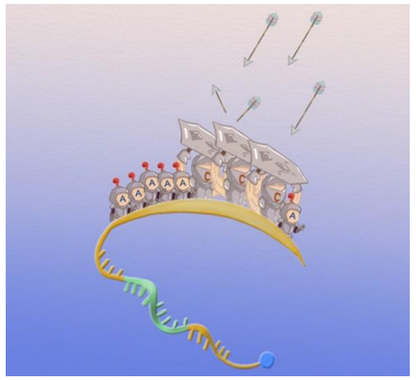
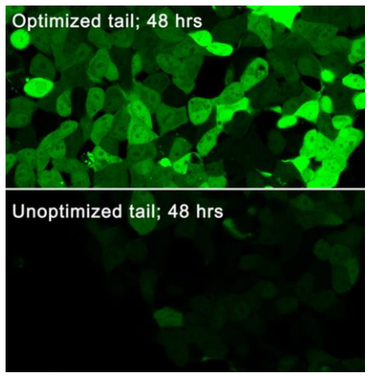
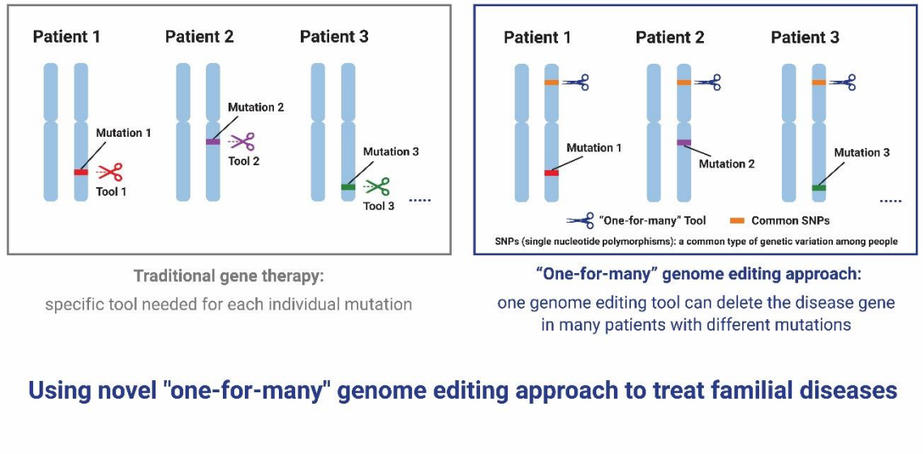
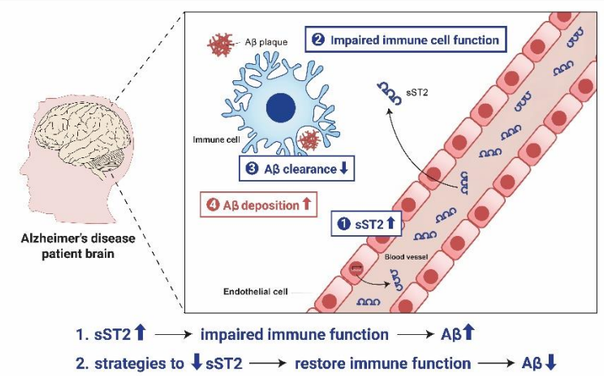
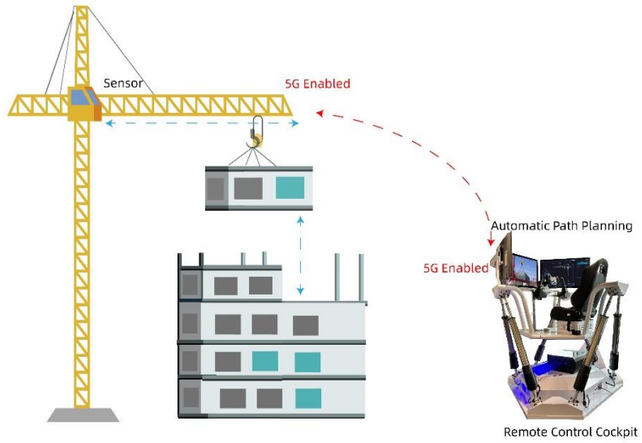
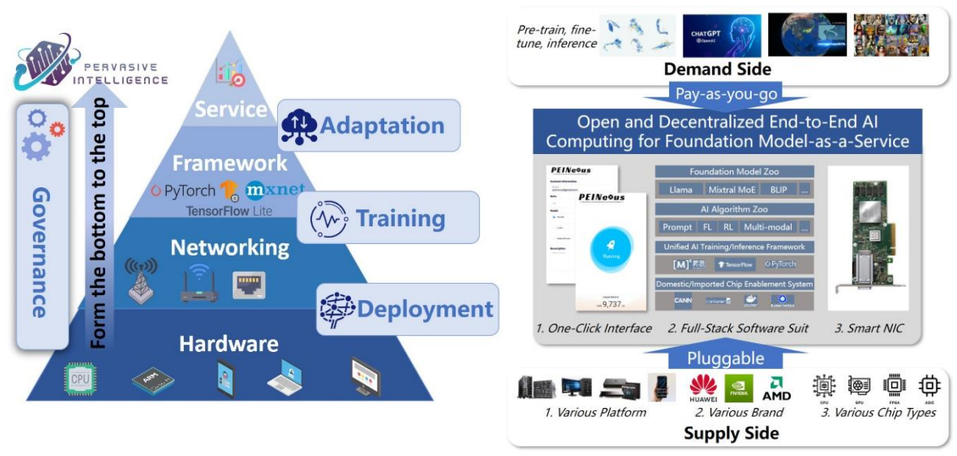
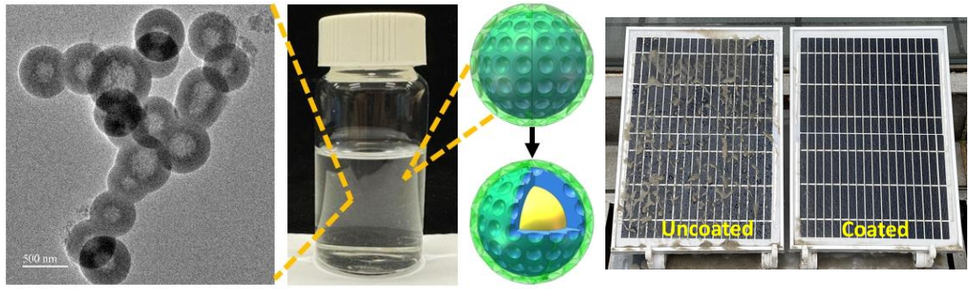
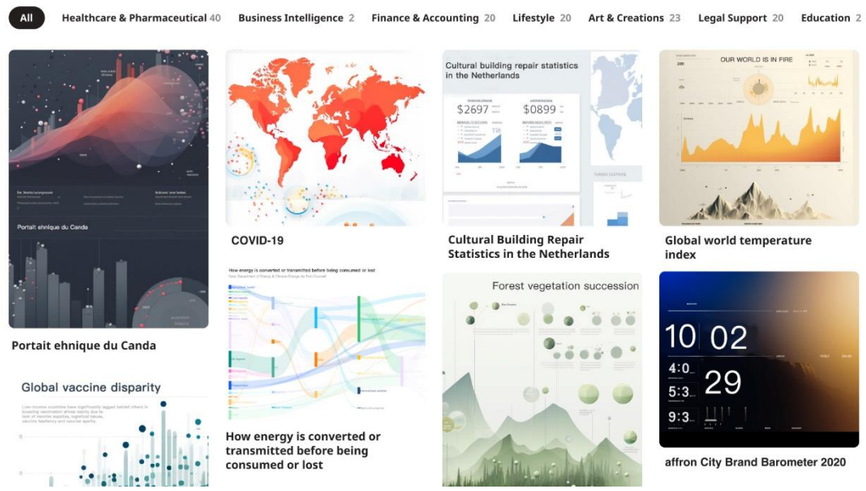
香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

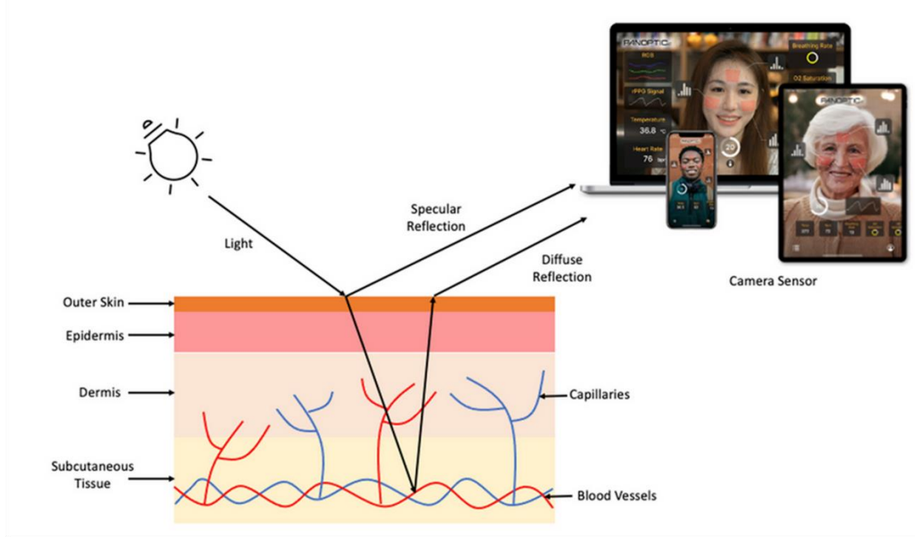
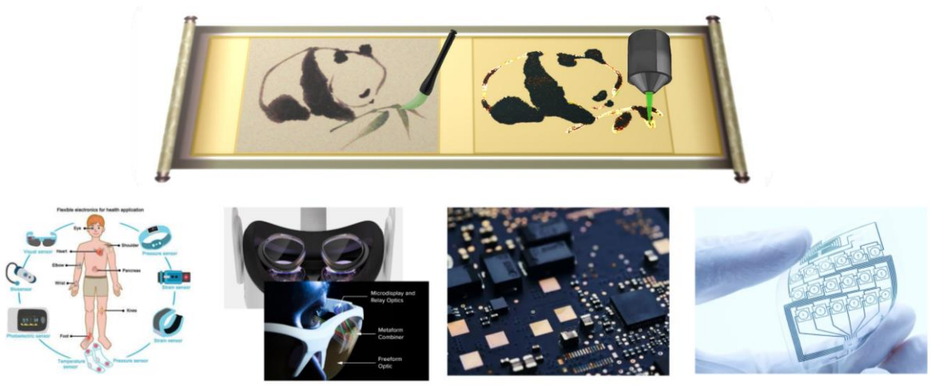
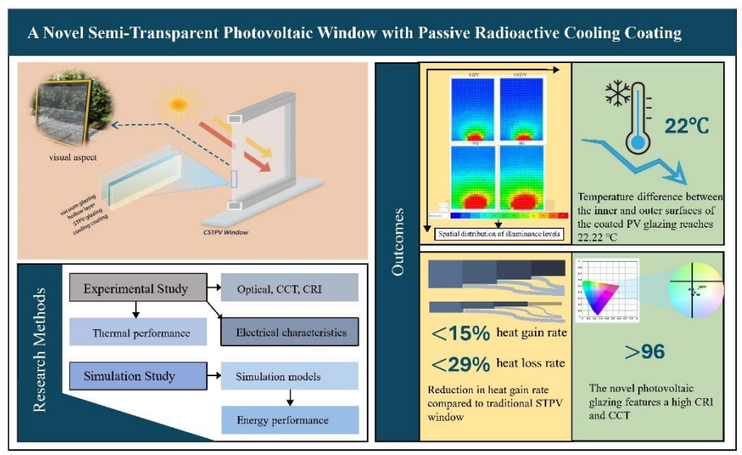
HKUST Projects in the 49th Geneva International Exhibition of Invention

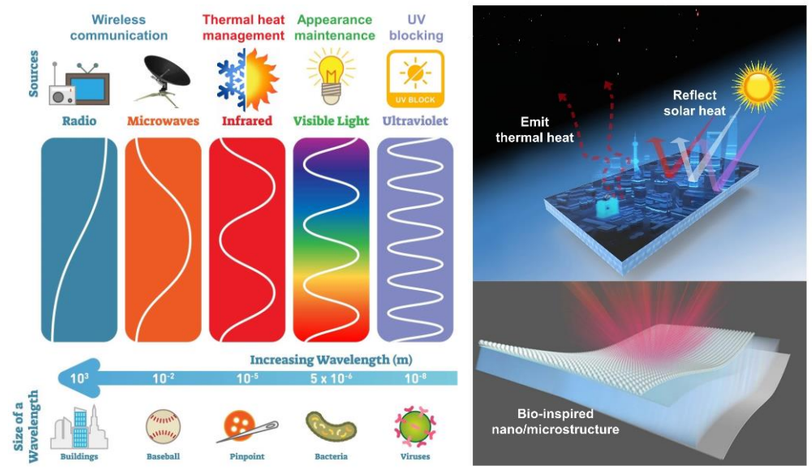
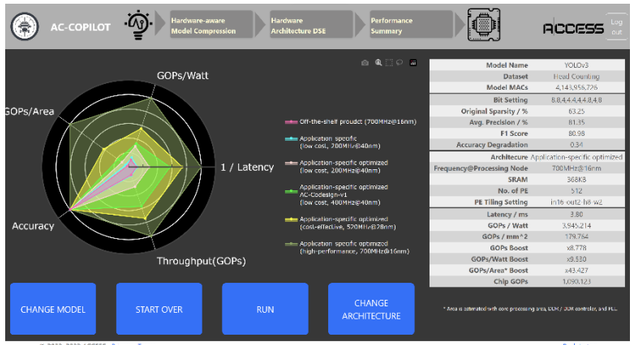
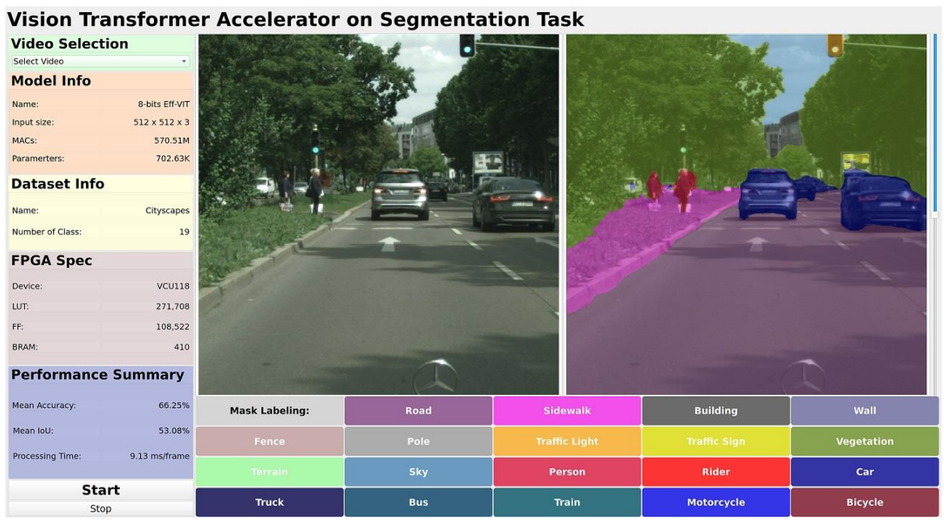
Invention and Award	Description	Key technology edges	Image
SGC/ ApiRegenin: An innovative non-invasive medical approach for skin transplant and prevention of amputation	Discover the next leap in wound care: our biopharmaceutical breakthrough dramatically reduces healing times and costs, backed by over 15 patents and comprehensive safety testing. Our protein-based solutions are designed for effectiveness, safety, and global demand, offering non-invasive, cost-effective treatments with a long shelf life. Embrace the healing revolution that promises restored health and comfort more swiftly and sustainably than ever before.	● 50% Faster Healing: protein-enhanced technology halves recovery time for chronic wounds, transforming patient outcomes. ● 70% Quicker Regeneration: Our SGC Technology boosts tissue repair by 70%, streamlining healing without invasive treatments. ● 24-Month Efficacy: Cytokine stabilization technology maintains full potency for up to two years, ensuring long-lasting freshness without additives.	
Optimized mRNA Tails Enhance Effectiveness of mRNA Drugs and Vaccines	The practical use of synthetic mRNAs has been restricted by their low cellular stability as well as poor protein production efficiency. We engineered prominent C-containing tail sequences that can be readily and generally applied for promoting the performance of a broad spectrum of synthetic mRNAs in vitro and in vivo. As the C-containing tails can be used along with other mRNA enhancement technologies to synergically boost protein production, we believe that these tails can be broadly used on synthetic mRNAs to directly promote their clinical applications.	● Elevated Expression & Duration: Amplify protein expression levels by 300-500% and extend mRNA activity up to 72 hours, maximizing therapeutic impact. ● Broad Compatibility: Our C-tail sequences work in harmony with all mRNA modification methods, offering a universal enhancement solution. ● Cost-Efficient: Achieve superior mRNA stability and efficiency without increasing production costs, ensuring economic viability.	 

Recycling of Wasted Products in Developing Health Supplements Targeting the Mental Health	Introducing Mind Balancing Tablets (MBT): a pioneering health supplement crafted from the flavonoid-enriched essence of peanut shells and seabuckthorn leaves—common by-products in food production. Our eco-conscious approach not only fosters sustainability but also propels the fight against depression, targeting the needs of the 5% of adults affected globally. MBT stands as a beacon of hope, aiming to alleviate mental disorders with fewer side effects, while supporting the green environment and enhancing farmer livelihoods.	• Fighting Depressing: Leverage the strength of seabuckthorn and peanut shell flavonoids to combat depression, a condition affecting 5% of adults worldwide • Natural Efficacy: Offer a side-effect-conscious mental health solution, potentially improving medication dependency for millions of patients • Waste to Wellness: Transform agricultural waste into mental health marvels, increasing farmer income and maintaining sustainable development	
Novel "One-for-Many" Genome Editing Tools for Familial Alzheimer's Disease: Addressing an Unmet Medical Need	Our technology has the potential to revolutionize treatment for over 160 million patients suffering from ~370 autosomal dominant diseases. These diseases are particularly devastating as inheriting a mutation means inheriting the disease itself. Traditional gene therapy for our target diseases would require customizing the genome editing tool for each patient, which is implausible in diseases caused by multiple mutations. Our groundbreaking "one-for-many" genome editing approach can treat a given disease in many patients with different mutations, providing a practical solution. We have completed proof-of-concept studies using a model of familial Alzheimer's disease, an aggressive inherited form of Alzheimer's disease. Our technology will bring hope to many more individuals who face the burden of inheriting an autosomal dominant mutation, showing them that their fate is not predetermined.	• Targeted deletion of Alzheimer's risk genes to rescue disease pathologies • First in the world to achieve non-invasive brain-wide genome editing approach • Universal genome editing approach for disease mutations based on genome-wide association studies	
sST2 as a Novel Therapeutic Target for Alzheimer's Disease	We have identified a novel drug target for Alzheimer's disease (AD): a plasma protein known as sST2. We have found a strong association between increased sST2 levels and AD pathology and risk. To address this, we are pioneering the development of two therapeutics to inhibit sST2: small molecules and RNA-based therapeutics, including antisense oligonucleotides (ASO) and siRNA. Importantly, since sST2 originates from peripheral cells outside the	• Unique therapeutic target with potential disease-modifying effects • Broad applicability to various diseases associated with increased sST2 levels • Disruptive potential to significantly impact the AD treatment market	

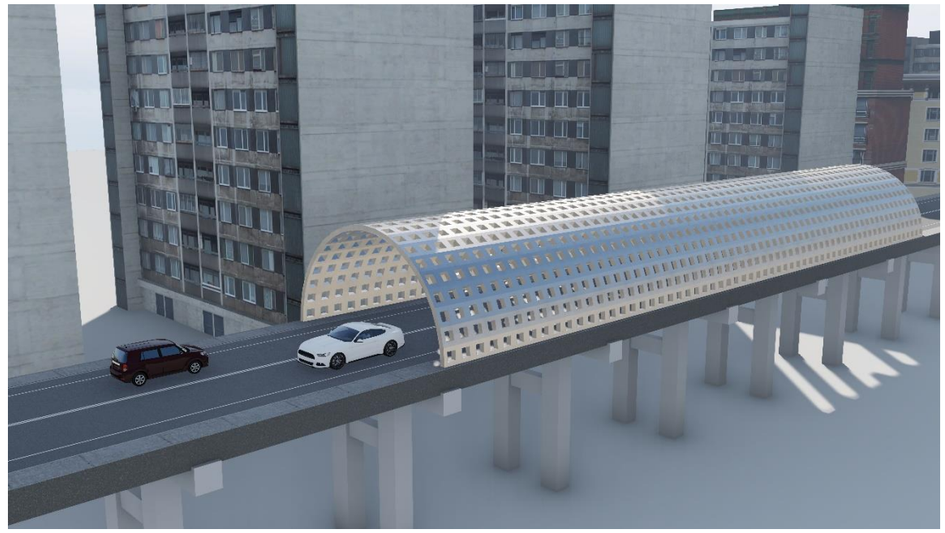
	brain, our therapeutics offer a safer and less invasive option compared to current AD therapies.		
Smart Tower Crane	The invention - Smart Tower Crane, with remote control capabilities, allows operators to perform operation from a safe distance, which will magnificently improve site safety. Equipped with cameras, LiDAR and other advanced sensors, the Crane is able to empower operators with a comprehensive 360-degree field of vision and analytic ability to improve operation precision by reducing blind spot mishaps. Beside, the crane can act as a vital information hub at the construction site by gathering real-time data on various aspects like load weight, wind speed, and structural stability through its sensors. These data are critical for improve decision-making and productivity , as well as enhance predictive safety maintenance ability.	• Remote control ability could reduce the operation risk and improve the working environment of crane operator • Addresses operation challenges such as limited visibility and adverse weather conditions with advanced sensor and camera • Data collect and analytic ability enables the autonomous haulage system works in the construction site	
Open and Decentralized End-to-End AI Computing for Foundation Model-as-a-Service	In the era of foundation models such as ChatGPT and DALL-E, the demand for computing power has skyrocketed. Traditionally, these models have been dependent on cloud servers, which are both expensive and limited in availability. This invention leverages the untapped potential of idle edge devices, including consumer-grade GPUs, laptops, and mobile phones, by transforming them from isolated units into a cohesive network. It utilizes our cutting-edge technologies, including token-adaptive serving, serverless AI, and heterogeneous computing, to provide users with cost-effective, high-quality computing resources tailored for a variety of personalized foundation model services. By decentralizing computing resources, this innovation not only reduces latency and improves bandwidth efficiency by bringing computing power closer to the user, but it also enhances data privacy and ensures reliable service, even in regions with unreliable internet connectivity.	• Enable an edge device to server foundation models with hundred billion of parameters via token-adaptive model serving technology. • Enable heterogenous edge devices (especially different brands such as NVIDIA, Apple, Huawei) to be integrated via heterogeneous computing technology. • Enable foundation model services to be lively and seamlessly migrated between edge devices via serverless AI technology.	
Multi-functional Self-cleaning Nanocoating with Visible Light Photocatalysis for Photovoltaic (PV) Panel	The unique core-shell nanotechnology enables robust and durable self-cleaning nanocoating to remove contaminants under visible light with efficient photocatalysis and anti-reflection functions. The coated PV panels can enhance power generation by up to 20% and save cleaning costs by about 50% compared with the uncoated ones.	• Efficient visible-light photocatalysis for superior self-cleaning performance: Doped core material shifts the photoresponse range from ultraviolet to visible light. • Superior anti-reflection for enhanced solar power generation: The unique solid-core-porous-shell structure possesses a low refractive index to capture as much light as possible. • Extended durability with minimal maintenance required: The in-house	

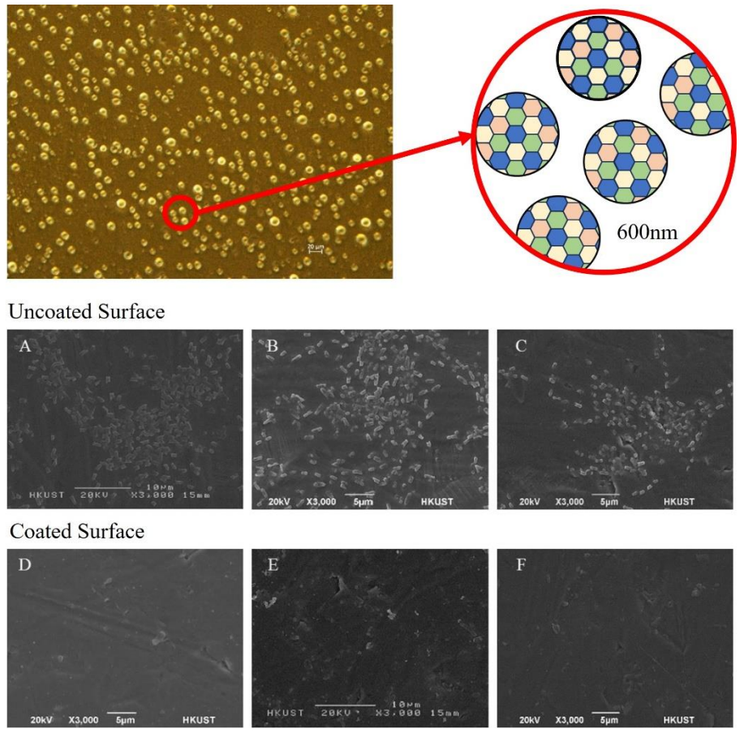
		synthesized organic binder small molecules allow the coating to have strong adhesion, long-lasting wettability and resistance against weathering attacks.	
AI-generated Food with 3D Printing Solution and Simultaneous Infrared Heating	3D printing technology has gained remarkable attention for its potential in creating customized on-demand food and personalized nutrition. However, ensuring the safety and taste of the printed food often requires cooking. Conventional post-processing methods, such as oven-baking, often present challenges such as undesired food shapes and the risk of microbial contamination. To overcome the mentioned challenges, we designed an AI-enhanced approach that combines extrusion-based printing with simultaneous infrared heating, enabling in-line and rapid cooking of complex starch-based food. This method is also applicable for preparing other common printable food types that requires heating, providing new ideas and approaches for developing in-line print and cook food fabrication systems. By leveraging generative AI algorithms in the 3D printing process, users can easily generate visual representations of their desired food shapes based on text descriptions. This approach simplifies the design process and eliminates the need for extensive computer graphics skills, making 3D food printing more accessible to a broader audience.	• Simultaneous 3D printing and infrared heating • AI-generated food design solution for various food types • Digital food and personalised nutrition fabrication	
ezpie: The Ultimate Platform to Unlock Value from Data	ezpie revolutionizes how we handle data by creating a one-stop platform that simplifies the entire data journey. Imagine having to use different tools for collecting, analyzing, and sharing data - it's time-consuming and complicated. ezpie solves this by bringing everything you need into one place. It uses smart algorithms to match projects with the best data professionals, ensuring that businesses find the expertise they need quickly and efficiently. Our platform also makes data analysis accessible to everyone, not just experts, by providing easy-to-use tools for creating beautiful, insightful visualizations. Plus, with our focus on security and collaboration, your data is not only safe but can be worked on by teams, anywhere, any time. Essentially, ezpie is about making data work easier, faster, and more secure for businesses and communities, breaking down the barriers to innovation and growth in the data industry.	• Innovative talent-matching algorithm and dynamic learning-and-earning model: Utilizes NLP and evaluation matrix for ideal project-professional alignment, with market-responsive pricing. • Built-in collaborative workspace: Features a secure, Kubernetes-based environment for seamless, real-time coding and project management, fostering efficiency and innovation. • AI-powered data ecosystem: Offers an interconnected suite of tools, including AI assistants and blockchain-secured data vaults, enhancing visualization and user experience from start to finish.	

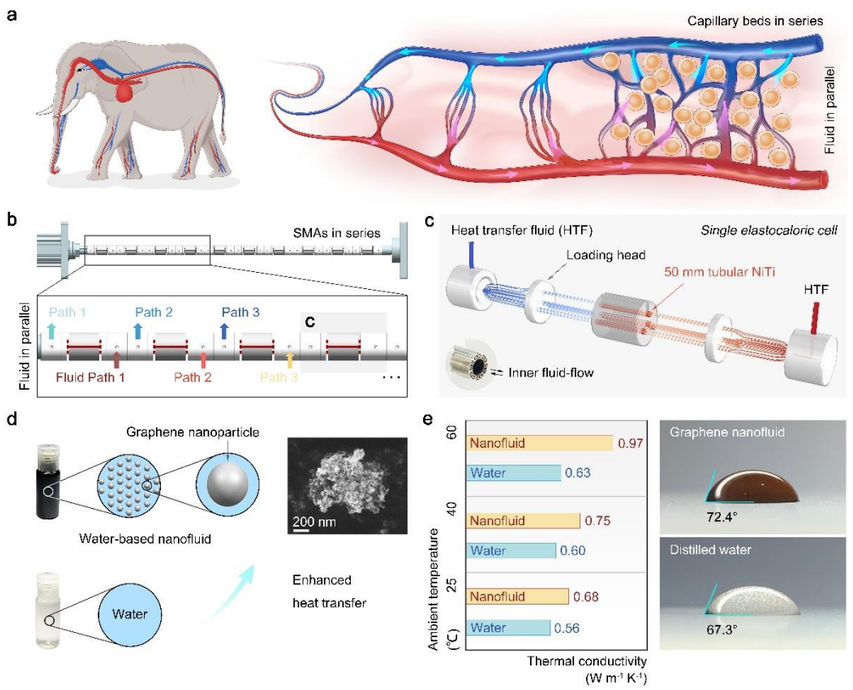
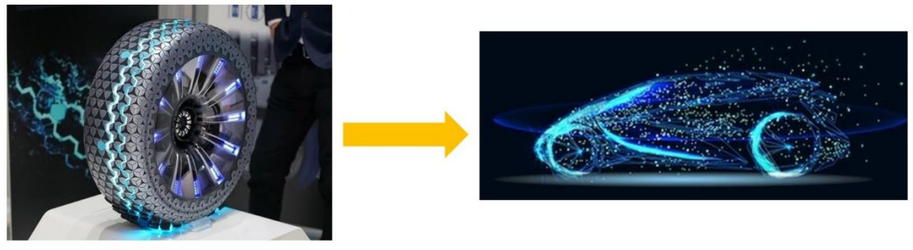
Vitals: Camera-based Health and Wellness Monitoring Solution	Vitals™ is a medical-grade camera-based health and wellness monitoring solution that makes measuring, interpreting and managing personal health contactless, affordable and as easy as smiling at a camera. Built on state-of-the-art artificial intelligence and signal processing, Vitals™ delivers comprehensive digital biomarkers with medical grade accuracy in under 30 seconds, providing insights into your cardiovascular, respiratory and nervous systems, and more. Vitals™ is delivered as a Software Development Kit (SDK) and can be installed on common consumer devices, transforming personal smartphones into real-time biomarker scanners. It makes health and wellness monitoring more accessible, especially in a digitally connected world with a rapidly aging population, while reducing the burden on the healthcare system. It also provides personal wellness and fitness data that is revolutionising the consumer markets across remote healthcare, personal wellness, insurtech and more.	• AI-Powered Analysis: Utilizes cutting-edge artificial intelligence to accurately interpret vital health data from simple camera input. • Contactless Monitoring: Offers a non-invasive way to measure health metrics, enhancing user convenience and safety. • Comprehensive Biomarkers: Delivers a broad range of digital biomarkers for cardiovascular, respiratory, and nervous system health in under 30 seconds.	
Nanoscale Direct Laser Fabrication System for Functional Material	We developed a nanoscale direct laser fabrication system for functional material patterning on arbitrary substrates. Our invention could be applied in the semiconductor industry, flexible healthcare and customized hologram optics, etc.. Differing from traditional photolithography, which requires expensive masks, complex processes and ultra cost, our technology provides a one-step service, from pattern design to microcircuits and functional structures without any previous problems. Also, our technology breaks the limitation in curvature surface and flexible substrate, as well as reducing the thickness and weight of the optical device in VR.	• Nanoscale mask-free technology brings ultra-precision and flexibility. • Applied with versatile functional materials (metal compounds) on arbitrary substrates. • Addictive fabrication with high speed, environmental sustainability and low cost.	
Advanced Thermal-managed Photovoltaic Smart Window	The invention involves a novel photovoltaic glazing component. The front surface of the photovoltaic glazing is coated with a passive radioactive thermal insulation layer, while the rear side is equipped with a sound and thermal insulation module that employs either hollow glazing, vacuum glazing, or a combination of both. In practical applications, the cooling coating on the front surface enables it to insulate a portion of the temperature rise caused by sunlight, thereby preventing the photovoltaic panel from experiencing reduced power generation due to excessive temperature. Concurrently, the sound and thermal insulation module, which utilizes a combination of hollow and vacuum glazing, can effectively mitigate external noise and minimize heat transfer, thereby reducing its impact on the indoor environment. The design holds significant practical value. It has the potential to save,	• Enhances thermal insulation and reduces cooling load • Provides onsite clean energy production • Customizable transparency for enhanced visual comfort	

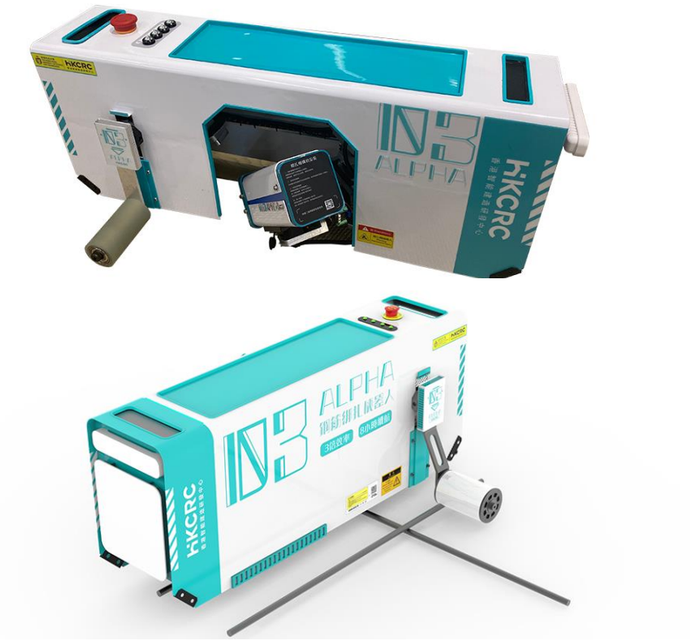
	produce, and store energy, making it highly suitable for use in smart home and smart city applications.		
Bio-inspired Radio-transparent Optical Metamaterial Films with Ultra-broadband Spectrum Manipulation for Passive Space Cooling	Space cooling accounts for about 10% of electricity consumption, and there is an urgent need for passive zero-energy cooling methods. Although some passive methods (like sunshades or solar films) were invented, they affect the appearance of spaces and transmission of radio signal. Inspired by butterfly wing nanoarrays, we design and modify the surface nano/micro-structure of the material, so that it has special effects on certain electromagnetic waves, while retaining its original appearance. The surface has high reflectivity to invisible sunlight to suppress solar heating and high emissivity in the atmospheric window to enable radiative cooling. It is completely transparent to radio signals, so wireless communications are not affected. In short, it is an invisible method for passive space cooling and emission reduction.	• Invisible solar heat reflection and visible appearance maintenance • Strong thermal emittance for radiative cooling • Allows for RF/WiFi transmission for wireless communication	
AC-Copilot: An Automated Toolchain for Neural Network and Hardware Accelerator Co-design and Co-optimization	AC-Copilot automates neural network co-design and optimization algorithm and hardware. It generates optimal architecture design (AC-Codesign-v1) for specific applications and achieves remarkable power efficiency increase.	• AC-Copilot optimizes architecture with algorithm and hardware modules. • The algorithm module compresses the architecture using hardware-aware quantization and pruning. • The hardware module explores the design space using a DSE engine, compilation, and simulation to generate high-quality designs.	
AC-Transformer: Transformer AI Accelerator on Road Scene Segmentation for Self-driving and Robotics	Image segmentation is vital for self-driving cars and robots to understand their surroundings accurately. Transformers, advanced neural networks, offer better accuracy but consume significant energy due to complex calculations, which is problematic for low-power devices. To address this issue, our team developed AC-Transformer, a specialized hardware that enhances energy efficiency. AC-Transformer utilizes a unique attention mechanism that reduces the computational load on the hardware, making calculations easier. It also simplifies complex operations in Transformers for more efficient processing. These improvements significantly enhance energy usage, a critical factor for devices with limited power. We successfully built a prototype road scene segmentation system using the FPGA version of AC-Transformer. It analyzes road scenes, identifying roads, cars, and pedestrians. Additionally, we're developing a smaller, more efficient ASIC version, enabling integration into compact devices like cameras or	• We have come up with a special technique to make Transformer work better on low-power devices. By combining the algorithm and hardware design, we can reduce the amount of memory required to 20% and the number of calculations to only 2.5%, all while keeping the same level of accuracy as before. • We have developed technology that allows complex tasks to be done on special hardware instead of regular computing processor units. This makes the system perform better overall, like having a high-powered engine	

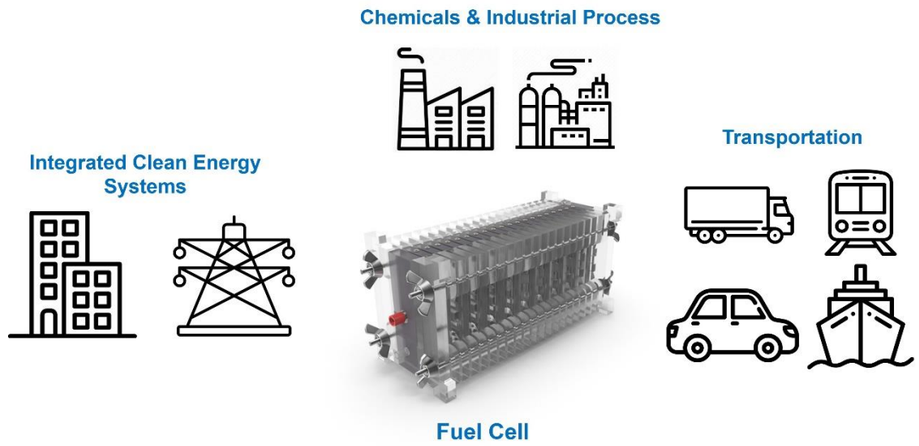
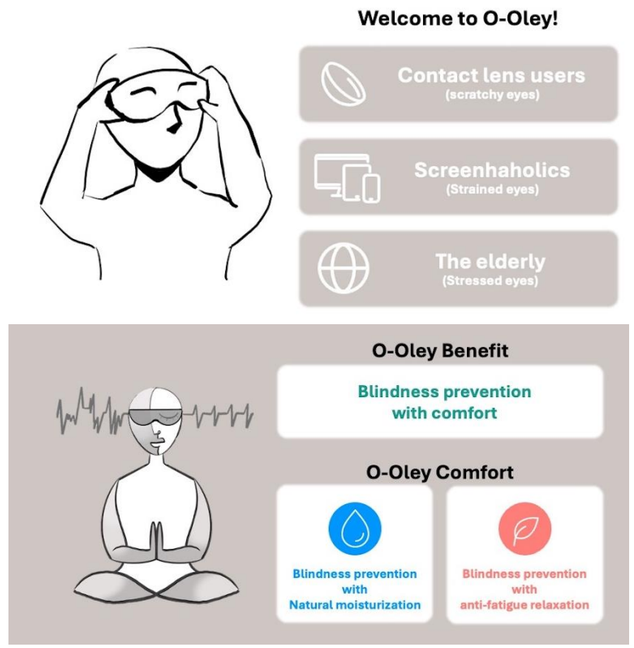
	sensors. This advancement optimizes energy consumption and expands the application of road scene segmentation technology.	dedicated to handling difficult operations. ● Our technology can efficiently divide a big Transformer model into smaller parts and assign them to different chips, making the system more flexible and able to handle different levels of computational task, depending on what is needed for each specific application.	
A Domain Knowledge-enhanced Generative AI based on Large Visual-Language Models for High-level Construction Site Safety Monitoring	Construction industry in Hong Kong has an accident rate of 25.5 per 1,000 workers in six months. Hence, we integrate vision-based pre-trained generative AI into a Smart Site Safety System, driven by a multi-modal large language model that embeds construction safety knowledge from regulatory documents and site images. It acts as an intelligent virtual assistant for predictive safety monitoring. Its natural language processing capability enables rapid system training and adaptation to fast-evolving safety regulations/guidelines, eliminating cumbersome and costly re-training required for existing systems. It possesses environmental awareness beyond traditional AI, identifying unsafe hazards/behaviors not recognizable by existing systems. Real-time alerts and actionable recommendations via visual question answering empower safety officers to proactively mitigate risks and prevent accidents. We aim to establish standardized construction safety protocols to (1) enforce safety culture and protect worker well-being, (2) enhance construction productivity and cost-effectiveness, (3) stimulate social responsibility and reputation of construction industry.	● Vision-based pre-trained GenAI/LLM for real-time on-site predictive hazard monitoring ● Adaptive NLP training for evolving regulations and actionable recommendations ● Environmental awareness on recognizing unsafe behaviours beyond traditional AI	
Butenolide: a Non-toxic, Highly Efficient and Environmentally-friendly Antifouling Agent	Biofouling is a worldwide problem affecting human marine activities. The global economic loss caused by this reaches 60 billion US dollars every year. Most of the existing solutions contain toxic substances and seriously damage marine ecosystems. Butenolide is non-toxic, highly efficient, easily degradable broad-spectrum product and is compatible with existing coating formulas. In global scale, Butenolide is to achieve high performance and effectiveness in antifouling paint industry in a green way, rendering it in the top class of the whole technology category. Instead of being a competitor, Butenolide displays excellent compatibility with other traditional antifouling additives to realize green antifouling coating formulations.	● Environmental: Non-toxic, biodegradable, total synthesis via green chemistry ● Effectiveness: Broad spectrum and long-lasting ● Compatibility: Adaptable to existing paint formulations ● Mode of action: clear molecular target	

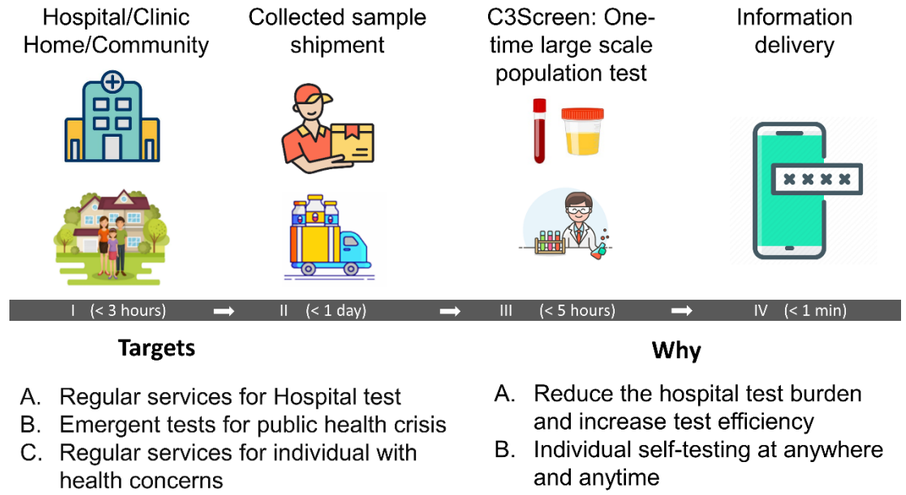
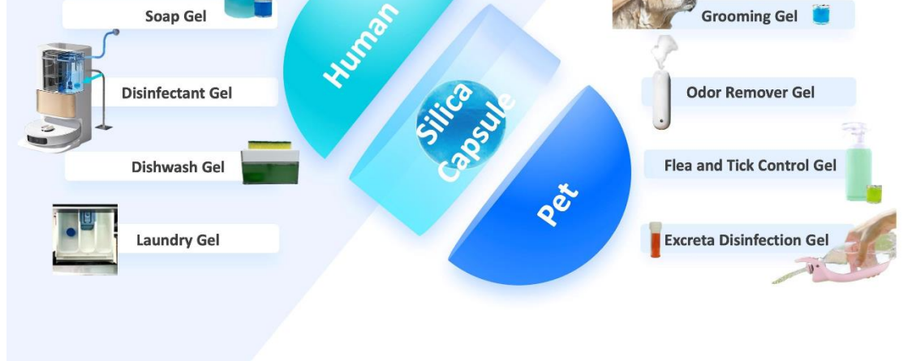
All-Round High-ventilation Noise Shield	People living near highways and railways have to endure daily disturbances from traffic noise. To reduce the pollution caused by traffic noise and emissions, Tranquility Acoustronics (HK) Limited has successfully developed a new generation of road ventilation silencers. Combining the ventilation silencers to form the all-round ventilation noise shield that effectively blocks noise within the frequency range of 300-2000Hz. The materials used in the ventilation silencers, including high and low temperature differences ranging from -10 to 95°C, high humidity and corrosive environments. The ventilation design allows natural airflow to dissipate exhaust emissions from vehicles. Undoubtedly, the ventilation silencers are the preferred construction material for sound barriers on highways, high-speed railways, and metro systems, creating a healthier and more tranquil living environment for urban dwellers.	• All-round ventilation noise shield formed by ventilation silencer • Large ventilation area allows vehicle emission to be effectively dispersed by natural wind • Applicable for highway, high speed rail, inter-and intracity light rail, etc.	
Smart Transient-features Recongintion for Defective Piplines Identification in Water Supply Networks	Our technology helps smart cities develop faster by introducing an innovative method to save water and energy while making urban water systems sustainable, resilient, and adaptable. We have created a new way to accurately detect and classify defective pipes in pressurized water networks using a simple and practical approach. Instead of dealing with the complexity of the entire network, our method focuses on localizing defects in individual pipes. This breakthrough overcomes practical obstacles that have hindered the use of similar methods in real-world systems. We have extensively tested and validated the accuracy, robustness, and resilience of our method using various pipe configurations and complexities. The technology is non-intrusive and non-disruptive, capable of diagnosing kilometers of pipelines within seconds. It can identify different pipe defects, such as leaks, bursts, blockages, malfunctioning devices, weakened pipe walls, and harmful disturbances. The benefits of our technology include supporting timely maintenance, saving water and energy, reducing operational costs and carbon footprints, and preventing major failures and catastrophic events in water systems.	• Accurate and efficient pipeline diagnostic technique • Practical and reliable in real systems • Robust against system complexity and noisy environment	

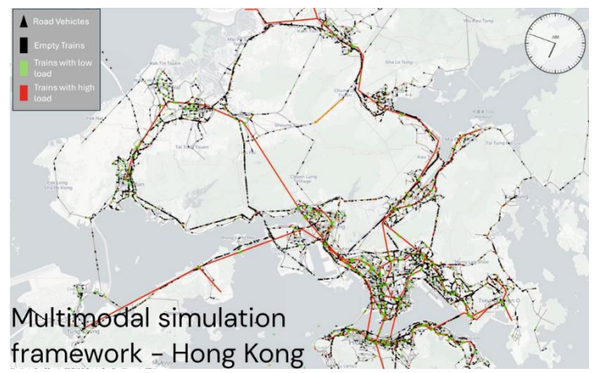
Cementless EcoBrix Derived from Municipal Solid Wastes	Production of cementless EcoBrix is developed using multiple municipal solid wastes including construction waste, plastic waste and food waste. Conventional and green construction materials (e.g., recycled aggregate concrete) usually require cement which is carbon-intensive and contributes to one-tenth of global carbon emissions. Disposing of these materials also generates construction waste which accounts for 15-70% of total solid wastes in different countries around the world. Besides, plastic waste and food waste constitute heavy burdens on society. According to the World Bank, these wastes account for more than 50% of solid wastes generated across the globe. Our invention upcycles multiple wastes to produce economically viable cementless EcoBrix, achieving CO2 sequestration and promoting carbon neutrality for human sustainability. Performance of EcoBrix also fulfils the requirement of BS and ASTM standards for non-structural and structural uses, such as partition walls, pavements, etc. Local government authorities and the construction sector are currently supporting the commercialisation and adoption of EcoBrix.	• EcoBrix is cementless and is produced using only combinations of construction waste, plastic waste and food waste • EcoBrix production upcycles multiple wastes, facilitates CO2 sequestration and captures CO2 to achieve carbon neutrality for human sustainability • Based on BS and ASTM standards, EcoBrix can be adopted for non-structural and structural uses, such as partition walls, pavements, etc.	
Durable Multilevel Antimicrobial Protection **Safe Antiviral and Antibacterial MAP-∞ for Surfaces**	MAP-∞ technology revolutionizes public health and hygiene by providing surface protection with its functional polymer nano-assembly, generating antimicrobial particles that eliminate microbes, viruses, and spores upon contact. These particles not only eradicate harmful microorganisms but also deter colonization and biofilm formation. With the design ability to controlled-release antimicrobials gradually, MAP-∞ ensures prolonged effectiveness. The technology creates a transparent and resilient protective layer capable of withstanding various environmental conditions, including sunlight, high temperatures, humidity, water immersion, and exposure to mild acids or alkaline solutions. It has obtained certification for potable water applications and has been proven effective against wide range of bacteria, fungi, and viruses, including the Omicron strain of COVID-19. By utilizing innovative nano-assembly techniques, MAP-∞ provides a shield that not only eliminates microbes but also prevents their return, thereby creating a safer and cleaner environment. Experience the groundbreaking power of MAP-∞ and enjoy long-lasting surface protection against harmful pathogens.	• Maintains original finish and texture: MAP-∞ is designed to impart antimicrobial properties while preserving the original finish and texture of the material, making it suitable for construction materials, interior finishing, and furnishing. • High clarity coating: MAP-∞ is ideal for optical lenses and laminate surfaces, offering high optical clarity while providing long-lasting antimicrobial properties with lifespan for at least five years based on accelerated aging tests. • Ease of use: MAP-∞ offers a versatile solution that can be applied on-site by unskilled personnel as a DIY coating, making it an attractive option for homeowners seeking to protect their homes from microbial contamination and fouling.	

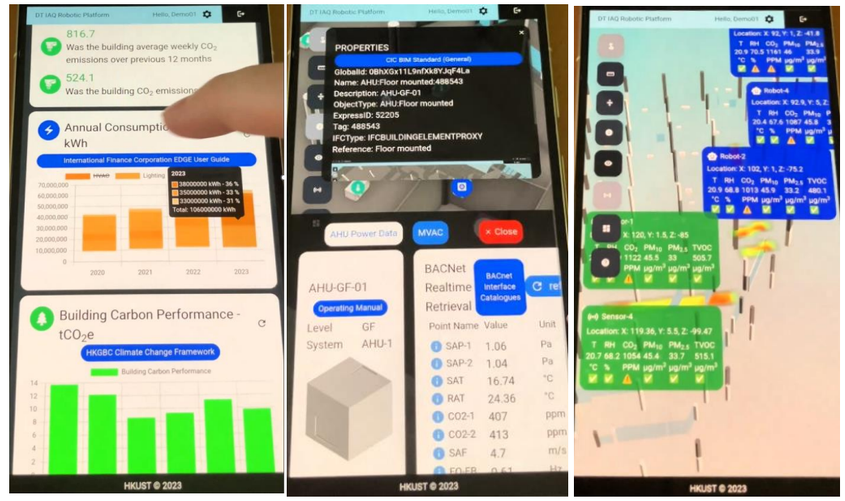
Zero Green-House-Gas (GHG) Elastocaloric Refrigeration --- Kilo-Watt Scale Air-conditioning Prototype	The invention aims to replace the high-global-warming-potential vapor-compression refrigeration which is currently widely used in the market. Using recyclable and Green-House-Gas free NiTi shape memory alloy, we built a solid-state air heater/cooler with 1.2-Kilowatt power to replace vapor-compression-based cooling/heating. We designed and fabricated tubular NiTi shape memory alloy solid refrigerant of large specific surface-area and heat-exchange-enhanced graphene nanofluid, which enables a large cooling power in an 'SMAs in series - fluid in parallel' architecture. The SMA-based solid-state heating/cooling is a disruptive technology and has the potential to replace the existing high-global-warming-potential vapor-compression-based refrigeration technologies. Compared with the conventional technologies (e.g., vapor-compression based air conditioner, electrical-resistance heating, and heat pump), the invention has much higher energy-efficiency for energy saving and carbon reduction. The market applications include but not limited to: (1) Consumer-grade air-conditioners for homes and offices; (2) Automobile air conditioning; (3) Heating-Ventilation-Air-Condition (HVAC) in commercial and residential buildings; (4) Data center cooling, etc.	• Disruptive technology to replace the existing high-global-warming-potential vapor-compression-based refrigeration technologies • Giant specific cooling power enabled by innovative `SMAs in series - fluid in parallel' multi-celled architecture and heat-exchange-enhanced graphene nanofluids	
Battery-less and Wireless Sensors for Cars and Railways	Imagine a world where devices and vehicles effortlessly receive power and transmit information without the need for wires or batteries. The invention makes this possible through Radio Frequency wireless power transfer and communication technology. With the self-developed advanced antennas, RF-DC circuits, and a customized embedded system, the sensorcapables to monitor and provides real-time and abundant data on railway conditions with various parameters such as motion, deformation, pressure, and temperature under battery-less operation, empowering operators with valuable insights to enhance operations, reduce costs, ensure punctuality, and, most importantly, prioritize safety. Besides, it offers a 'fit and forget' solution, allowing wireless and autonomous monitoring of rotational conditions, like car shafts, as well as long-distance and large-scale scenarios, such as miles-long railways.	• Enables wireless operation in rotating wheels, long-distance railways, and implanted medical devices • Self-powered battery-less operation eliminates the hassle of recharging and significantly extending service • Low fabrication and maintenance cost	

Rebar Tying Robot	The invention-Rebar Tying Robot revolutionizes construction automation with its remarkable autonomy, consistency, and efficiency in rebar tying scenarios like residential building, infrastructure facilities, etc. Equipped with advanced multi-sensor positioning technology, it could achieve an impressive design efficiency of 700 nodes/hr and a superior tying success rate of 98%, surpassing industry standards. Additionally, with the installation of multiple detection sensors, it is able to detect obstacles and humans in all directions, providing real-time warnings and reminders for on-site safety. Currently undergoing thorough operational testing at renowned construction sites, including those managed by Zhu Hai Huafa Group and CSCEC, the robot's performance and reliability are being rigorously validated.	• Multi-sensor interactive positioning: Ultilizes magnetic sensors with computer vision algorithm (yolov8) for accuracate and efficient rebar positioning. • Multi-degree-of-freedom floating tying structure: Reduces external factors impact and instability ,providing adaptability in multiple directions This structural design gives the tying structure multi-directional adaptability. • Automatic track changing: Enables seamless transition to adjacent rebars when reaching the end or encountering obstacles, ensuring uninterrupted workflow and automation.	
Photo-aligned Multi-domain LCD Using Cost-effective LED Exposure for Mass Production	Our advanced multi-domain display technology enables wide viewing angles, ensuring consistent image quality and contrast from different angles. Thanks to our cost-effective turnkey solutions, this accessibility extends to all LCD manufacturers, including monochrome displays. This breakthrough revolutionizes the field and puts us at the forefront of this exciting development.	• To produce unique all viewing angle, high contrast LCD • Patented LED light exposure system much cheaper than conventional photo-alignment exposure system • Easy to implement multi-domain manufacturing process suitable for all existing LCD production lines	
GUIDi - AI Smart Belt to Aid Navigation for Visually Impaired	GUIDi is a smart belt designed to enhance navigation for everyone, particularly benefiting those with visual impairments. This wearable tech features a powerful camera module and an AI chipset that work together to 'see' the environment. It processes visual data in real-time to detect obstacles and plots a safe path. The belt's haptic feedback system then communicates with the user through touch, indicating which direction to move in, even without the need for GPS or Wi-Fi. This invention addresses the challenges faced by the visually impaired by offering them greater independence and mobility. It stands to transform the assistive device industry, providing a discreet, intuitive solution for safe and efficient navigation in any environment.	• Advanced Computer Vision Integration: GUIDi leverages a combination of wide-angle, depth, and night vision cameras to ensure comprehensive environmental perception, regardless of lighting conditions. • AI-Driven Edge Processing: With edge computation, GUIDi swiftly analyzes sensory data for immediate obstacle detection and efficient path planning, operating within milliseconds to ensure real-time responsiveness. • Haptic Navigation System: GUIDi's innovative haptic feedback system delivers waist-level vibrations for	

		directional guidance and obstacle alerts, enhancing navigation beyond the audio cues.	
Low Cost and Long-life Hydrogen Fuel Cells Powered by Super Catalysts	Hydrogen fuel cells are zero-emission power devices converting hydrogen and oxygen into electricity and water. The high cost and low durability of platinum-based catalysts hinder their wide adoption. We design a novel hybrid catalyst that consists of atomically dispersed platinum and iron single atoms in carbon and platinum-iron alloy nanoparticles. The multi-active centers and strong interaction between the modified carbon and metal nanoparticles result in an unprecedented activity and durability in a fuel cell. The fuel cell integrated with the low-platinum hybrid catalysts shows excellent durability, which can significantly reduce its material cost and prolong the lifespan. The wide spread adoption of this clean technology will help achieve the carbon neutrality target.	• Enhanced synergy between nanoparticles and carbon supports: improved activity and stability • Low precious metal loading: 85% reduction in platinum loading • High durability: less than 3% activity drop after 100,000 cycles, in comparison, 50% drop after 30,000 cycles for commercial platinum catalysts	
Wearable to Prevent Blindness: Hot-yoga Goggle for Glaucoma Prevention and Eye Rejuvenation	Glaucoma, a silent thief of vision, is the leading cause of irreversible blindness that has no symptoms until vision loss is severe. Treatment after diagnosis can slow progression, but prevention is the best strategy to fight against irreversible blindness. Intraocular pressure (IOP) is a major risk factor for glaucoma, which becomes more prevalent with age and eye stiffness. A cutting-edge wearable that lowers the risk of irreversible blindness is developed by the O-Oley team. By targeting the biomechanical properties of the eye and its correlation with IOP, the wearable effectively transforms stiff-stressed eyes into compliant-relaxed ones. Anti-fatigue and moisturizing functions are built into the O-Oley wearable. Eye strain is relieved after wear; tear production is increased after one week of 15-min wear; and the IOP is lowered after 8 weeks of integrated-negative-pressure therapy. Trial users are drawn to the relaxation and moisturization comfort, and the blindness risk reduction from O-Oley.	• For the elderly to relax the age-stiffened eyes for blindness prevention • For contact lens users to relieve lens discomfort • For people with eye fatigues to relieve eye strain by lowering IOP	

C3Screen: Low-cost and High-throughput Viral Testing	Current nucleic acid test requires expensive PCR platforms with intensive labour force while cannot address the population-based nucleic acid test evidenced in COVID pandemic. Combined with Microfluidics and CRISPR diagnostics, the C3Screen platform is an isothermal solution for large-scale genomic confirmation and offers a cost-effective alternative to current PCR-based tests. It addresses the limitations of existing platforms by providing accurate, affordable, and high-throughput screening for various diseases. The platform's low-cost and accurate nucleic acid test enables massively parallel diagnostics, enhancing the efficiency of high-throughput systems. With its potential to advance the field of population screening, C3Screen has the power to transform public health, ensuring timely and effective screening for a wide range of diseases while addressing the challenges faced by the industry and community.	• Versatile system: The platform is a tool that can check for different diseases at once, either for one person or lots of people at PCR level accuracy • Easy to read color barcodes: It uses a special CRISPR method with colorful fluorescent tags to make sure it identifies diseases correctly and quickly. • Droplet microfluidic platform: It uses tiny droplets to do its tests, which saves money and makes the system even better at doing its job.	
Multi-purpose Silica Encapsulating Matrix for Long Term Usage in Human and Pets Hygiene and Cosmetic Applications	Our silica capsule technology revolutionizes product sizes in human and pet care, reducing waste and emissions. It encapsulates concentrated ingredients, enabling controlled release with water. This silica-based technology enhances hygiene products and cosmetics by utilizing a porous matrix that releases ingredients upon water contact. It decreases GHG emissions by over 90%, reducing volume, weight, transportation, and packaging demands. The silica matrix is safe to dispose of, minimizing environmental impact. Furthermore, businesses benefit from lower costs and can align with ESG objectives without major investments. IoT integration enhances functionality, allowing smart dispensers, usage tracking, refills, and personalized ingredient release. This versatile technology advances sustainability and user experience in consumer products.	• Efficiency and Sustainable : Control release of hygiene ingredients to reduces waste, packaging and emissions for a greener footprint. • IoT Compatibility: Can be adapted for IoT systems for better usage tracking and resource management. • Cost Savings: Smaller product sizes lower storage and transportation expenses.	

Safe and Environmentally Friendly Multilevel Antimicrobial & Pest-Repellent (MAPR) Formulated Products	Multilevel Antimicrobial and Pest Repellent (MAPR) utilizes advanced nano-assembly of functional polymers to create capsules with an antimicrobial shell to store safe pest repellent formulation for long-term microbial disinfection and pest repellence. It effectively eliminates viruses and microbes upon contact while also preventing them from adhering through its "contact-killing" and "anti-adhesion" features. It is programmed to dose a pest-repellent formulation, effectively repelling pests	• Effective and long lasting: Kills 99.99 % bacteria, 99.9 % virus, 100 % pest repellent. • Safe and Eco friendly : With Natural essential oils and Biodegradable polymers. • Compatible: Easy integration into different surfaces in everyday products e.g. cloth and bedding.	
PET GROOMING: Light-based devices to disinfect, deodorize, and care for pet's fur and skin	Light-based grooming technology for pets uses high-intensity narrow wavelength (HiNW) lights powered by Asynchronous Intermittent (AI)-lighting system to rapidly kill microbes that resides on pet's skin and fur while adding lustre and repelling pest It is designed to disinfect, deodorizes, and care for pet's fur and skin and repels biting insects, promote skin health, and fur lustre by programmed light treatment that is safe and effective.	• Broad Spectrum Care: Not only disinfects but also promotes skin and coat health in pets • Fast Acting & Chemical free: Eradicates harmful microbes in under 120 seconds using light technology to reduces allergy risk and environmental impact • Mobile Versatility: Compact and adaptable for pet care everywhere—homes, clinics, shelters, and salons	
Disruption Management – Ridership modelling by multimodal traffic simulation	This invention is a breakthrough in planning of railway operations. Through an advanced large-scale simulation, it simulates passenger behaviour during railway service disruption in Hong Kong to predict how passengers traverse across the city and take alternative transportation routes. Usage of the model helps to plan ahead for crowd management and resources allocation during service disruption. The simulator is calibrated with and validated by an extensive dataset featuring more than 10 million trips in Hong Kong, with over 8000 entry / exit points and 4.7 millions daily ticketing transactions.	• Large scale simulation • Agent based simulation • Big data calibration	

Digital Twin, AI, Robotics, and IoT Empowered ESG Platform for Property and Facility Management Industrie	A Digital Twin-based robot-assisted surveillance platform to support ESG reporting and environmental management based on novel robot localization, digital twin integration, and AI-based spatial-temporal analytics technologies	• IoT data capturing and integrating module • Robotic location data capturing for spatial-temporal analysis • Holistic robot path planning • Point-of-interest AI analytics for FM with alert system • Data fusion on Digital Twin for ESG reporting	
Virtual program on Hong Kong massive open online course platform – junior secondary science online self-learning scheme	Discover a new era of science learning with our massive open online course (MOOC) platform, where engaging video narratives and interactive assessments blend to create a gamified educational experience. Our platform harnesses data analytics to enhance learning efficiency, making education both effective and enjoyable.	• Robust massive open online course platform • Comprehensive learning analytics • Gamified learning experience