THE HONG KONG POLYTECHNIC UNIVERSITY
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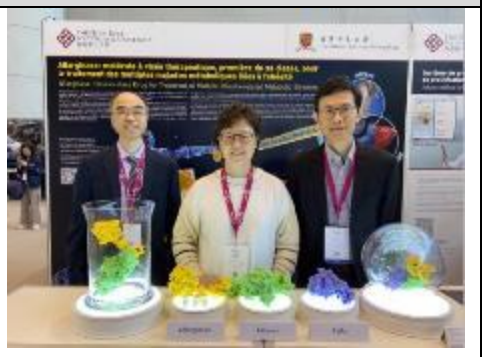
Appendix

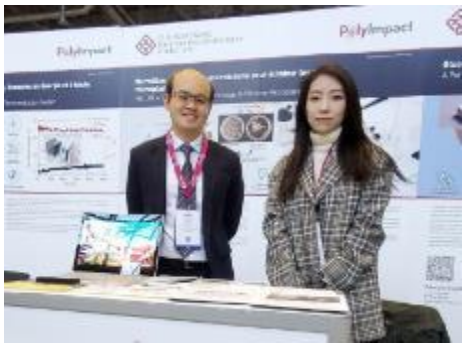
PolyU's winning innovations at 48th Geneva Inventions Expo

Project description	Principal Investigator(s)	Images and videos
Novel High Efficacy Nano Multi-ring Defocus Incorporated Spectacle Lens for Myopia Control The novel Nano Multi-ring Defocus Incorporated Spectacle (NMDIS) lens combines the cutting-edge Defocus Incorporated Soft Contact (DISC) lens and Ultra-precision Nano Multi-ring Machining Technology (UPNMMT) to slow myopic progression in children. It features annular spaced correction zones and defocus zones. The former correct vision at the central retina and the latter focus light slightly before the retina to achieve myopia defocus, slowing myopic progression by inhibiting eyeball elongation. UPNMMT enables the precision moulding of NMDIS lenses, reasonably distributes optical power to generate a smooth and seamless lens surface, and effectively balances clear vision, comfort and myopia control.	**Prof. Benny CHEUNG Chi-fai** Chair Professor of Ultra-precision Machining and Metrology, Department of Industrial and Systems Engineering and Director of State Key Laboratory of Ultra-precision Machining Technology **Prof. TO Chi-ho** Visiting Chair Professor of Experimental Optometry, School of Optometry **Mr Jackson LEUNG Tze-man** Co-founder, Vision Science & Technology Co Ltd (a PolyU Academic-led start-up)	  Download images: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
ABarginase: First-in-class Drug for Treatment of Multiple Obesity-related Metabolic Disease ABarginase, an albumin-binding recombinant human arginase, is the world's first therapy that safely and effectively treats multiple metabolic diseases related to obesity and insulin resistance, including prediabetes, type 2 diabetes and nonalcoholic fatty liver disease, via arginine starvation. Having a long circulating half-life and strong enzymatic activity, it starves the semi-essential amino acid arginine by maintaining it in circulation at low levels. Based on the research team's breakthrough discovery that arginine starvation suppresses fat synthesis, promotes fat breakdown and sensitises cells to insulin, ABarginase was engineered using an advanced fusion protein strategy that enables an inexpensive and highly efficient fabrication process, making it affordable and widely adoptable for clinical applications.	**Prof. Thomas LEUNG Yun-chung** Professor, Department of Applied Biology and Chemical Technology and Lo Ka Chung Charitable Foundation Professor in Pharmaceutical Sciences, The Hong Kong Polytechnic University **Prof. Alisa SHUM Sau-wun** Associate Professor, School of Biomedical Sciences, Faculty of Medicine, The Chinese University of Hong Kong	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
Mars Landing Surveillance Camera for Tianwen-1 Mars Soft Landing Mission Designed for use in the harsh Martian environment, this space qualified camera has a wide temperature range, low distortion, an ultra-wide 170-degree diagonal field of view and shock resistance up to 6,200G (i.e. 6,200 times the force of Earth's gravity). Weighing only 390 grams, it features integrated thermo-dissipation and layered metallic radiation protection with a flexible shock absorbing structure. It landed on Mars onboard Tianwen-1 lander in 2021, and monitored the landing status and the deployment of the Mars rover. The key technologies developed for this camera have been transferred to products on earth, e.g. surgery robotics and robotic in-line inspection for water mains.	**Prof. YUNG Kai-leung** Sir Sze-yuen Chung Professor in Precision Engineering, Director of Research Centre for Deep Space Explorations, Chair Professor of Precision Engineering and Associate Head, Department of Industrial and Systems Engineering, PolyU	  Download images: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
AI-Assisted Design of Functional Clothing for Scoliosis Treatment This new approach significantly improves scoliosis treatment and the quality of life for adolescent idiopathic scoliosis (AIS) patients by adopting AI to create tailor-made functional clothing for treating AIS. Patient data is used to train a decision tree and three neural networks to prescribe and configure the brace, which is then customised by professionals. Optimised designs, e.g., padding placement, tightness of elastic straps and configurable 3D structures, are suggested to enhance functionality, increase wearing comfort, and reduce the wearer's spinal curvature. This makes an excellent alternative to the heavy and uncomfortable traditional braces prescribed by orthotists.	**Dr Joanne YIP Yiu-wan** Associate Dean and Associate Professor, School of Fashion and Textiles	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
MicroGlue: Microbial-derived Technology to Remove Microplastic Pollutants This microbial biotechnology offers a safe, low-cost and efficient way to remove microplastics from water, using biodegradable microbial-derived polymers to aggregate hard-to-remove microplastic contaminants into clumps that are easily separable and removable from the environment. It can be integrated into the final purification stage of wastewater treatment, or used as a stand-alone solution for polluted sea water or fresh water. It is scalable, simple to install into existing processes, and has low operating costs, making it a convenient way to retrieve microplastics for resource recovery and plastic recycling, and mitigate the harmful effects of microplastics on humans and ecosystems.	**Dr CHUA Song-lin** Assistant Professor, Department of Applied Biology and Chemical Technology **Dr LIU Yang** GBA Startup Postdoctoral Fellow, Department of Applied Biology and Chemical Technology	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
A Novel Wireless Self-adaptive Hydropower Harvesting System for Applications in Urban Water Supply Pipelines This micro system generates electricity from water pipelines to power the data monitoring meters and sensors in Hong Kong's Water Intelligent Network (WIN) for water supply management and leakage reduction while limiting water head loss. Successfully tested on the city's water pipelines for over one year, the 4th-generation system demonstrated superior performance in providing a continuous and reliable power supply to the WIN and other potential users. The system is more sustainable and cost-effective than traditional chemical batteries which need frequent replacing, reducing maintenance costs and improving reliability. It has the potential for use in water pipelines in other cities.	**Prof. YANG Hongxing** Professor, Department of Building Environment and Energy Engineering	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
Advanced Real-time Prediction and Early Warning System for the Spread of Emerging Pathogens This platform provides daily predictions of early risk for different pathogen variants at different locations and active early warning of high-risk locations. It uses novel patented spatiotemporal epidemic prediction models and automatic data collection/prediction engines to make highly accurate real-time predictions with fine spatial resolution, supporting government control measures and helping the public make safer travel plans. Since 2020, it has successfully tracked different SARS-CoV-2 variants and supported COVID-19 control measures around the world. Research reports based on this system were highly praised by the World Health Organization. The system has been reported on by global media about 100 times.	**Prof. John SHI Wenzhong** Otto Poon Charitable Foundation Professor in Urban Informatics, Chair Professor in GISci and Remote Sensing, Director, PolyU-Shenzhen Technology and Innovation Research Institute (Futian), Director, Smart Cities Research Institute, Academician, International Eurasian Academy of Sciences, Fellow, Academy of Social Sciences (UK)	 Download image: https://polyu.me/3AESrGR

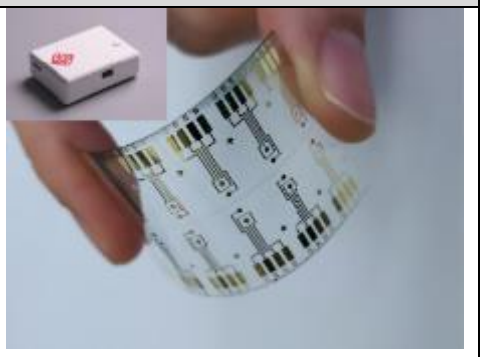
Project description	Principal Investigator(s)	Images and videos
A Sport-Specific Soft Manikin System for Sports Bra Design This soft manikin system offers a complete solution and scientific guidelines for designing effective sports bras, providing designers with valuable insights. Using simulated skin, breast tissue and human running motion, it can replace human bra fit trials and measures the performance and pressure of sports bras scientifically, objectively and reliably. The biomechanics of breast motion are incorporated to evaluate and optimise the fit, comfort, support, and protection offered by sports bras. It measures bra pressure and sensation comfort, while tracking 3D body and breast motion to assess the bras' breast control performance in all directions (X, Y and Z).	**Dr YICK Kit-lun** Associate Professor, School of Fashion and Textiles	 Download image: https://polyu.me/3AESrGR

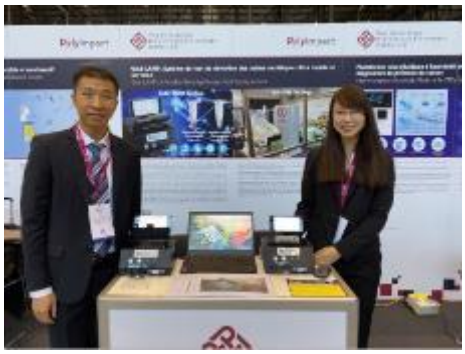
Project description	Principal Investigator(s)	Images and videos
Revolutionary Mussel-inspired Polyester for Next Generation Sportswear and Functional Clothing Inspired by how marine mussels stick to rocks, this invention improves polyester's abilities to absorb water, resist odours and prevent static electricity build-up by adding a special polymer which forms a long-lasting bond with the polyester. When sprayed on one side of the polyester, it creates a one-way moisture transport effect, meaning that sweat and water is absorbed by the clothing and transported from the body, keeping the wearer cool and dry. The resulting clothes are more comfortable and hygienic to wear, and can withstand over 100 laundry cycles. This technology is ideal for making sportswear and other functional clothing.	**Prof. John XIN Haozhong** Lee Family Professor in Fashion & Textiles, Chair Professor of Textile Chemistry, School of Fashion and Textiles	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
Safe and Eco-friendly Antimicrobial Materials with High Efficiency Novel proprietary technologies have been developed to prepare highly-efficient, eco-friendly antimicrobial polyhydroxyalkanoate oligomers (PHAOs), which can be used as disinfectants, finishing agents for personal protective equipment, and in PHAO/PA blend yarns. These PHAO materials are ideal for medical applications as they are fully biodegradable, transparent, non-toxic and non-allergic. With wide-spectrum antimicrobial properties, they can eliminate more than 99.99% of S. Aureus, K. pneumoniae, C. albicans, Methicillin-resistant S. aureus, as well as COVID-19, H1N1 and H3N2 viruses. Compared with current commercial antimicrobial agents, they are more effective against microbes, safer, more biodegradable, cheaper, and emit less carbon.	**Prof. TAO Xiaoming** Director, Research Centre of Smart Wearable Technology, Vincent and Lily Woo Endowed Professorship in Textiles Technology, Chair Professor of Textile Technology, School of Fashion and Textiles **Dr ZHANG Ziheng** Postdoctoral Fellow, School of Fashion and Textiles, CEO, Ecolar Technology Limited (a PolyU Academic-led start-up)	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
Advanced Intelligent System for Radiation-free Scoliosis and Posture Evaluation This radiation-free, non-contact edge intelligence system can screen, diagnose, monitor, and provide real-time treatment feedback for common adolescent spinal deformities, e.g., scoliosis and posture problems. Based on intelligent light sensing technology, topographical technology and artificial intelligence algorithms, the AI + 3D infrared imaging system allows users to conduct AI-based online scoliosis screening and monitoring comfortably at home using edge devices (e.g., smartphones). It can perform 3D spine reconstruction, visualisation and measurement during monitoring and rehabilitation for comprehensive evaluation. Compared to costly and potentially harmful traditional methods such as manual mass screening and X-rays, it is safe, cost-effective, accurate and easy-to-use.	**Mr Jackal XU Zhenda** PhD Student, Department of Computing, Founder, Zero Dynamic Medical Technology Company Limited (a PolyU Academic-led start-up) **Prof. GUO Song** Professor, Department of Computing, Chief Scientist, Zero Dynamic Medical Technology Company Limited (a PolyU Academic-led start-up)	 Download image: https://polyu.me/3AESrGR

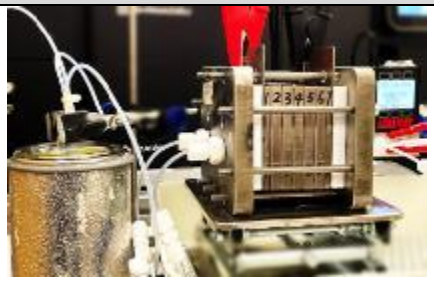
Project description	Principal Investigator(s)	Images and videos
Novel AI Automated Histological System for Carcinoma Detection This cost- and time-effective AI solution enables more efficient and accurate cancer diagnosis by predicting and prioritising carcinoma cases for histopathological analysis without requiring pixel-level annotation. It uses a down-sampling method to transform massive image information into countable features for disease diagnosis, and presents a computer-aided diagnosis by measuring relative cell density with suspicious significant histological features. It also offers a method for histopathological triage systems before implementation in a digital pathology setting. It solves the problem of triaging biopsies in clinical settings, developing decision support systems without pixel-level annotation, and providing bio-interpretable heatmaps for highlighting significant histopathological features.	**Dr Martin YEUNG, Ho-yin** Research Assistant Professor, Department of Health Technology and Informatics, Co-Founder, Anatomic Technologies Limited (a PolyU start-up)	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
A Portable Non-invasive and Ultrasensitive Saliva Glucose Sensor This new type of ultra-sensitive glucose sensor is portable, cost-effective, and non-invasive. Based on a flexible organic electrochemical transistor, it detects real-time saliva glucose levels using a portable meter and a smartphone, making it possible to calculate corresponding blood glucose levels. The biosensor has a stable sensing performance and high selectivity and sensitivity, with a detection limit of approximately 10nM. Clinical trials have shown a consistent relationship between fasting saliva and blood glucose levels in hundreds of human subjects with and without diabetes. This invention paves the way for non-invasive and continuous blood glucose monitoring through saliva analysis.	**Prof. YAN Feng** ADoRI-IWEAR & Chair Professor of Organic Electronics, Department of Applied Physics	 Download image: https://polyu.me/3AESrGR Video: https://polyu.me/3naPfzG

Project description	Principal Investigator(s)	Images and videos
Gold-LAMP: A Portable Ultra-fast Nucleic Acid Testing System Gold nanoparticle-based loop-mediated isothermal amplification (Gold-LAMP) technology offers a portable, fast, low cost, and highly accurate nucleic acid testing method that is convenient and efficient especially for on-site and decentralised settings. It uses surface-functionalised gold nanoparticles that appear as a red dispersion in a negative LAMP sample, but as red precipitates in a positive LAMP sample. Real-time precipitation monitoring using a handheld instrument takes just 10–20 minutes. Clinical validation conducted for on-site COVID-19 testing in a hospital accident and emergency department achieved 98.4% sensitivity and 100% specificity with a total assay time of 25–45 minutes.	**Prof. YIP Shea-ping** Chair Professor and Head, Department of Health Technology and Informatics, Co-Founder, Pocnat Limited (a PolyU Academic-led start-up) **Dr Thomas LEE Ming-hung** Associate Professor and Associate Head (Academic), Department of Biomedical Engineering, Co-Founder, Pocnat Limited (a PolyU Academic-led start-up)	 Download image: https://polyu.me/3AESrGR Video: https://polyu.me/3oKylbp

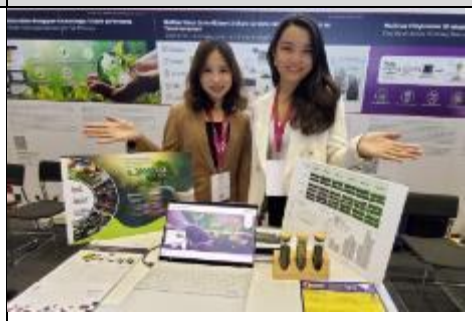
Project description	Principal Investigator(s)	Images and videos
High-throughput Microfluidic Platform for CTCs Detection in Cancer Precision Diagnostics Early tumour detection by analysing circulating tumour cells (CTCs) in the bloodstream is difficult due to its small population in the blood. Addressing this challenge, the portable and non-invasive nanosensor-integrated digital microfluidic flow cytometry (Nano-DMFC) platform accurately isolates CTCs from clinical samples within 10 minutes with a CTC purity greater than 95%. It can also detect multiple characteristic tumour microRNAs (miRNAs) in single CTCs to determine tumour heterogeneity for cancer precision diagnostics. It offers high-throughput, and rapid, accurate detection and analysis of CTCs in clinical samples at the single cell level, facilitating early detection, diagnosis, prognosis and effective treatment of cancer.	**Prof. YANG Mo** Associate Head (Research) and Professor, Department of Biomedical Engineering	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
Long-lasting Self-disinfecting Materials Technology The world's first antiviral 3D printing technology developed by Immune Materials Limited is used to create products that can eliminate 70% and 99.2% of the pathogens on their surface within two minutes and 20 minutes respectively. It is highly effective in preventing the spread of pathogens, e.g. E. coli and human coronavirus, in settings such as healthcare facilities, schools, and public transportation. The resulting products have a long-lasting performance of over three years, and can be custom-designed in any shapes and sizes. This technology can also be used to produce high-quality, soft, non-toxic and versatile materials, such as vegan leather.	**Dr Chris LO Kwan-yu** Associate Professor, School of Fashion and Textiles, Co-Founder, Immune Materials Limited (a PolyU Academic-led start-up) **Prof. KAN Chi-wai** Professor, School of Fashion and Textiles, Co-Founder, Immune Materials Limited (a PolyU Academic-led start-up)	  Download images: https://polyu.me/3AESrGR Video: https://polyu.me/40GWVau

Project description	Principal Investigator(s)	Images and videos
Durable, High-Selectivity, and Energy Efficient CO_2 Electroreduction System This durable, energy-efficient CO_2 electroreduction system offers a promising solution for reducing CO_2 emissions. Comprising a sandwich-structured membrane-electrode-assembly with a combined anion- and proton-exchange membrane separating the cathode and anode, it converts CO_2 to C_2H_4 with a high selectivity of up to 50% Faradaic efficiency and remain stable for over 1,000 hours. It requires pure H_2O as the electrolyte, involving no chemical input. The lab operating current can exceed 10A, meaning that it can be easily scaled up to an industrial scale. This system can accelerate the development of CO_2 electrocatalysis technology, potentially revolutionising modern fossil fuel energy systems.	**Prof. Daniel LAU Shu-ping** Head, Director of UMF, Associate Director of PRI, Chair Professor of Nanomaterials, Department of Applied Physics	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
One-Stop Solution with AI Visual Object Recognition for 3D Model Generation This new technology makes 3D virtual tours more accessible and affordable by removing the need for costly professional software and high-performance hardware, as well as time-consuming manual work. The system creates a nearly fully automatic workflow with a robot-based 3D model generation system and a browser-based visualisation platform. Using a smartphone, tablet or computer with a browser, users can experience immersive virtual tours anytime and anywhere. This technology has the potential to revolutionise the way we create and experience virtual spaces and paves the way for a future where the metaverse is a part of our daily lives.	**Dr LI Yaxin** Postdoc Fellow, Department of Land Surveying and Geo-informatics, CEO, Micro Dimension Limited (a PolyU start-up) **Prof. CHEN Wu** Head and Professor, Department of Land Surveying and Geo-informatics	 Download image: https://polyu.me/3AESrGR Video: https://youtu.be/h__n9nIjBTs

Project description	Principal Investigator(s)	Images and videos
PolyPi: Edge-AI Empowered Robot for Autonomous In-pipe Inspection The innovative autonomous PolyPi robot provides real-time, effective and efficient pipeline inspection that leads to safer and more sustainable infrastructure in future smart cities. Using advanced Edge-AI technology, the defect detection AI models are optimised with compression and embedded in the robot, enabling it to detect pipeline defects in real time even in challenging environments, e.g., underground or underwater pipelines. The robot's unique deformable design allows it to adapt to and navigate through various pipe structures, e.g., curved, distorted, cross-branch, and broken pipes. Its self-control algorithms enable it to navigate autonomously without the need for manual operation.	**Prof. CAO Jiannong** Dean of Graduate School, Otto Poon Charitable Foundation Professor in Data Science, Chair Professor of Distributed and Mobile Computing, Director of Research Institute for Artificial Intelligence of Things (RIAIoT), Associate Director of University Research Facility in Big Data Analytics (UBDA)	 Download image: https://polyu.me/3AESrGR Video: https://youtu.be/MruTKKZXYP0

Project description	Principal Investigator(s)	Images and videos
BioCharttery: A Climate-smart and Carbon-negative Growing Material To tackle soil pollution, soil degradation and reduced soil fertility caused by the use of traditional fertilisers, e.g., chemical fertilisers and compost, as well as reduce the high carbon footprint due to their energy-consuming production processes, Biocharttery developed a patented thermochemical technology and a machine learning process that turns food waste into a carbon-negative biochar soil conditioner. The products have a highly porous structure, a large surface area, and other features that retain water, nutrients and microbes, activate the soil ecosystem, and adsorb pollutants. This significantly enhances long-term soil health, reduces maintenance and costs, and reverses soil degradation.	**Prof. Daniel TSANG Chiu-wa** Professor, Department of Civil and Environmental Engineering, Co-Founder, BioCharttery Limited (a PolyU Academic-led start-up) **Dr HE Mingjing** Research Associate, Department of Civil and Environmental Engineering, Co-Founder, BioCharttery Limited (a PolyU Academic-led start-up)	 Download image: https://polyu.me/3AESrGR

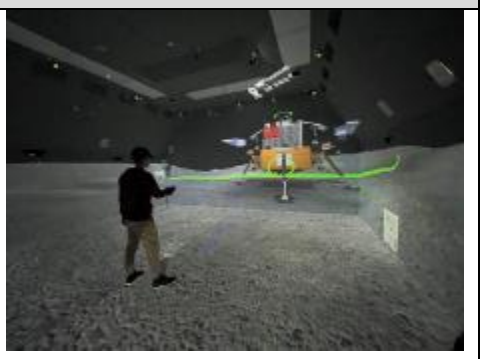
Project description	Principal Investigator(s)	Images and videos
System for Evaluation and Triage for Healthy Knee This smart ageing solution improves the quality of life of older adults, promotes early identification and intervention of diseases, supports healthy living, and helps to reduce medical burdens. The mobile app uses vision computing technology to assess physical health and the risk of common degenerative diseases through simple and convenient tests, including walking, sit-to-stand and knee bending. It offers fast and easy screening by measuring knee health data and categorising users into different risk groups subsequently. It also recommends exercise programmes tailored to individual needs, and tracks progress and changes regularly to evaluate and monitor knee health.	**Prof. Amy FU Siu-ngor** Peter Hung Professor in Pain Management, Assoc. Head (RS) & Professor, Department of Rehabilitation Sciences **Prof. CHEN Changwen** Chair Professor of Visual Computing, Department of Computing	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
All-in-one Luminescence-based Point-of-care Testing Device for Virus Diagnosis Unlike conventional viral-testing techniques, this all-in-one point-of-care diagnostics platform detects all nucleic acids, antigens and antibodies in a single testing device, providing a comprehensive and complementary diagnostic approach. This helps provide thorough information about infected patients, leading to more rapid and accurate diagnosis, better clinical treatment and better infection control for different viruses. Bluetooth technology enables rapid data transmission on the platform, thus reducing the risk of viruses spreading in the community. This device is highly accurate, rapid, and low-cost, offers an early diagnosis scheme that can guide clinical treatment, infection control, and vaccine developments for different viruses.	**Prof. HAO Jianhua** Chair Professor of Materials Physics and Devices, Department of Applied Physics	 Download image: https://polyu.me/3AESrGR Video: https://polyu.me/40Xsc9r

Project description	Principal Investigator(s)	Images and videos
Mutual Cognitive Human-robot Collaborative Manufacturing System This system provides a safer, more intuitive and user-friendly way for humans and robots to work together, which is promising for human-robot symbiotic manufacturing scenarios under Industry 4.0/5.0. It employs advanced machine learning to achieve vision-based human-robot collaboration (HRC) holistic scene perception with an average accuracy rate exceeding 97%. Digital twin and augmented reality (AR) technologies, deep reinforcement learning and inverse kinematics are adopted to ensure safe human-robot interaction with an accuracy rate of over 99.5%. It also leverages AR to provide intuitive support for HRC instructions and deploy visual reasoning-based cognitive decisions with an overall response time of less than 0.6s.	**Dr ZHENG Pai** Assistant Professor, Endowed Young Scholar in Smart Robotics, Department of Industrial and Systems Engineering, Co-founder, CobotAI Limited (a PolyU Academic-led start-up)	 Download image: https://polyu.me/3AESrGR Video: https://youtu.be/rqqBNET6GSs

Project description	Principal Investigator(s)	Images and videos
Novel Smart Precast Porous Road System Against Flooding Designed to replace conventional roads, this precast modular road system features a surface-induced drainage cover enhanced with 3D printing technology, filters in the drainage cover, a porous road base structure with optimised cavities, and an optional IoT-based sensing subsystem for flood warnings. The system effectively directs rainwater flow, improves driving safety, reduces traffic noise, removes sediments from stormwater runoffs, prevents clogging, reduces water pollution, detains stormwater and spreads heavy traffic loads. The detained water can help mitigate flooding risks, cool road surfaces, and discharge gradually into natural bodies of water. The light-weight, modular construction improves constructability and saves costs.	**Prof. WANG Yuhong** Professor, Department of Civil and Environmental Engineering	 Download image: https://polyu.me/3AESrGR Video: https://polyu.me/3NhcOBd

Project description	Principal Investigator(s)	Images and videos
The Fleming Ankle – Lightweight and Wearable Exoskeleton for Mobility Enhancement Fleming Ankle is a lightweight, easy-to-use, medical-grade, wearable robot that helps stroke patients rebuild neural pathways, regain mobility and restore independence. The sensors in the device analyse the wearer's intention to walk by detecting muscle movements and the electrical current inside those muscles. The soft robot at the ankle joint then exerts force to support the patient's movement. Meanwhile, therapists can track patients' rehabilitation progress through the device's software and create appropriate rehabilitation plans. Expected to be more affordable than similar products, Fleming Ankle is ready for a soft launch in collaborating rehabilitation centres, physiotherapy clinics and hospitals this year.	**Dr Kelvin HEUNG Ho-lam** Research Assistant Professor, Department of Building and Real Estate, Co-Founder & CTO, Fleming MedLab Limited (a PolyU Academic-led start-up)	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
HiVE: Hybrid Immersive Virtual Environment HiVE is the world's first large-scale X-Reality hybrid classroom with fully immersive Cave Automatic Virtual Environment (CAVE) technology, which blends virtual technology with conventional teaching for practical and collaborative learning. The 6-sided CAVE projection technology creates extremely real immersive 2D/3D environments that can visualise abstract concepts and novel viewpoints. The trapezoidal CAVE design enables low-cost ultra-short throw projectors to achieve excellence image quality. In HiVE, teachers can seamlessly switch between face-to-face and immersive teaching, while users can interact with real or digital objects simultaneously for hands-on practical learning. The Multi-CAVE Platform allows real-time interaction and collaboration between geographically dispersed teams.	**Dr Jacky CHUNG Kin-hung** Senior Engineering Manager (Building Services, Construction & Safety), Industrial Centre **Dr Kevin WONG Ka-fai** Senior Engineering Manager (Building Services, Construction & Safety), Industrial Centre	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
Modular Rail Particle Damper for Noise and Vibration Reduction in Railways Combining particle damping technology with a modular design, the modular rail particle damper (MRPD) effectively controls rail vibration and rolling noise. By adjusting its particle content, it can be tuned to the target frequencies in the 1,000-2,000Hz frequency range. This lightweight damper's content can be conveniently added or removed without using heavy mass, making it more effective than passive tuned mass dampers (PTMDs). Its insensitivity to extreme temperatures ensures long-term durability for rail applications. The MRPD can benefit the local and global rail industry by reducing noise pollution, and potentially lowering maintenance costs and increasing rail lifespan.	**Prof. NI Yi-qing** Yim, Mak, Kwok & Chung Professor in Smart Structures, Chair Professor of Smart Structures and Rail Transit, Director of National Rail Transit Electrification and Automation Engineering Technology Research Centre (Hong Kong Branch) **Dr AO Wai-kei** Research Assistant Professor, Department of Civil and Environmental Engineering	 Download image: https://polyu.me/3AESrGR

Project description	Principal Investigator(s)	Images and videos
Food Waste-derived 3D Printing Material This invention reduces food waste while providing a sustainable filling material for 3D printing. The food waste-polylactic acid (PLA) composite filaments created from food processing by-products spent coffee grounds and spent tea leaves can be used in fused deposition modelling (FDM), a popular 3D printing technology. With up to 40% food waste and a tensile strength of 10-40MPa, they are suitable for many applications, e.g., modular furniture, display articles. They can be customised to provide excellent ductility for shock-absorbing printing designs. The chemical-free production of these filaments involves mainly mechanical processing, and is easily adaptable for field-scale operation.	**Prof. WONG Ka-hing** Director, Research Institute for Future Food, Professor, Department of Food Science and Nutrition **Prof. Daniel TSANG Chiu-wa** Professor, Department of Civil and Environmental Engineering, Core Member, Research Institute for Future Food	 Download image: https://polyu.me/3AESrGR