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Appendix: PolyU's winning innovations at the 51st International Exhibition of Inventions Geneva

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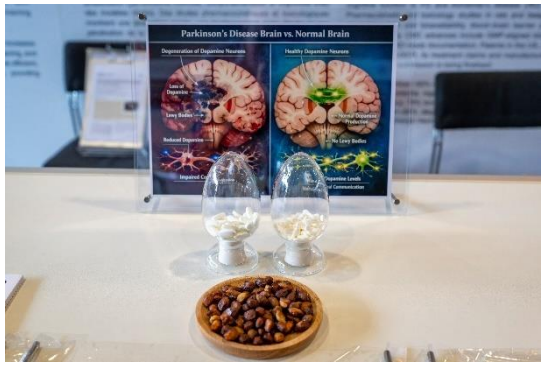
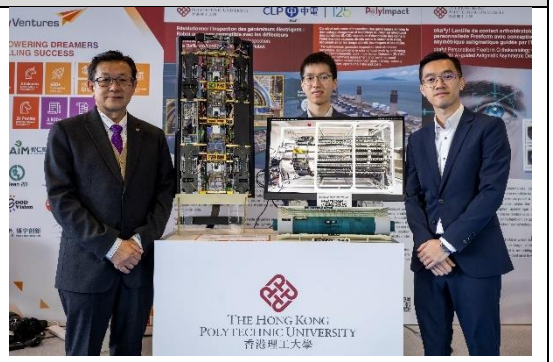
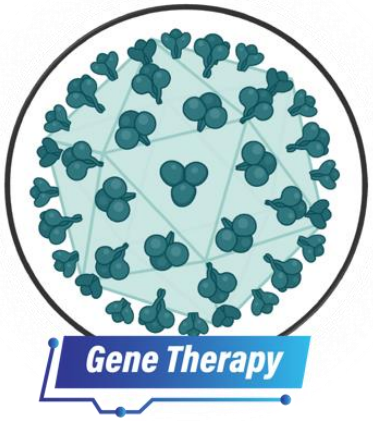
Award(s)	Project description	Principal Investigator(s)	Image(s)
Prize of the Korea Invention Promotion Association **Gold Medal**	**PD-001R: A First-in-Class Candidate for the Treatment of Neurodegenerative Diseases** PD-001R is a first-in-class, disease-modifying candidate for Parkinson's disease (PD). Derived from Alpinia oxyphylla fruits and chemically synthesised via a novel scaffold, PD-001R activates the immunoproteasome to degrade pathological α-synuclein aggregates. Preclinical studies demonstrate neuroprotection, reduced neuronal loss, mitigated dopamine depletion and improved motor, behavioural and cognitive function in PD and Alzheimer's disease (AD) mouse models. Pharmacokinetic and toxicology studies in rats and beagles show rapid absorption, high oral bioavailability, blood–brain barrier penetration and favourable safety. Chemistry, Manufacturing and Controls (CMC) advances include GMP-aligned kilogramme-scale synthesis with IND-ready documentation. Patents in the US, EU, China and Japan cover PD-001R, its treatment claims and manufacturing. Preclinical work for PD Investigational New Drug (IND) submission is being finalised. Key results: PD mice—50% motor improvement, 140% dopamine recovery, 32% higher substantia nigra neuron survival; AD mice—44% shorter water-maze latency, 78% longer target-quadrant time, 50% reduced $A\beta_{1-42}$; α-synuclein mice—60% degradation of Triton-insoluble α-syn and 56% increased dopaminergic neuron preservation.	**Prof. Simon LEE Ming-yuen** Cally Kwong Mei Wan Professor in Biomedical Sciences and Chinese Medicine Innovation; Chair Professor of Biomedical Sciences, Department of Food Science and Nutrition; Director, PolyU-BGI Joint Research Centre for Genomics and Synthetic Biology in Global Ocean Resources; Founder, AIM Pharmaceutical International Limited (a PolyU startup) **Dr ZHAO Chen** Postdoctoral Fellow, Department of Food Science and Nutrition; Chief Technology Officer, AIM Pharmaceutical International Limited (a PolyU startup)	 **Photographed are Prof. Simon Lee Ming-yuen (left) and Dr Zhao Chen (right)* 

Award(s)	Project description	Principal Investigator(s)	Image(s)
Thailand Award for the Best International Invention & Innovation **Gold Medal**	**Revolutionising Power Generator Inspection: The Baffle-compatible Autonomous Robot** This low-profile autonomous robot is designed for inspecting electrical generators without dismantling the multi-ton rotor, reducing costs and downtime. The 36mm thick robot can pass through the gap between the stator and rotor. It integrates (1) visual inspection; (2) an EL CID system to detect/locate defects in the stator core; and (3) a Leeb durometer for assessing material integrity and identifying degradation. Uniquely, the robot navigates internal baffles and winding passages using an autonomous mobility system with retractable legs and wheels, enabling it to perform all essential inspections inside the generator. A rotating launch platform, mounted on the generator's retaining ring, positions the robot around the interior and moves it precisely from one inspection slot to the next. The system operates autonomously with continuous position tracking and a fail-safe retrieval mechanism to ensure recoverability under all conditions. Additionally, the robot carries a fibre-optic condition monitoring system that continuously assesses the health of critical components. This provides early indication of component condition trends, supporting proactive maintenance and enhancing generator reliability.	**Prof. TAM Hwa Yaw** Chair Professor of Photonics, Department of Electrical and Electronic Engineering; Associate Director, Photonics Research Institute	 **Photographed are Prof. Tam Hwa Yaw (left) and his research team members* 

Award(s)	Project description	Principal Investigator(s)	Image(s)
Special Prize of "Lucian Blaga" University of Sibiu, Romania **Gold Medal with Congratulations of the Jury**	**Viromids: A Redosable, Low-Cost Gene-Delivery Platform for Ocular Therapy** Viromids represent a new class of viromeinspired, redosable gene-delivery platforms that combine immune silence, large payload capacity (8–15 kb), and bacterial-scale manufacturability. By enabling single-vector delivery of large genes and repeatable dosing while reducing production costs by orders of magnitude, Viromids offer a practical, globally accessible path to preserve and restore sight in patients with inherited retinal diseases such as Stargardt disease. Their scalable production model also positions Viromids as a foundational technology for next-generation affordable gene therapy worldwide.	**Prof. Roderick SLAVCEV** Associate Professor, School of Pharmacy, University of Waterloo; Principal Investigator, InnoHK Centre for Eye and Vision Research **Prof. Chien-ling HUANG** Associate Professor, Department of Health Technology and Informatics, PolyU; Principal Investigator, InnoHK Centre for Eye and Vision Research	 **Photographed are Prof. Roderick Slavcev (2nd from right), Prof. Chien-ling Huang (left) and their research team member* 

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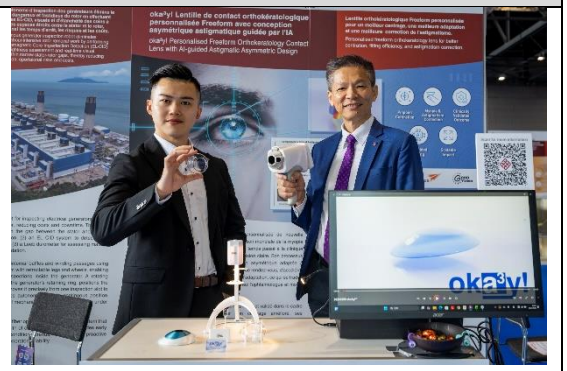
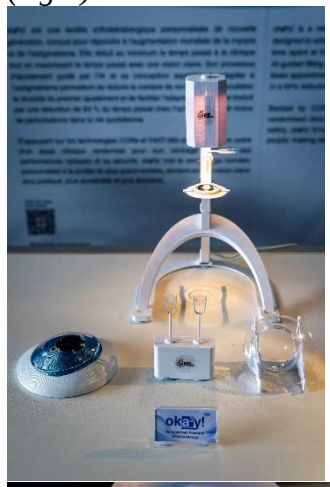
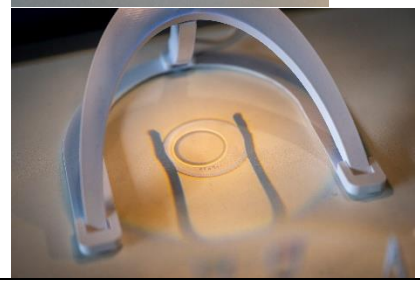
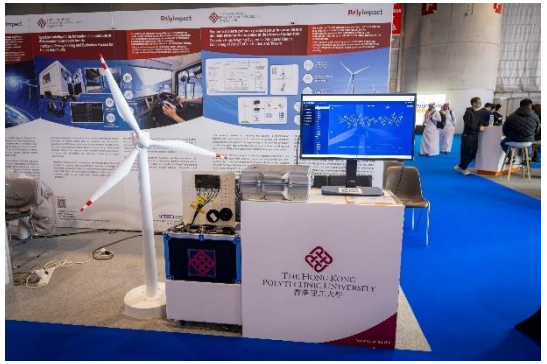
Award(s)	Project description	Principal Investigator(s)	Image(s)
Special Merit Award from CORNELIUGROUP Association **Gold Medal with Congratulations of the Jury**	**oka³y! Personalised Freeform Orthokeratology Contact Lens with AI-guided Astigmatic Asymmetric Design** oka³y! is a next-generation, personalised freeform orthokeratology lens designed to address the global rise of myopia and astigmatism. It minimises time spent at the clinic while maximising time spent with clear vision. Its AI-guided fitting process and asymmetric, astigmatism ready design mean fewer appointments, faster first fit success and quicker adaptation, resulting in a 64% reduction in chair time and less disruption to daily life. Backed by CORe and FAST 360 technologies and validated in a randomised clinical trial for improved centration, optical performance and safety, oka³y! brings personalised corneal reshaping within reach for more people, making clear vision more convenient, accessible and scalable.	**Prof. KEE Chea-su** K.B. Woo Family Professor in Optometry; Head and Professor, School of Optometry; Associate Director, Research Centre for SHARP Vision; Co-founder, GOOD Vision Technologies Co., Limited (a PolyU startup)	 **Photographed are Prof. Kee Chea-su (right) and his research team member*  

Award(s)	Project description	Principal Investigator(s)	Image(s)
Special Merit Award from "Lucian Blaga" University of Sibiu, Romania **Gold Medal**	**Proactive Early Warning System for Structural Health Monitoring of Wind Turbine Blades and Towers** This invention addresses frequent safety incidents, inaccurate early damage identification, and passive operation and maintenance in offshore wind power systems. It introduces a proactive early warning system for structural health monitoring combining finite element (FE) simulation, Fiber Bragg Grating (FBG) sensing and reinforcement learning algorithms. A high-fidelity FE model is constructed to simulate the mechanical responses of wind turbine structures under loads such as strong winds, waves and earthquakes, identifying stress concentration areas and potential risk points. Based on these results, a customised FBG sensing array is deployed to achieve real-time monitoring of parameters including strain, temperature and vibration. A reinforcement learning-driven analysis framework then fuses simulation and sensing data to optimise safety thresholds dynamically, enabling identification of early damage (e.g. cracks, delamination, corrosion) and prediction of operational trends. The system overcomes the traditional decoupling between mechanical modelling and optical sensing, forming a closed-loop optimisation mechanism for structural health monitoring.	**Prof. YU Changyuan** Chair Professor of Photonic Information System, Department of Electrical and Electronic Engineering; Director, PolyU-Jinjiang Technology and Innovation Research Institute; Scientific Advisor, Xiaoma Technology Limited (a PolyU startup) **Ms MA Zhiqin** PhD Candidate, Department of Electrical and Electronic Engineering; Founder, Xiaoma Technology Limited (a PolyU startup)	 **Photographed are Ms Ma Zhiqin (2nd from right) and her research team members* 

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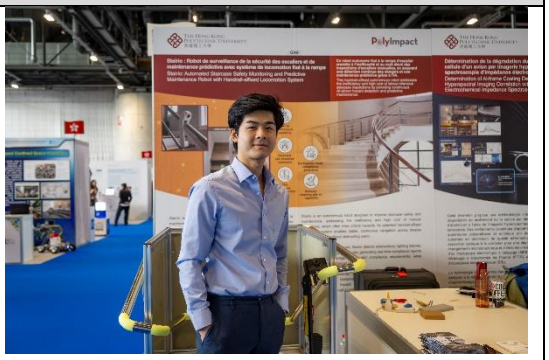
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of the Jury	**Stairio: Automated Staircase Safety Monitoring and Predictive Maintenance Robot with Handrail-affixed Locomotion System** Stairio is an autonomous robot designed to improve staircase safety and maintenance, addressing the inefficiency and high cost of manual inspections, which often miss critical hazards. Its patented handrail-affixed locomotion system enables stable, continuous navigation across diverse staircase designs without obstructing users. Equipped with AI and sensors, Stairio detects obstructions, lighting failures, and cleanliness and signage issues, generating real-time compliance reports to help property managers safeguard compliance requirements, while reducing reliance on manual labour. Targeted at high-rise buildings, Stairio helps ensure unobstructed emergency routes and supports sustainable building management. By combining autonomous mobility, hazard detection and predictive maintenance, it represents a breakthrough in preventive safety robotics.	**Prof. HSU Li-ta** Associate Professor, Department of Aeronautical and Aviation Engineering; Limin Young Scholar in Aerospace Navigation	 **Photographed is member of the research team* 

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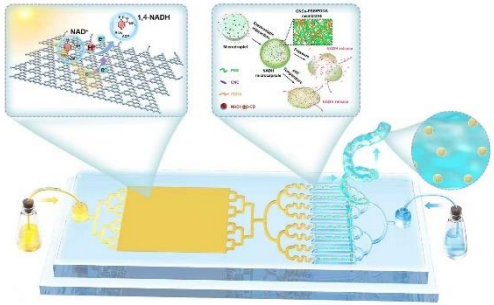
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of the Jury	**Anti-ageing Beauty and Healthcare via Advanced Microfluidics** This invention is a generalisable microfluidic platform with two granted patents and is the first platform capable of producing stable, high-purity nicotinamide adenine dinucleotide (NADH) microcapsules for anti-ageing therapy. It integrates biomimetic photocatalysis and microfluidic encapsulation to synthesise 100% bioactive 1,4-NADH, then packages it into hydrogel-shelled microcapsules that enhance the stability of active ingredients, reduce irritation potential and enable targeted, controlled release. The platform overcomes major challenges in the purity and stability of NADH production, achieving high potency in anti-ageing and providing an energy-boosting effect. In cell studies, the NADH microcapsules outperformed leading anti-ageing compounds, boosting collagen regeneration and antioxidant activity while reducing inflammation at lower doses. The technology is backed by significant funding and is poised for commercialisation. By enabling a next-generation anti-ageing solution, it addresses the global challenge of an ageing population and contributes to improved long-term health.	**Dr XIE Fengjia** Postdoctoral Fellow, Department of Applied Physics; Co-founder, X Beauty Technology Limited (a PolyU startup) **Dr TSOI Chi Chung** Postdoctoral Fellow, Department of Applied Physics; CDO, X Beauty Technology Limited (a PolyU startup)	 **Photographed are Dr Xie Fengjia (left) and Dr Tsoi Chi Chung (right)*  

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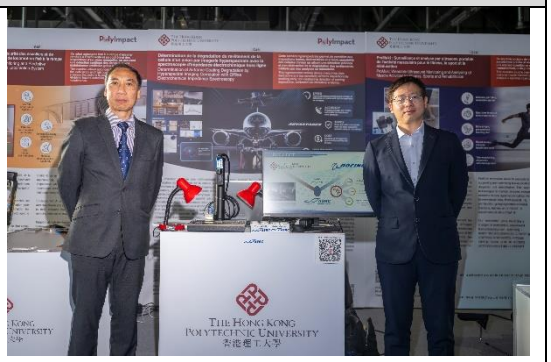
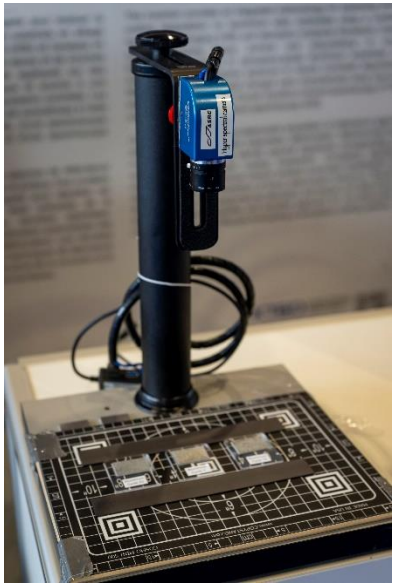
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of the Jury	**Determination of Airframe Coating Degradation by Hyperspectral Imaging Correlation with Offline Electrochemical Impedance Spectroscopy** This invention provides an integrated methodology for assessing airframe coating degradation on aluminium alloy substrates using a combined hyperspectral imaging (HSI) and laboratory analytical framework. Coating systems—including epoxy primers and polyurethane or acrylic topcoats—were applied to aerospace-grade aluminium substrates and subjected to cyclic corrosive exposure to induce controlled degradation. Microstructural and chemical changes were characterised using scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), and electrochemical impedance spectroscopy (EIS). Concurrent HSI enabled non-destructive acquisition of reflectance spectra associated with surface and subsurface deterioration. Machine-learning models were developed to identify spectral signatures corresponding to early-stage corrosion and coating breakdown. Correlating spectral, electrochemical, and chemical metrics enabled automated classification of degradation states and prediction of future deterioration behaviour. Results demonstrate that HSI, supported by laboratory techniques and data-driven analytics, provides a scalable and sensitive approach for non-destructive corrosion detection and lifecycle forecasting of aerospace coating systems.	**Dr TANG Hon Ping** Principal Research Fellow and Project Lead, Aviation Services Research Centre	 **Photographed are Dr Tang Hon Ping (left) and his research team member* 

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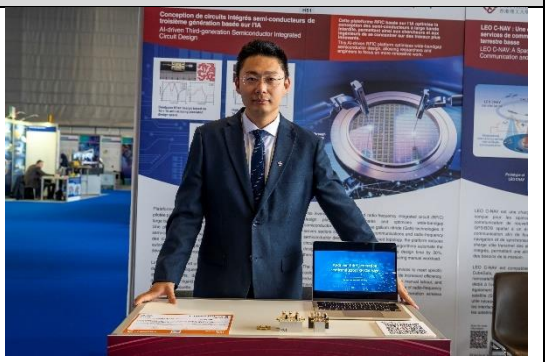
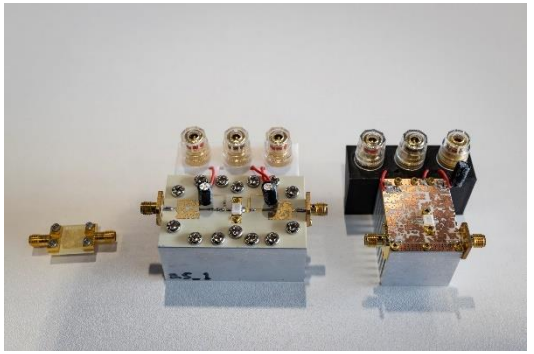
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal with Congratulations of the Jury	**AI-driven Third-generation Semiconductor Integrated Circuit Design** This invention is an AI-powered radio-frequency integrated circuit (RFIC) design platform that automates and optimises wide-bandgap semiconductor circuit design, such as in the use of gallium nitride (GaN) technologies. It serves sectors such as 5G, IoT, telecommunications and radio-frequency semiconductor design. Using a pixel-based topology, the platform reduces circuit area by 50% and improves chip yield. AI algorithms automate the design and optimisation process, shortening the design time by 30%, thereby accelerating product development and reducing manual workload. The platform provides customised RFIC design services to meet specific customer requirements. Additional advantages include increased efficiency, reduced costs, faster design cycles, less reliance on manual labour and maximised chip yield per wafer. It supports a wide range of radio-frequency circuit designs, particularly those required for next-generation wireless technologies.	**Dr ZHOU Xin Yu** Research Assistant Professor, Department of Electrical and Electronic Engineering	 **Photographed is Dr Zhou Xin Yu* 

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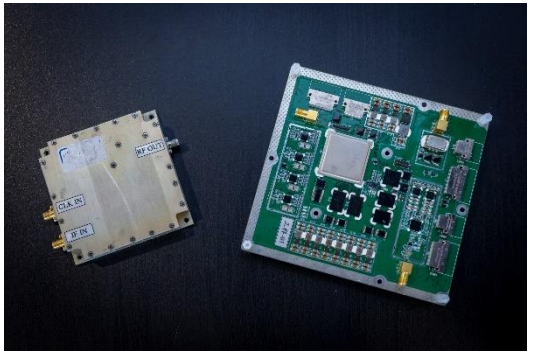
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**LEO C-NAV: A Spaceborne Payload for Low-Earth Orbit Communication and Navigation Services** LEO C-NAV is a low-Earth orbit (LEO) satellite payload designed for next-generation integrated navigation and communication applications. It integrates a spaceborne GPS/BDS receiver with a navigation and communication signal transmitter to deliver high-precision and reliable positioning, navigation and timing (PNT) services. The payload transmits integrated navigation and communication signals, allowing flexible allocation of resources based on mission needs. LEO C-NAV is compatible with nanosatellites including CubeSats, enabling the development of a LEO C-NAV Nanosatellite constellation providing an independent LEO-dedicated PNT service at low cost. It can also be combined with existing Global Navigation Satellite Systems (GNSS) to provide PNT augmentation. The payload requires minimal space, consumes low power, and adheres to standard interfaces and protocols, making it easy to integrate with all satellites, particularly nanosatellites.	**Prof. WEN Chih-yung** Chair Professor of Aeronautical Engineering, Department of Aeronautical and Aviation Engineering; Director, COMAC-PolyU Research Institute for Large Aircraft; Director, Research Centre for Unmanned Autonomous Systems; Associate Director, Research Institute for Sports Science and Technology **Prof. XU Bing** Assistant Professor, Department of Aeronautical and Aviation Engineering	 **Photographed are members of the research team* 

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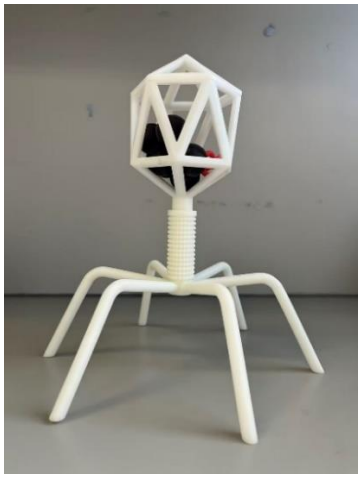
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Magnetophages: A New Class of Programmable Viral Nanocontainers with Active Control** Magnetophages are bioengineered phages (viruses that naturally kill bacteria) designed to overcome a key limitation of conventional phages: their inability to move purposefully towards bacterial pathogens. By repurposing the phage head as a biological container, iron nanoparticles are encapsulated within the virus, enabling external magnetic control while fully preserving phage infectivity, specificity and safety. This internal cargo-loading strategy provides controllable motility—the ability of a virus to move purposefully rather than drifting passively—without chemical surface modification or genetic alteration. Under magnetic guidance, Magnetophages can be directed through dense biofilms, food materials and living aquaculture animals to eliminate harmful bacteria at contamination sites while avoiding unnecessary spread elsewhere. This targeted, chemical-free approach offers a sustainable alternative to disinfectants and antibiotics, which are increasingly ineffective or restricted in many industries. The technology is broadly applicable in disinfection, food safety, animal farming, and biofouling prevention, opening new possibilities in precision antimicrobial intervention.	**Prof. CHUA Song Lin** Associate Professor, Department of Applied Biology and Chemical Technology **Dr MA Yeping** Scientific Officer, Department of Applied Biology and Chemical Technology	 **Photographed is Prof. Chua Song Lin* 

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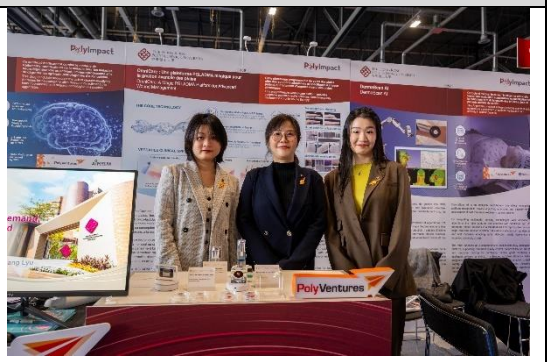
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**OmniCare: A Magic PGLADMA Platform for Advanced Wound Management** OmniCare is an advanced, programmable wound care platform powered by poly (lactide-co-propylene glycol-co-lactide) dimethacrylates (PGLADMA), a photocrosslinkable polymer material with highly adjustable mechanical, chemical and biological properties. Using flexible formulation and bio-inspired structural design, OmniCare enables 'On-shape, On-demand, On-beyond' wound healing for a wide range of clinical scenarios. For open wounds, the material can be instantly sprayed to conform to any shape, either alone or combined with drugs and hydrogels to rapidly form a biomimetic double-layer dressing. For wounds requiring rapid closure, PGLADMA is moulded into gecko-inspired patches with adjustable contractile force for secure, patient-specific healing and tension modulation to prevent scarring. PGLADMA can be crafted into drug-loaded microneedles for targeted, sustained delivery, supporting scar prevention, hair regeneration and other advanced therapies. OmniCare provides comprehensive, customisable solutions for wound management, from emergency care to chronic therapy.	**Prof. ZHAO Xin** Professor, Department of Applied Biology and Chemical Technology; Limin Young Scholar in Biomaterials and Tissue Engineering; Founder, ReNew Biotechnology Limited (a PolyU startup)	 ** Photographed are Prof. Zhao Xin (centre) and her research team members* 

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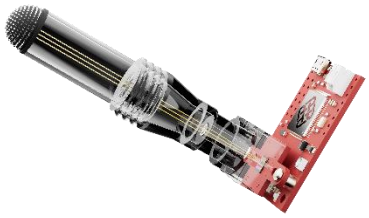
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Dragonfly Vision: A Mini Camera for Instant 180° Imaging** This camera mimics dragonfly vision using tens of thousands of micrometre-scale channels filled with self-developed light guides and distributed within a hemisphere. Each light-guiding channel is capped with a tiny lens or aperture that controls light acceptance and transmits light from the curved hemispherical surface to a flat detector array. Integrated with AI, the system performs full-stack biomimetic processing from light to electrical signals to neural-style computation, enabling real-time, ultra-fast, wide-angle imaging at the millimetre scale. Related work has been published in leading journals, including the *Nature* family of journals, the *Science* family of journals, and *Science* partner journals over the past two years. Already applied in drones and robotics, the technology has won multiple international competitions, demonstrating a cutting-edge fusion of biology, optics, electronics and AI.	**Prof. ZHANG Xuming** Associate Head and Professor, Department of Applied Physics; Advisor, Dragon Vision Technology Limited (a PolyU startup) **Dr JIANG Heng** Postdoctoral Fellow, Department of Applied Physics; Co-founder, Dragon Vision Technology Limited (a PolyU startup)	 * *Photographed are Dr Jiang Heng (left) and his research team member*  

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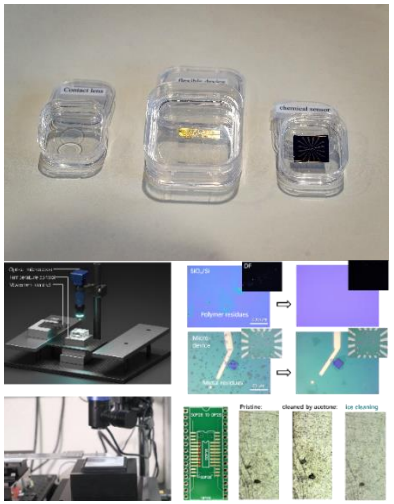
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**A Mechanical Cleaning Method for Semiconductors and Electronics Using Ice** The global semiconductor market is experiencing significant growth, driven by the increasing demand for advanced electronics across multiple sectors. However, contamination introduced during the fabrication process remains a critical issue as it can severely deteriorate device performance. This invention introduces an ice-assisted mechanical cleaning method for preparing ultra-clean semiconductor and electronic devices. By exploiting the adhesion properties of ice, the method removes surface contaminants effectively. Compared with conventional cleaning methods, this ice-based cleaning method is universal, time- and cost-saving, and more environmentally friendly.	**Prof ZHAO Jiong** Professor, Department of Applied Physics; Co-founder and Scientific Advisor, Clean2D Co., Limited (a PolyU startup) **Dr LIU Haijun** Postdoctoral Fellow, Department of Applied Physics; Founder, Clean2D Co., Limited (a PolyU startup)	 ** Photographed is member of the research team* 

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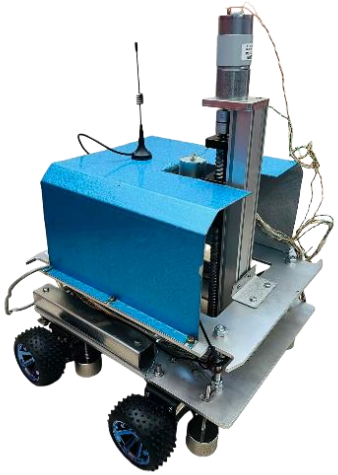
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Construction Robot for Modular Integrated Construction (MiC) and Steel Structure** This invention is an autonomous (or remotely controlled) climbing construction robot designed to automate bolt installation in modular integrated construction (MiC) and steel structures. Equipped with LiDAR, AI vision, negative pressure (or magnetic) adsorption technology and an innovative bolt installation system, the robot can climb vertical or inclined surfaces, align bolt holes with an accuracy of ± 0.2 mm, install the bolt shank and tighten nuts using a smart torque wrench. Using a modular battery system and a dual-rope safety mechanism, it can operate continuously, thereby improving construction quality, accelerating project timelines and enhancing on-site safety. This innovation represents a major step for the construction industry towards intelligent, automated and unmanned operations. A robust global IP portfolio is also being developed, with patent applications already submitted in the United States, the United Kingdom, the Chinese Mainland, and the Hong Kong Special Administrative Region.	**Dr HAN Xiao-Zhou** Postdoctoral Fellow, Department of Civil and Environmental Engineering	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Green Energy-driven Electrochemical Upcycling of Urban Solid Wastes** Modern industry follows a linear model: finite materials are extracted from the Earth, used, and discarded as waste. This accelerates depletion and environmental damage. This invention closes this disconnect by transforming urban solid wastes and captured CO_2 into high value, carbon negative minerals—specifically high purity calcium carbonate and nano-silica for diverse applications. Powered by renewable electricity, the electrochemical process achieves in hours what geological processes require millennia to accomplish. Carbon is permanently mineralised and securely stored, while problematic wastes are upcycled into valuable raw materials. The system ultimately converts pollution into products and liabilities into assets, reducing reliance on virgin mining and conserving natural resources. By re-establishing circular material flows, the technology creates a scalable industrial pathway that mitigates climate change and generates durable economic value across multiple industries. It enables governments and investors to deploy measurable, high-impact decarbonisation and waste-management solutions.	**Prof. ZHANG Shipeng** Assistant Professor, Department of Civil and Environmental Engineering; Associate Director, Research Centre for Resources Engineering towards Carbon Neutrality **Prof. POON Chi Sun** Michael Anson Professor in Civil Engineering; Distinguished Research Professor, Department of Civil and Environmental Engineering; Director, Research Centre for Resources Engineering towards Carbon Neutrality	 **Photograghed are members of the research team* 

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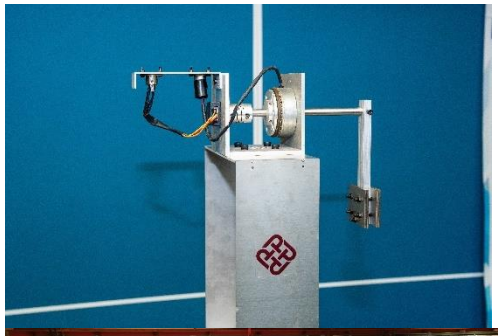
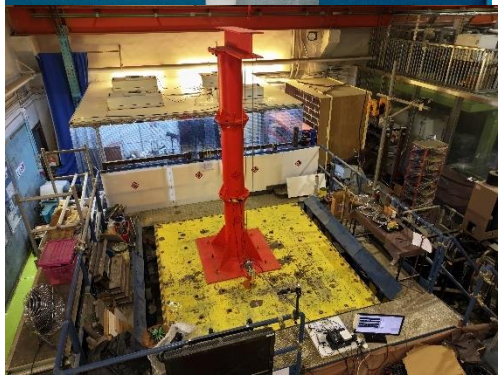
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Latching-based Smart Control System for Mitigating Ultra-low-frequency Vibrations: Inspired by Wave Energy Converters** Inspired by wave energy converters, this invention introduces a smart latching-based vibration control system that addresses one of the toughest engineering challenges: ultra-low-frequency vibrations in floating and flexible structures such as wind turbines, high-rises and towers. These vibrations can impair functionality or even cause catastrophic damage, a challenge that conventional control methods fail to fully address. The compact, high-efficiency system significantly enhances energy dissipation through robust algorithms, delivering reliable control of ultra-low-frequency vibrations to improve operational performance and extend the service life of key structures. The technology has passed conceptual validation as well as small-scale and full-scale model tests, confirming its feasibility and readiness for real-world deployment. Its potential applications include ocean platforms, wind turbines, cranes and other large-scale structures, setting a new standard for vibration control.	**Prof. ZHU Songye** Interim Head and Professor, Department of Civil and Environmental Engineering; Interim Director, Chinese National Engineering Research Centre for Steel Construction (Hong Kong Branch) **Mr WANG Hao** PhD Candidate, Department of Civil and Environmental Engineering	 **Photographed are Prof. Zhu Songye (right) and Mr Wang Hao (left)*  

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**WING: Wireless Infrastructure for Next-generation EV Charging** Wireless charging offers a safe, convenient and intelligent solution for electric vehicle (EV) charging. WING advances this technology by addressing critical compatibility, safety and cost challenges that constrain existing systems, delivering a universal and simplified platform. WING's novel OA3 architecture decouples the physical and control layers, enabling low- or non-invasive installation in under four minutes without vehicle modification or software updates. It also ensures compatibility with all EV models, communication protocols, parking accuracies and chassis heights. The system incorporates advanced dual-layer coils that achieve an industry-leading 0.51 distance-to-diameter ratio—an improvement of over 25% relative to the conventional 0.41, with 43% better misalignment tolerance than SAE standards. AI-optimised magnetic-, module- and semiconductor-level innovations deliver grid-to-battery efficiency above 95.6%, while advanced intelligent magnetic and thermal protection ensures ultra-safe operation. By integrating hardware, software and safety innovations, WING offers a practical, scalable and future-ready wireless charging platform for global EV adoption.	**Prof. CHAU Kwok-tong** Chair Professor of Electrical Energy Engineering, Department of Electrical and Electronic Engineering	 **Photograghed is member of the research team* 

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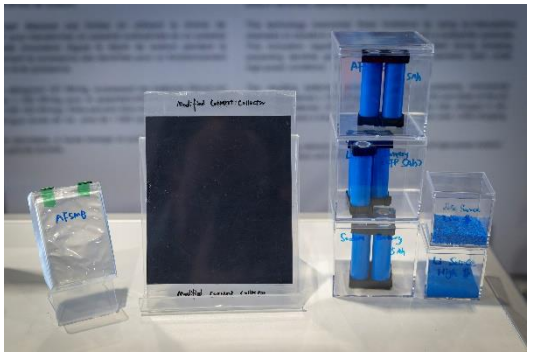
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Fast-charging Anode-free Sodium Metal Batteries** Sodium batteries are naturally safer and more affordable than lithium-ion batteries, but their energy density remains too low for many applications. Anode-free sodium metal batteries (AFSMBs) offer high energy density, but typically suffer from short lifespans and the formation of sodium dendrites, especially during fast charging. This technology overcomes these limitations by using co-intercalation chemistry to transform a sodiophobic substrate into a sodiophilic substrate. This innovation regulates how sodium is deposited during charging, preventing dendrite growth and enabling stable operation even under high-power conditions. The resulting batteries achieve 197 Wh/kg, surpassing commercial lithium-ion batteries (~160 Wh/kg for graphite/LiFePO4) and state-of-the-art sodium-ion batteries (100–150 Wh/kg). They can be fully charged in ten minutes and have a long lifespan with stable operation over 1,000 charging cycles. This technology delivers an affordable, high-energy and high-power solution for next-generation and large-scale energy storage.	**Prof. XU Zheng Long** Associate Professor, Department of Industrial Systems and Engineering **Dr LYU Lin Long** Postdoctoral Fellow, Department of Industrial Systems and Engineering	 **Photographed is Dr Lyu Lin Long* 

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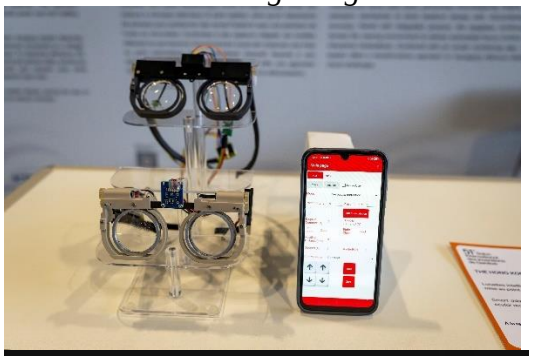
Award(s)	Project description	Principal Investigator(s)	Image(s)
Gold Medal	**Adaptive Freeform Eyeglass for Instant Refractive Control** This invention is the first freeform eyeglass that automatically adjusts its own prescription to instantly correct refractive errors. Its slim, ergonomic mechatronic frame uses silent, sensorless microstepping motors and a precision mechanism to drive freeform lenses with micrometre-level accuracy. Paired with integrated sensors, the eyeglass continuously senses the viewing environment to deliver automated focus control and interactive biofeedback. Combined with an ocular monitoring app, this system offers a transformative approach to managing defocus-related visual challenges.	**Dr Elie Aymard Jonathan de LESTRANGE-ANGINIEUR** Research Fellow, School of Optometry **Prof. George WOO** Emeritus Professor and Senior Advisor, School of Optometry	 **Photographed is Dr Elie Aymard Jonathan de Lestrange-Anginieur*  

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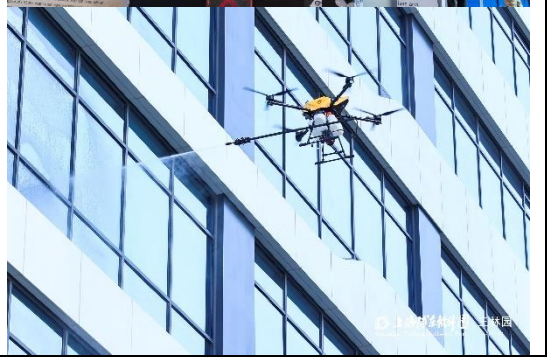
Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Safety-assured AI-driven Drone System for Cleaning Building Exteriors** This safety-assured, AI-driven drone system eliminates the high risks and inefficiencies of manual high-rise cleaning. Unlike conventional drones that struggle in dense cities due to signal obstruction, this innovation uses advanced multi-sensor fusion (LiDAR/GNSS/Vision) to achieve centimetre-level precision even in GNSS-denied urban canyons. The system offers fully autonomous operation, integrating disturbance-resistant control, intelligent obstacle avoidance and optimal path planning without the need for manual piloting. It enables close-proximity cleaning with exceptional stability and connects to an unattended replenishment platform for continuous operation. By resolving the critical industry bottleneck of positioning reliability in complex environments, this solution establishes a new standard for trustworthy, efficient and safe urban infrastructure maintenance.	**Prof. WEN Weisong** Assistant Professor, Department of Aeronautical and Aviation Engineering; Founder, CeresRobotics.ai Limited (a PolyU startup)	 **Photographed is member of the research team*  

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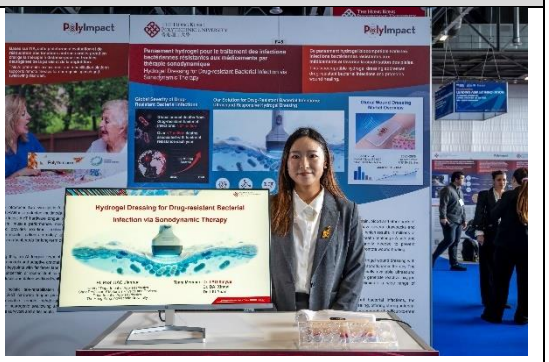
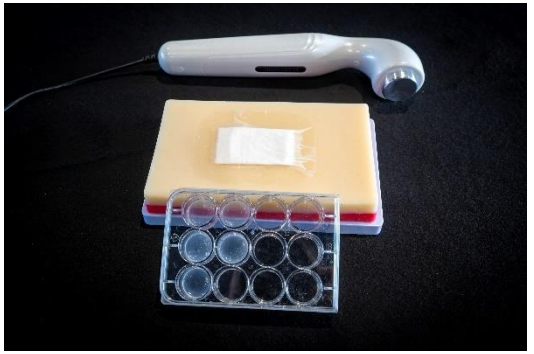
Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Hydrogel Dressing for Drug-resistant Bacterial Infection via Sonodynamic Therapy** Bacterial infections can affect skin, lungs, brain, blood and other parts of the human body. Conventional antibiotics have several drawbacks and may lead to antimicrobial resistance (AMR), which results in millions of deaths worldwide and poses a major public health challenge. A safe and effective treatment approach is thus urgently needed to prevent multidrug-resistant bacterial infections and promote wound healing. This invention introduces a biocompatible hydrogel wound dressing with broad-spectrum sterilising effects enabled by sonodynamic therapy. The dressing requires only a portable, commercially available ultrasound device to activate its sonosensitisers, which generate reactive oxygen species under ultrasound irradiation to eliminate a wide range of bacteria. In addition to treating multidrug-resistant bacterial infections, the dressing also promotes diabetic wound healing, offering strong potential for clinical translation and improved management of difficult-to-treat wounds.	**Prof. HAO Jianhua** Head and Chair Professor of Materials Physics and Devices, Department of Applied Physics; Associate Director, PolyU-Wuhan Technology and Innovation Research Institute	 **Photographed is member of the research team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**ProMuki: Wearable Ultrasound Monitoring and Analysing of Muscle Activities for Fitness, Sports and Rehabilitation** ProMuki empowers users to understand the complexities of human motion, supporting and optimising tele-applications in sports training, musculoskeletal diagnosis and rehabilitation. This wearable platform integrates advanced technologies to monitor, analyse, interpret and provide feedback on signals related to muscle dynamics in real-time. By combining electrophysiological and biomechanical data, ProMuki enables in-depth assessment of muscle health and function, going beyond conventional static imaging. It draws the attention of clinicians, trainers or patients to dynamic muscle behaviour and immediate adjustments to interventions based on the results. Our embedded AI-driven sonomyography algorithm instantly quantifies changes in muscle architecture from ultrasound images, allowing tracking of fluctuations in muscular structures and performance trends. The platform features wireless, palm-sized ultrasound hardware and adaptable transducer designs, ensuring comfort and mobility without restricting natural movement. By removing the constraints of traditional cabled and operator-dependent systems, ProMuki enhances time- and cost-effectiveness and expands assessment possibilities across diverse environments.	**Prof. ZHENG Yongping** Henry G. Leong Professor in Biomedical Engineering; Chair Professor of Biomedical Engineering, Department of Biomedical Engineering; Director, Research Institute for Smart Ageing; Director, Jockey Club Smart Ageing Hub	 **Photographed is member of the research team*  

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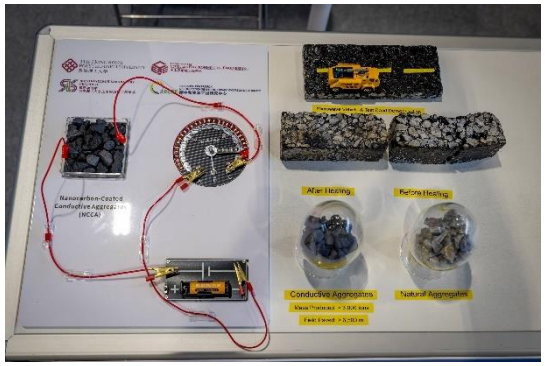
Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Nanocarbon-coated Conductive Aggregates (NCCA) for Smart, Sustainable Asphalt Pavement** Nanocarbon-coated Conductive Aggregates (NCCA) are the world's first smart pavement material combining self-healing, self-sensing, defect detection and deicing to enable intelligent pavement maintenance and improve winter traffic safety. Developed to address the uneven dispersion of carbon material in traditional asphalt modification, NCCA replace natural aggregates in asphalt pavement construction to achieve uniform performance and enhanced durability. The material has excellent electrical, microwave-heating, thermal and mechanical properties. It improves mechanical strength and enables efficient conversion of electrical or microwave energy, significantly enhancing microwave-heating, self-healing, and conductive or microwave-heating deicing performance. NCCA also function as a piezoresistive sensor for intelligent traffic detection. When combined with 3D ground-penetrating radar and AI, they also enable more accurate identification of hidden defects, such as cracks, and help determine the optimal timing for self-healing.	**Prof. LENG Zhen** Professor, Department of Civil and Environmental Engineering; Associate 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)
Silver Medal	**Next-generation Electric Vehicles Based on In-motion Wireless Resonant Charging Technologies** In-motion-charging wireless power transfer (WPT) technology uses road-embedded energy transmitters to power direct-drive in-wheel motors, eliminating the need for onboard batteries. This approach significantly reduces vehicle weight and avoids power loss from battery charging and discharging. The project introduces a resonant wireless charging system featuring dual receiver coils and compensation networks connected to a voltage doubler rectifier, ensuring stable DC output. To maximise efficiency, DD coil structures are used on both the ground and vehicle sides, enhancing the coupling coefficient between track and receiver coils while minimising cross-coupling between adjacent track coils. This solution offers a compact and reliable design, paving the way for next-generation battery-free, direct-drive electric vehicles.	**Prof. NIU Shuangxia** Professor, Department of Electrical and Electronic Engineering	 **Photograghed is member of the research team*   

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**DermaScan AI** DermaScan AI is an intelligent radiotherapy side-effect management platform designed to provide objective, automated and clinically reliable assessment of post treatment toxicities in cancer patients. By integrating multimodal sensing technologies with advanced AI algorithms, the robot captures and analyses skin conditions and other treatment related reactions in a standardised and reproducible manner. It helps clinicians monitor radiation induced side effects such as dermatitis and oral mucositis, enabling earlier detection, timely intervention and improved continuity of care. The robot functions as a comprehensive post radiotherapy management platform, supporting treatment quality control, patient follow up and long-term outcome tracking. By combining medical grade hardware with intelligent software analytics, it enhances workflow efficiency, reduces subjective variability in clinical assessment and helps establish consistent toxicity evaluation standards across radiotherapy centres. Ultimately, it enhances patient safety and improves the overall treatment experience in modern cancer care.	**Prof. CAI Jing** Head and Chair Professor of Medical Physics and Intelligent Oncology, Department of Health Technology and Informatics; Technical Advisor, InsightRT Limited (a PolyU startup) **Dr MA Zongrui** Postdoctoral Fellow, Department of Health Technology and Informatics; CEO, InsightRT Limited (a PolyU startup)	 ***Photographed is member of the researched team* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Intelligent Driving Training and Evaluation System for Heavy-duty Trucks** The Intelligent Driving Training and Evaluation System is a cutting-edge simulator designed for commercial driver training. Featuring a six-degree-of-freedom motion platform and a real truck cabin, it offers realistic driving experiences. Sensors track driver behaviour in real time, enabling precise assessment and targeted feedback. Supporting logistics, emergency services and fleet operations, the system provides scalable and cost-effective training to enhance safety and operational efficiency. Backed by Hong Kong's Smart Traffic Fund, it has achieved key milestones through industry collaboration and academic contributions.	**Prof. FU Xiaowen** Head and Chair Professor of Logistics Engineering, Department of Industrial and Systems Engineering **Dr TANG Yuk Ming** Senior Lecturer, Department of Industrial and Systems Engineering	 ** Photographed are Dr Tang Yuk Ming (right) and his research team member*  

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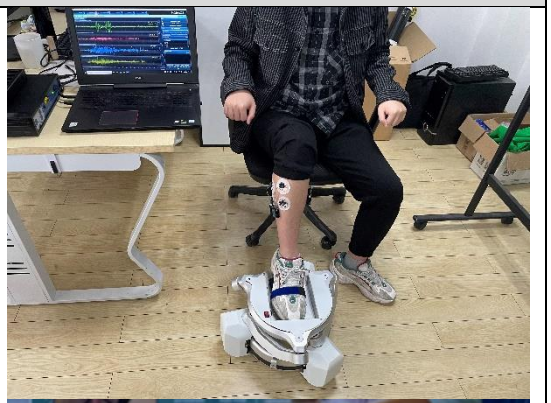
Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Intelligent Ankle Rehabilitation Robot** The Intelligent Ankle Rehabilitation Robot addresses the limitations of traditional rehabilitation devices, which often lack precision, adaptability and suitability for home use. The robot uses a generalised parallel mechanism to offer improved compactness, rigidity and precision, making it well-suited for home rehabilitation. It integrates three-axis motion rehabilitation with electromyographic feedback technology, enabling personalised training and increased adaptability to patient needs. By reducing device size and improving portability, the system increases accessibility for home rehabilitation, enhances efficiency of training and eases the workload of rehabilitation professionals. It offers a more efficient, precise and user-centred approach to ankle rehabilitation, providing significant advantages over existing solutions.	**Prof. ZHANG Dan** Chair Professor of Intelligent Robotics and Automation, Department of Mechanical Engineering; Director, PolyU-Nanjing Technology and Innovation Research Institute	 

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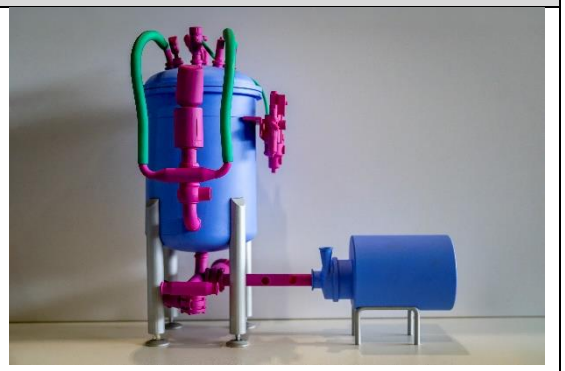
Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**Carbon Dioxide Reduction Device** This invention is a carbon dioxide reduction device that converts CO_2 into carbon and metal oxides through reaction with gallium-based alloys. Designed for use in fuel power plant processes, the process leverages the chemical reactivity of the alloy to promote efficient CO_2 conversion, supported by an equipment structure designed to enhance reaction performance. In addition to producing carbon and metal oxides, the device helps to remove deposited carbon and suppress coking, thereby improving overall conversion efficiency.	**Mr TAN Qian** Alumnus, Department of Management and Marketing; CEO, Huaxia Gallium Carbon Technology (Shenzhen) Co., Ltd (a PolyU startup)	

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Silver Medal	**FlavoTear - Baicalein: A Novel Disease-Modifying Agent for Dry Eye Disease** Baicalein, a bioactive plant-derived flavonoid, offers a multifunctional therapeutic solution for dry eye disease through its potent anti-inflammatory, anti-oxidative and anti-apoptotic properties that disrupt the disease's vicious cycle. In hyperosmolar human corneal epithelial cell models, baicalein significantly reduced elevated cytokine expression, enhanced wound healing and improved cell viability. It also suppressed mitochondrial reactive oxygen species and malondialdehyde levels, indicating protection against oxidative damage and mitochondrial dysfunction. This allows Baicalein to treat the root cause of dry eye — the "vicious cycle" of inflammation and oxidative stress — rather than merely masking the symptoms.	**Prof. Chi-wai DO** Associate Professor, School of Optometry; Associate Director, PolyU-Nanjing Technology and Innovation Research Institute; Principal Investigator, InnoHK Centre for Eye and Vision Research **Prof. Emmanuel HO** Associate Director, Graduate Studies and Research, University of Waterloo; Principal Investigator, InnoHK Centre for Eye and Vision Research	 **Photographed are Prof. Chi-wai Do (right) and his research team member* 

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Award(s)	Project description	Principal Investigator(s)	Image(s)
Bronze Medal	**Oral-motor Assessment and Rehabilitation Mobile App (ORAR App)** This invention introduces two synergistic AI innovations for oral motor rehabilitation. ORAR is a patented multimodal AI mobile application that, paired with the latest AIoT hardware tongue pressure sensors, assesses tongue and oral muscle performance, delivers personalised gamified exercises, and provides real-time feedback and progress tracking. Therapists can monitor patients remotely, adjust treatment plans, and review data-driven dashboards for long-term outcome evaluation and early risk detection. Complementing this, an AI tongue keypoint training system uses dual computer-vision models and adaptive annotation to detect tongue direction and anatomical keypoints with far fewer labelled images. By automatically selecting only uncertain or inconsistent samples for manual labelling, it significantly reduces annotation workload while improving model accuracy. Our holistic tele-rehabilitation multimodal AI technologies, integrated with an AIoT hardware tongue pressure sensor, enable precise assessment, scalable remote rehabilitation and efficient model development for neurogenic swallowing and speech disorders, thereby benefiting stroke survivors and older adults.	**Dr Winsy WONG** Research Assistant Professor, Department of Language Science and Technology; Clinical Consultant and Co-inventor, Feelings Group Ltd (a PolyU startup) **Miss YIP Chi Hay** Founder, Feelings Group Limited (a PolyU startup)	 **Photographed is member of the research team*