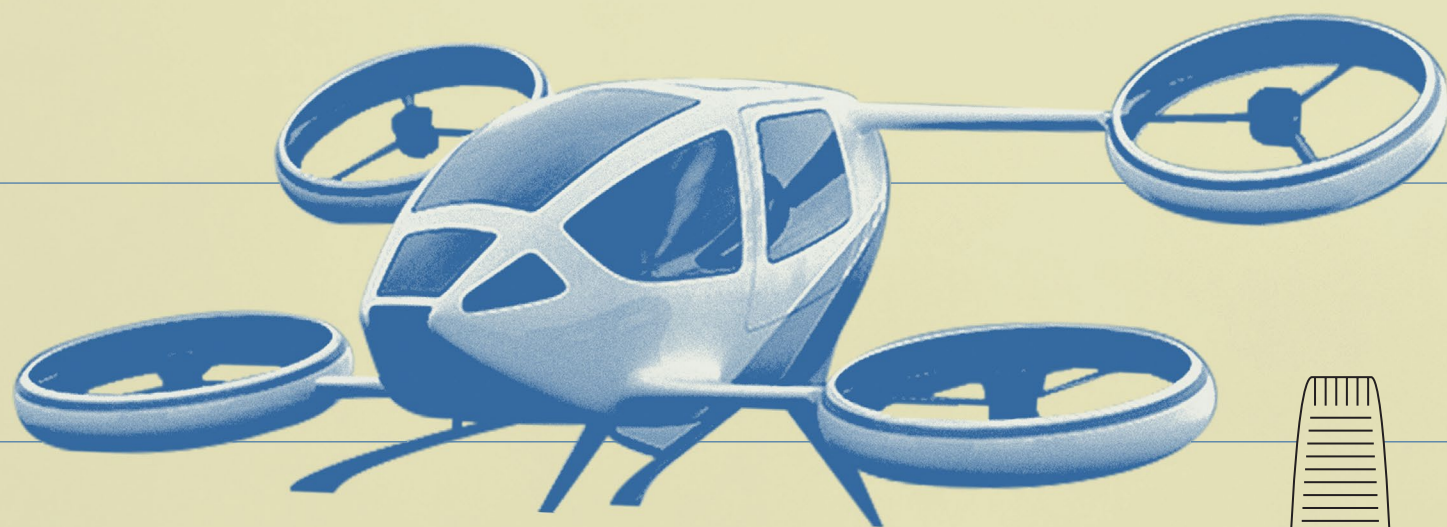
BEEE Postdoctoral Fellow Dr Du Ying (second from left) and three PhD students—Zhang Junxiang (third from left), Zhu Shibo (third from right), and Chen Dayin (second from right)—won the Global First Prize in the 2024 ISETS-ESCAP Youth Voice Competition.

# Flying High in the Emerging Low-Altitude Economy

Pioneering technologies that will put Hong Kong at the forefront of an exciting new industry

The investment bank Morgan Stanley projects that the global LAE market will reach a staggering US$9 trillion (approximately HK$70 trillion) by 2050, transforming urban landscapes worldwide, unlocking new opportunities, and reshaping industries. Alongside Shenzhen and other Greater Bay Area (GBA) cities, Hong Kong is gearing up to be a leader in this global race.

Demonstrating its proactivity, the HKSAR Government established a dedicated working group in 2024 and launched the Low-altitude Economy Regulatory Sandbox in early 2025. PolyU is also playing a pivotal role in advancing LAE development in Hong Kong and the GBA through research, education, collaborations and technology transfer, thought leadership and policy recommendations.

## Guiding Hong Kong's LAE strategy

PolyU's Policy Research Centre for Innovation and Technology (PReCIT) is advising the HKSAR Government on amending existing or establishing new regulations to manage the LAE. For example, it has already suggested setting up an inter-departmental working unit to efficiently supervise LAE developments and encourage the involvement of businesses through favourable policies. Other ideas include creating a research and development centre focusing on low-altitude transportation technology.

The PReCIT also urged the Government to finalise the planning of the pilot LAE zone to facilitate the expansion of cross-border low-altitude transportation services. It has recommended drawing on Shenzhen's LAE experience when developing the "Northern Metropolis" integrated living and economic region, and refining the SAR's laws, regulations and development strategies to support low-altitude opportunities.

## Pooling knowledge from experts and innovators

In addition to providing regulatory advice, PolyU scholars are spreading the word about Hong Kong's LAE capabilities throughout the wider LAE community. To promote collaboration and innovation, PolyU hosted the Aerospace Innovation Research Summit (AIR Summit) on campus in November 2024. The event brought together nearly 1,000 political and business leaders, researchers, and industry professionals from the aerospace technology and innovation sectors, to share their latest achievements, technological breakthroughs and ideas for innovative aerospace solutions.

**Three things you need to Know about LAE**

**What is LAE?**
LAE generally refers to flying activities by manned and unmanned aerial vehicles (UAVs) within airspace up to 1,000 metres above ground level.

**1,000** metres

**Hong Kong's progress?**
Initiatives highlighted in the HKSAR Government's 2024 Policy Address include forming a Working Group on Developing the Low-altitude Economy to formulate strategies, and launching a Low-altitude Economy Regulatory Sandbox for testing projects safely.

**Does LAE mean drones?**
While drones are a type of UAV and a prominent part of LAE, the category also includes other low-altitude aircraft such as electric vertical take-off and landing (eVTOL) vehicles, such as helicopters, and potentially flying taxis. LAE also includes the operation aspect of these aircraft such as air traffic monitoring and management, airspace design, and ground support systems and infrastructure.

With potential applications ranging from drone deliveries and flying taxis to aerial sightseeing and pesticide spraying, the burgeoning low-altitude economy (LAE) is set to revolutionise a host of important sectors, such as logistics, tourism, agriculture, and even emergency rescue operations.

**Professor Huang Hailong**
⫽ Assistant Professor,
Department of Aeronautical
and Aviation Engineering

❞❞ To unlock the full potential of LAE, it's essential to consider airspace regulations and guidelines, surveillance of the low-altitude airspace, infrastructure readiness, and public safety. ❝❝

**Professor George Liu**
⫽ Professor, Department of Land
Surveying and Geo-Informatics
⫽ Chief Scientist of Meteorological
Observation Center, China
Meteorological Administration

❞❞ Collaboration between government departments, research institutions and the mainland authorities should be fostered to enhance the local capabilities in space weather services in support of LAE development. ❝❝

**Professor Ng Kam-hung**
⫽ Assistant Professor,
Department of Aeronautical
and Aviation Engineering
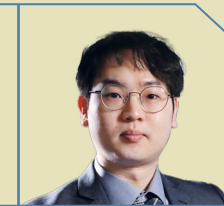
❞❞ Land in the Northern Metropolis can be utilised to establish a research centre and a site for flight testing of unmanned systems, supporting use by various operating companies and universities. ❝❝

**AIR Summit 2024**

LAE was one of the five thematic sessions held during the AIR Summit in 2024

**The Last-Centimeter project**

Led by Professor Huang Hailong, the project aims at enabling drones to autonomously navigate urban environments, and seamlessly deliver parcels directly to customers' balconies.

## Building industry networks

The University is actively pursuing collaborations with industry partners, including a partnership with the Greater Bay Area Low Altitude Economy Alliance (LAEA). This relationship aims to drive innovation, advance LAE practices, and promote academic research and technology transfer.

Recently, PolyU has signed a strategic cooperation agreement with China Tower Corporation Limited, the world's largest telecommunications tower infrastructure service provider, for in-depth cooperation in areas including LAE.

Beyond laboratory research, the University is actively encouraging the practical application of LAE technologies to address societal needs. A notable example is the PolyU startup LifeSparrow Solutions, which harnesses a self-developed AI algorithm and drone imagery to locate lost hikers, reducing search and rescue time by over 65%.

PolyU is helping to position Hong Kong on the cutting-edge of the LAE revolution, through a comprehensive approach that integrates innovative research, talent development, strategic collaboration, and technology transfer. As the LAE sector continues to evolve, the University's contributions will be instrumental in shaping a future where the sky is no longer the limit.

## Pioneering the new low-altitude frontier

The University demonstrated its commitment to LAE when it established the Research Centre for Low Altitude Economy (RCLAE) in 2024. Focusing on developing key technologies for low-altitude transportation and logistics, and ensuring efficient and safe use of airspace, the RCLAE aims to explore innovative solutions for transporting goods and passengers, and facilitate the transfer of technology from the lab to the commercial market. Like the PReCIT, the RCLAE is also advising the administration on policy decisions to support LAE growth in Hong Kong and the GBA.

One of the RCLAE's most promising LAE initiatives is the Last-Centimeter Project, which uses transformative drones to deliver parcels directly to a customer's balcony. The project features advanced autonomous navigation algorithms and integrates multiple sensor data to provide accurate 3D mapping of the surrounding environment. Achievements include an advanced drone prototype, capable of executing precision landings in challenging weather conditions and amidst obstacles, developed entirely in-house.

The RCLAE is breaking new ground with its innovative use of autonomous drones to clean the exterior of buildings. Utilising LIDAR and GPS, the drones conduct detailed scans of target structures. The data collected is then transformed into accurate 3D models, enabling drones to plan the most effective cleaning routes automatically. Moreover, this innovative UAV system significantly reduces carbon emissions.
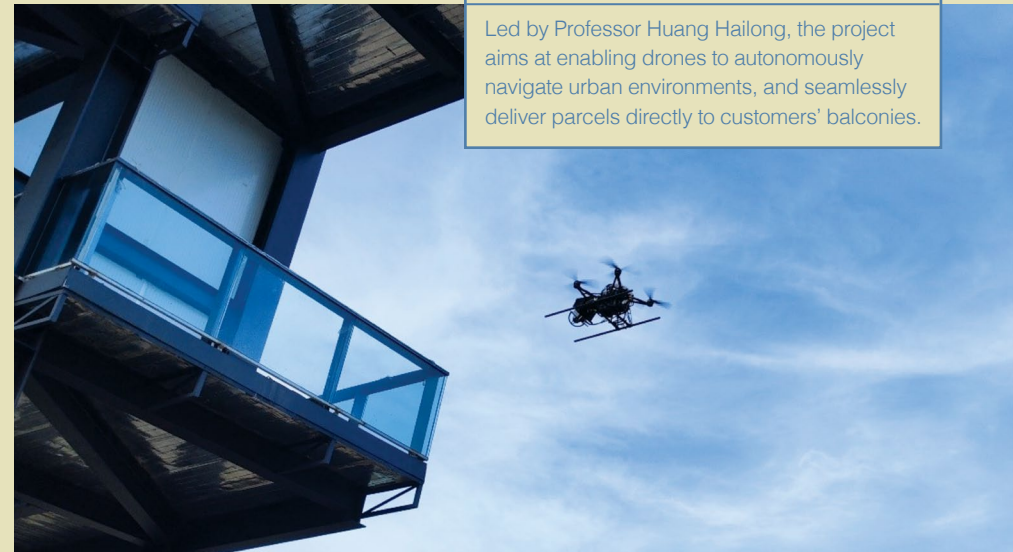
For example, cleaning a 100 m² surface area of the windows of the PolyU Jockey Club Innovation Tower would emit 277.8 kgCO2e using large machinery commonly used by the cleaning industry, but only about 2.91 kgCO2e with the UAV system. The potential for even greater carbon reduction is promising as the project progresses towards completion.

More about RCLAE

Many more LAE research projects led by top PolyU scholars are currently underway. These initiatives tackle a variety of issues, such as infrastructure planning, the design of low altitude airspace, and dependable perception techniques. The development of robust control technology, and the mission-critical consideration of ensuring safe flights in emergency scenarios, are also major research areas.

## Nurturing the next generation of LAE experts

PolyU secured its place at the forefront of LAE education with the launch of its Master of Science programme in LAE in September 2025. This interdisciplinary degree offers advanced training in airspace systems, design of U-space for unmanned aircraft system operation, aviation safety, and infrastructure design for next-generation aerial vehicles. The curriculum is designed to equip students with cutting-edge expertise in LAE, preparing them to become future leaders in a rapidly emerging industry.

According to Professor Huang Hailong, the programme has the potential to create numerous job opportunities across multiple sectors, including research and development, technical management, commercial, and public and government services.

Professor Wen Weisong, the visionary behind the project, believes this nascent industry could potentially generate over

## HK$
# 300M
each year

**Using drones to clean exteriors**

Professor Wen spearheaded the innovative project that employs drones to clean building exteriors.

**Professor Wen Weisong**
⫽ Assistant Professor,
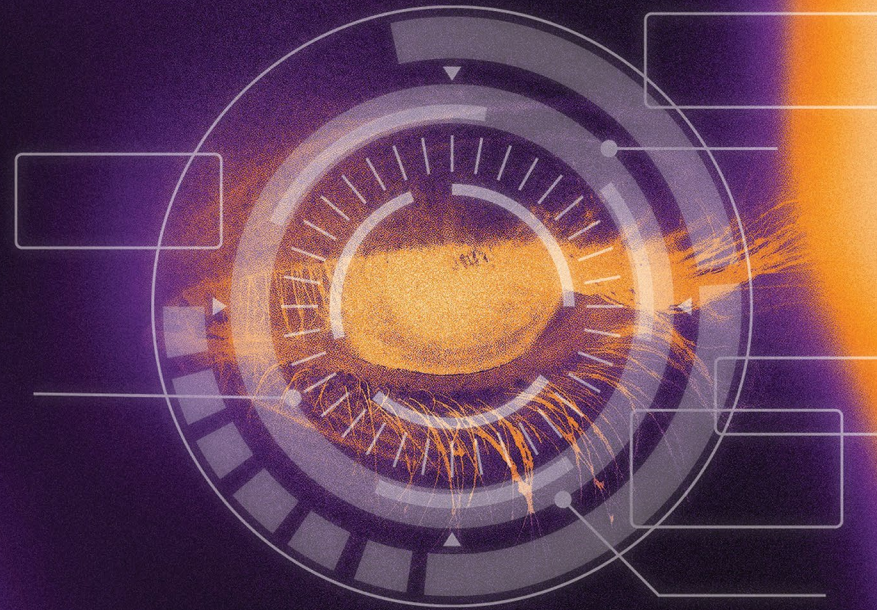Department of Aeronautical
and Aviation Engineering

# Sensing Breakthroughs

## Overcoming major hurdles to make artificial intelligence (AI) sensing systems more efficient

Talking to Siri. Clearing immigration and customs with a facial scan. Receiving meals from a restaurant service robot. Riding in a self-driving vehicle. The common denominator in all these new lifestyle trends is sensory AI.

Sensory AI transforms ordinary machines into entities that can see, hear, smell, taste, and feel, much like human do. By interpreting sensory information, these devices can understand their environment in a more holistic way, and perform complex tasks that require a nuanced perception of the world.

### Stumbling blocks

Sensory systems are becoming an integral part of daily life, but several challenges hinder their development.

First, they consume significant power, making deployment difficult in resource-limited environments. Second, they often experience high latency, which is problematic for applications like autonomous vehicles that need to make split-second decisions or industrial automation systems that require immediate responses. Lastly, processing sensory data, especially for high-resolution vision and audio, demands substantial amount of memory and computational resources. This can be a significant obstacle when it comes to deploying sensory systems on edge devices.

Professor Chai Yang, Associate Dean (Research) of the Faculty of Science and Chair Professor of the Department of Applied Physics, and his research team are breaking these barriers, winning renowned awards, locally and internationally, for their incessant effort.
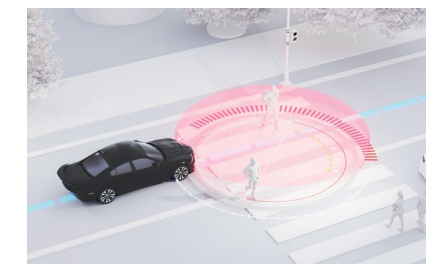
### Breaking the walls

The team has examined the concepts and implementation of bioinspired near-sensor and in-sensor computing and successfully reduced the amount of redundant data transmitted between sensing and processing units. This means large amounts of data can now be efficiently processed while consuming less power.

Inspired by natural sensory systems such as the human retina, Professor Chai and his team have offered a solution that avoids relying solely on backend computation. They have also developed sensors that can adapt to different light intensities and wavelengths, thus drastically reducing power consumption and latency. This approach improves machine vision systems used for identification tasks.

Professor Chai's research is enabling the use of sensory AI in a wide range of real-time, mission-critical systems, such as autonomous vehicles that need to make instantaneous decisions. The focus is on exploring specialised hardware accelerators that can reduce inference latency to as low as microseconds.

His research also explores innovative in-sensor computing paradigm, and hardware-software co-design approaches. The idea is to reduce the transmission of huge amounts of data and to enable the execution of complex sensory AI models on resource-constrained platforms.

The hardware architectures and optimisation techniques he developed lay the foundations for the deployment of advanced sensory AI systems in mobile devices, IoT sensors and edge computing. These innovations will significantly enhance a wide range of applications in smart cities, from autonomous vehicles to industrial automation.
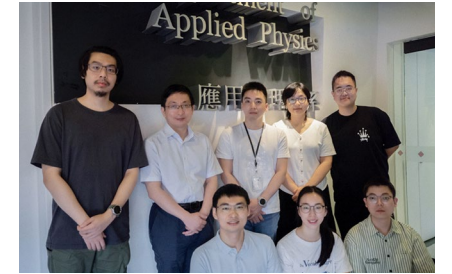


Professor Chai Yang (back, second left) and his team are revolutionising sensory AI by breaking down barriers in power consumption and latency.

### Building on success

These outstanding findings have been published in high-impact journals including *Nature Electronics*, *Nature Nanotechnology*, and have been highlighted in *Nature*, *IEEE Spectrum*, among others.

Professor Chai is a receipt of the Falling Walls Science Breakthroughs in Engineering and Technology for his work on "Breaking the Wall of Efficient Sensory AI Systems". Locally, he was awarded the BOCHK Science and Technology Prize in Artificial Intelligence and Robotics for his scientific discoveries. He is also an IEEE Fellow, an Optica Fellow, and a NSFC Distinguished Young Scholar.

The Professor is now looking for innovative ways to harness these achievements. He envisions developing cutting-edge microelectronic and nanoelectronic devices with new functionalities. "My long-term goal is to create imaging technology capable of perceiving three-dimensional depth, four-dimensional spatial-temporal and multiple spectral information, employing bioinspired mechanisms to reduce power consumption and latency," he said.



Sensory systems' high latency is a major obstacle hindering the development of autonomous vehicle.

# New AI Paradigm Levels the Playing Field for Large Language Model Development

Fusing small domain-specific models into a single powerful one could cut Centralised AI training costs by over 99.9%

In January, China's DeepSeek artificial intelligence (AI) startup made headlines with the surprise launch of its large language model (LLM). The media frenzy was fuelled by the new offering's ability to outperform LLMs from the biggest AI tech players, despite having access to less funding and technological resources. However, according to Professor Yang Hongxia of PolyU's Department of Computing, the most significant aspect of DeepSeek's LLM is the fact it is entirely open source. Combined with an innovative "Model-over-Models" approach pioneered by her research team, this will enable smaller companies, startups and individual developers to disrupt, enhance, and accelerate LLM development.

> While current LLMs have made impressive strides in general intelligence, they still fall short in specific domains in fields like manufacturing and biochemistry.

Professor Yang Hongxia

**Professor Yang Hongxia**
// Associate Dean (Global Engagement), Faculty of Computer and Mathematical Sciences
// Professor, Department of Computing
// Executive Director, PolyU Academy for Artificial Intelligence

## Overcoming LLM obstacles

Formerly Head of LLM at ByteDance and AI scientist at Alibaba's DAMO Academy, Professor Yang believes AI development is being hindered by a de facto monopoly. Training LLMs from scratch requires access to centralised and costly graphic processing unit (GPU) resources, which only a few tech companies can afford. This issue particularly affects enterprise-based generative AI (GenAI), where models trained only on general web data perform poorly in a range of specialised sectors, such as healthcare, material intelligence and energy.

"This gap exists because much of the relevant data for these areas that cannot be crawled from general web hasn't been incorporated into AI model development," said Profeesor Yang.

In her opinion, building a comprehensive model that consistently excels across all domains remains challenging.

## Model over models

To address the challenge, Professor Yang and her team are leading the development of a "Model-over-Models" (MoM) approach, which builds a foundational model from smaller, stackable domain-specific models.

Called InfiFusion, their solution effectively distils knowledge from diverse source models, regardless of their origin or architecture, overcoming vocabulary mismatches and computational inefficiencies.

They also supply continual pretrain platform which opens the door for training AI tailored to specific domains. In fact, it is now possible to combine various domain-specific models into a single model, harnessing their unique advantages without the necessity of retraining a massive, monolithic model.

Experimental data indicates that InfiFusion performs better than other state-of-the-art models, such as Alibaba's Qwen-2.5-14B-Instruct and Microsoft's Phi-4, across 11 benchmark tasks, including reasoning, coding, mathematics, and instruction-following. It can also complete trainings at a fraction of the cost—just 0.015%—of traditional centralised methods.

> This approach also maximises the utility of less advanced, heterogeneous computing resources, allowing domestic chips to be more effectively used for small model training. This efficiency also positions Hong Kong to lead in GenAI development while fostering China's AI hardware ecosystem through optimised use of heterogeneous computing resources.

Professor Yang Hongxia

Professor Yang is confident that InfiFusion represents an efficient and scalable solution for high-performance LLM deployment. It paves the way to a decentralised LLM, which she views as the future of generative AI.

"We can leverage distributed high-performance computing (HPC) centres equipped with diverse computing accelerators, including those at Cyberport, Science Park, and Zhejiang Lab (Zhejiang HPC Center) via the MoM architecture. Heterogeneous, entry-level GPUs can be efficiently utilised, in contrast to traditional approaches that require large clusters of identical high-end GPUs for training from scratch."

## Leading the AI academy

Professor Yang is now in charge of PolyU's new PolyU Academy for Artificial Intelligence (PAAI), which was established to drive fundamental scientific breakthroughs and enhance the University's reputation as an AI leader. Her duties include developing the innovative MoM machine learning paradigm.

PAAI facilitates collaboration among PolyU researchers across diverse disciplines. The goal is to develop AI models with specialised domain expertise, which enable the training of a more general AI model using MoM. The resulting AI models will be suitable for a variety of university applications, including research and teaching, where they could transform language education for students.

Professor Yang and her team are currently developing foundation models in cutting-edge fields, including healthcare, manufacturing, energy, and finance. Their latest research involves working on a cancer foundation model in collaboration with top hospitals in Zhejiang and Beijing.
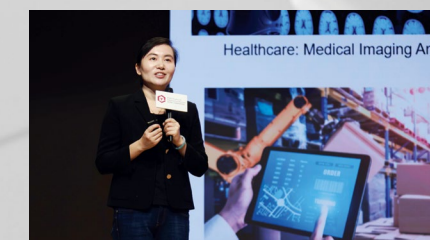


At a forum organised by The PolyU Academy for Interdisciplinary Research, Professor Yang speaks to over a thousand audiences including leaders from the innovation and technology sector on the topic "DeepSeek and Beyond".

# Taking Aim at Dangerous Ice

New nature-inspired approach prevents ice build-ups and eliminates safety hazards

> Our research demonstrates how to effectively harness the volume expansion of freezing droplets to generate ballistic motion. This breakthrough could expand the application of energy conversion phenomena and inspire the development droplet-based energy generators and robotic catapults built from flexible materials
>
> Professor Yao Haimin

Ice can be a major safety hazard. When it settles on pavements, driveways, and stairs, it dramatically increases the risk of slips and falls which can lead to serious injuries. Build-ups on roofs can result in leaks or even structural failure. The conventional approach to ice removal involves manual labour or machinery, both of which can be costly and are frequently ineffective. But, what if there was a way to stop dangerous ice from accumulating in the first place?
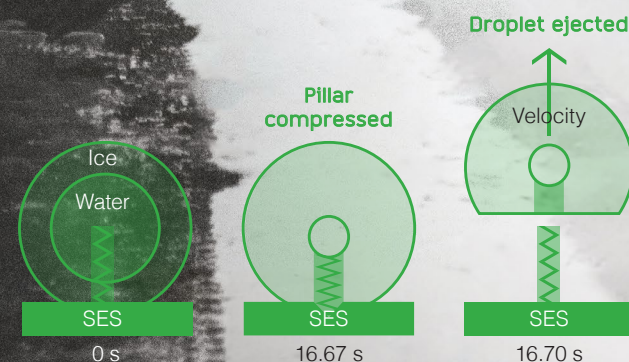
A PolyU research team led by Professor Wang Zuankai, Kuok Group Professor in Nature-Inspired Engineering, and Professor Yao Haimin, Associate Professor of the Department of Mechanical Engineering, has dreamed up an amazing new solution to this age-old problem.

Their inspiration came from a unique fungus, which uses a process of osmosis-induced volume expansion to shoot out spores during reproduction. By imitating this natural mechanism, the researchers have created a special elastic surface (SES), dotted with tiny spring-like pillars that can automatically repel ice crystal.

The team's research findings have already been published in a research paper titled "Freezing droplet ejection by spring-like elastic pillars", which featured on the front cover of a recent issue of *Nature Chemical Engineering*.

### No batteries required

When a water droplet freezes, it gets bigger and compresses the tiny pillars on the SES. Acting like springs, the pillars store energy from the droplet's expansion. In milliseconds the stored power is converted into kinetic energy that literally fires the droplet away from the surface. In the blink of an eye, the ice is gone, and the pillars are ready to deal with the next droplet.

The innovative structure enables the SES to expel freezing droplets, overcoming both wind and gravity without the need for any external power. This ingenious approach promises to revolutionise methods of ice removal, making them more efficient and cost-effective. Potential applications include everything from aircraft and wind turbine blades, to overhead cables.

### Paving the way for a self-powered device revolution

Research team member and Postdoctoral Fellow, Dr Zhang Huanhuan, is convinced that the concept of self-powered ice removal has a bright future. The team plans to continue improving the design of the SES to enable large scale manufacturing at lower costs to meet the needs of societies in colder climates.

Team leader Professor Wang, who is also PolyU's Associate Vice President (Research and Innovation) and Chair Professor of the Department of Mechanical Engineering, is equally optimistic about the idea's long-term impact. "We believe this prototype example of freezing droplet ejection could pave the way for a variety of self-powered solutions, from automatic de-icing technologies to renewable energy harvesting and soft robotics," he said.
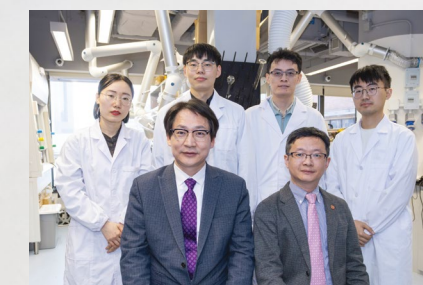


The research project is led by Professor Wang Zuankai (front row, left) and Professor Yao Haimin (front row, right). The co-authors of the research paper published in *Nature Chemical Engineering*, include (back row, from left) Postdoctoral Fellow Dr Zhang Huanhuan, PhD student Zhang Wei, Research Assistant Professor Dr Jin Yuankai, and PhD student Wu Chenyang.



Droplet ejected

Pillar compressed

Velocity

Ice
Water

| SES | SES | SES |
| 0 s | 16.67 s | 16.70 s |

The research team has developed a structured elastic surface with spring-like pillars and wetting contrast that allows for the spontaneous ejection of freezing water droplets.

# Revitalising the Classic of Mountains

Harnessing the power of AI to paint a vivid picture of a legendary tome

Image generated with AI

Among the treasures of ancient Chinese literature, *the Classic of Mountains and Seas* (*Shan Hai Jing*) is a remarkable work that has enchanted readers for more than 2,000 years. It paints a vivid picture of a fantastical world, merging mythic landscapes with descriptions of incredible creatures.

A page from volume five of *the Classic of Mountains and Seas*

## A breathtaking classic

Comprising 18 volumes, this exceptional collection is split into three distinct parts: *the Classics of Mountains*, *the Classics of Seas*, and *the Classics of Great Wilderness*. With a total of over 31,000 words, it provides a wealth of information on more than 100 countries, and mentions over 500 mountains and more than 300 waterways, as well as the geography, traditions, products, and myths of different regions. Although its content cannot be independently verified, the book remains an important reference for understanding the customs and geography of different regions.

A PolyU research team led by Professor Huang Chu-ren, Chair Professor of Applied Chinese Language of the Department of Chinese and Bilingual Studies, is conducting a project to analyse *the Classic of Mountains*. The team leverages artificial intelligence (AI) to transform and enhance the understanding of ancient Chinese geographical and ecological knowledge.

Entitled the "Integration of Knowledge from *the Classic of Mountains*: Using AI to Reconstruct Ancient Ecological and Geographical Heritage", this trailblazing endeavour combines scientific advancements with the humanities, adopting an interdisciplinary approach to enhance and revitalise China's cultural heritage. By extracting and formally representing geographic and ecological knowledge from historical works, the project addresses the limitations of traditional text studies. It provides innovative solutions for digitising ancient texts, facilitating the transmission of knowledge, and visually presenting historical geographical and ecological information.

Traditional ecological knowledge is recognised as a shared cultural heritage and a critical tool for tackling today's environmental challenges.

> A deep and systematic understanding of ancient geography and ecology provides us with longitudinal data about how our environment has changed. This is also crucial for contemporary ecological governance.
>
> Professor Huang Chu-ren

## Using AI to enhance and revitalise cultural heritage

The innovative application of digital technologies is opening up new possibilities for the preservation and dissemination of traditional knowledge and cultural heritage. The research team uses various AI technologies, including information extraction, knowledge graphs, graph retrieval-augmented generation (RAG), and large language models (LLM), to analyse, organise, integrate, and present the geographical and ecological knowledge embedded in the text.

The goal is to create a detailed knowledge system that can be used as a template for studying how the geography and environment of ancient China changed over time. For example, it will assist researchers looking into other old texts and records from different Chinese dynasties, offering valuable insights and enabling a better understanding of historical events.

As a first step, the team is building a question-and-answer platform that gathers information about the landmarks mentioned in *the Classic of Mountains*, along with a digital map that shows the geographical features described in the book.

The PolyU project was selected as one of the top ten innovative exploratory projects in Tencent's Tanyuan Scheme 2024, which was guided by the Science and Technology Education Department of the National Cultural Heritage Administration. The competition attracted 79 entries from 48 universities and research institutions, with PolyU being the only institution from Hong Kong and Macau to be selected.

Professor Huang Chu-ren (first on the right) leads the research team, which includes postdoctoral researcher Dr Tang Xuemei (second from the right), PhD student Ms Liang Ke (second from the left), Dr Gu Jinghang, Research Assistant Professor (first on the left), and Professor Su Qi, Associate Professor, Peking University (not in photo).

# Greenland Getting Greener as the World's Largest Ice Sheet Melts

International research team is studying meltwater patterns to accurately predict rises in global sea-levels

The 10th century Norse explorer Erik the Red discovered "Greenland" and established the first European settlement on the unforgiving island, 80% of which is covered by a 1.7 million km² ice sheet. To attract as many settlers as possible, Erik purposefully avoided any association with ice when naming the island. Today, the ice he worried might put people off is vanishing at the alarming rate of 30 million tonnes every hour, prompting an urgent scientific investigation into its impact on rising sea level.

## A symbol of climate change

The stark contrast between Greenland's name and its frozen nature is a powerful metaphor for our changing climate. At around 3 km thick, the Greenland Ice Sheet is the second-largest ice mass on Earth. If it were to melt entirely, global sea levels could rise by seven metres. Due to global warming, especially Artic warming, the Greenland Ice Sheet melting is currently the largest contributor to global sea level rise and coastal inundation. Yet, the processes of water accumulation and release within the ice remain largely unknown.

In collaboration with an international research team, Professor Chen Jianli from PolyU's Department of Land Surveying and Geo-Informatics and Research Institute of Land and Space has made important progress in understanding the hydrological processes of Greenland's ice sheet. The team's study, published in the peer-reviewed scientific journal *Nature*, explores how ice movement affects global sea levels.

## Innovative approach to investigating Greenland's ice dynamics

The conventional method for detecting changes in terrestrial water storage relies on data collected from two identical spacecraft that fly 220 km apart in a polar orbit 500 km above Earth. However, due to the coarse spatial resolution and accidental removal of useful data when filtering noise, such method is not the best choice when it comes to conducting a regional-specific assessment of Greenland's hydrology.

The research team has pioneered the use of the Greenland GPS Network (GNET), coupled with satellite gravity measurements from NASA's Gravity Recovery and Climate Experiment, to gain insights into regional meltwater storage and bedrock deformation and subsidence. Using data from numerous Global Navigation Satellite System (GNSS) stations around Greenland, GNET provides precise positioning data for analysis. This innovative approach has enabled the researchers to effectively monitor vertical bedrock subsidence and measure summer water storage within the Greenland Ice Sheet.

Their findings reveal that a substantial amount of meltwater is temporarily stored within the ice sheet during the summer months, peaking in July before gradually diminishing. Data collected from 22 GNSS stations between 2009 and 2015 indicates that this seasonal melting contributes to bedrock subsidence of up to 5 mm near the stations, with extreme melt events in 2010 and 2012 causing subsidence of 12 and 14 mm, respectively.

The study also highlighted regional variations in the duration of meltwater storage, averaging around eight weeks across the ice sheet. In the northeast and west, storage lasted approximately nine weeks, while in the south and southeast, it averaged about four and a half weeks.

## Implications for future research

As summer temperatures rise, accurately predicting meltwater storage will become increasingly critical for assessing changes in sea levels. Recent research has revealed that current meltwater runoff models, derived from regional climate projections, may have overestimated water retention and underestimated snowmelt runoff—potentially increasing predicted meltwater storage by as much as 20%. This discrepancy suggests that during the warmest years, adjustments to these models could be necessary.

> The significant results underscore the importance of extensive international cooperation in addressing climate change challenges. Our research will contribute to achieving accurate model performance for warmer years, aiding in the projection of ice-sheet behaviour and its impact on sea-level in the coming decades. This is significant amidst anticipated Arctic warmings //
>
> Professor Chen Jianli

**Professor Chen Jianli**
// Professor, Department of Land Surveying and Geo-Informatics
// Member of the Research Institute of Land and Space
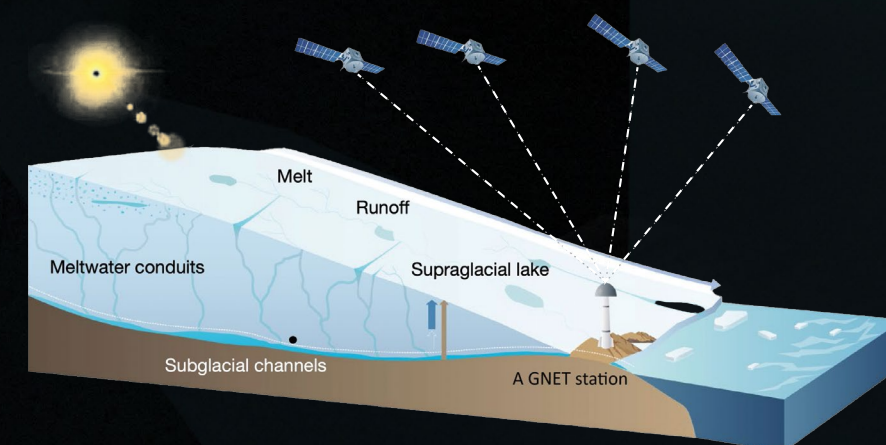


GNET and satellite gravity measurements are helping PolyU researchers to study meltawater patterns within the Greenland Ice Sheet.

# Transforming Ordinary Phone Snapshots into Stunning High-resolution Pictures

Enhanced partnership with top smartphone brand leverages AI to ensure high-quality camera images

Generating hi-res image...
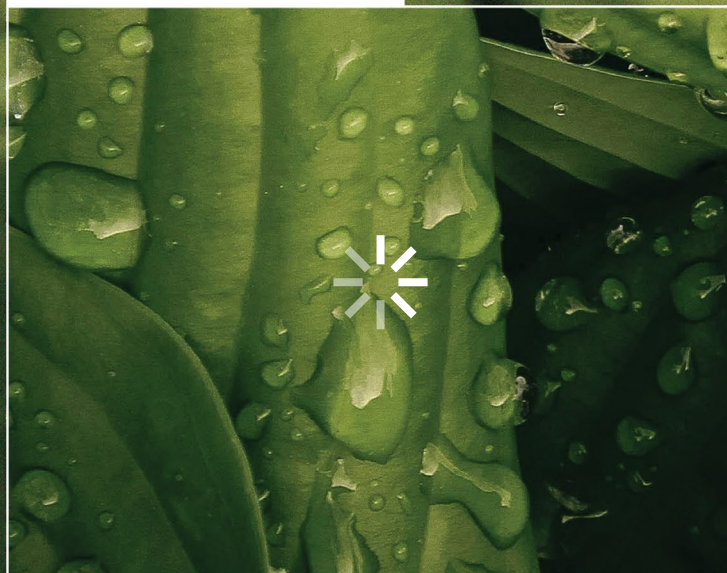
How often do you snap pictures without using your smartphone? Both professional photographers and amateurs are increasingly turning to their mobile devices to share visual narratives and capture special moments. For companies in the smartphone market, ensuring their devices produce top-notch images is now an essential element for success.

Recognising the importance of image quality, researchers at PolyU have created advanced Generative AI algorithms that can quickly convert blurry smartphone images into stunning high-resolution photos that appear lifelike to the human eye. This breakthrough innovation in smartphone imaging was achieved as a result of a three-year partnership with the Guangdong OPPO Mobile Telecommunications Corp., Ltd. (OPPO), and has now been integrated into OPPO's flagship smartphones.

## Knowledge transfer success

Building on these remarkable results, PolyU and OPPO took their research collaboration to new heights by upgrading the existing PolyU-OPPO Joint Innovation Lab to the PolyU-OPPO Joint Innovation Research Centre in January 2025.

Mr Jason Liao, President of the OPPO Research Institute, reflected on the partnership's achievements. "In the three years of collaboration between OPPO and PolyU, we witnessed significant technological breakthroughs and notable achievements in talent cultivation through the former Joint Lab," he said.

OPPO is a leading global smart device brand with a footprint in more than 70 countries and regions, and over 40,000 dedicated employees. Supported by OPPO's substantial commitment of at least RMB 30 million in funding over the next five years, the new Research Centre will adopt a more comprehensive and in-depth approach to AI-driven computational imaging research.

## New direction to drive innovation

As demand for filming mobile video and creating multimedia content continues to grow, the new Research Centre will extend into more complex areas, such as video algorithms, album editing and lightweight Generative AI models. It aims to leverage AI technology for mobile devices while maintaining high-quality image output.

Before

After

The Generative AI models developed by the PolyU-OPPO collaboration can turn ordinary-looking images taken on smartphones into clear, high-resolution pictures.

The enhanced partnership also expands the scale of co-training for PhD and postdoctoral researchers, who represent the next generation of AI talent. This demonstrates the impact of academia-industry collaboration in driving technological innovation. The new centre aims to recruit around 25 doctoral researchers and several postdoctoral candidates over a five-year period.

Emphasising the strategic nature of the collaboration, Professor Jin-Guang Teng, President of PolyU, noted that this latest development coincided with the launch of the Faculty of Computer and Mathematical Sciences in January 2025.

> This new structure will effectively promote in-depth exchanges and collaboration among research teams, creating more impactful outcomes. We believe the cooperation with OPPO will enable us to fully realise opportunities and actively promote technological innovation and knowledge transfer. //
>
> Professor Jin-Guang Teng,
> President of PolyU

# Cultivating Creativity and Technological Excellence

New PolyU-Tsinghua joint STEAM lab combines arts and design with STEM to encourage an innovative mindset and enhance industrial and societal impacts

STEM education combines Science, Technology, Engineering and Mathematics into a comprehensive learning framework that emphasises problem-solving. Its goal is to equip learners with the practical, "future-ready" skills that are essential for navigating the complexities of the 21st century. Incorporating Art and Design into the equation turns STEM into STEAM, enriching the experience by fostering creativity and imagination. It also encourages both teachers and students to consider the human impact when approaching scientific problems.

PolyU recently launched a Joint Lab for STEAM in partnership with Academy of Arts and Design at Tsinghua University. This inaugural collaborative laboratory formed by the two universities brings together art, design and STEM to drive innovation in Artificial Intelligence (AI), sustainable technology, and human-machine interaction.

The new lab is leveraging the expertise and achievements of both universities in multidisciplinary research, with a particular focus on knowledge transfer in art and design for impactful social applications. It is dedicated to developing a culture of creativity, innovation and technological excellence, paving the way to a sustainable future.

## Synergy in innovation

The initiative is led by two distinguished academics: Professor Stephen J. Wang from the PolyU School of Design, who is also Director of its Research Centre for Future (Caring) Mobility (RcFCM); and Professor Ma Sai, Director from the Art and Science Research Center at Tsinghua University. They will lead research projects and guide seminars and promotional activities highlighting the effectiveness of combining arts and design with STEM to enhance innovation and promote economic and social well-being.

Key research domains revolve around artificial intelligence and design, including the creation of intelligent interactive systems, sustainable design
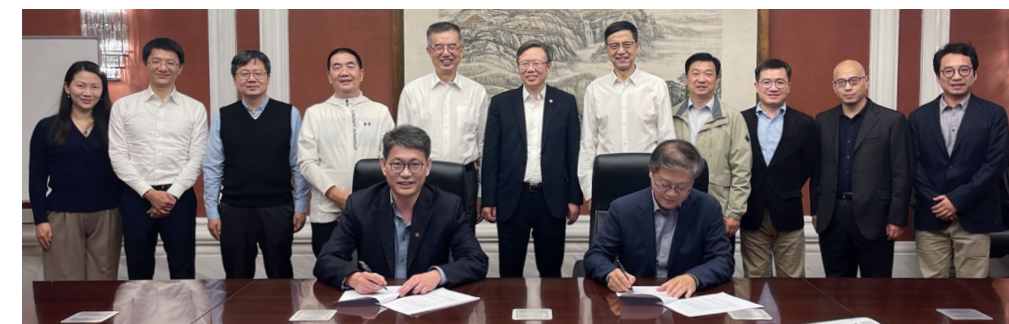


Professor Jin-Guang Teng, President of PolyU (back row, centre), led a delegation to Tsinghua University. A Memorandum of Understanding was signed by Professor Christopher Chao, Vice President (Research and Innovation) of PolyU (seated, left) and Professor Ma Sai, Dean of the Academy of Arts & Design and Director of the Art and Science Research Center at Tsinghua University (seated, right). Professor Stephen Wang (back row, right), Director of RcFCM, was among the witnesses.



An RcFCM invention is SyncKnee, a knee-monitoring system that tracks both joint angles and swelling patterns, providing detailed knee-state monitoring for daily use.

and technology, data-driven design, and symbiotic human-machine design. The lab will also explore innovative educational methods.

Projects will be prioritised with a view to fostering collaboration among academia, research and industry, while also strengthening inter-university cooperation and bolstering the overall academic standing of the two universities.

Underscoring the significance of an interdisciplinary approach to enhance human well-being, the PolyU RcFCM has launched a design-oriented innovations platform aimed at conducting high-impact research. This

reflects a visionary blend of cutting-edge STEAM and innovative design, focusing on aspects of living, caring, and well-being in various mobility contexts. It has made notable strides, especially in the realms of intelligent, interactive, and experiential design.

The Art and Science Research Center of Tsinghua University was created in 2001 through the partnership of the distinguished contemporary Chinese painter Mr Wu Guanzhong, and the late Nobel Prize Laureate in Physics, Mr Lee Tsung-Dao. The centre uniquely integrates teaching and research in arts and sciences, nurturing talent with a focus on individuality and innovation.

# AI Innovation Means Safer Scans and Fewer Side Effects

## PolyU invention is poised for clinical tests

A novel AI-powered magnetic resonance imaging (MRI) system developed by PolyU researchers provides high-resolution imaging in tumour detection, eliminating the need for contrast agents and their potential side effects.
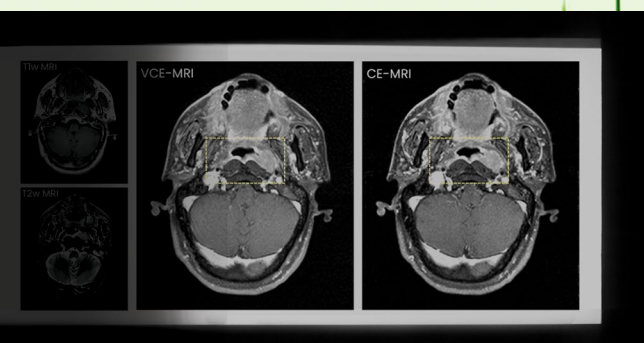
The picture on the right is an MRI image using contrast agents (CE-MRI), while the one on the left is enhanced using AI technology (VCE-MRI). The images are on average 88.7% similar.

**Professor Cai Jing**
⫽ Head and Professor, Department of Health Technology and Informatics

MRI scans can be conducted with or without the use of contrast agents. Administered intravenously, the agents gather in particular tissues or organs, including tumours, vascular abnormalities, or areas of inflammation. This enhances the visibility of these tissues on MRI images, offering valuable insights into the nature of any lesions.

Invaluable for accurate diagnosis of diseases such as cancer, contrast agents often contain heavy metals like gadolinium, which can cause discomfort, allergic reactions, and pose risks to foetuses and patients with kidney disease.

### Virtual MRI Contrast Enhancement System

Now, a groundbreaking innovation from PolyU is transforming the landscape. This AI-powered solution eliminates the need for contrast agents while maintaining diagnostic precision.

Led by Professor Cai Jing of the Department of Health Technology and Informatics, the Virtual MRI Contrast Enhancement System leverages sophisticated artificial intelligence algorithms to generate high-resolution imaging comparable to traditional contrast-enhanced MRI. The system was developed using a comprehensive dataset of thousands of MRI scans collected from 39 hospitals across Hong Kong, Macau, and Mainland China, achieving a remarkable 88.7% similarity to contrast-enhanced images in nasopharyngeal cancer tumours.

"Traditional contrast agents, while effective, can pose significant risks to patients with kidney problems and pregnant women, not to mention the discomfort and potential allergic reactions," explains Professor Cai. "Our system provides a safer, more cost-effective alternative without compromising diagnostic accuracy."

### Global recognition and achievement

The innovation has received prestigious awards and academic achievements. It secured a Gold Medal at the 49th International Exhibition of Inventions Geneva 2024, demonstrating its global impact. The system also earned a Gold Medal at the 2024 China International College Students' Innovation Competition, and a Silver Medal at the 2023 Asia Exhibition of Innovations and Inventions. The Bronze Award received at the 2023 Qianhai Guangdong-Hong Kong-Macao-Taiwan Youth Innovation and Entrepreneurship Competition (Hong Kong Division) further validating its commercial potential.

The research team has published extensively in leading medical imaging and artificial intelligence journals, gaining attention from the international research community, and highlighting the scientific rigor behind the innovation. Additionally, the team has secured patent applications in both the United States and Mainland China, protecting the technology across major markets.

### From laboratory to market: the path forward

In 2023, Professor Cai and his team established MedVision Limited to take the technology to market. The startup has secured substantial government funding, including support from the Hong Kong Innovation and Technology Fund and HKSTP Incubation. This strong financial backing is helping the team to further enhance the technology while preparing for market entry.

Clinical trials at a local public hospital will begin in 2025, a crucial step toward widespread adoption. The team is also in discussions with major hospitals in the Greater Bay Area to expand the testing scope, to validate the system's effectiveness across different patient populations and clinical settings.

"This technology represents more than an improvement in cancer detection," Professor Cai emphasises. "It's about making advanced diagnostic capabilities more accessible, safer, and more efficient for both healthcare providers and patients. Our goal is to revolutionise cancer diagnostics by offering a more sustainable, patient-friendly approach to medical imaging."

The development exemplifies PolyU's commitment to impactful research and knowledge transfer. It also promises to set new standards in non-invasive tumours imaging while improving patient outcomes in cancer treatment. The innovation highlights Hong Kong's expertise in medical technology and will play a significant role in enhancing global healthcare solutions.

# Steel Matters

Improving welding technology and understanding atmospheric corrosion will enhance the safety and sustainability of Hong Kong buildings

PolyU's welding technology for S960 steel was applied in a footbridge at the Fanling North New Development Area.

Steel is essential for sturdy buildings and long-lasting infrastructure. To make steels even stronger, PolyU researchers have uncovered key enhancements.

High-strength steels including S690 and S960 offer excellent strength-to-weight ratios, reducing steel usage and construction costs in multi-storey buildings and long-span bridges. According to Professor Chung Kwok-fai from PolyU's Department of Civil and Environmental Engineering, who is also the Director of the Chinese National Engineering Research Centre for Steel Construction (Hong Kong Branch) (CNERC), although S690 and S960 have been produced worldwide since the 1990s, their use remains limited, partly owing to persistent challenges around welding and quality assurance. Improper welding can compromise the material, and affect the integrity and performance of structures built with them.

### Addressing welding challenges

A CNERC research team led by Professor Chung has been addressing challenges that fabrication with high-strength steel presents. They conducted extensive tests on the S690 welded sections, finding that controlling heating and cooling processes is critical to minimising microstructural changes in heat-affected zones of welded joints. While some heat is unavoidable, basing welding parameters on joint geometry can help ensure minimal heat input. These findings have improved the use of S690, exemplified by its application in the Double Arch Steel Bridge of the Cross Bay Link in Tseung Kwan O, setting a global industry precedent.

The research team has taken the solution further to minimise or even eliminate adverse effects of welding when applying ultra-high strength S960 steel. In a practical setting, the solution has been adopted in a footbridge at the Fanling North New Development Area—Fanling Bypass Eastern Section. The new welding technology enables the use of thinner and fewer steel materials, thereby reducing the self-weight of the footbridge, and hence, the number of foundation piles required. This, in turn, has led to decreased carbon emissions and enhanced sustainability. This project marks Hong Kong's first public works using S960 steel.

### Tackling atmospheric corrosion

While these advances in high-strength steel technology are promising, understanding how corrosive sea air affects steel is also essential, especially in coastal areas like Hong Kong, where protecting infrastructure from damage by salt in the air is vital.

Since 2010, Professor Chung's team has conducted air exposure studies at seven separate locations in Hong Kong. The results show that carbon steel corrodes at a rate of 30 to 40 micrometres each year, whereas the zinc and galvanised steel used outdoors corrode more slowly at 3 micrometres per year. Buildings near Victoria Harbour are particularly susceptible to corrosion, which can weaken structures and pose safety risks.
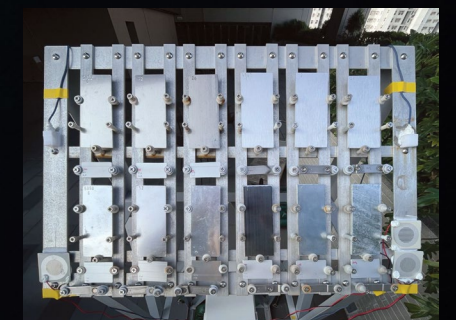
To combat these challenges, PolyU PhD student Mr Yuen Ka-fai has developed a real-time corrosion monitoring system under Professor

> Hong Kong's unique climate makes atmospheric corrosion a serious issue. This study will help develop more effective maintenance strategies, extending the lifespan of buildings while reducing costs.
>
> Professor Chung Kwok-fai

Chung's supervision. Between 2020 and 2024, he collected approximately 40,000 datasets a year from all seven sites, employing electrochemistry, remote sensing, and AI to assess the impact of corrosive chemicals and climate factors on steel structures.

The monitoring system was implemented at the InnoCell Building in the Hong Kong Science Park, and also at Nam Cheong 220, which was the first structural steel social housing project in Hong Kong to use modular integrated construction (MiC) technology.

**Professor Chung Kwok-fai** *right*
// Professor, Department of Civil and Environmental Engineering
// Director of the Chinese National Engineering Research Centre for Steel Construction (Hong Kong Branch)

**Mr Yuen Ka-fai** *left*
// PhD student, Department of Civil and Environmental Engineering

Outdoor exposure tests determine atmospheric corrosion rates of different steel alloys.

## Protect the environment

To help reduce the carbon footprint, share the magazine with friends and colleagues.
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# Among the Global Best

PolyU ranks

# 57

in the latest
**Quacquarelli Symonds (QS) World University Rankings 2025**

The Hong Kong Polytechnic University (PolyU) has established itself as a leading global university, a fact reflected in major international rankings that consistently recognise the strength of the University across a range of criteria, including academic reputation, international research network, research impact, internationalisation, employment outcomes, sustainability performance, and others.

## Among top 100 worldwide

**67**
U.S. News & World Report
**Best Global Universities Rankings 2024/25**

**84**
Times Higher Education (THE)
**World University Rankings 2025**

**3**
THE
**World's Most International Universities 2025**

**7**
THE
**Young University Rankings 2024**

**17**
QS
**Asia University Rankings 2025**

**18**
THE
**Asia University Rankings 2025**

**29**
THE
**Interdisciplinary Science Rankings 2025**

**77**
THE
**Impact Rankings 2024**

**7** subjects in global top 30
QS World University Rankings by Subject 2025

**11**
Hospitality & Leisure Management
1st in Hong Kong

**16**
Nursing

**17**
Architecture & Built Environment

**17**
Civil & Structural Engineering

**22**
Art & Design
1st in Hong Kong

**22**
Marketing

**27**
Environmental Sciences
1st in Hong Kong