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Appendix: PolyU's winning innovations at the 50th Geneva Inventions Expo

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Saudi Innovation Excellence Prize - Ministry of Education **Gold Medal with Congratulations of Jury**	**Surface Sampling and Packing System for Chang'E-5 and -6 Lunar Sample Return Missions** This Surface Sampling and Packing System, developed and manufactured by PolyU in collaboration with the China Academy of Space Technology (CAST), collected over 1.5kg of surface samples on the lunar front side and 1.6kg on the far side, significantly contributing to our understanding of the universe. On the Chang'e-6 mission, it performed the historic first lunar far-side surface sampling. The system includes two samplers, two high temperature nearfield cameras, and a sample packing system, designed to sample all types of lunar regolith. The packing system automatically performs all sample packing operations, such as unlocking after landing, lifting the container lid, swiping a funnel over the container to protect the rim from contamination while allowing smooth deposition of the sample into the container, sealing the container with the lid, and releasing the container for transfer to the ascender. The accompanying cameras provide visual guidance for sample acquisition, deposition, precision pickup of the container, and insertion into the ascender for return to Earth.	**Prof. YUNG Kai Leung** Sir Sze-yuen Chung Professor in Precision Engineering; Director, Research Centre for Deep Space Explorations; Chair Professor of Precision Engineering and Associate Head, Department of Industrial and Systems Engineering	 **Photographed are Prof. Yung Kai Leung and his research team member* 

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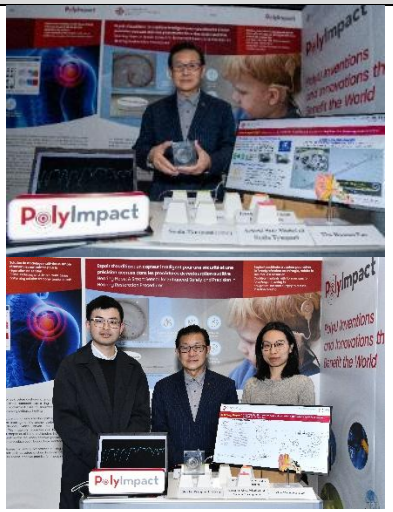
Award(s)	Project description	Principal Investigator(s)	Image(s)
Thailand Award for the Best International Invention & Innovation **Gold Medal with Congratulations of Jury**	**Hearing Hope: A Smart Sensor for Enhanced Safety and Precision in Hearing Restoration Procedures** This medical device is designed to enhance surgical navigation and reduce trauma during cochlear implantation procedures. It integrates an optical fibre sensor directly into the cochlear implant electrode array, which must be precisely inserted into the scala tympani. The optical fibre incorporates sensors to guide the electrode array and monitor contact force during implantation. Additionally, the device can be adapted with an active actuation function by modifying the optical fibre sensor, enabling real-time adjustments to the electrode array's bending angle to further minimise tissue damage. The invention addresses two critical challenges: ensuring contact forces with the cochlear wall remain below thresholds that cause trauma, and optimising insertion depth for clinical efficacy. Beyond cochlear implantation, this technology is also adaptable to other medical applications, offering a versatile approach to improving safety, precision and effectiveness in delicate surgical procedures. By integrating real-time navigation with responsive actuation, this innovation establishes a new benchmark for advanced robotic-assisted medical device placement in modern surgical practice.	**Prof. TAM Haw Yaw** Chair Professor of Photonics, Department of Electrical and Electronic Engineering; Associate Director of Photonics Research Institute	 **Photographed are Prof. Tam Haw Yaw and his research team members* 

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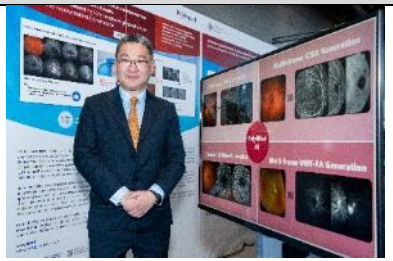
Award(s)	Project description	Principal Investigator(s)	Image(s)
Special Merit Award from French Inventors Federation and Europe-France Inventors **Gold Medal with Congratulations of Jury**	**Seeing the Invisible: Generating Non-invasive Angiography as an Alternative to Invasive Retinal Examinations** This innovation addresses diabetic retinopathy (DR), a leading cause of blindness, by replacing invasive and expensive fundus fluorescein angiography (FFA) with a non-invasive, cost-effective screening solution empowered by generative artificial intelligence (GenAI). It converts colour fundus photography into high-resolution, realistic FFA images, preserving critical lesion details without the need for dye injections. It also supports ultra-widefield imaging and dynamic lesion-preserving video generation. Validated by retinal specialists, this method enhances DR screening accuracy, reduces costs and improves patient comfort. Ongoing multi-centre clinical trials will assess its diagnostic performance, treatment outcomes and efficiency compared with traditional FFA. Offering a safe, scalable and impactful solution, this GenAI-driven innovation revolutionises DR evaluation while making the process more accessible and efficient in clinical practice.	**Dr SHI Danli** Research Assistant Professor, School of Optometry	 ** Photographed is research team member Prof. He Mingguang*

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of Jury	**A Customisable Wearable Saliva Sensing Platform** This personalised, comfortable, saliva sensing platform integrates multi-gate organic electrochemical transistors, a wireless circuit, an ultrathin battery and a wearable substrate designed for intraoral use. Positioned near the sublingual glands, it ensures direct detection of fresh saliva, enabling real-time, continuous monitoring of critical salivary biomarkers such as glucose, uric acid and lactate. The platform effectively records dynamic changes in these metabolites during daily activities such as eating, drinking, running and working. Clinically, the platform has achieved accurate glucose monitoring, showing a strong positive correlation (90%) between fasting saliva and blood glucose levels in 500 subjects, who included both diabetic and healthy individuals. This finding suggests that saliva glucose levels can non-invasively estimate fasting blood glucose. Being capable of tracking glucose variations in both saliva and blood, the platform offers a promising approach to non-invasive continuous glucose monitoring, marking a significant advancement in wearable sensors for personalised healthcare.	**Prof. YAN Feng** Associate Director, Research Institute for Intelligent Wearable Systems; Chair Professor of Organic Electronics, Department of Applied Physics	 **Photographed is member of the research team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of Jury	**Smart Fire Extinguisher for Spacecraft** Water cannot be used to extinguish fires in spacecraft because floating water droplets in microgravity cannot suppress fire well while also causing short circuits. This air vortex ring fire extinguishing device can address this by using artificial intelligence (AI) to automatically detect and target fires. It also generates air vortex rings via a pressure regulation system to extinguish flames efficiently and autonomously. The vortex rings propagate stably in microgravity, offering stronger fire-extinguishing capabilities and greater energy efficiency than traditional firefighting blowers. The compact device is easy to integrate into various areas of a spacecraft. Using only ambient air as a medium, it avoids the storage space and residue issues associated with traditional fire extinguishers. It can also be combined with other advanced technologies such as gas extinguishers and robots to achieve superior results, enhancing the safety of space missions and astronaut well-being. By incorporating it with firefighting robots, this technology can also be adapted for diverse firefighting scenarios on Earth.	**Prof. HUANG Xinyan** Associate Professor, Department of Building Environment and Energy Engineering; Co-founder, Widemount Dynamics Tech Limited (a PolyU startup)	 **Photographed are members of the research team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of Jury	**CO_2-driven Superhydrophobic Carbon-sink Concrete** The excessive emission of CO_2 poses a significant environmental challenge. This CO_2-driven superhydrophobic carbon-sink foam concrete (SCFC) can revolutionise the capture and use of carbon in construction. By mixing ultra-stable CO_2 foam – 50 times more stable than commercial alternatives – into a high-strength, low-carbon paste, SCFC achieves exceptional performance. It captures over 100 kg of CO_2 per cubic metre through internal carbonation, creating a rough microstructure that enables superhydrophobicity, or water resistance. SCFC offers more than three times the strength of traditional foam concrete, along with superior durability, self-cleaning capabilities, thermal insulation and soundproofing properties. Enhancing structural performance and reduces ecological impact, exemplifying multifunctional design for a low-carbon future, SCFC not only addresses critical environmental challenges by reducing carbon emissions, but also provides energy-efficient, sustainable solutions for modern green buildings.	**Prof. POON Chi Sun** Michael Anson Professor in Civil Engineering; Chair Professor of Sustainable Construction Materials and Head, Department of Civil and Environmental Engineering; Director, Research Centre for Resources Engineering towards Carbon Neutrality	 **Photographed are members of the research team* 

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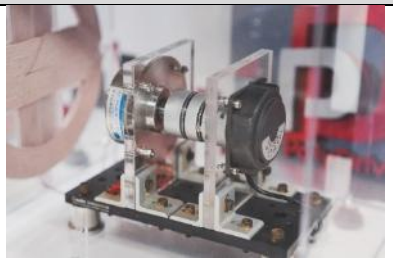
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of Jury	**Highly Integrated Wireless Ultrasonic Motor System for Fully Enclosed Environments** The challenge is how to control motor systems in fully enclosed environments without batteries, controllers or power cables. This innovation presents a highly integrated wireless ultrasonic motor system that is designed to wirelessly power and control motors in such environments. The innovative system features a single integrated magnetic coupler connected to the ultrasonic motor, achieving remarkable simplicity and integration. Key benefits: • Battery and cable free: Eliminates the need for batteries and cables, reducing the cost and complexity of maintenance. • Controller and sensor independence: Operates without additional controllers or sensors, streamlining design. • Modular design: Can be easily adapted to various applications, facilitating seamless integration. This system is ideal for environments where traditional cabling is impractical, such as in robotic arms, thereby enhancing mobility and flexibility. In enclosed environments such as underground pipelines or underwater propellers, it avoids complications from perforated installation cables, preventing gas or liquid leaks. This innovation offers new solutions for advanced applications in robotics and industrial automation.	**Prof. CHAU Kwok Tong** Chair Professor of Electrical Energy Engineering, Department of Electrical and Electronic Engineering	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of Jury	**High-efficiency GaN Converter Module for Wireless Power Transfer Facilities** This invention integrates gallium nitride (GaN) chips into high-performance power converters, achieving low stray inductance and low switching loss for the gate driver. The gate driver has minimal ringing and voltage overshoot, ensuring the smooth switching characteristics of GaN switches. An insulated metal substrate printed circuit board design is used to lower thermal resistance while ensuring electrical isolation. Compared with insulated-gate bipolar transistors, silicon-based metal-oxide-semiconductor field-effect transistors (MOSFET) and silicon carbide MOSFET converters, this GaN high-electron-mobility transistor offers greater efficiency, higher power density, and higher switching frequency. Additionally, compared with other GaN converters at the same power level, this invention offers better drive performance and lower cost, which will promote its commercialisation. This technology can be applied in various wireless power transfer facilities, including wireless charging for electric vehicles and other high-frequency, high-power-density wireless charging scenarios.	**Prof. LIU Wei Lucian** Assistant Professor, Department of Electrical and Electronic Engineering	

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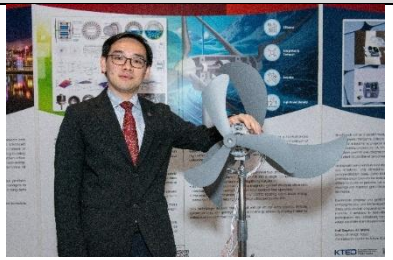
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of Jury	**Highly Efficient Brushless Dual-rotor Contra-rotating Wind Power Generation System** The most common wind turbines on the market feature a horizontal-axis single-rotor design, which, according to Betz's theory, can extract a maximum of only 59% of the available wind energy. To more effectively utilise this wake energy and enhance power generation, this invention introduces a compact, brushless, high-efficiency contra-rotating generator and systems, which can increase wind energy utilisation by 10%-20%. Key benefits: • Unlike traditional dual-rotor systems with two separate units, this system's integrated and compact design combine both into a single, compact structure, reducing space requirements and simplifying installation. • Being brushless and having a magnetic-geared structure eliminates mechanical wear, ensuring long-term, maintenance-free operation. • Contra-rotating rotors boost energy conversion rates, significantly increasing wind energy utilization by 10%–20%. This invention can significantly increase induction voltage and power generation efficiency even at low wind speed operation, while also saving in terms of the system size, making it ideal for residential and commercial applications.	**Prof. NIU Shuangxia** Professor, Department of Electrical and Electronic Engineering	 **Photographed is member of the research team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of Jury	**SweatMD: Health-monitoring Wearable Sweat Sensor** SweatMD is a cutting-edge, all-textile wearable sensor that non-invasively tracks biomarkers in sweat, such as glucose and potassium ion levels. It decodes user health conditions at the molecular level with exceptional accuracy, comfort and durability. By continuously detecting multiple biomarkers and displaying real-time data on an intelligent mobile app, SweatMD empowers users to seamlessly self-monitor their health metrics and gain valuable insights into their well-being. The innovative textile-based microfluidic design features a nature-inspired sweat collection system, enabling the rapid and directional transport of fresh sweat for precise analysis – even against gravity. Meanwhile, the advanced electrochemical sensing yarns are wrapped in skin-friendly fibres, further ensuring superior durability and comfort. This breakthrough technology sets new standards in wearable healthcare, while also revolutionising how individuals manage their well-being and fostering global health awareness. SweatMD, by combining accessibility, user-friendliness and comfort, has the potential to transform disease prevention and health management strategies on a global scale.	**Prof. SHOU Dahua** Associate Director, PolyU-Xingguo Technology and Innovation Research Institute; Associate Director, Research Centre of Textiles for Future Fashion; Limin Endowed Young Scholar in Advanced Textiles Technologies; Associate Professor, School of Fashion and Textiles	 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Radome Assessment and Transmission Test System (RATTS)** The Aviation Services Research Centre (ASRC) has developed a device to test the transmittance of aircraft radomes. Radomes, used to protect radar equipment in aircraft, are prone to damage and need regular maintenance. Traditional radome testing, however, requires high-power radar and a testing distance of 50 metres, which is costly as well as being space-consuming. To address this, ASRC has developed a compact, low-cost system that evaluates radome transmissivity and displays the results as a heat map. It uses a low-power vector network analyser mounted on two robots to provide signals for the radar antennas and a turntable to scan the entire radome surface. By simulating the weather radar aperture, the system calculates the average transmittance of the radome in 45 specific test directions. This new system is significantly more affordable, costing about 10% of traditional systems. Its small size makes it suitable for use in workshops.	**Mr Robert VOYLE** Chief Executive Officer, Aviation Services Research Centre (ASRC)	 **Photographed are members of the research team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**A Multi-objective Yaw-control System for Wind Farm Optimisation Based on Novel 3D Wake Model** This digital yaw optimisation system is designed for large-scale wind farms. It combines an innovative 3D wake model with a machine learning module to accurately calculate power and loads based on given yaw angles. The system then uses multi-objective optimisation strategies to balance energy output and structural loads for maximising power generation from the whole wind farm. Currently, it is at Technology Readiness Level 6. For the 60-turbine Princess Amalia Wind Farm, located offshore of IJmuiden in the Netherlands, the system can increase power production by up to 8.79% in the main wind direction. It is effective for both upgrading the performance of existing wind farms and in the early design phase of new farms, enabling optimised wind turbine locations and energy capture from the outset. The invention improves the operational efficiency and reliability of wind farms, offering significant economic and social benefits for wind power development.	**Prof. YANG Hongxing** Professor, Department of Building Environment and Energy Engineering	

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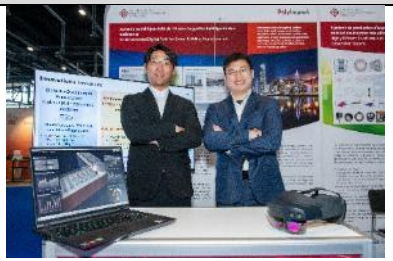
Gold Medal	**AI-empowered Digital Twin for Smart Building Management** The building sector is the largest contributor to global energy demand and greenhouse gas emissions, significantly impacting climate change. While advanced technologies such as AI, digital twin (DT), the Internet of Things (IoT), and augmented/mixed reality (AR/MR) are transforming building operations, this innovative AI-powered digital twin management platform offers a transformative approach to smart building management. It optimises energy efficiency, reduces carbon emissions and enables predictive maintenance, all while ensuring optimal indoor comfort and air quality. Seamlessly integrating DT, AI, IoT and AR/MR technologies, the platform provides real-time operational insights that empower building managers to make informed decisions. It has achieved over 20% energy savings in long-term trials, from single buildings to building clusters. Currently designed for desktop and MR devices, the platform will soon expand to mobiles, setting a new benchmark in sustainable building management.	**Prof. XIAO Fu** Associate Dean, Faculty of Construction and Environment; Professor, Department of Building Environment and Energy Engineering; Associate Director, Research Institute for Smart Energy	 **Photographed are members of the research team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Multi-mode Optical Characterisation Interferometer (MOCI)** Optical characterisation is essential for determining whether an optical system or element meets specific performance requirements. This process has wide applications in various industrial fields. However, many existing optical characterisation instruments can only measure individual optical parameters for specific industrial fields. This invention introduces a novel multi-mode optical characterisation interferometer (MOCI). Based on wavefront and shear interferometry measurement principles, MOCI uses light wavefronts to determine the optical properties that may affect the functional performance of an optical system or element. The MOCI offers versatile measurement capabilities, allowing it to evaluate multiple optical properties in a single instrument and be used across different applications, including power maps, cylindrical distribution, and astigmatism axis for optometry products like myopia defocus spectacle lenses. Additionally, the system can assess phase distributions, reflective index and modulation transfer function for metastructures, and evaluates the surface roughness and flatness of wafers for semiconductor applications.	**Prof. CHEUNG Chi-fai Benny** Chair Professor of Ultra-precision Machining and Metrology, Department of Industrial and Systems Engineering; Director, State Key Laboratory of Ultra-precision Machining Technology	 **Photographed are Prof. Benny Cheung and his research team members* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Smart Structural Integrity Monitoring System** The Smart Structural Integrity Monitoring System (LiFY-S) was co-developed by LeafIoT and the Drainage Services Department of HKSAR to enhance construction site safety. This cutting-edge solution revolutionises structural monitoring by integrating Artificial Intelligence of Things (AIoT) sensing, big data analytics, structural simulation and digital twin technology, transforming traditional surveying methods into a real-time continuous monitoring system with sensitivity six times greater than conventional techniques. Key components of LiFY-S include real-time displacement monitoring sensors that precisely measure structural micromovement; a centralised AIoT cloud platform for monitoring structural health and integrity; and an alarm system that is seamlessly integrated with smart watches to deliver early warning alerts to design and construction teams on excessive movement, ensuring timely communication and investigation. LiFY-S optimises resource allocation in structural health monitoring, greatly reducing deployment costs to less than 30% of traditional manual surveying. It also significantly improves operational efficiency and site safety. As a transformative solution for the construction industry, it sets a new benchmark for safety, efficiency, and innovation in structural integrity management.	**Prof. WONG Man Sing Charles** Associate Dean, Faculty of Construction and Environment; Associate Director, Research Institute for Sustainable Urban Development; Professor, Department of Land Surveying and Geo-Informatics **Mr CHAN Pak Kwan** Managing Director & Co-founder, LeafIoT Technology Limited (a PolyU startup)	 **Photographed are members of the research team*

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Artificial Reef for Oyster Reef Restoration in Topological Approach** This project aims to restore ecosystems through innovative topological artificial oyster reefs, improving water quality and promoting marine biodiversity. The artificial oyster reefs have specially designed structures that mimic the function of natural oyster reefs to provide habitats for marine life and helping filter harmful substances from the water. These reef structures feature a unique topological design that enhances oyster growth rates and contributes to improving the marine environment. This solution combines eco-friendly technology and innovative design, making use of recyclable materials in 3D printing to achieve cost-effective and efficient ecological restoration. In addition to restoring marine ecosystems, this project also includes long-term water quality monitoring. The reef structures are equipped with water quality monitoring systems that can track various indicators in real time, such as water temperature, salinity, and pH levels. The data are then relayed to a control panel, providing continuous data support for ecological environment. The project plan to conduct trials in real marine areas to verify the invention's effects of water quality improvement and use this as a basis to promote larger-scale applications.	**Mr Dean CHAN** Alumnus, School of Design; Engineer, Team Orz Limited (a PolyU startup)	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Behaviour Recognition Method, Device and Wearable Device** This invention features a smart health-monitoring watch and platform that analyses multiple types of data in real-time and provides alerts on health patterns, events and behavioural changes. The device leverages an intelligent health-monitoring technology designed to recognise and process multiple sources of data in real-time. It continuously monitors a diverse range of sensor inputs, including non-identifiable sound, GPS, accelerometer and photoplethysmograpy, and sends the data to a cloud-based 4G network. Using deep learning, the platform then analyses behavioural patterns, health fluctuations and specific health events, and present its findings through a visual alert interface, providing users with immediate feedback.	**Prof. HE Mingguang** Henry G. Leong Professor in Elderly Vision Health; Chair Professor of Experimental Ophthalmology, School of Optometry; Director, Research Centre for SHARP Vision **Dr TO Yuen Ying Elaine** Postdoctoral Fellow in Ophthalmology, School of Optometry	

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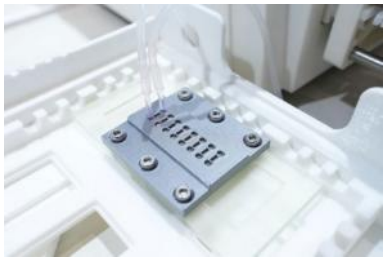
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Eye-on-a-chip Device** Approximately 90% of ocular drugs fail in clinical trials, largely due to outdated preclinical testing methods. Though the U.S. Food and Drug Administration Modernization Act 2.0 now permits in vitro alternatives to animal testing for pre-clinical screening, the current in vitro methods for evaluating ocular drugs still rely on simplistic cell culture models that inadequately replicate the human eye's complex environment. This limitation compromises the accuracy, reliability and relevance of test results. Utilising more advanced in vitro models, therefore, will accelerate the research progress while significantly reducing R&D costs and resources. This Eye-On-a-Chip Device is a next-generation in vitro platform that mimics the ocular environment for testing eye products, including ophthalmic solutions, pharmaceuticals, drugs and medical devices. Designed for researchers and pharmaceutical companies, it also utilises microfluidics to simulate tear flow and employs real-time imaging with an automated analysis algorithm for cell health assessment. Built for easy integration with existing lab setups, it saves time and money, streamlines research processes and produces more accurate, clinically relevant data.	**Dr ZHOU Liping** Research Assistant Professor, School of Optometry and Department of Applied Biology and Chemical Technology; Principal Investigator, InnoHK Centre for Eye and Vision Research; Director, Eyenova Biotech Limited (a PolyU startup) **Dr PHAN Chau-Minh** Research Assistant Professor, School of Optometry and Vision Science, University of Waterloo; Principal Investigator, InnoHK Centre for Eye and Vision Research; Director, Eyenova Biotech Limited (a PolyU startup)	 **Photographed are Dr Zhou Liping, Dr Phan Chau-Minh and their research team member* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Last-centimetre Drone Delivery in Urban Environments** Drone flight in urban areas is challenging due to the unreliable and inaccurate Global Navigation Satellite System service. This innovation comprises hardware and algorithms that enable drones to deliver parcels directly to apartment balconies using Light Detection and Ranging (LiDAR) without any human intervention. The key features of the innovation include: • **An advanced perception algorithm** that enables precise localisation for both the drone and the balcony, significantly enhancing landing accuracy • **A LiDAR-based obstacle detection algorithm** that does not rely on pre-training, making it versatile and adaptable to various scenarios • **A robust control algorithm** for stability and safety that enables the drone to navigate with precision through disturbances such as wind This comprehensive solution integrates cutting-edge perception, obstacle detection and control technologies, enabling seamless parcel delivery and safe drone operation in complex urban environments.	**Prof. HUANG Hailong** Assistant Professor, Department of Aeronautical and Aviation Engineering	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**IHAC Film: Intelligent Humidity Control and Atmospheric Water Collection Film** Intelligent Humidity Control and Atmospheric Water Collection Films (IHAC films) manage indoor humidity and supply fresh water without using energy. It combines hydrophilic PAN/CNT nanofibre layers with water-retaining PAM hydrogels, offering exceptional water absorption and storage. These lightweight, portable and cost-effective ($16.94/m²) films are scalable and durable in various conditions. Reducing humidity from 90.7% to 21.6% in one hour and producing freshwater yield of 1.1kg/m² daily, IHAC films significantly outperform traditional dehumidifying materials. Unlike conventional methods, the films require no external energy to operate and prevent bacterial growth. They also contribute to environmental sustainability by lowering energy consumption by 30 kWh/(year·m²) and CO_2 emissions by 16.5kg/(year·m²). IHAC films enable energy-free humidity control and clean water in both indoor and outdoor settings, fostering plant growth, reducing CO_2 and improving air quality. Their rapid cost recovery (48 days) presents strong potential for future applications.	**Prof. YAN Jinyue Jerry** Chair Professor of Energy and Buildings, Department of Building Environment and Energy Engineering	 **Photographed are members of the research team* 

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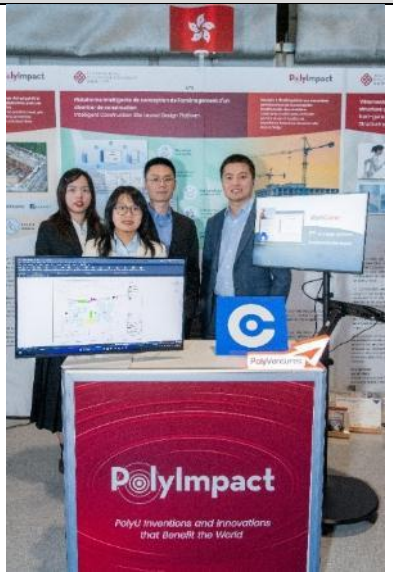
Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Intelligent Construction Site Layout Design Platform** This invention is the world's first generative AI-powered design platform for generating optimal crane and site layouts in construction projects. This innovative platform streamlines the traditionally labour-intensive decision-making process, offering the following significant benefits: • Accelerates the speed of the design process by over 90% • Lowers collision risks on site by 59% • Improves operator visibility by 49% • Enhances crane operation efficiency by 27% • Reduces module installation degrees by 26% • Reduces carbon emissions by 800kg This platform provides engineers with multiple design channels, including local software, online platforms and CAD plugins. Engineers can further customise their designs based on the real-time visualised effects of the AI-generated solutions. Aiming to revolutionise traditional manual site layout design practices, the innovation is expected to advance the construction industry towards enhanced safety, increased productivity and greater sustainability.	**Dr WANG Dong** Postdoctoral Fellow, Department of Building and Real Estate; Founder, ICC (Hong Kong) Limited (a PolyU startup)	 **Photographed are Dr Wang Dong and his research team members*

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**AI-based Railway Obstacle Intrusion Detection System with Multimodal Transformers** Rail accidents caused by obstacles on the tracks are a major concern. Developing intelligent obstacle intrusion detection systems (OIDS) is thus crucial for train safety. It has three main components: (1) sensors, including a camera and LiDAR, (2) a real-time data collection and warning module, and (3) a transformer-based detection model. First, the visual sensors are calibrated for optimal performance and mounted on locomotives. The collected multimodal data are then synchronised and fed into the transformer-based detection model, which extracts features from both images and point clouds and analyses the combined data, thereby detecting obstacles that are currently or potentially encroaching on the rail area. Based on the detection results, real-time warnings are sent to operating trains to prevent potential accidents. The transformer model is trained using both real and synthetic samples in different weather and lighting conditions, enhancing its robustness and versatility in diverse scenarios.	**Prof. NI Yiqing** Yim, Mak, Kwok & Chung Professor in Smart Structures; Chair Professor of Smart Structures and Rail Transit, Department of Civil and Environmental Engineering; Director, National Rail Transit Electrification and Automation Engineering Technology Research Centre (Hong Kong Branch); Director, PolyU-Hangzhou Technology and Innovation Research Institute	 **Photographed are members of the research team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**LungRT Pro: Advanced Radiotherapy Support System** This innovation enhances lung radiotherapy by automating the analysis of patient's CT images and simplifying clinical procedures. With just a few clicks, the system identifies organs and creates lung ventilation and perfusion maps, providing a comprehensive visual representation of lung function. This streamlined process helps clinicians make informed treatment decisions, improving patient outcomes. The system uses cutting-edge image processing algorithms and AI techniques to ensure high accuracy and consistency, while featuring a user-friendly interface, a powerful backend and 3D visualisation capabilities. Automating manual tasks reduces workload and minimises human error, enhancing precision and effectiveness and thereby contributing to improved patient care. Designed with functionality and user experience in mind, the system is compatible with major operating systems and is distributed digitally, reducing environmental impact. Its innovative combination of automation, advanced visualisation and broad accessibility also makes it a valuable tool in lung radiotherapy.	**Prof. CAI Jing** Head and Professor, Department of Health Technology and Informatics; Technical Advisor, InsightRT Limited (a PolyU startup)	 **Photographed are members of the research team*

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Virtual Patient Simulation System** This invention is an algorithm that generates synergistic markers to predict treatment outcomes, such as cancer treatment responses and relapse. Using genomic (DNA) or phenotypic (observable traits) data, the system simulates clinical outcomes with probability estimates and decision curve visualisations. The system is compatible with high-end standalone workstations and cloud platforms, offering high flexibility and scalability. Its key advantages include personalised treatment planning, faster clinical decision-making, and improved patient outcomes by reducing trial-and-error approaches. By providing accurate, data-driven insights, the system also helps healthcare providers optimise treatment strategies, reduce costs and enhance overall healthcare efficiency. Enabling more precise, effective treatments, this invention has the potential to revolutionise personalised medicine and improve overall care management. It also empowers clinicians to make more informed decisions, ultimately leading to better patient care and outcomes.	**Prof. CHAN Wing Chi Lawrence** Associate Professor, Department of Health Technology and Informatics; Founder, Advantage Data Vision Limited (a PolyU startup)	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**EmoFriends** EmoFriends is a modular toolkit that transforms plush toys into intelligent companion robots. Using patented Emosense technology, it tracks stress levels through touch and delivers AI-driven, personalised, emotion-aware conversations and haptic stimulation. The modular design allows easy integration into any plush toy, making it accessible and customisable for a range of users. The toolkit features advanced stress tracking, emotion-aware AI conversations, haptic stimulation and modularity for seamless customisation. The intuitively-designed technology is the first to understand emotional states through touch, and is adaptable across various plush toys. In addition, the modular components, made from Thermoplastic Polyurethane (TPU) via injection moulding, ensure durability and scalability for mass production. Providing stress management, emotional support and companionship in a comforting, relatable form, EmoFriends tackles the global stress epidemic by offering a unique, accessible tool for mental health support. It improves emotional well-being, fosters trust and user engagement, while its sustainable design enhances its societal and environmental value.	**Prof. WANG Jia Stephen** Professor, School of Design	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**The EyeFatigue Tracker: Exploring Visual Health through Wearable Devices and Deep-Learning Technology** The EyeFatigue Tracker is a diagnostic tool designed to objectively measure and manage visual fatigue. It features advanced capabilities such as eye movement analysis, blink pattern detection and pupil size monitoring, along with critical flicker fusion technology for precise fatigue assessment. The interface is easy-to-use and tailored for clinical settings. The EyeFatigue Tracker has several advantages over traditional methods. It delivers objective data for accurate diagnosis and supports pre- and post-treatment comparisons to effectively monitor progress, enhancing diagnostic accuracy. It also enables personalised treatment approaches, saving time and improving patient outcomes. Additionally, its portable design allows for versatile use in hospitals, clinics and research labs. By integrating objective metrics and streamlining clinical workflows, the EyeFatigue Tracker revolutionises visual fatigue assessment and ultimately enhances patient care. Its introduction paves the way for wider adoption of standardised fatigue measurement tools in healthcare, promising a more effective approach to fatigue management.	**Dr CHEN Yanxian** Research Assistant Professor, School of Optometry	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**STARS: Smartphone AI Refraction System** STARS is an AI-powered smart system for the early detection and simplified monitoring of myopia, lazy eye risks and strabismus for children. Unlike traditional examinations that require professional training and the use of bulky and expensive instruments, STARS offers a compact, user-friendly solution, with AI-assisted photo-refraction that ensures precision and user comfort. Its multi-lingual interface makes vision screenings accessible and easy, especially benefitting those in remote and developing regions. Developed and patented by PolyU, the AI algorithms in STARS are continuously optimised using large data sets. It was built on more than 30,000 real-life clinical eye profiles, enabling STARS to quickly provide reliable and reproducible results. With deep learning, the technology will become increasingly precise over time.	**Prof. DO Chi Wai** Associate Professor, School of Optometry **Prof. Grace NGAI** Associate Professor, Department of Computing	 **Photographed are Prof. Do Chi Wai, Prof. Grace Ngai and their research team member*

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Biomimetics Nanoplatform for the Treatment of Retinal Diseases** Current drug treatments for retinal diseases present several challenges. First, many medications lack targeting specificity, leading to off-target and undesirable side effects. For glaucoma, the prolonged use of single or multiple eye-drops often results in drug resistance due to the cumulative side effects, which may reduce patient adherence and long-term efficacy of the treatment. Additionally, treatments specifically targeting retinal inflammation are limited and may suffer from limited drug stability, predisposing them to degradation before reaching the target site. These issues highlight the need for more targeted, stable, and sustained-release treatments. This innovation addresses the limitations of retinal disease treatments by utilising natural immune cell membrane materials to create a biomimetic nanodrug delivery platform. The platform leverages precise biorecognition to target and deliver drugs directly to sites of neuroinflammation in the retina, facilitating more controlled drug release. It also protects unstable and easily degradable drugs, enhancing the therapeutic efficacy while minimizing the off-target effects.	**Prof. DO Chi Wai** Associate Professor, School of Optometry; Principal Investigator, InnoHK Centre for Eye and Vision Research **Prof. Emmanuel HO** Professor, School of Pharmacy, University of Waterloo; Principal Investigator, InnoHK Centre for Eye and Vision Research	 **Photographed are Prof. Do Chi Wai, Prof. Emmanuel Ho and their research team member* 

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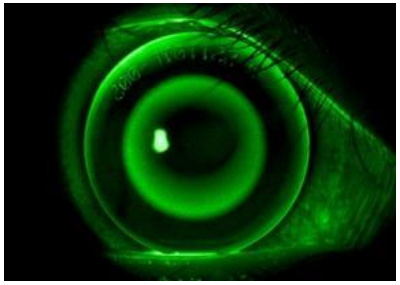
Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Wellsess Orthokeratology Contact Lens** Wellsees Orthokeratology Contact Lens is a groundbreaking innovation for individuals with high myopia and astigmatism. As China's first lens with a toric base curve, it offers a personalised fit that enhances myopia control and provides clear, spectacle-free vision all day. With myopia projected to affect 50% of the global population and over 85% of Chinese teenagers by 2050, early intervention is crucial. This advanced technology further extends the benefits of corneal reshaping to astigmatism patients. The unique lens design features customised curves and advanced materials, maximising oxygen flow to safeguard corneal health. Prioritising comfort and ease of use, Wellsees Orthokeratology Contact Lens sets a new standard in orthokeratology fitting, transforming vision care for a brighter and clearer future.	**Dr Jason Ki-Kit LAU** Technical Director, Wellsees Technologies Co., Ltd. **Mr Roger Jing ZHANG** Founder, Wellsees Technologies Co., Ltd. **Prof. Chea-su KEE** Head, School of Optometry, The Hong Kong Polytechnic University; Co-Founder, Wellsees Technologies Co., Ltd. **Dr Andy Wang** Associate Professor, College of Mechatronics and Control Engineering, Shenzhen University; Co-Founder, Wellsees Technologies Co., Ltd. (a PolyU startup)	 **Photographed are members of Wellsees Technologies Co., Ltd.* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Bronze Medal	**Suture Anchor-Tendon Hybrid Graft** This bone-tendon graft combines a suture anchor and tendon graft to restore biomechanical function. Its simple approach uses a single stem or progenitor cell treated with the same biochemical cues to simultaneously generate fibrocartilage and tendon, thereby enhancing biological healing. Mechanically, combining a suture anchor with a tendon graft can reduce potential failure points, such as suture breakage at the anchor eyelet. This was impossible to achieve with previous devices as they lacked our biocompatible, photocrosslinkable material, the properties of which can be adjusted to approximate the mechanical properties of human bone and tendon. Biologically, this straightforward method streamlines the regulatory approval process by using only one cell type and inducer to produce both fibrocartilage and tendon. This invention aims to revolutionise the century-old practice of using separate devices for bone-tendon repair, such as suture anchors for bone fixation and tendon grafts for tendon replacement. It shows promise for improving rotator cuff repair.	**Prof. Elmer Dai Fei KER** Associate Professor, Department of Biomedical Engineering	 **Photographed are Prof. Elmer Dai Fei Ker and his research team member* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Bronze Medal	**Advanced Self-cleaning Oil Fume Purification System for Commercial Kitchens** The Advanced Self-Cleaning Oil Fume Purification System for Commercial Kitchens offers an innovative solution for efficiently removing oil fumes. It features a self-cleaning mechanism, ensuring optimal performance with minimal maintenance. The system includes a cooking device and a purification unit with a rotatable carrier body that allows gas and liquid to pass through. An oil fume purification ring cleans fumes during rotation, with its inner cavity directed towards the exhaust for enhanced efficiency. A liquid supply provides cleaning liquid to the ring, while a suction component extracts and releases purified gas. The system effectively cleans oil fumes using a self-developed surface-active agent, achieving a purification efficiency of 60–80% for volatile organic compounds and 90% for particulate matter in commercial kitchens. This makes it a valuable addition to modern restaurants.	**Prof. LEE Shun Cheng** Professor, Department of Civil and Environmental Engineering; Technical Advisor, AeroGreen Technology Company Limited (a PolyU startup) **Dr LI Xinwei** Postdoctoral Fellow, Department of Civil and Environmental Engineering; Founder, AeroGreen Technology Company Limited (a PolyU startup) **Dr HAN Shuwen** Alumnus, Department of Civil and Environmental Engineering; Chief Technology Officer, AeroGreen Technology Company Limited (a PolyU startup)	 **Photographed are Dr LI Xinwei and Dr Han Shuwen* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Bronze Medal	**Next-generation Sportswear with Polylactic Acid, Auxetic Knitting Structure and Ergonomic Design** This ergonomic sportswear solution uses polylactic acid (PLA), a natural eco-substitute for polyester, for its fabrication, combined with auxetic knitting structure (AKS) textile engineering. This combination delivers improved shaping, support and fit without using Lycra or polyurethane, while also enhancing the sportswear's antibacterial properties, UV protection, flame retardancy, and temperature and moisture management. Additionally, the ergonomic construction maximises athletic performance by aligning with muscle groups, allowing full-range motion and effective temperature regulation. Being 100% sustainable, using PLA can improve environmental sustainability in textile production waste management and sportswear functionality. Meanwhile, the auxetic knitting structure ensures superior shaping, elasticity and support. The ergonomic design also provides a better-contoured fit, improving protection against injury and offering better body support. This solution not only enhances performance for athletes and physically fit individuals who exercise rigorously, but also improves the exercise experiences of individuals in less-than-perfect physical condition by providing better safety, functionality, support and fit.	**Prof. Erin CHO** Dean and Limin Professor in Integrated Strategies and Leadership in Fashion, School of Fashion and Textiles; Advisor, Leopitorca Global Limited (a PolyU startup)	 **Photographed are Prof. Erin Cho and her research team member* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Bronze Medal	**3D-printed Superior Light and Breathable Wearable Textiles** Produced using the Low Force Stereolithography printing system with flexible photosensitive resin based on a 3D model, this innovative 3D-printed material comprises multiple unit structures systematically arranged along the X, Y and Z axes. Each unit structure features a cubic diamond configuration made of truss rods, with dimensions ranging from 2mm to 2.5mm in length, width and height, and truss rod diameters between 0.2mm and 0.3mm. Incorporating a cubic diamond structure as the fundamental unit of the microcrystalline fabric significantly enhances the material's breathability, lightness, durability and aesthetic appeal. It also accommodates various body shapes and movement conditions, ensuring comfort and adaptability. The material is soft and skin-friendly, offering breathability that surpasses traditional woven fabrics, and exhibiting excellent elasticity. This advancement showcases the significant improvement in the performance and comfort of 3D-printed textiles.	**Prof. JIANG Shou-xiang Kinor** Professor, School of Fashion and Textiles	 **Photographed is member of the research team*