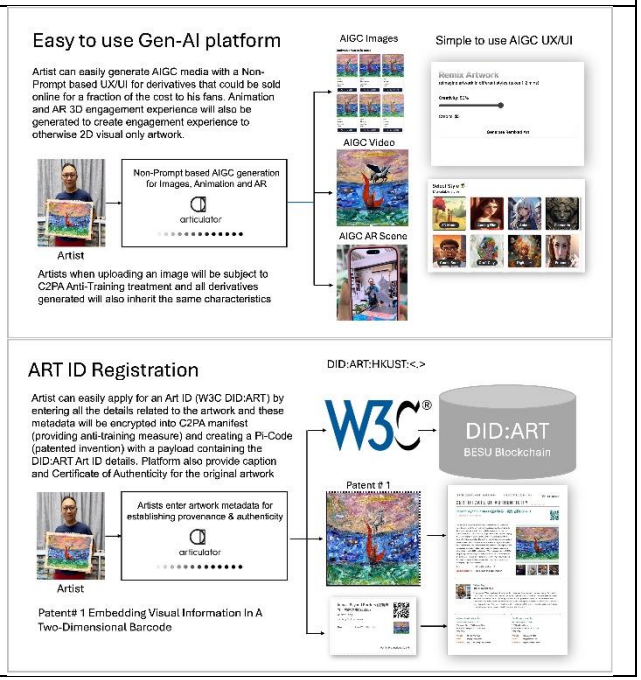
香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

HKUST Projects

Project	Description	Key technology edges	Images
<u>Gold Medals with Congratulations of the Jury</u>			
Articulator.ai - One-stop Platform for Gen-AI Creation, Art ID Registration, Authentication and Monetization for Emerging Artists	Articulator.ai is a one-stop platform for artists to create, register Art IDs, authenticate, and monetize digital art using AI and blockchain-based DID:ART. It embeds secure watermarks, supports IP rights, and provides e-Commerce suite for artists	• Patented technology (US 8,948,445 B2 / CN 103383738B) embeds visual information in a picture-based QR code, storing Art ID and ownership data invisibly in artworks and derives. • W3C-compliant decentralized identifier (DID:ART/DID.ART domain name) registers unique Art IDs on a blockchain-enabled database, ensuring tamper-evident provenance. • Simple One-stop Gen-AI platform with non-prompt based UX/UI for a variety of media and integrated shopping cart.	

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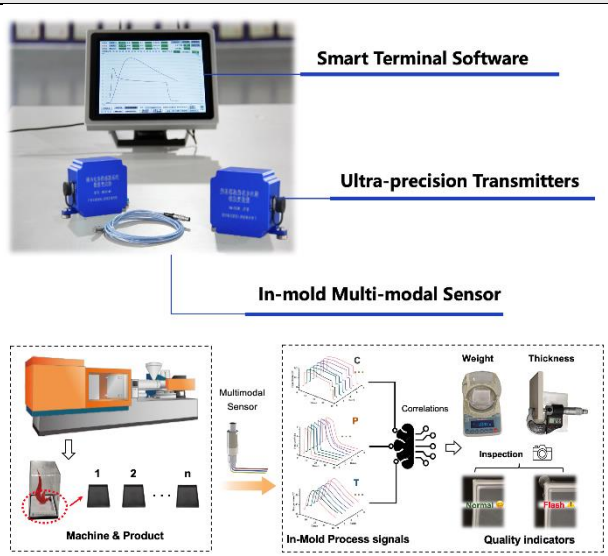
Sensing Empowering Real-time Quality Control and Process Optimization for Autonomous, Zero-defect Molding	World's first and only multi-modal in-mold sensor for injection molding based on super-precision capacitive sensing. It's the eye of mold, empowering online automatic quality control and dynamic process optimization for injection molding.	• World's First In-Mold Capacitive Sensing for automated, comprehensive online anomaly detection in injection-molded parts. • Multi-Modal Sensing & Factor Decoupling to isolate variables affecting quality, enabling precise root-cause identification of defects. • Closed-Loop, Autonomous Process Optimization driven by real-time digital quality feedback.	

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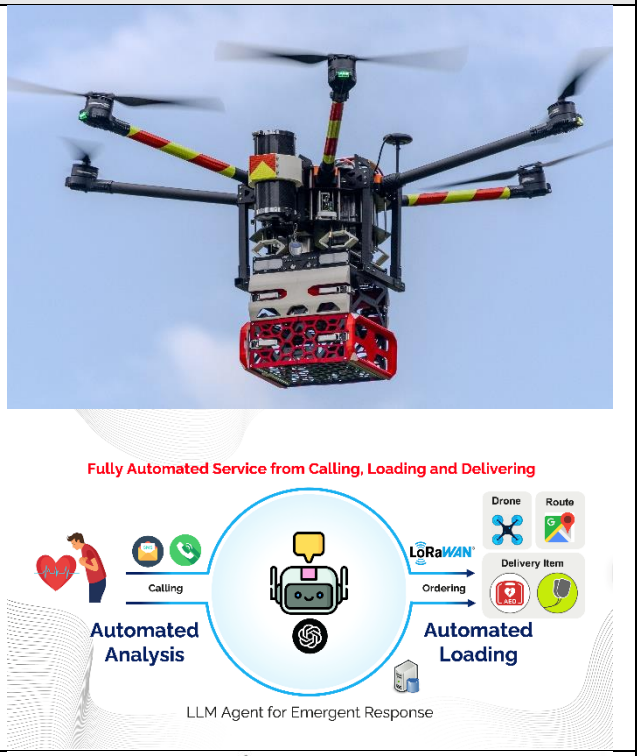
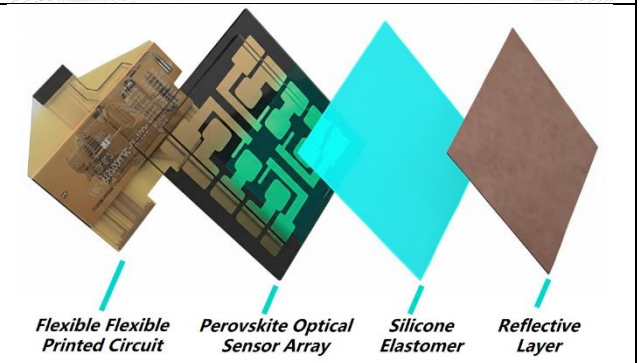
AeroRelief: Autonomous UAV First-Responder System	An autonomous UAV system that rapidly delivers critical medical supplies using AI dispatch, modular payloads, and winch-based mid-air delivery for time-sensitive emergencies.	• AI-powered emergency dispatch enables faster, consistent decision-making without relying solely on human operators. • Winch-based mid-air delivery allows safe supply drop without landing in complex or uneven terrain. • Long-range LoRa communication ensures reliable drone control even in remote or low-signal environments.	
LightSkin: Optical Tactile Skin Enabled by Perovskite for Next-Generation Robotics	LightSkin is an ultra-thin, flexible, perovskite-based tactile sensor to convert mechanical stimuli into 3D high-resolution tactile data. It is engineered for seamless integration into robots and smart devices, powering the next wave of embodied AI.	• Perovskite-based optical tactile sensing enables high sensitivity, stability, and low-power operation. • Ultra-thin (3-5 mm) and flexible electronic skin adaptable to complex surfaces and large-area deployment. • Integrated AI-driven tactile decoding for high-resolution, real-time, 3D force perception.	

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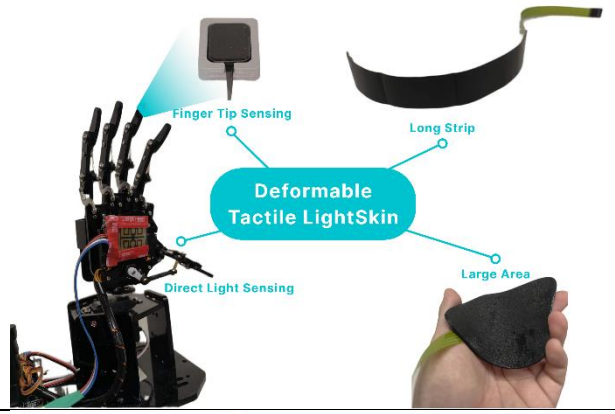
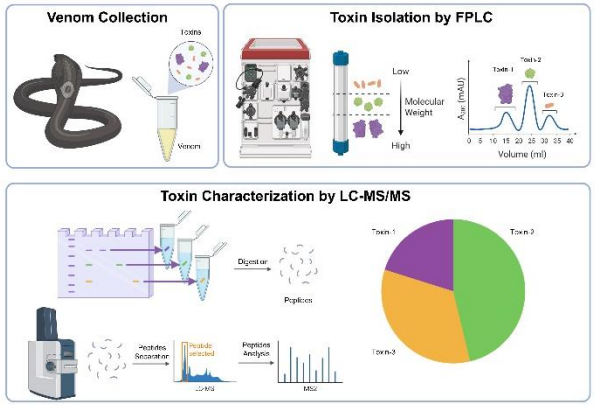
			
Next-generation Recombinant Antivenom for Snakebites Envenoming Treatment, Prevention, and Diagnosis	This invention is a next-generation antivenom autoinjector utilizing human monoclonal antibody cocktails developed through a single B-cell screening platform. The innovative antivenom autoinjector allows for immediate on-site use via rapid subcutaneous delivery. It functions as a dual-purpose post-envenomation detoxification and preventative agent, offering a fully human antibody solution that overcomes the side effects and limitations of traditional animal-derived antivenom.	• Advanced Toxin Isolation and Characterization Platform. • High-Efficiency Antibody Discovery Platform Using Single B-Cell Technology. • Comprehensive Antivenom Efficacy Validation Platform.	

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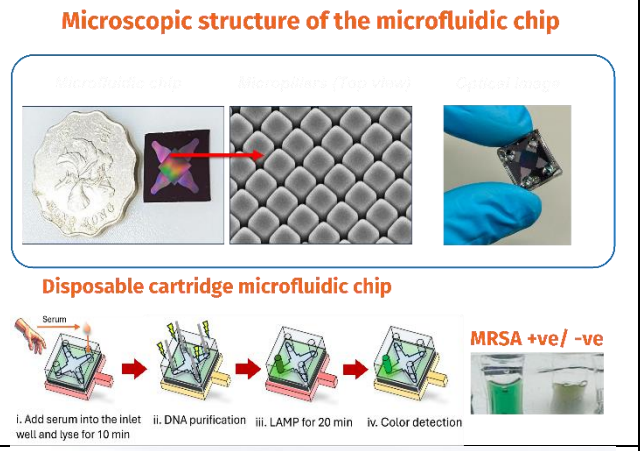
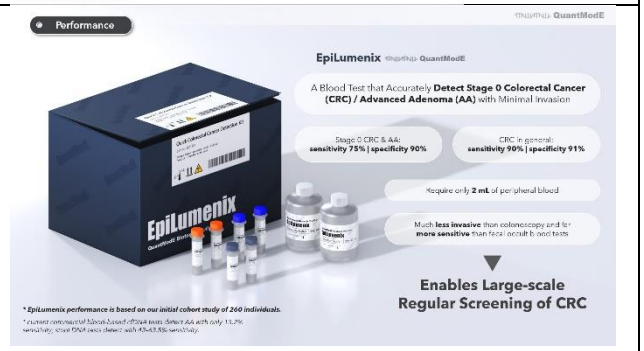
An AI-powered portable diagnostic platform that offers sample-to-answer detection for multiplexed Antimicrobial Resistance to fight superbugs	Our solution includes a patented microfluidic chip and an integrated device powered by an AI-driven software. It can be used in both general and pediatric hospitals to speed up AMR detection and safeguard children from up to 8 harmful pathogens.	• Performs LAMP based antimicrobial detection within 45 mins using only small blood samples on a portable device. • AI powered detection system with multiplexing capabilities, could perform detection of 8 pathogens per sample. • Rapid, robust, and low-cost portable platform with low turnaround time, ideal for low-resource settings.	
RNA Epitranscriptomics and AI: Empowering First-Strike Screening to Prevent Cancer Before Its Onset	EpiLumenix by QuantModE Biotech is a next-generation, non-invasive blood screening platform using cell-free RNA epitranscriptomics and AI to detect precancerous lesions in deadly cancers, aiming to enhance early prevention	• Pioneering microbiome-derived cell-free RNA epitranscriptomics to capture dynamic tumor microenvironment fingerprints. • Patented scBID-seq technology enabling high-precision, quantitative and robust detection of trace cell-free RNA modifications. • AI-driven algorithms achieving breakthrough 75% sensitivity for Stage 0 CRC and advanced adenomas.	
AI-Powered Home Healthcare Management System for COPD Patients	This AI-powered home health system transforms COPD management with the EasySpiro earbud for clinical-grade lung monitoring, the DeepBreath camera for contactless breathing training, and the AECOPDector software for early exacerbation prediction.	• EasySpiro features the world's first earbud device capable of clinical-grade lung function assessment through natural exhalation. • AECOPDector represents the highest precision and smartphone solution worldwide for predicting COPD acute exacerbations. • DeepBreath is the first contactless breathing rehabilitation solution that utilizes	

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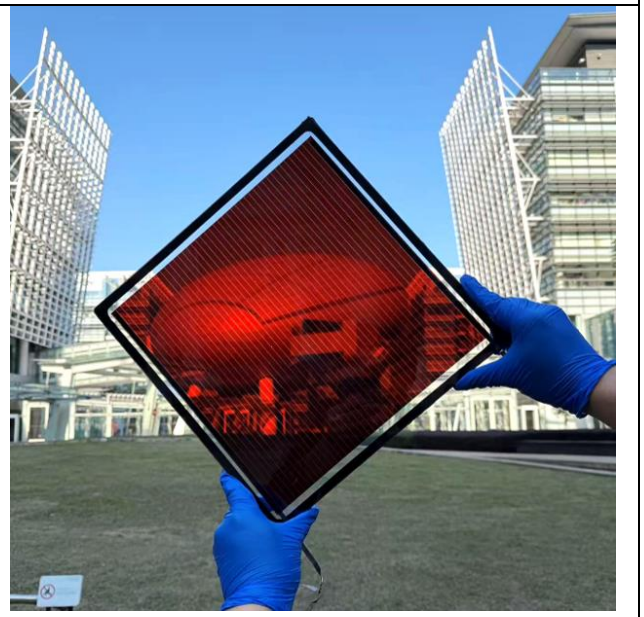
		depth-sensing cameras to provide real-time visual biofeedback.	
High-Efficiency, Durable Semi-Transparent Perovskite Solar Cell Module	A family of perovskite solar technologies featuring interface-engineered and composition-tuned films with flattened grain boundaries and stable heterointerfaces, enabling large-area modules with outstanding efficiency and durability.	• Microstructure-engineered perovskite films enable efficient light harvesting and fast charge transport for record-high module efficiency. • Semi-transparent module design delivers both high power output and visual transparency for building-integrated photovoltaic applications. • Optimized microstructure enhances operational stability, significantly extending device lifetime under real-world working conditions.	

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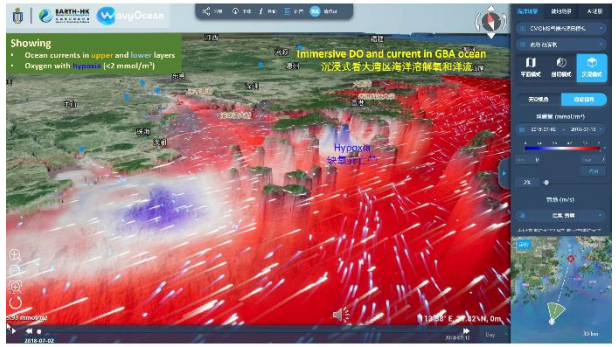
Other Winning Inventions and Entries			
Science and AI-empowered Digital-twin Visualization of Ocean System	This invention provides a geo-digital-twin platform and a technique for 3D immersive visualization for the ocean and earth system, by dynamically integrating geographic information system with high-fidelity rendering of ultra-large-scale data.	• Global Connectivity: the first 3D rendering engine to support instantaneous synchronous rendering of geographic information and data. • Geoscientific digital-twin platform integrating geographic Information Systems (GIS), Building Information Modeling (BIM) and digital-twin technologies. • Derivable Analytical Variables for: Unlocking the scientific codes behind the data.	
Modular General-purpose Aerial Work Robot	This novel Aerial Work Robot mainly adopts a dual-arm coordination mode to complete collaborative tasks at height, including high-altitude drilling, installation, spraying, inspection and other operations in construction scenarios.	• Integrated aerial platform and dual-arm robot system enabling stable, precise, and safe high-altitude operations. • Modular dual-arm design with interchangeable tools supports multiple tasks across construction, maintenance, and inspection scenarios. • Human-robot collaboration approach transfers high-risk work to robots while keeping workers in safer supervisory roles.	

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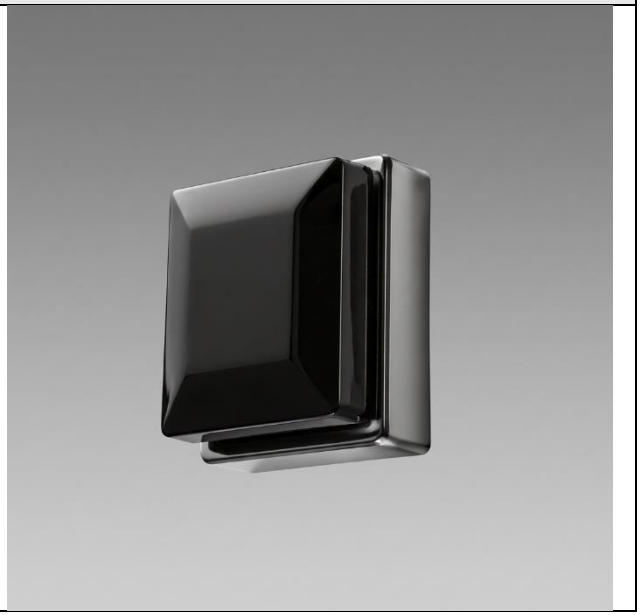
MagTact: Low-Cost, High-Performance 3D Tactile Sensor	MagTact's patented magnetic matrix and AI deliver high-precision 3D force sensing at drastically reduced cost. This robust solution enables advanced tactile capabilities for industrial robots, medical devices, and humanoid robotics.	• Patented magnetic self-decoupling hardware enables accurate 3D force sensing without complex computation. • AI-powered super-resolution algorithm achieves precise touch detail recognition from limited sensor data. • Hardware-software co-design for robustness ensures reliable operation in diverse, challenging real-world environments.	

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A Speech to Text Technique for Better Performance with Mixed Languages	The mixed language data generation process and hyperparameters can be updated to enhance further training of the Speech to Text model to enhance fidelity, accuracy, and latency regarding performance of speech recognition by the model.	A novel data synthesis framework: LinguaMaster. It addresses the lack of high-quality code-switching data by aligning the synthesized data aligns with real-world linguistic patterns • The first large-scale code-switching dataset: SwitchLingua. It serves as a critical resource for advancing ASR research in multilingual and code-switching scenarios • The Fine-tuned Whisper model: Whisper-MCE. It can better handle code-switching scenarios	

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Multi-industry Molecular Testing Platform for Rapid, Lab-grade Nucleic Acid Detection Outside the Laboratory	A platform delivering lab-comparable nucleic acid detection within 30 minutes at the point of care through a compact device and dual cartridge system for sample to result process. Applicable to veterinary, clinical, food safety, and other industries.	• Cartridge-based, on-site processing of various raw sample types in minutes • Results readable by eye, with no external equipment required • Compact, low-power, maintenance-free platform	
Fast, Smart and Autonomous Microheating Robot for Chemical-free Pest Control	A new paradigm in pest control technology — our autonomous laser-scribed microheating robot prioritizes safety, efficiency, and sustainability through the combination of biomorphic design and AI, IoT and robotic technologies.	• Autonomous mobile robots precisely locate and targets insects, reducing human intervention and improving treatment accuracy and consistency. • Ultrathin, flexible laser-scribed microheater delivers rapid, localized heating that kills pests without damaging surrounding household surfaces advanced. • Chemical-free, reusable thermal approach minimizes indoor toxins, environmental impact, and long-term health risks compared with conventional pesticides.	

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High-Durability Anti-BioFilm (ABF) Epoxy for Drainage and Sewer Networks: Odor Control and Corrosion Resistance	By utilizing an antimicrobial polymer-enhanced epoxy, this Anti-BioFilm (ABF) coating protects sewer pipes from biofilm-induced corrosion, offering a proven solution to reduce maintenance expenditures and extend infrastructure lifespan.	• Active & Safe Biofilm Prevention: Proprietary, potable-water certified ingredients actively stop microbial attachment and biofilm growth • Dual-Infrastructure Protection: Extends service life in both corrosive sewers and clean-water distribution networks • Proven Durability & Efficiency: Provides long-term defense that reduces maintenance, improves hydraulic efficiency, and can be tailored for specific applications	

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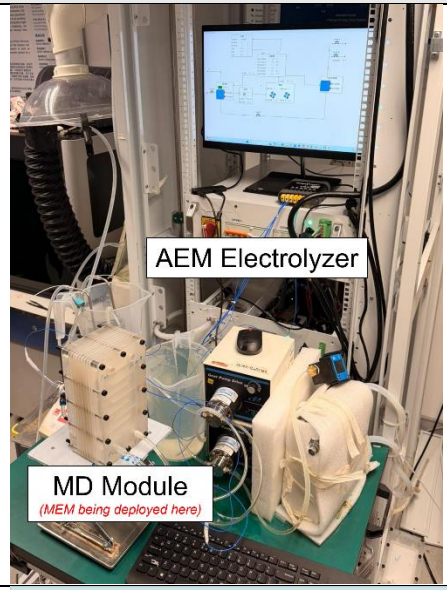
Thermal Shielding and Vapor Permeable MOF-Enabled Nanofiberic Membrane (MEM)	A ZIF-8-enabled nanofiberic membrane features a hierarchical porous structure, with an ultra-low thermal conductivity (0.03 W m^{-1} K^{-1}). The MEM demonstrates a vapor flux of 44.5 LMH and a thermal efficiency of 71.3%, improving membrane distillation.	• Ultra-Low Heat Loss: Special porous structure acts like a thermal blanket, keeping 71% of heat for water purification instead of wasting it. • Triple-Layer Pore Design: Combines large, medium, and tiny pores to both block salt while letting clean water vapor pass through easily. • Works with Waste Heat: Operates effectively at lower temperatures (40°C), making it perfect for using industrial waste heat instead of expensive energy.	
ACLGuard: AI-empowered Knee Monitoring System for Anterior Cruciate Ligament Injury Prevention	ACLGuard is an AI-empowered wearable-based system that tracks knee motion and knee loading on the field, flags abnormal poses linked to ACL injury, and gives real-time feedback to adjust training and reduce injury risk.	• The world's first on-field knee loading monitoring system with a closed-loop of AI-powered sensing and real-time ACL injury risk feedback. • Knee biomechanical analysis based on multi-modal sensor fusion technology with physics-guided hybrid deep learning framework. • Personalized AI risk profiling powered by large motion model and ACL-specific knowledge.	

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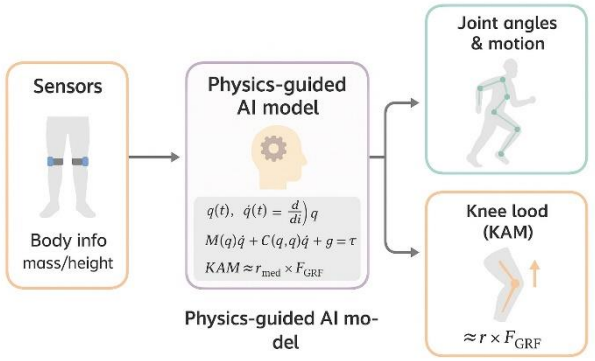
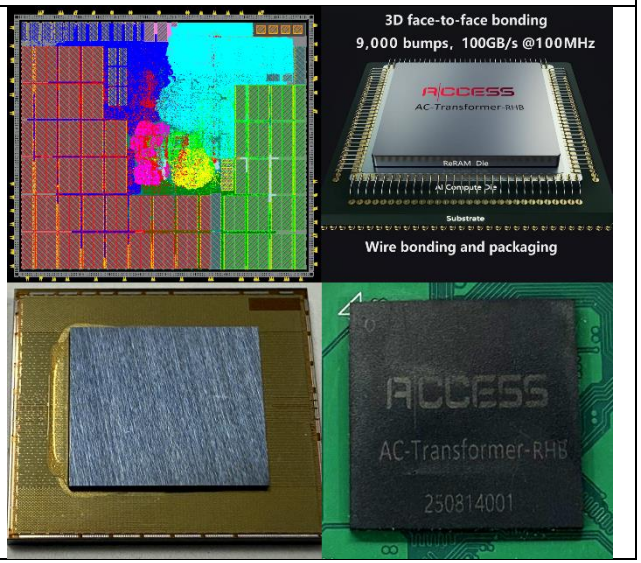
			
Efficient Protein Sequence Design on 3D AI Chip	An ultra-low-power AI chip that accelerates protein sequence design. Through a ReRAM-to-Logic 3D stacking design, this chip achieves 7.5× higher performance and 235.9× lower power consumption compared to existing GPU solutions. It can significantly speed up the discovery and design of new drugs and enzymes.	• Algorithm-architecture co-optimization of ProteinMPNN model using proprietary software toolchain. • Advanced 3D stacking of ReRAM and AI accelerator by die-on-wafer bonding. • Ring-based network-on-chip interconnection inside AI accelerator.	

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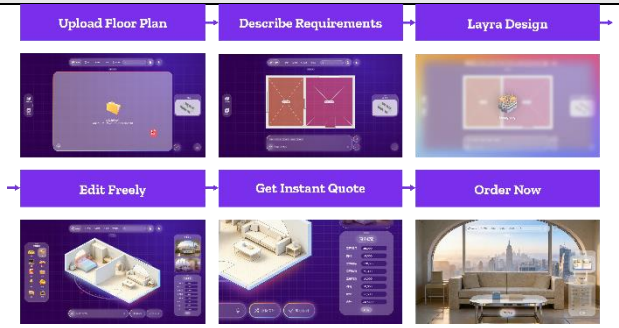
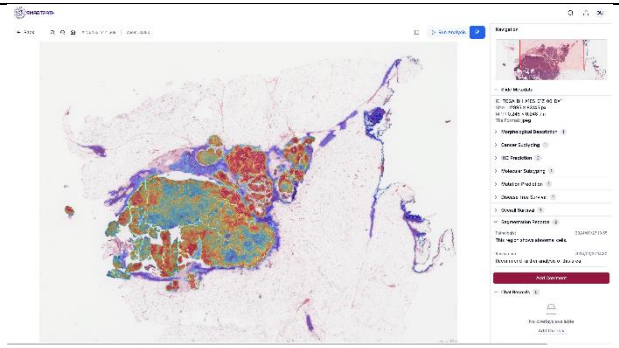
Layra AI: Generative Intelligence for Personalized and Adaptive Living Spaces	Layra AI is an intelligent design platform that transforms interior design and installation into a fast, human-centered workflow— "design in minutes, install in hours"—delivering personalized, adaptive living spaces through generative AI.	• Generative AI: Merges Large Language Models with rule-based optimization to synthesize aesthetic, compliant, and diverse 3D layouts. • Design Automation: Instantly transforms raw requirements into optimized layouts, handling complex constraints to suit diverse architectural conditions. • Human-Centered Design: Prioritizes customization, rapidly iterating styles and functional needs to deliver the perfect personalized design match.	
SmartPath: A Full-stack Digital Pathology Solution	SmartPath is a full-stack digital pathology solution powered by a large-scale pathology model. It covers the entire cancer care cycle, proactively alerts patient risks, improves diagnostic accuracy, and empowers the evolution of smart healthcare.	• 10B-parameter pathology foundation models trained on 10M whole-slide images enable precise diagnosis and treatment guidance. • Clinical-grade inference in under 1 minute via scalable, affordable deployment, lowering costs for hospitals and remote clinics. • Efficient PACS storage with up to 100× compression across diverse scenarios, preserving diagnostic integrity while reducing infrastructure burden.	
Hearing the Invisible: Ultrasonic Ultra Early Diagnosis of Battery Health Degradation	An ultrasonic monitoring system that maps internal battery structures in real time, identifying early-stage defects and degradation to enhance safety, lifespan prediction, and smart energy management.	• Ultrasonic in-situ, in operando array imaging gives 3D high-resolution volumetric visualization of battery interior structure and defects • Multi-physics AI-enhanced highly accurate estimation and prediction of the battery failure point and degradation trajectory • Real-time acoustic sensing and imaging of battery early-stage degradation enables	

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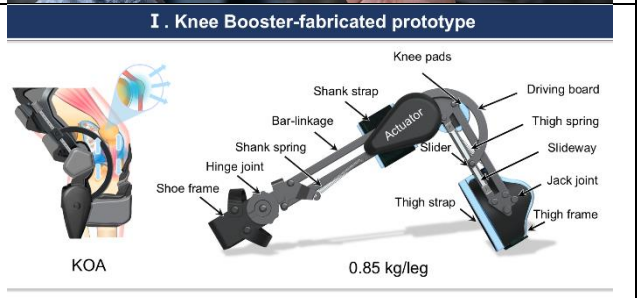
		ultra early warning of thermal runaway far ahead of conventional diagnostics	
StructSense 3D: AI Stereo Camera for Instant Depth, Counting & Geometry Analysis	A handheld AI-powered stereo 3D camera that delivers instant measurement, defect detection, and scene reconstruction using human-like binocular vision. A fast, accurate tool for construction inspection and close-range 3D sensing.	• One Shot, Instant 4K Depth: Human-like stereo vision computes dense 4K depth instantly from a single shot. • One Click, Measure Anything: Pixel-accurate segmentation and geometric measurement – no office, no delay. • From Vision to Action: Spatial AI turns 3D perception into counting, evaluation, and robotic actions.	
A Lightweight, Passive, Energy-harvesting Knee Booster with a High Augmentation Factor	Knee Booster — world's lightest passive knee exoskeleton (0.85 kg) cuts knee load 21.2%, metabolic cost 6.9%, pain 47.8%. Energy-harvesting stimulation. 0.38 W/kg. Clinically proven. The new	• 21.2% reduction in peak knee joint load. • 6.9% lower metabolic cost with natural gait. • Energy harvesting for on-demand stimulation, reducing knee pain 47.8%. • Augmentation factor: 0.38 W/kg, 10× higher than existing devices	

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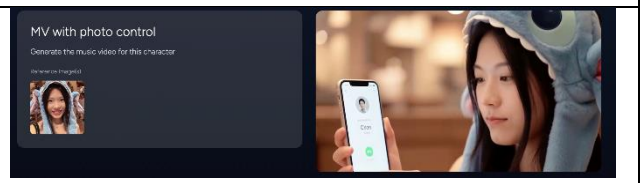
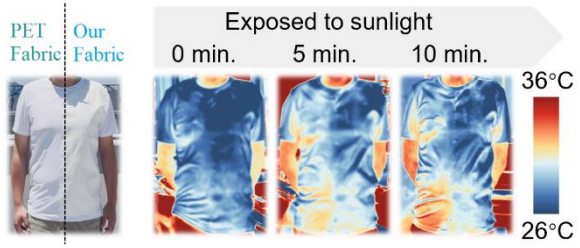
	gold standard for workers, elderly & Osteoarthritis.	• Clinical trials show improved joint function (WOMAC −38%), greater joint space, and less effusion.	
Minute-level Music Video Creation from One Sentence	A system that turns a single natural-language sentence into a fully coherent, minute-level music video. It automates scene planning, visual generation, rhythm alignment, and narrative consistency to produce long-form, high-quality videos instantly.	• Single-sentence input generates minute-level, structurally complete music videos instead of short, fragmented clips. • Automatic alignment of visuals with music rhythm, emotion, and narrative progression. • Consistent characters, style, and storytelling maintained across the entire generated video.	
Green Strategy for Body Cooling in Summer: Radiative Cooling Metamaterial Fabrics	To reduce the human body temperature in summer, it mimics the structure of snowflakes, reflecting solar thermal radiation, at the same time, emits human body heat into outer space through the atmospheric window, making life healthier and greener.	• Radioactive cooling technology: Pump heat out of the body. • High reflection technology against solar and thermal radiation: Keep body away from heat. • Quick-dry technology for fabrics: Make sweat evaporate quickly.	

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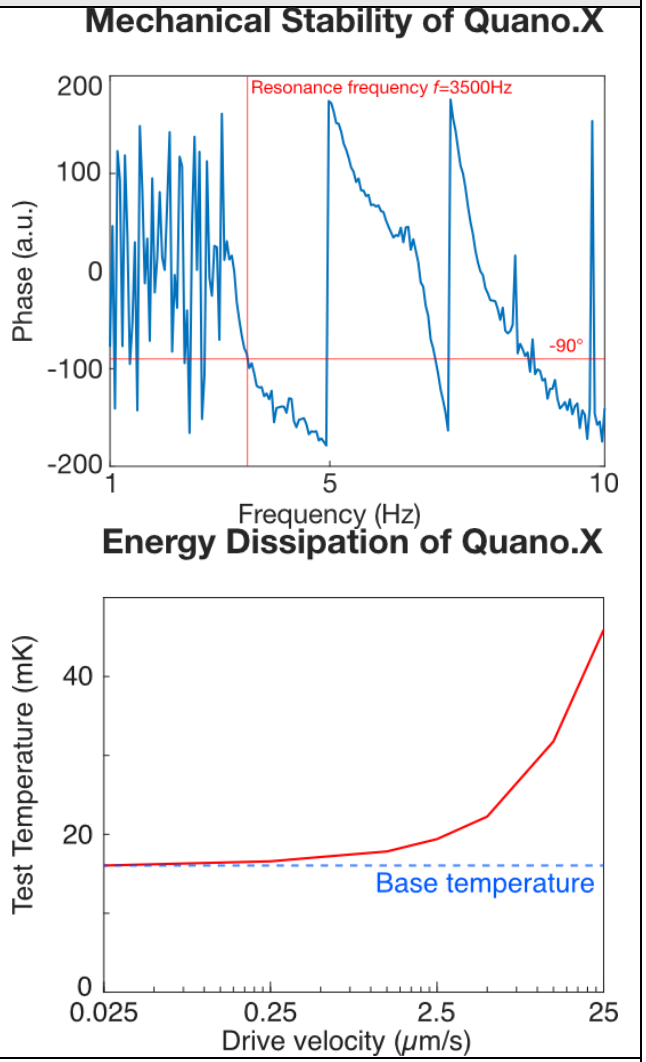
Ultrastable Nanopositioning Technology for Cryogenic and Vacuum Operation	Our invention describes the design and realization of precision positioning stages with nanometer accuracy for reliable operation across various temperatures and pressure ranges which are characterized by unprecedented mechanical stability.	• Innovative structural designs of the piezo drive backed by finite-element simulations results in high mechanical stability and robustness. • Judicious material choices of high-performance alloys and ceramics facilitate mechanical stability and thermal heat load management even near absolute zero temperature. • Insights from interface physics and chemistry combined with advanced manufacturing techniques facilitate reliable and wear-free motion under various hydrostatic and cryogenic conditions.	
AI-powered Commercial Pool Cleaning Robot	The Wave Robot is a fully automated pool cleaning robot designed specifically for large pools. Our robot utilises world-leading	Vision Underwater SLAM technology, allowing it to sense high-resolution 3D spatial data for navigating complex underwater terrains	

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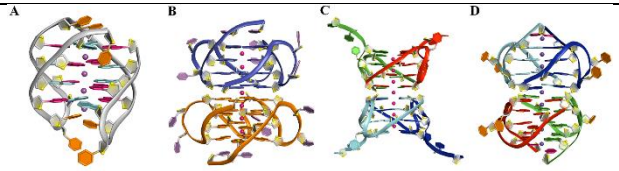
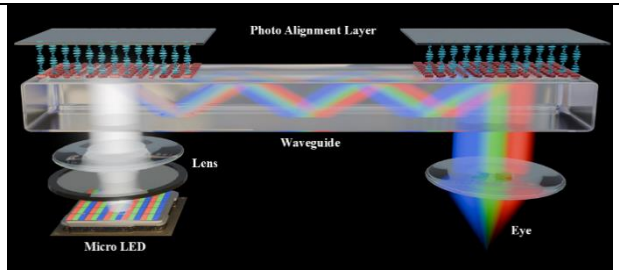
	underwater VISION SLAM technology, which empowers it with the capability of navigating complex underwater terrain.	• Predictive maintenance, our robot will collect cleaning data after every task and analyze this data, which could reduce unnecessary cleaning and optimize energy consumption • Docking Station: The Mobula X1 includes a smart docking station that is installed at the pool's edge, allowing the robot to automatically return for recharging after completing its cleaning tasks	
Targeting C9orf72 G-Quadruplexes: Structure-Based and AI-Optimized Small Molecule Therapeutics for ALS/FTD	First-in-class small molecules rationally designed by structural biology and AI specifically bind C9orf72 G-quadruplexes, a root-cause strategy that substantially reduces pathological signature and exhibits high efficacy in ALS/FTD models.	• Integration of multi-modal structural biology approaches. • Targeting G-quadruplex structures formed by C9orf72 G4C2 repeat expansions in ALS/FTD pathology. • Structure-based and AI-optimized small-molecule discovery for ALS/FTD treatment.	
Ultra-High-Efficiency Optical Waveguide for Augmented Reality Device	Experience next generation AR with our waveguide, based on photo-induced liquid crystal polarization volume gratings, enables vivid, high-brightness overlays onto the real world, with mass-producible, optically efficient, durable, and cost-effective.	• Safety First: Unlike current solutions with glass lenses that pose injury risks in accidents, our waveguides use lightweight resin materials. This design enhances safety and ensures our AR wearables are comfortable for everyday use. • Vivid Visuals: Our waveguide produces bright, full-color images with a wide field of view - perfect for engaging experiences in everyday activities.	

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		• Cost-Effective Manufacturing: Thanks to our unique photo-alignment technology, we can produce these waveguides in large quantities with high quality and low cost, making AR devices more accessible to everyone.	
SANI Process: An Innovative Wastewater Treatment Technology Achieves Carbon Capture and Valuable Bioactive Polysaccharides Recovery	The SANI process revolutionizes wastewater treatment plants by transforming it from a major resource-consumer to resource factory through recovering valuable bioactive polysaccharides and changing the CO_2 emissions process into carbon capture.	• Transforms WWTPs from resource consumers to recovery facilities • Converts CO_2 emission into deliberate carbon capture • Recovers high-value bioactive polysaccharides from wastewater	

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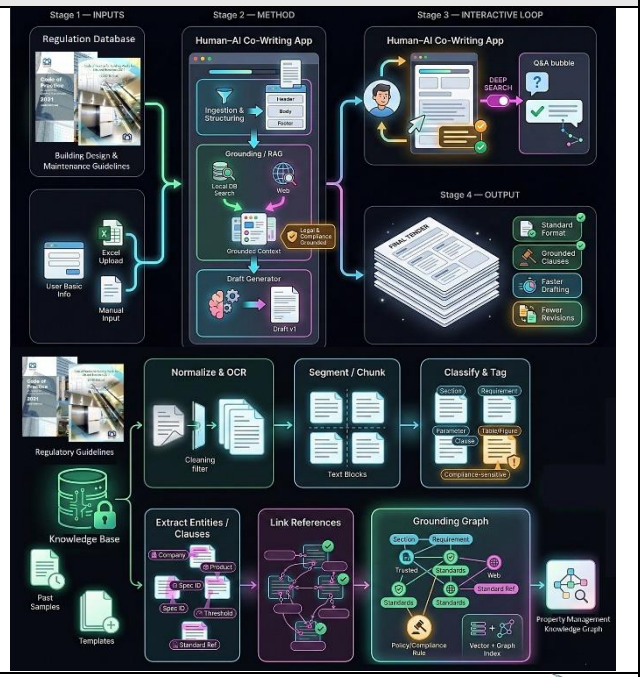
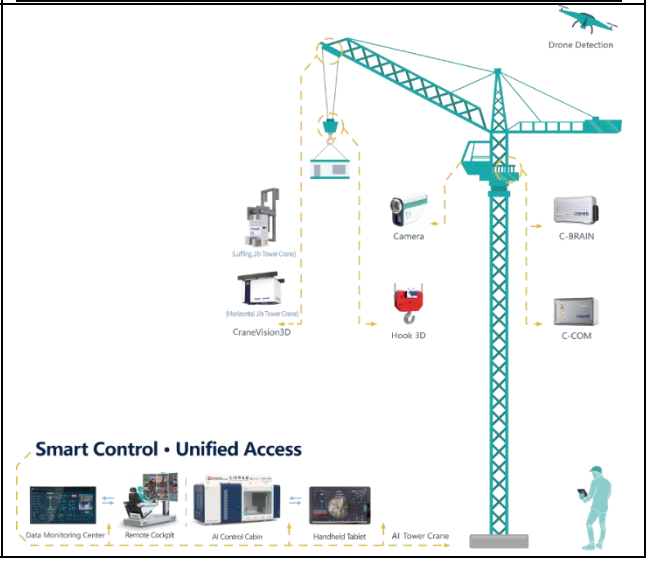
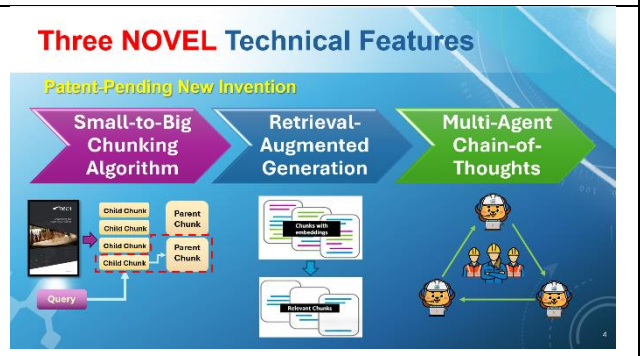
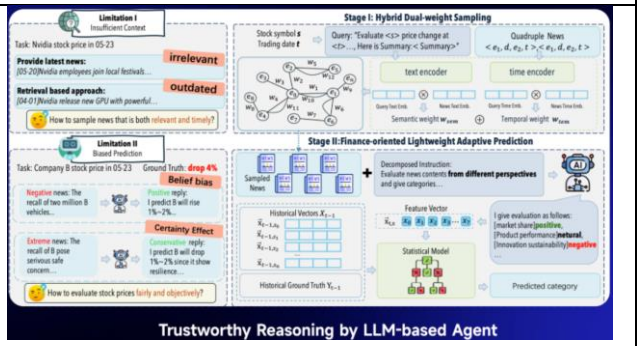
An AI-Powered Retrieval-Augmented Intelligence System for Tender and Contract Management	This invention is an AI-powered system combining large language models with retrieval-augmented intelligence to automate tender drafting, contract analysis, and compliance checking, enabling trustworthy decision support for construction documents.	• Context-aware document chunking algorithm for precise vectorization of regulatory building maintenance codes and standardized design guidelines • Domain knowledge graph-enhanced evidence retrieval algorithm for real-time cross-referencing among complex building regulations and property-specific compliance standards • Human-AI collaborative tender documentation interface with instant building-domain regulation searching and evidence-based compliance checking	
AI Tower Crane System	AI Tower Crane System includes AI safety monitoring system, remote control system and AI auto-lifting system. Powered by AI technology, the lifting efficiency can be improved by 30% and has successfully reduced the accident rate to zero since deployment. Meanwhile, the very low cost can be achieved through self-developed full stack retrofit system.	• AI safety monitoring system. • Remote lifting control system. • AI path-planning and anti-swing control system.	

Project	Description	Key technology edges	Images
Water Tank Cleaning Robot	The Water Tank Cleaning Robot is co-developed by Hong Kong Center for Construction Robotic Limited and the Electrical and Mechanical Services Department. It replaces workers who would enter confined spaces to perform cleaning tasks. The robot features AI for contamination detection, autonomous navigation, brushing, suction, high-pressure rinsing, and disinfection. It enhances occupational safety and health level, reduces manpower, costs, and improves operational efficiency.	• AI contamination analysis. • Underwater navigation, wireless communication and control. • Amphibious cleaning technology.	
CEDD AI Assistant	CEDD applies AI to assist in reviewing tender documents and to further automate related processes, thereby improving the efficiency of the tendering procedure. In addition, AI is also used to analyse engineering contract matters and to formulate solutions in accordance with established guidelines,	• A hierarchical document chunking algorithm that automatically construct a knowledge chain for over 16,000 pages of New Engineering Contract and civil engineering standard & guidelines. • A context-aware retrieval-augmented generation framework based on a domain-tailored XML tagging system to anchor retrieved clauses to traceable sources. • A multi-agent reasoning framework with task-specialized and collaborative AI agents to resolve engineering scenarios,	

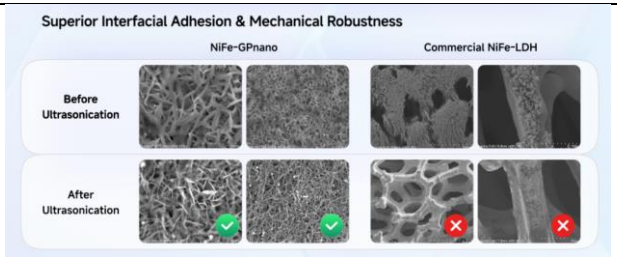
Project	Description	Key technology edges	Images
	thereby enhancing the overall efficiency of contract management.	with a feedback-based knowledge self-reinforced learning mechanism.	
Digitalization of underground pipeline inspection and management system	A revolutionary integrated system that comprises AI analytic, 3D digital twin and a common platform for intelligent asset management. The system autonomously analyses CCTV footage via AI for defect coding and instant pipe grading, constructs precise and immersive 3D digital twin through hybrid photogrammetry and laser scanning and provides a centralised web platform for real-time data submission improving inspection speed, accuracy, and long-term planning.	• Centralised collaboration hub: A secure, centralised platform that connects multiple stakeholders and enables seamless data exchange with existing systems. • Hybrid one-stop inspection for 3D digital twins: A hybrid capture workflow — laser scanning at manholes and pipe ends combined with photogrammetry for pipe runs — delivers precise measurements and high-fidelity texture for 3D digital twins. • AI video analytics for pipeline assessment: The system deploys Vision Language Model for automated, continuously improving pipeline condition assessment.	

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

HKUST(GZ) Projects

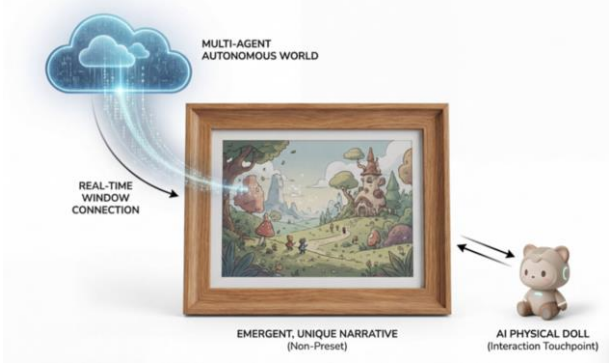
Invention / Project	Description	Key technology edges	Images
Gold Medals with Congratulations of the Jury			
LingCopilot: An LLM-Empowered Multi-agents No-Code Quantitative Trading System	LingCopilot is a code-free quantitative trading engine designed to address the high barriers to entry and difficulties in strategy implementation in quantitative investment. It automatically "compiles" natural language investment ideas into backtestable and executable quantitative strategies. The core of the system consists of a large-scale model driven by financial knowledge and a multi-agent collaborative architecture, covering the entire chain from data processing, strategy modeling, risk control and early warning to live execution, enabling continuous strategy optimization and full-cycle management. Technically, the project has built a leading dynamic financial knowledge graph in the Chinese A-share market and introduced innovative mechanisms such	Dynamic Financial Knowledge Graph Engine (HiDy Dynamic Financial KG Engine) • Designed for multi-source heterogeneous financial data, the system provides a full lifecycle capability, "Extraction-Fusion-Continuous Updating", creating an evolvable financial knowledge backbone. For knowledge extraction, the proposed method improves average accuracy by 18.20% over baselines such as OpenIE on knowledge extraction tasks. For knowledge updating, it achieves a 44.20% higher recall than baselines such as GUpdater on labeled datasets. Built on this engine, the open-sourced HiDy Dynamic Financial Knowledge Graph is among the largest and most relation-rich open A-share (China equity) KGs, comprising over 50,000 entities, 17 entity types, 34 relation types, and more than 500,000 relations. Its coverage spans four knowledge layers (macro, meso, micro, and others) and supports more than five downstream financial tasks. Knowledge-driven Intelligent Quantitative Prediction Engine (Knowledge-driven Quant Prediction Engine)	

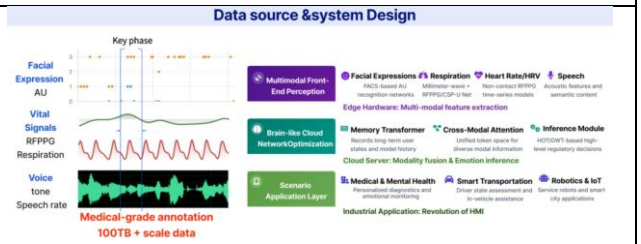
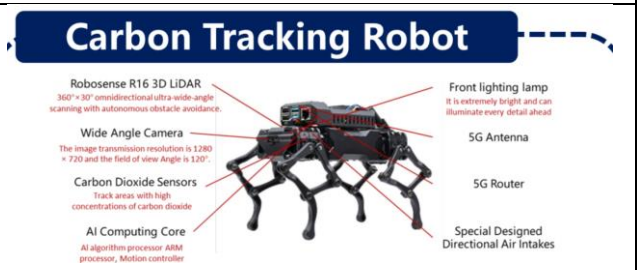
Invention / Project	Description	Key technology edges	Images
	as reliable reasoning, illusion filtering, and adaptive market sentiment prediction to improve strategy credibility and practical performance. LingCopilot serves both professional institutions and individual investors, and is suitable for diverse application scenarios such as strategy incubation, intelligent investment advisory, and automated trading, contributing to the AI-driven inclusive quantitative and fintech industry upgrade.	• Using the financial knowledge graph as a structured prior, the engine explicitly injects entity relations, event chains, and industry structures into the quantitative modeling pipeline to support stock return and factor prediction. Through model ensembling and continual updating, it improves predictive robustness and generalization under changing market regimes. Compared with baseline models such as KGEEF, it delivers a relative improvement of 31.14% in IC and 19.95% in ICIR. Incremental Learning and Fast Refresh Framework (Incremental Learning & Fast Refresh Framework) • To address market non-stationarity and concept drift, the system replaces frequent full retraining with incremental training, enabling continuous iteration and high-frequency refresh with substantially lower operational cost. Compared with full-update training, the incremental-update model achieves a relative improvement of 35.20% in IC and 45.58% in ICIR, while delivering an update speed more than 18.3× faster—supporting time-sensitive and operationally scalable live trading deployments. Global–Local Integrated Explainability Engine (Global–Local Explainability Engine)	

Invention / Project	Description	Key technology edges	Images
		• To satisfy auditability requirements in research and live trading, the system provides an integrated explainability framework that captures both global patterns and per-sample decision rationales. It characterizes overall contribution distributions of key factors/relations at the global level and produces structured evidence chains for individual predictions at the local level, improving trustworthiness and usability of model outputs. On public datasets, the proposed explainability approach achieves over 21.62% relative improvement in accuracy compared with existing methods such as Effect and SubgraphX.	
Next-Gen Energy Solution: Robust, Ultra-Low Loading Solvent-Free Electrode Platform	Breakthrough solvent-free electrode platform based on UHMWPE Membrane. Delivers superior stability and performance at ultra-low catalyst loading. A scalable, universal solution for diverse electrochemical energy conversion technologies.	Process Innovation: PVD & Dry Formation • Principle: Distinct from traditional wet slurry coating, we utilize Magnetron Sputtering (PVD) combined with Thermal Transfer technology. • Objective Advantage: This process is entirely solvent-free, physically avoiding potential catalyst interface contamination caused by solvent residues. It simplifies post-processing and enables an environmentally friendly manufacturing route. Structural Design: UHMWPE "Shish-Kebab" Skeleton • Principle: We construct a unique "Shish-Kebab" nanofiber network using Ultra-High Molecular Weight Polyethylene (UHMWPE).	

Invention / Project	Description	Key technology edges	Images
		• Objective Advantage: This hierarchical microstructure significantly increases the specific surface area of the electrode, providing abundant sites for catalyst deposition. Furthermore, its open and interconnected pore structure optimizes gas-liquid transport pathways, notably enhancing mass transport efficiency and reducing concentration polarization at high current densities. Interface Optimization: Ionomer-Free Direct Anchoring • Principle: Catalysts are physically deposited directly onto the nanofiber skeleton, eliminating the ionomer (binder) layer typically used to hold catalysts in traditional electrodes. • Objective Advantage: Removing the ionomer wrapping reduces the physical blocking of active sites by non-active materials. This significantly improves the effective utilization of the catalyst surface and lowers interfacial resistance for electron transport. Performance Validation: High Stability via Metal Embedding • Principle: During the thermal transfer process, metal catalyst particles are physically embedded into the surface of the softened polymer fibers, creating a strong mechanical interlocking structure.	

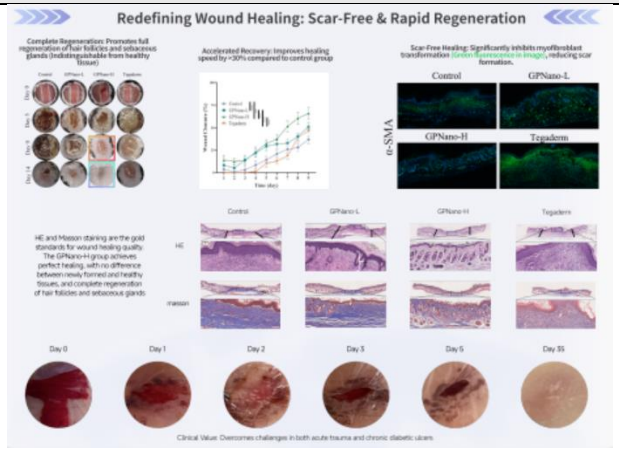
Invention / Project	Description	Key technology edges	Images
		Measured Data: • Cost Reduction: Achieving comparable performance benchmarks, Platinum (Pt) loading in PEMWE is reduced by approx. 50%, and NiFe loading in AEMWE is reduced by approx. 95%. • Stability: This "embedded" architecture effectively prevents catalyst detachment during operation. In 40,000-cycle accelerated stress tests, the electrode exhibited a voltage decay of approx. 40mV, demonstrating superior mechanical and electrochemical stability even at low loadings. Scalability: Roll-to-Roll (R2R) Manufacturing • Principle: Adapting laboratory fabrication protocols to continuous production equipment. • Objective Advantage: We have validated the feasibility of the Roll-to-Roll (R2R) process and achieved square-meter scale fabrication. This demonstrates that the technology has reached Technology Readiness Level 6 (TRL 6), establishing a solid foundation for industrial scale-up.	

Invention / Project	Description	Key technology edges	Images
MagiRealm: AI Color E-Ink Frame to a Living Virtual World	An AI-powered full-color e-ink photo frame that connects to a self-running virtual world driven by multi-agent AI; it shows a daily scene from this evolving world through a chosen character's view and supports AI art creation.	• Emergent Multi-Agent Narrative Engine — Enables multiple AI agents with distinct personalities to run autonomously around the clock in the cloud, generating non-scripted, logically consistent world evolution through dynamic interaction. • Long-Term Memory & Spatiotemporal Consistency Management — Addresses memory decay and logic conflicts in long-running multi-agent systems, ensuring narrative continuity and believable character behavior across the virtual world. • End-to-End "Text → World-State → Artistic Image" Generation Pipeline — Automatically distills complex agent interaction logs into high-quality visual frames, with a generative model fine-tuned (LoRA) for the color gamut and texture of full-color E-ink to guarantee artistic fidelity in every output. • Key Narrative Beat Detection & Ultra-Low Power Refresh Strategy — Intelligently identifies high-value narrative moments in the cloud-based world and triggers E-ink screen refresh only at critical instants, balancing a 1–2 year battery life with a sense of real-time presence. • "E-Ink Frame + AI Plush" Dual-Carrier Interaction Architecture — The frame serves as a low-power visual anchor for ambient companionship, while the AI plush acts as a high-frequency interaction	

Invention / Project	Description	Key technology edges	Images
		touchpoint for emotional expression and world intervention, together forming a complete experience loop.	
Multimodal Emotional Intelligence System	An on-device system that fuses facial micro-expressions, voice and contact-free vital signs to infer real-time emotion/intent, providing APIs/SDKs for proactive, high-EQ assistance across embodied robots, wearables and smart devices.	• Multimodal fusion: Integrates facial micro-expressions, voice and contact-free vital signs for real-time emotion/intent inference. • Proactive empathy: Provides active, personalized high-EQ interactive feedback based on real-time recognition. • On-device & cloud collaboration: Ensures low latency, privacy protection and scalable management.	
<u>Other Winning Inventions and Entries</u>			
An Intelligent Integrated Carbon Tracking and Carbon Dioxide Removal Robots Deployment System based on Blockchain and Internet of Things technology	An Intelligent Integrated Net-Zero System with Carbon Tracking and Carbon Dioxide Removal Robots (CTR & CDRR). CTR locates high CO_2 areas via 3D LiDAR, CDRR uses solar power, waste heat and TVSA tech to capture CO_2 (purity >92.6%) autonomously, applicable to urban/industrial area.	• Carbon Tracking Robot • Carbon Dioxide Removal Robot • Temperature-Vacuum Swing Adsorption (TVSA) Pathway • Direct Air Capture Contactors and Adsorbents	

Invention / Project	Description	Key technology edges	Images
New Propulsion System for Unmanned Vessels: Wireless-Powered Full-Azimuth Podded Thruster	Addressing the evolving power needs of future unmanned surface vessels (USVs), this project has developed a novel podded thruster based on wireless power transfer technology, enabling highly efficient direct drive with 360° full rotation. It features a compact structure, light weight, non-contact operation, and free maintenance, facilitating ultra-high maneuverability operations such as lateral translation, turning on the spot, and reversing for future USVs.	• Fully sealed and highly reliable: By replacing the traditional mechanical transmission and carbon brush slip ring with high-power wireless power transmission, a non-contact fully sealed power supply is achieved. This innovation eliminates the risks associated with mechanical wear and poor contact. Additionally, it offers exceptional resistance to salt fog, moisture, and vibration, ensuring stable operation in harsh environments such as marine conditions over extended periods. • All-Around Vector Thrust Operation: The hanging compartment allows for 360° unrestricted rotation. When paired with an efficient motor drive, it can generate vector thrust in any direction. This capability enables the vessel to execute complex, high-precision maneuvers—including forward and reverse movement, lateral shifts, and turning at original point. As a result, operational flexibility is significantly enhanced, particularly in narrow waterways and precise operational scenarios. • Modular and Highly Integrated: Both the transmitting and receiving modules can be independently assembled and disassembled in a modular fashion, eliminating the need for complex transmission shaft systems and extensive wiring. This design significantly optimizes internal space for the placement of battery	

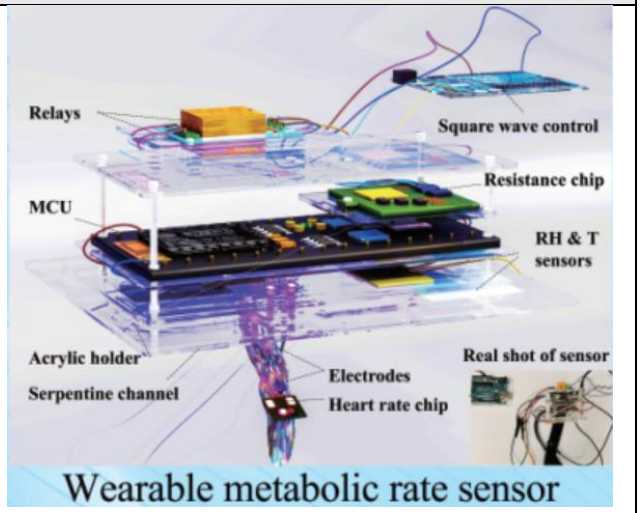
Invention / Project	Description	Key technology edges	Images
		packs or payloads, while also achieving a lightweight structure, functional integration, and enhanced endurance.	
AI Origin Revolution: EBL R&D Reimagined —— Full Automation for Inclusive EBL Access – 30x Faster Training, 20x Higher R&D Efficiency	Our robot-led system enables unmanned operation and universal access, boosting throughput while advancing semiconductor research equity and democratizing high-end chip education for all learners.	• Ultra-High Precision Intelligent Control: Integrating machine vision and force control, it features a customized ultra-precise collaborative robot with end precision of 0.05mm (exceeding industry standards), repeat positioning accuracy ≤±0.005mm, and a miniaturized layout for limited spaces to efficiently complete ultra-precise processes. • Multi-Scenario Adaptation: The end effector adopts a modular design, adapting to various complex process scenarios, compatible with multi-specification samples, with low pollution, high flexibility, high stability, high efficiency and high repetition rate. • AI-Driven End-to-End Automation: AI integrates core technologies such as visual recognition, with natural language interaction, enabling unmanned EBL lithography preprocessing, lowering the operation threshold, aligning with the "dark factory" trend and improving efficiency.	

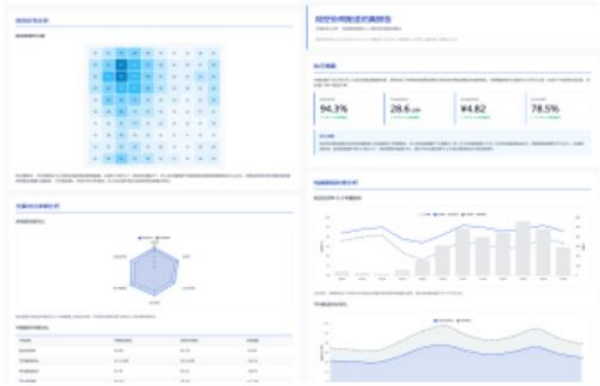
Invention / Project	Description	Key technology edges	Images
Functional Material for Skin Repair Based on Ultra-High Molecular Weight Polyethylene Nanomembrane and Its Applications	The present invention provides a functional material for skin repair, comprising an ultra-high molecular weight polyethylene nanomembrane with a 3D porous network. It exhibits superior mechanical properties, breathability, biocompatibility, and promotes scarless wound healing.	• Precisely Designed Physical Structure and Performance: The nanomembrane features ultrahigh porosity with tailored thickness and architecture, achieving a perfect balance of air and moisture permeability. Its multilayer fibrous structure combined with high hydrophobicity enables 100% barrier against bacteria and viruses. • Highly Controllable Chemical Processability: Compatible with a variety of chemical modification approaches, it serves as a modular platform for the loading of bioactive molecules. • In-situ Formation of a Growth Factor Reservoir: The nanoporous structure of the nanomembrane can sequester growth factors and extracellular matrix (ECM) from wound exudate, forming an in-situ sustained-release growth factor reservoir that preserves the bioactivity of growth factors and enables a complete absorb-stabilize-release pathway.	
SceneGEN	SceneGEN is an AI-driven 3D scanning and cloud rendering platform enabling users to capture, reconstruct, and share immersive spaces seamlessly via mobile devices and web-based tools.	• Neural 3D Reconstruction: High-fidelity modeling from 2D images using NeRF and Gaussian Splatting. • Cloud Rendering: Real-time visualization of complex scenes on web/mobile via distributed cloud architecture. • Automated Workflow: Seamless "Scan-to-Web" pipeline without specialized hardware or manual processing.	

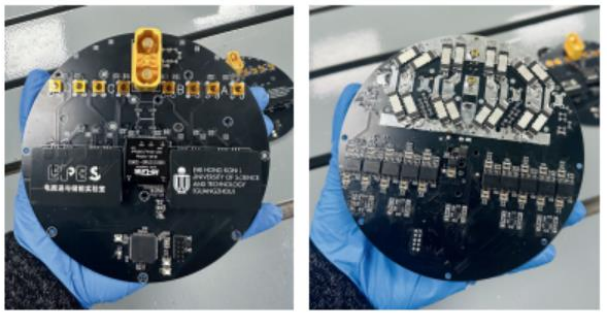
Invention / Project	Description	Key technology edges	Images
Industrial AI Control Code Generation and Soft-Motion System	AI-generated automation control code faces significant challenges in handling complex control scenarios, proprietary motion library calls, and ensuring safety and trustworthiness. The AI-augmented software motion control system integrates industrial-grade AI models with a real-time software control kernel on a general-purpose PC equipped with CPU, NPU, and GPU. Through task decomposition, domain-level semantic understanding, simulation and digital twin verification, and multi-level human–machine interaction, it substantially enhances the reliability and deployment safety of industrial control code. The system was recognized as a Finalist for the IEEE CASE 2025 Best Student Paper and featured in the Intel Industrial Control White Paper 2026, demonstrating its effectiveness in advancing autonomy and intelligence in smart manufacturing.	AI-based industrial control code generation • Up to 3× higher programming efficiency in complex automation scenarios • 60% reduction in technical support and debugging time Safety-critical trustworthiness via multi-stage simulation and digital-twin verification • Zero observed machine crashes or human hazard incidents in validated deployments	

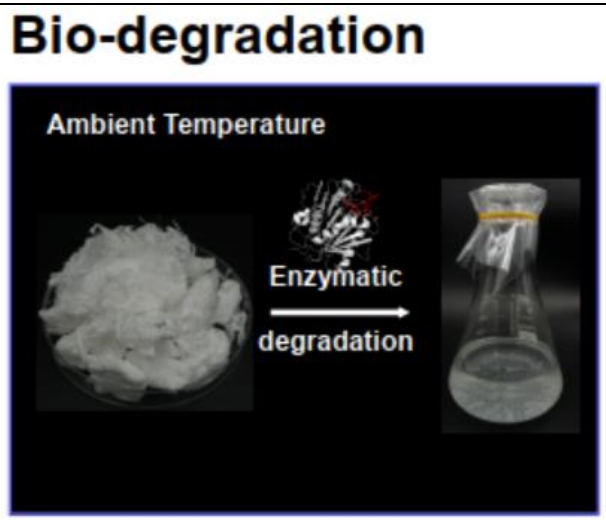
Invention / Project	Description	Key technology edges	Images
Intelligent Health Monitoring and Industrialization of High-Strength Bolts for Heavy-Duty and Heavy-Load Equipment	High-strength bolt intelligent monitoring: online & offline devices. Collects multi-dim data via piezoelectric/electromagnetic ultrasonic probes; enables health monitoring, fracture positioning, cloud visualization & AI trend prediction.	• The project has established a solid technological barrier, with a total of 18 patents and software copyrights. Its technical accuracy error is less than 3% (surpassing the industry standard of ±5%) and has obtained 4 certifications from authoritative institutions. Three categories of core products have been developed, including an online intelligent bolt monitoring system adaptable to complex working conditions, a portable ultrasonic axial force measuring instrument covering multiple bolt specifications, and a bolt preload calibration platform providing standardized services. These products can meet monitoring needs in different scenarios and have all achieved market adaptation. • The application scenarios are extensive and effective: in the wind power sector, it cooperates with leading enterprises to provide bolt detection solutions; in the hydropower sector, it serves key power stations and deploys monitoring equipment; in the marine sector, it focuses on key bolts of the main propulsion system, capable of monitoring main engine foundation bolts (preventing vibration or fracture caused by loosening), main engine end support bolts (preventing axial displacement and foundation bolt shearing caused by loosening), shafting	

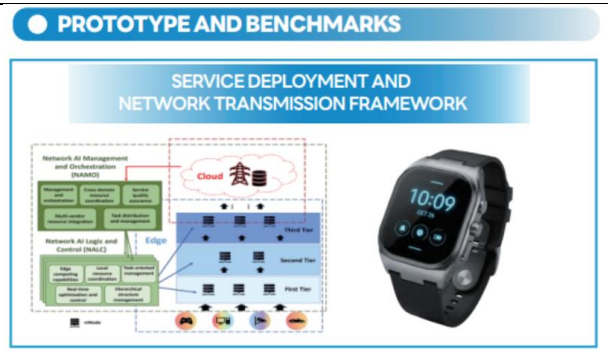
Invention / Project	Description	Key technology edges	Images
		connection bolts and gearbox foundation bolts (preventing vibration or fracture caused by loosening), thus addressing potential safety hazards in equipment operation. All scenarios have effectively solved the pain points of traditional detection and achieved breakthroughs in commercial implementation.	
LingEar	LingEar Smart Earphones redefine hands-free AI interaction. Wake AI from lock screen, record calls, manage tasks, and access life services—all by voice. Always-on technology seamlessly integrates AI into daily life.	• Hands-Free, Conversing with the Future • LingEar Smart Earphones, built on the 'Always-On & Hands-Free' core concept, redefine human-computer interaction — let life move with your voice	
WindScout: Next-Generation Mobile Wind Sensing Platform for Low-Altitude Meteorological Safety and Operations	A UAV-based lidar system that provides mobile, high-resolution wind field measurements, integrating motion compensation, real-time data fusion, and lightweight hardware for Low-Altitude Economy Operations.	Integrated Opto-mechanical Design • Highly compact design adapted for drone payload limitations. Advanced Doppler Wind-sensing Technology • High-performance autonomous laser source technology. AI-driven Motion Compensation • Intelligent algorithms to suppress interference from drone vibrations. AI-based Multi-source Data Assimilation • Multi-source fusion for precise 3D wind field reconstruction.	

Invention / Project	Description	Key technology edges	Images
Personalized Intelligent Thermal Comfort Device: A Next-Generation Smart Energy-Saving System with Metabolic Rate-Aware	The smart-sensing, personalized-metabolic-rate-driven system enables precise thermal comfort profiling and dynamic environmental control, delivering core technology for human-centric, smart, energy-efficient, and low-carbon next-generation systems.	Smart thermal comfort and energy-saving control core for human-centric systems • About 30% energy can be saved if the technology was adopted to adjust HVAC • Reduces over-conditioning from fixed setpoints through human thermal demand-driven operation, while maintaining occupant comfort and providing a health-conscious thermal environment for the elderly and infants. Personalized metabolic insights via easy-to-measure paramaters • Compact prototype with multi-modal sensing integration	 Wearable metabolic rate sensor
The Low-Altitude Economy Ground–Air Collaborative Delivery Digital Twin Platform	The Low-Altitude Economy Ground–Air Collaborative Delivery Digital Twin Platform is built on digital twin technology, ground–air collaborative scheduling algorithms, and large-model-based intelligent agents. It enables the simulation of multiple types of vehicles and transportation modes, including drones, unmanned ground vehicles, and delivery robots. By modeling real urban environments, airspace resources, delivery routes, weather conditions, and regional consumer behavior, the platform	• Fully Integrated Single-Engine Architecture: Integrates flight control algorithms, physics solvers, scene rendering, and human-machine interaction within a single Unity process, eliminating millisecond-level delays from cross-platform communication and achieving a single-threaded, microsecond-level closed-loop process from control input to rigid-body force application. • High-Precision Four-Thrust-Point Dynamic Modeling: Deploys independent motor thrust points based on actual geometric positions, leveraging Unity's native inertia tensor to naturally capture roll-pitch cross-coupling and gyroscopic effects. This yields significantly higher	 Parameters setup Interface

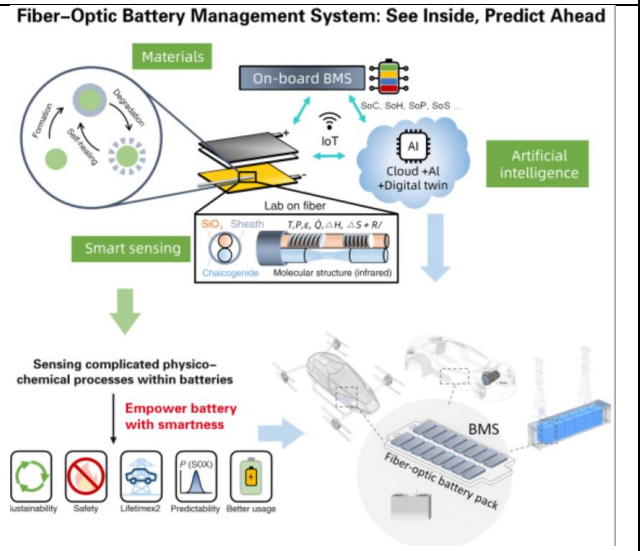
Invention / Project	Description	Key technology edges	Images
	provides valuable data support for algorithm designers and assists policymakers in evaluating and validating low-altitude economy regulations.	simulation fidelity in large-angle maneuvers compared to conventional simplified single-thrust-point models. • Modular Low-Barrier Deployment: Through templated C# PID controller design and drag-and-drop node interfaces, the system enables algorithm integration within minutes and supports real-time parameter tuning. Multi-UAV collaborative transport, heterogeneous formation, and other complex missions can be rapidly validated without cross-platform compilation. • Native Multi-Physics Coupling: UAV dynamics, cable mechanics, and environmental disturbances are solved concurrently within the unified PhysX engine, ensuring highly consistent real-time simulation. • Air-Ground Collaborative Digital Twin: Integration of Unity UGUI interactive components with Python/FastAPI server-based command dispatching, combined with real-time streaming geospatial data from Cesium/ArcGIS and detailed road network information, enables 3D reconstruction of any global city and supports comprehensive air-ground integrated cooperative scheduling simulations.	 3D World Wide Simulation  Automatic Report Generation

Invention / Project	Description	Key technology edges	Images
Rare-Earth-Free Axial-Flux Motor and High-Performance Control System for Electric Aviation	The project develops a rare-earth-free motor system for electric aviation, offering torque-ripple suppression and sensorless control with low cost and high power density, while removing rare-earth magnets to reduce environmental impact.	• The motor adopts an axial dual-stator structure, achieving higher power density and more compact, lightweight arrangement compared with conventional radial structures. • The use of rare-earth-free, permanent-magnet-free technology effectively reduces manufacturing costs and dependence risks on rare-earth materials, improving the stability of the industrial chain. In addition, the rare-earth-free motor overcomes the poor high-temperature resistance of conventional permanent magnet motors and provides superior transient power output capability. • An integrated drive system controller and advanced control algorithms are proposed: • (1) Torque ripple suppression is realized based on nonlinear control techniques, significantly reducing the vibration and noise of the rare-earth-free motor and addressing key technical bottlenecks of conventional rare-earth-free motors. • (2) Sensorless control is implemented, in which the rotor position is estimated by measuring current/voltage signals and tracking inductance/flux linkage variations, thus enhancing system reliability and redundancy.	 Drive-Control Integrated Board

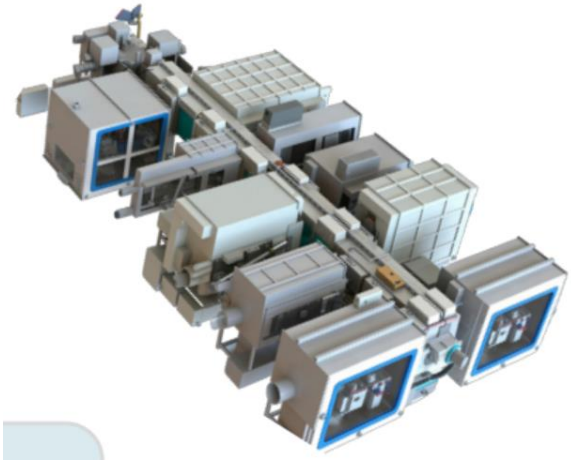
Invention / Project	Description	Key technology edges	Images
		• (3) The drive system adopts a disc-type integrated structure, realizing miniaturization of the drive and high integration with the mechanical structure, further improving system power density and reliability.	
AI-powered room-temperature bio-recycling of high-crystallinity PET plastic	Our AI-enhanced, room-temperature enzymatic process for high-crystallinity & blended PET plastic delivers 129x faster depolymerization and >95% polymer recovery.	AI-Driven "Molecular Navigator" • The Edge: Beyond traditional trial-and-error experimentation. • The Power: We utilized PolySolv AI, a transformer-based deep learning platform, to navigate a chemical space of one billion molecules. This digital-first approach accelerated a discovery process that would have traditionally taken decades, identifying the "perfect match" for plastic deconstruction in a fraction of the time. Thermodynamic Revolution: The 25°C Breakthrough • The Edge: Solving the "Energy-Cost Paradox." • The Power: While current industrial recycling requires "brute force" (heating to >250°C), our technology achieves near-complete depolymerization at ambient temperature (25°C). By eliminating the need for extreme heat, we have slashed the carbon footprint and made truly carbon-neutral recycling a reality.	

Invention / Project	Description	Key technology edges	Images
		Shattering the "Crystallinity Barrier" • The Edge: Making the "inert" digestible. • The Power: We have moved beyond the limitation where enzymes could only attack low-grade plastic. Our technology physically modulates the ordered molecular architectures of high-crystallinity PET (the toughest 80% of commercial waste), rendering it accessible to enzymes and boosting biodegradation efficiency by 129-fold.	
IntelliCare Guardian – AI Agent for Elderly Protection	The "IntelliCare Guardian" project aims to address the rising anxiety around eldercare in China, where nearly 300 million people are over 60. Existing monitoringF36:F43 devices are limited in function and depend on seniors to seek help, failing to meet families' deeper need for proactive, remote care. To solve this, the project introduces an AI-Agent–powered smartwatch at the core of a "proactive protection" system. Its key innovation is an end-edge-cloud collaborative multi-agent AI framework that enables the device to sense, predict, and intervene in potential risks, shifting eldercare from passive	• A low-latency, large-model distributed inference framework employs self-developed model decomposition and pipelined parallelism technologies, reducing large-model inference latency by 43% and achieving millisecond-level fall alarm response within 100ms. • Agent-based proactive perception technology integrates vital signs, environmental perception, and user profiles into a collaborative process. Through a chain of thoughts, it verifies the full picture of an event, reducing the false alarm rate by over 60%. • A user-centric self-evolving learning mechanism combines RLHF (Human Feedback Reinforcement Learning) with large-model fine-tuning technology to build agents with continuous evolution capabilities, accurately adapting to the	

Invention / Project	Description	Key technology edges	Images
	monitoring to truly active guardianship. The system's strengths lie in its technological lead and two differentiated features: the original AHA proactive-intervention mechanism, which adapts services to personal habits, and a precise four-tier risk-alert system that significantly reduces alert fatigue. Targeting high-net-worth families within China's trillion-yuan smart-senior-care market, the project leverages advanced technology to deliver warmer, more connected care.	unique behavioral patterns of each elderly person.	
AscendSpark Brain - Edge AI Computing NAS	An intelligent private cloud designed for content creators, equipped with vertical large model computing power, helping users store, process, share and backup multimodal data more intelligently. Core features: faster speed, fine-grained retrieval, cost-effective, privacy security.	• Computing power ranges from 6TOPS to 2000TOPS, enabling the efficient operation of "decentralized multi - modality large - scale models". With FP8 computing, power consumption is reduced by 50% under the same performance level, and storage requirements are significantly lowered, achieving dual optimization of computing power and energy efficiency. • NVLink high - speed multi - channel communication technology is adopted to support multi - device collaborative computing. The interfaces support	

Invention / Project	Description	Key technology edges	Images
		connecting up to 8 mechanical hard disks (compatible with 2.5/3.5 - inch SATA interfaces), 4G/5G module expansion, and eSIM chips, meeting customized expansion needs for storage and network. • Compatible with the CUDA ecosystem, it can locally deploy inference/generation models under 200B, and supports “multi - modality Agent with infinite context”. At the same time, it deeply interoperates with local AI tools such as PS, covering all scenarios of multi - modality AI and supporting customized AI workflows.	
Fiber-Optic-Based Advanced Battery Sensing Solution	Fiber-optic sensing system for real-time, internal monitoring of battery temperature, gas pressure, and stress. Enhances safety and management for EVs, energy storage, and high-performance batteries.	• In-situ "Neural" Sensing: Ultra-fine (<200μm), chemically inert fiber sensors enable long-term implantation without structural damage, capturing internal physicochemical evolutions beyond "black-box" limitations. • Multi-dimensional Characterization: Real-time, multi-point monitoring of temperature, gas pressure, strain, and chemical composition. This multi-scale perception provides hour-to-day early warnings for thermal runaway. • AI-Driven Paradigm: Integrates high-fidelity sensing with Digital Twin technology to build lifecycle physical models. It enhances the robustness and interpretability of SOC/SOH estimations, reducing reliance on traditional electrical signals.	

Invention / Project	Description	Key technology edges	Images
		• Industrialization Path: Comprehensive platform featuring low-cost sensors, high-precision demodulators, and standardized integration for cylindrical, prismatic, and pouch cells, ready for large-scale commercial deployment. Strategic Application Outlook Electric Vehicles (EV): Proactive Safety • Monitors internal outgassing and abnormal heat generation. Leveraging a "Sensing-Edge-Cloud" architecture, the system identifies irreversible mutations hours before thermal runaway, redefining safety standards through early evacuation alerts. Low-Altitude Economy (eVTOL): High-Reliability Power • Lightweight and EMI-immune sensors provide real-time Remaining Useful Life (RUL) evaluation. This enables precise control of maximum charge/discharge power and intervals, ensuring optimal energy states during high-power flight missions. Large-Scale Energy Storage (ESS): Trillion-Dollar Stability • Distributed networks cover everything from individual cells to container systems. By capturing subtle fault indicators in single cells, it prevents chain reactions	

Invention / Project	Description	Key technology edges	Images
		and catastrophic failures, significantly extending service life and grid stability.	
High-precision intelligent batching and thin film coating preparation system	Automated system for precise solid–liquid dosing (±0.1%) and thin-film coating with in-situ monitoring. Supports real-time mixing, auto-calibration, and adjustable coating speed and gap to improve efficiency and reproducibility in lab workflows.	• In-situ PL inspection & crystallization quality monitoring: By integrating in-situ photoluminescence (PL) inspection, real-time evaluation of crystallization quality during blade coating and annealing is enabled, providing a highly reliable data foundation for closed-loop process control. • Fluid-model-based reinforcement learning control algorithm: Automatically adjusts blade-coating speed according to the real-time film state to optimize film formation quality, achieving thin films with high uniformity and high reproducibility. • In-house micro-dosing mechanism — high-precision hopper and feeding module (self-designed): A self-developed, high-precision material hopper and dispensing unit enables stable, controllable, mg-level micro-dosing of both powders and liquids. • Sensor-based high-precision liquid/solid compensation: Through real-time weighing and multi-sensor data fusion, the algorithm automatically detects dosing deviations and performs intelligent compensation, enabling high-precision closed-loop control across the entire process.	

Invention / Project	Description	Key technology edges	Images
AICORUMI - A Multi-Agent Collaborative Companion Agent	The invention discloses a companion agent for proposal compliance based on evidence verification and multi-agent collaboration. The method includes: segmenting the content input and performing entity extraction; performing dual-channel retrieval over a real-content index and a precedent repository to obtain candidate evidence; computing an evidence score with a weighted function of content relevance, precedent similarity, version recency, and source credibility, and then performing version and source verification; under the verified evidence constraints, launching content interpretation, rule auditing, precedent retrieval, and risk planning agents in parallel according to an interleaved scheduling protocol, so that the reliability of the LLM-based agent's output is significantly improved.	• Embodied Professional Companion Interface Transforms the compliance algorithm into an emotional support robot that accompanies users through high-pressure proposal work. It understands both document context (via entity extraction) and user intent, acting as a tireless partner that alleviates the anxiety of regulatory review. • Dual-Channel Verifiable Knowledge Retrieval Equips the companionship robot with a "professional brain" using dual-channel retrieval over regulation indices and precedent repositories. This ensures the robot's advice is not just comforting but legally grounded, cross-referencing real-time laws with historical case outcomes. • Interleaved Multi-Agent Cognitive Engine Utilizes an interleaved scheduling protocol to coordinate internal agents (Legal Interpretation, Rule Audit, Risk Planning). This allows the robot to "think" in parallel—processing complex logical audits while maintaining a smooth, responsive, and human-like interaction flow. • Evidence-Anchored Trustworthy Interaction Builds deep user trust through weighted evidence scoring system (relevance, recency, credibility). By enforcing strict version and source verification, the companionship robot eliminates "hallucinations," ensuring its	

Invention / Project	Description	Key technology edges	Images
		companionship is based on absolute professional reliability.	
HoloSoul: A Holographic Digital Companion with Autonomy and Long-Term Memory	HoloSoul: An AI/AIGC system for creating holographic digital companions. It uses a real-time action engine and permanent memory, enabling AI companion to learn, show emotion, and interact naturally via holographic display.	Ultra-fast 3D Digital Avatar Creation • Enables ordinary users to generate a personalized 3D digital avatar within 120 seconds, significantly lowering the creation barrier compared to traditional 3D pipelines. AIGC-driven Motion and Behavior Engine • A self-developed generative motion engine that produces natural, continuous, and context-aware avatar movements, avoiding scripted or repetitive behaviors. Memory-based Intelligent Agent Architecture • Incorporates long-term memory modeling to maintain consistency in behavior, preferences, and relationship context across extended periods of interaction. Proactive Decision and Low-interruption Interaction • Moves beyond command-based interaction by enabling the system to decide when and how to act, supporting sustained presence with minimal user interruption.	

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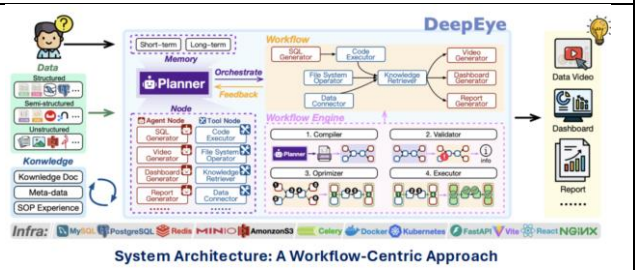
Ship-based Carbon Capture Technology	Our technology captures and treats ship engine exhaust directly at the source. It helps reduce a ship's overall CO2 emissions by more than 70%. This is a significant advance in green maritime technology, helping to decarbonize the global shipping industry and paving the way for a more sustainable future on our oceans.	Motion Stabilized Absorber for Shipboard Operation • A dedicated absorber stabilization design maintains stable gas-liquid contact under ship rolling and pitching, ensuring reliable CO_2 absorption in real marine operating conditions. Continuous Kettle-Type Absorber with Compact Layout • The continuous kettle-type absorber improves mass transfer efficiency while maintaining a compact and modular structure suitable for space- and weight-constrained shipboard. AI-Assisted Solvent Development with High-Throughput Validation • Solvent formulation is supported by AI-assisted screening and validated through high-throughput experiments, resulting in absorbents with improved CO2 capacity, stability, and ship compatibility. Multi-Point Reflux Control for Stable Long-Term Operation • Multi-point reflux control enables precise regulation of internal flows, allowing the system to adapt to fluctuating exhaust conditions and maintain stable capture performance during extended voyages. Integrated Leak-Resistant Pipeline Design with Real-Time Monitoring	

Invention / Project	Description	Key technology edges	Images
		• A multilayer, vibration-resistant pipeline system combined with real-time operational monitoring significantly reduces leakage risk and enhances overall system safety in harsh marine environments. Pilot-Scale Demonstration Supporting Engineering Feasibility • Pilot-scale operation demonstrates the technical feasibility and robustness of the system, providing a solid engineering basis for further scale-up and shipboard deployment.	
DeepEye: A Visual Programming Workflow-Driven Data Agent System	DeepEye transforms complex data analysis into visual, programmable workflows. It uses an AI Agent orchestration engine for dynamic tasks and a zero-code visual system for transparent, interactive complex data analysis and process management.	• In the era of Big Data, traditional AI often acts as a "black box"—providing answers without explaining the reasoning, especially when dealing with a mix of databases and documents. DeepEye redefines data analytics by transforming AI from a simple chatbot into a "steerable self-driving system." By organizing complex analysis into transparent, visual workflows, DeepEye enables users to orchestrate heterogeneous data sources with precision, transparency, and enterprise-grade reliability. • Transparent & Controllable Analysis (Workflow-Centric): Unlike "black-box" AI, DeepEye maps out its entire thinking process as a visual workflow. Users can inspect, verify, and correct any step,	 System Architecture: A Workflow-Centric Approach

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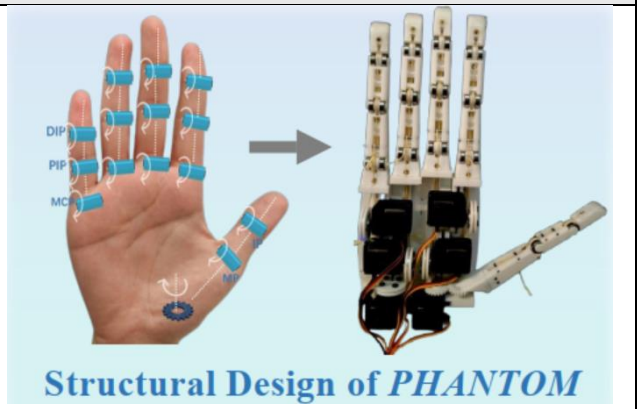
		making AI results fully trustworthy and auditable. • All-in-One Data Intelligence (Multimodal Orchestration): It seamlessly bridges the gap between structured databases and unstructured PDF reports. DeepEye doesn't just provide text; it automatically synthesizes insights into interactive dashboards and data videos. • Smart "Brain" with Laser Focus (Hierarchical Reasoning): For complex projects, DeepEye splits the workload among specialized "mini-brains." This hierarchical approach prevents the AI from getting confused or losing focus, ensuring high accuracy even in multi-step tasks. • High-Speed, Error-Free Engine (Database-Inspired): Built with the rigor of a high-performance database engine, it automatically checks for errors before execution and handles tasks in parallel, delivering results with maximum speed and safety.	

Invention / Project	Description	Key technology edges	Images
PHANTOM: An Open-source and Modular Underactuated Dexterous Hand for Precise Manipulation	PHANTOM is a 6-axis 15-degree-of-freedom tendon-driven dexterous hand; based on analytical mapping and one-time sweep angle calibration, combined with segmented offset compensation, it achieves sub-degree-level, repeatable joint control without additional sensors; the system is open-source and modular.	Sensorless Precision & Extreme Cost-Efficiency • Pioneers a mechanics-based algorithm to achieve sub-degree accuracy without fragile, costly sensors. This radically slashes manufacturing costs, democratizing high-end robotics for everyday adoption. Rigid-Soft Hybrid for Absolute Safety • Overcomes the unpredictability of traditional underactuated hands. It robustly wields heavy power tools yet instantly absorbs impact forces during collisions, making it the ultimate safe partner for healthcare and rescue. Plug-and-Play Maintenance for Global Operations • Packs 15 DoFs into a 1:1 human-scale, magnetic modular design. Damaged digits can be hot-swapped in one second like building blocks. This zero-barrier maintenance eliminates complex cross-border repairs and maximizes uptime.	 Structural Design of *PHANTOM*