THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

OKT OFFICE OF KNOWLEDGE TRANSFER

HKUST DeepTech Playbook 2025

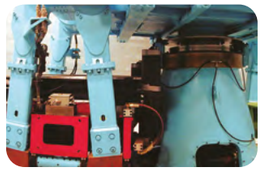
Pioneering Innovation – First in Hong Kong to Implement Central Research Facilities (CRFs) as Cornerstone of Multidisciplinary Research


Data Center


Bioscience Central Research Facility


Aerodynamics and Acoustics Facility

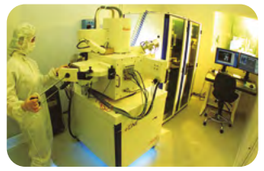

Environmental Central Facility

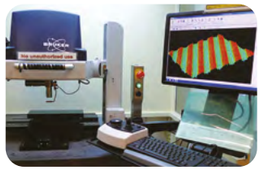

Geotechnical Centrifuge Facility

10 CRFs on Clear Water Bay campus

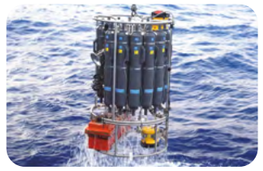
15 CRFs on Guangzhou campus


Laboratory Animal Facility

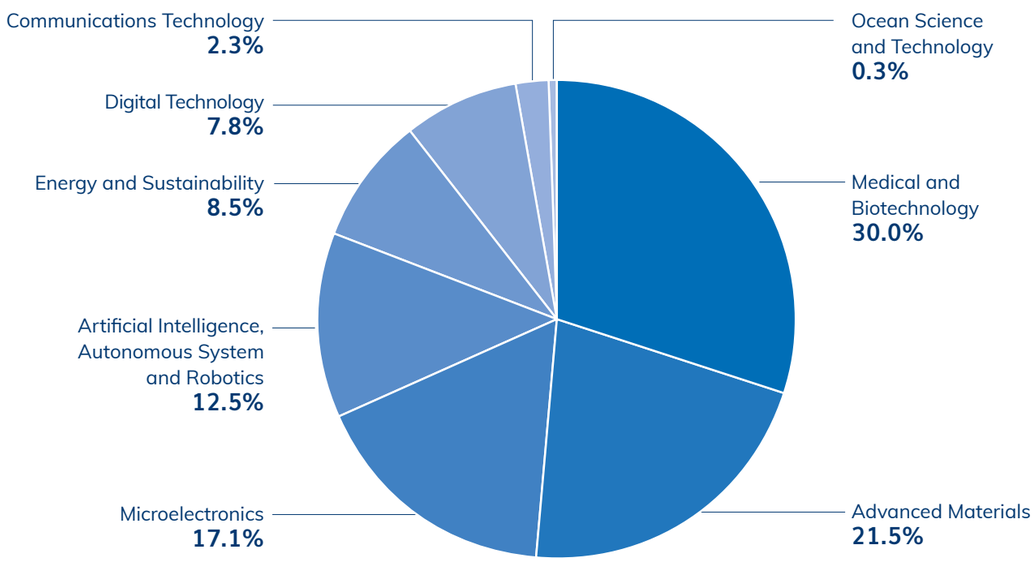

Materials Characterization and Preparation Facility


Materials, Design and Manufacturing Facility


Nanosystem Fabrication Facility


Ocean Research Facility

Current Active Patent Portfolio by Technology Area



HKUST Clear Water Bay & InnoHK Centers

As of May 2025

Empowering Enterprise and Research Impact Beyond Borders

No.1 in China
Patent Influence Metric by Nature Index (2022)

30%
Patents utilization rate owned by HKUST Clear Water Bay campus

As of May 2025

462
IP filed

386
IP granted

90
new IP utilized

As of October 2024

261
invention disclosures

A record of
211
active license agreements

As of May 2025

Powerhouse for Innovation and Entrepreneurship

1,900+
active start-ups

As of July 2025

17
successful exits (IPO or M&A)

As of May 2025

10,000+ teams
participated in the HKUST One Million Dollar Entrepreneurship Competition since 2011

10
Unicorns

HK$500M
Establishment of HKUST Redbird Innovation Fund

100+
cutting-edge technologies showcased in Unicorn Day 2025

As of November 2025

Electronics, AI and Smart Systems (EAS)

EAS 01 IoT and Sensing Technologies for Smart City Applications

Principal Investigator | **Prof. Gary CHAN**

Technology Readiness Level | **TRL 9** IP status | **Patented**

Research, develop and deploy innovative IoT and sensing technologies based on machine learning and data mining for smart city applications.

Key Technology Edges:

- **Edge AI:** Our computations are at the edge, saving cloud resources
- **Cost-effective:** Our algorithms are able to use minimal resources in IoT devices without much sacrifice in performance
- **Patented or patent-pending:** Our sensing and video technologies are either patented or patent-pending

Potential Applications

Artificial Intelligent | Smart Cities

Applicable Industries

Information Technology, Communications and Software Services | Construction and Property

EAS 02 AI-Powered Automated Smart Dental Treatment Design System

Principal Investigator | **Prof. Hao CHEN**

Technology Readiness Level | **TRL 6** IP status | **Patented**

Introducing a game-changing AI-Powered Dental Treatment Design System.

It leverages AI and computer vision for precise treatment planning, including implants, crowns, dentures, braces, and aligners. This technology disrupts dental care by:

- Personalizing treatment options for each patient
- Optimizing the design process for superior outcomes
- Revolutionizing workflow efficiency with advanced medical imaging

Key Technology Edges:

- Contour-aware multi-modality registration for CBCT and 3D intra-oral scan
- Generative teeth crown inpainting
- Human-in-the-loop implant position design

Potential Applications

Artificial Intelligent | Medical Imaging

Applicable Industries

Biomedical, Healthcare and Food | Dental, Orthodontic

EAS 03 VideoCrafter: A Unified Toolkit for Personalized Text-to-Video Generation and Editing

Principal Investigator | **Prof. Qifeng CHEN**

Technology Readiness Level | **TRL 6**

Foundation models for high-quality video generation support a range of controls, including text, image, motion, character, and style, providing users with a highly flexible tool for producing innovative content.

Key Technology Edges:

- **High Controllability:** Our technology provides diverse user controls, encompassing text, image, motion, character, and style. This level of controllability is unmatched by competitors
- **High Resolution Generation:** Our technology supports high-generation resolutions, reaching up to 2K resolution
- **Complex Motion:** Our video generation model manages to generate complex motions include scenarios like “teddy bear riding a bicycle”

Potential Applications

Artificial Intelligent

Applicable Industries

Information Technology, Communications and Software Services | Education, Research, and Professional Services

EAS 04 Collaborative and Personalized Digital Twin Platform for Smart Facility Operation Management

Principal Investigator | **Prof. Jack CHENG**

Technology Readiness Level | **TRL 5** IP status | **Patented**

Introducing our groundbreaking Collaborative and Personalized Digital Twin Platform for Smart Facility Management.

It integrates 3D digital environments and real-time sensing data, enabling predictive decision-making and optimization. This innovative platform disrupts facility management by:

- Streamlining operations through real-time asset management and conditions monitoring
- Empowering informed decision-making for built asset stakeholders
- Enhancing efficiency and productivity while reducing costs
- Promoting environmental protection and social well-being through optimized energy usage and occupant interactions

Key Technology Edges:

- Lightweight & standardized digital twin platform for 30-40% faster BIM-based digital twin creation & management
- AIoT-based ESG analytics and LLM-embedded robotic virtual assistants for 20-30% more efficient FM
- Efficient and scalable integration of AIoT and updating of digital twin models
- BIM-Blockchain-enabled common data environment collaboration framework based on open standards for secure & personalized FM

Potential Applications

Smart Cities | AI-embedded facility asset management

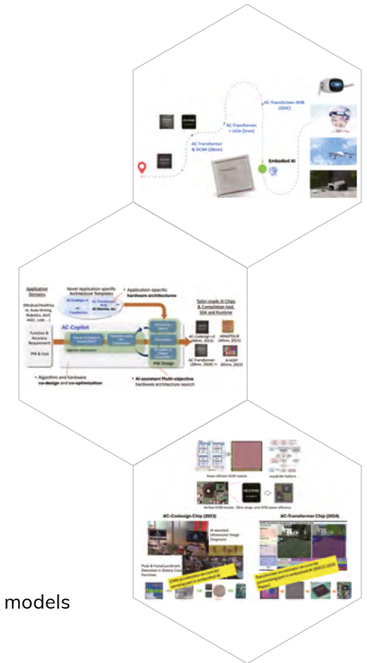
Applicable Industries

Construction and Property | Retail, Consumer Goods, and Hospitality

EAS 05 Efficient Inference Accelerator for Large AI Model

Principal Investigator | **Prof. Tim CHENG**

Technology Readiness Level | **TRL 4** IP status | **Patented**



We provide efficient edge computing chips and systems that can handle large AI models in real-time, creating efficient, low-cost, and flexible intelligent inference hardware to provide the core "brain" for embodied AI, driving the development of applications for embodied AI.

We utilize a software-hardware co-design platform, model compression techniques, and advanced digital compute-in-memory technology to address challenges such as real-time processing, privacy, and cost in handling large AI models and embodied intelligence computing, while meeting the demands of heterogeneous computing, energy efficiency, and storage bandwidth.

Key Technology Edges:

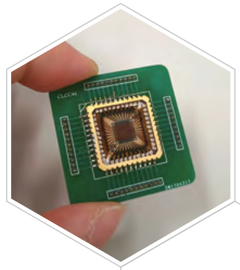
- Customized AI hardware design using application-algorithm-hardware co-design platform
- Digital Compute-In-Memory technology for high power efficiency AI computing
- Compression technology specifically designed for transformer-based large AI models

Potential Applications

Artificial Intelligent | Robotics

Applicable Industries

Electronics and Semiconductors | Information Technology, Communications and Software Services



EAS 06 Development and Commercialization of Bionic Olfactory Chips and System

Principal Investigator | **Prof. Zhiyong FAN**

Technology Readiness Level | **TRL 6** IP status | **Patented**

- **Gas/odor sensors with high performance and high reliability with the up-scalable processes to manufacture**
- **Smart gas/odor sensor systems distinguish various kinds of odors**
- **Wide-range array of applications, including food, environmental, medical, and industrial process control**

Key Technology Edges:

- The olfactory chip offers high sensitivity to various gases with excellent distinguishability for mixed gases
- Realtime analysis for mixture gases with novel machine learning algorithms
- Small form Factor: monolithic sensor array (from 3x3 to 10x10, 100x100 pixels) in a tiny area (5mm X 5mm)

Potential Applications

Sensor | Semiconductor

Applicable Industries

Electronics and Semiconductors | Enviromental monitoring, Biomedical, Healthcare and Food

EAS 07 Middleware for Quantum Computers and Simulators

Principal Investigator | **Prof. Gyuboong JO**

Technology Readiness Level | **TRL 3** IP status | **Patented**

The market has been lacking comprehensive middleware solutions for quantum technologies, with major players such as IBM and Google keeping their middleware proprietary.

QUANTier is actively addressing this gap by developing an advanced software stack capable of connecting users to quantum devices such as quantum computers and simulators. By doing so, QUANTier aims to create an open and inclusive ecosystem that fosters the development of quantum hardware and algorithms, unlocking new opportunities in the field of quantum computing.

Key Technology Edges:

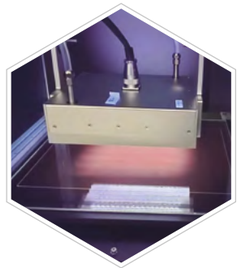
- Provide labs with an all-in-one solution for the lab control
- Connect the research labs and hardware companies to external users
- First comprehensive middleware company in the quantum computing market

Potential Applications

Quantum computing | Research tool / Edu-tech

Applicable Industries

Information Technology, Communications and Software Services | Education, Research, and Professional Services



EAS 08 Photo-Aligned Multi-Domain Vertical Alignment LCD for Cost Effective Mass Production with Existing Equipment

Principal Investigator | **Prof. Hoi Sing KWOK**

Technology Readiness Level | **TRL8** IP status | **Patented**

The technology offers a method of using azo dye for photorealignment using blue light with viscosity modifiers optimizing the coating solution, allowing the manufacturer to achieve an efficient and cost effective way of LCD mass production using existing equipment.

Key Technology Edges:

- Patented advance material for photo-alignment to break foreign country material monopoly
- 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

Potential Applications

To Produce Unique All Viewing Angle, High Contrast LCD That Can Replace All Existing Black and White Passive LCDs in the Market | To Enter the Active TFT LCD (TV or Monitor) Market with Strong Competitiveness

Applicable Industries

Manufacturing and Engineering

EAS 09 An Integrative System for food 3D Printing and Multi-Level Cooking for Making Personalized Meals with Ease

Principal Investigator | **Prof. Mitch LI** Technology Readiness Level | **TRL 8** IP status | **Patented**

Creates personalized meals using smart 3D food printing and multi-level cooking, including an ultrafast infrared cooker and selective laser cooking for texture and flavor customization while retaining nutrition.

Key Technology Edges:

- **Multi-Level Cooking with Nano Materials:** Experience fast and efficient cooking and sterilisation without the need for human labor. Our patented world's first commercialised real-time print and cook device utilizes nano materials to enable multi-level radiative cooking, ensuring precise temperature control and enhanced food safety
- **Laser Cooking for Selective Cooking and Texture Creation:** Experience a new level of culinary creativity with laser cooking. This cutting-edge feature enables the selection of specific cooking areas and temperature-sensitive regions, resulting in custom textures like crispiness. Say goodbye to traditional cooking limitations and embrace a world of endless possibilities
- **AI-Generated Food Design Process:** Unleash the power of AI-generated food design. Our advanced algorithm translates text into intricate printing patterns, allowing for the creation of endless possibilities in food shapes and structures while retaining their integrity. Further integration with AI Nutrition Tracking Platform seamlessly connects our Smart 3D Food Printing system with an AI nutrition tracking platform. Analyze personal diet habits and preferences to recommend and prepare personalized food snacks that cater to individual needs, promoting optimal health and well-being

Potential Applications

Food Technology | Artificial Intelligent

Applicable Industries

Biomedical, Healthcare and Food | Retail, Consumer Goods, and Hospitality

EAS 11 Revolutionizing Construction: Integrating Smart Technologies for a Sustainable Future

Principal Investigator | **Dr. Haobo LIANG**

Technology Readiness Level | **TRL 8** IP status | **Patented**

By leveraging advanced technologies such as AI, IoT, 5G, and robotics, we are pioneering the development of innovative robotic and autonomous systems tailored for the construction industry.

Key features include:

- Digital Transformation in Construction: Enhancing operational efficiency, quality, and safety through digital solutions
- Connected Construction IoT: Facilitating seamless connectivity and enabling data-driven decision-making across projects
- Robotics in Construction: Transforming traditional processes to boost productivity and efficiency
- Streamlined Operations: Optimizing construction workflows by integrating state-of-the-art robotic technologies

Key Technology Edges:

- **Cutting-Edge Research and Development:** Our commitment to continuous R&D allows us to stay at the forefront of construction technology. We invest in exploring new methodologies and innovations that enhance our offerings and keep pace with industry advancements
- **Robust Industry Network:** Our extensive network of industry contacts, including suppliers, contractors, and regulatory bodies, enables us to navigate the construction landscape effectively. This network supports our ability to implement solutions that align with industry standards and best practices
- **Scalability and Integration:** Our technologies are designed with scalability in mind, allowing for easy integration into existing construction processes. This flexibility ensures that our solutions can grow alongside our clients' needs, providing long-term value and adaptability to changing project requirements

Potential Applications

Robotics | Artificial Intelligent

Applicable Industries

Construction and Property

EAS 12 ezpie: the Ultimate Platform to Unlock Value from Data

Principal Investigator | **Prof. Mengqian LU**

Technology Readiness Level | **TRL 7** IP status | **Patent in Progress**

One-stop solution to unlock data value by optimally matching tasks with professionals in a secure, functional and AI-empowered environment.

Key Technology Edges:

- Proprietary dynamic pricing and personalized recommendation system that can optimally match data with experts to maximize mutual value proposition at an online marketplace
- Build-in web3.0 online workstation that allows experts to securely work on data-related projects with maximum data security allowing for versatile collaborations
- Generative AI-empowered tools that assist task posting, management and data visualization, making ezpie a marketplace where data, technology, and art meet

Potential Applications

Data Science | Artificial Intelligent

Applicable Industries

Education, Research, and Professional Services | Information Technology, Communications and Software Services

EAS 13 Agile Executive Terminal for Robots

Principal Investigator | **Prof. Yajing SHEN** Technology Readiness Level | **TRL 7** IP status | **Patent in Progress**

The development of a tactile sensor comparable to the human fingertip is of paramount importance for robotics.

Our project team previously proposed a flexible tactile force sensing solution based on the Hallbach magnetic array in the top robotics journal Science Robotics. This technology achieved precise tactile feedback comparable to human fingertips for the first time, decoupling normal and tangential forces, achieving ultra-high resolution, and possessing characteristics such as small size and low cost. On this basis, we have conducted in-depth research development and technology iteration in terms of high-precision measurement of multi-dimensional forces, product durability and communication compatibility. It now has a foundation for industrialization and has applied for multiple patent protections.

Key Technology Edges:

- **High resolution:** This technology achieved precise tactile feedback comparable to human fingertips for the first time, decoupling normal and tangential forces, and achieving ultra-high resolution
- **High dynamic:** Through structural design and corresponding force decoupling algorithm, the sensor can achieve real-time highly dynamic force detection and feedback, greatly reducing the need for computing power
- **Low cost:** Our sensor is simple and suitable for mass manufacturing, and the cost and selling price are far lower than similar products with similar performance. similar products with similar performance

Potential Applications

Robotics | Sensor

Applicable Industries

Manufacturing and Engineering | Biomedical, Healthcare and Food

EAS 14 Quantum Rod LEDs for Display and Lighting with High Quantum Yield and Tunable Wavelength of Emission

Principal Investigator | **Prof. Abhishek SRIVASTAVA**

Technology Readiness Level | **TRL 7** IP status | **Patented**

The technology offers a method for fabricating core shell/alloy quantum rods that can have tunable emission in the visible region of the spectrum, particularly around green emission, allowing the maker to produce polarized emission, achieve high quantum yield and tunable wavelength of emission better than quantum dots.

Key Technology Edges:

- Using innovative quantum rod nanomaterial we can create any desired light spectrum solving the main problems of LED illumination
- Better thermal stability of QRs enables development of low-blue lighting LEDs with high color performance and efficacy
- Applying of quantum material in on-chip configuration enables a new generation of QLED display with up to 40% less price and better performance

Potential Applications

- Displays (LCD Backlighting, Micro-LED, QR-CF, Mini-LED)
- Lighting (High CRI Low-Blue LEDs, Highly Efficient LEDs, Monochromatic LEDs)
- Illumination for Special Needs (Medical Application, Exhibition Space Etc)

Applicable Industries

- Electronics and Semiconductors

EAS 15 Physics-guided AI & Intelligent Satellite-empowered Climate Hazard Management SaaS Platform

Principal Investigator | **Prof. Hui SU** Technology Readiness Level | **TRL 7** IP status | **Patent in Progress**

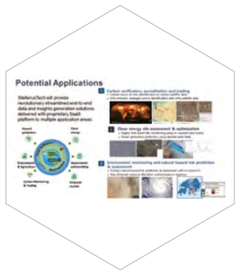
Accurate & Quantitative climate hazard management platform solution empowered by physics-guided AI and intelligent satellite capabilities.

Highlights include:

- Proprietary remote sensing data for both asset and meteorological parameter monitoring and prediction
- Proprietary physics-guided AI analytics for automatic hazard (flooding, typhoon etc.) risk management
- Streamlined end-to-end hazard management services for various industry verticals through a cloud-based SaaS platform

Key Technology Edges:

- Multimodal satellite constellation and on board AI intelligence provides timely, feature-rich and scalable remote sensing data
- Proprietary physics-guided AI algorithms enable automatic prompt hazard risk assessment and risk-informed decision making
- End-to-end streamlined applications for multiple verticals delivered by cloud based SaaS platform



Potential Applications

- Climate hazard management
- Green and sustainable finance
- Insurance

Applicable Industries

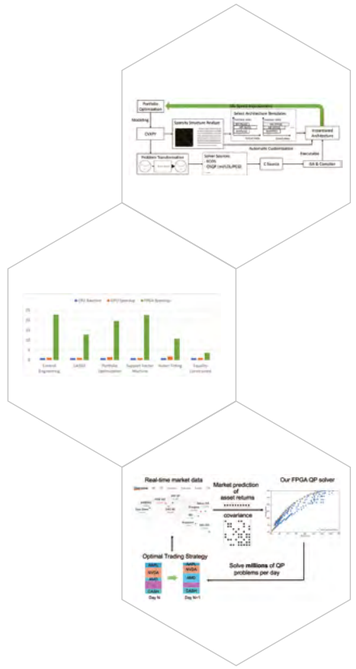
- Information Technology, Communications and Software Services
- Energy, Environmental and Utilities

EAS 16 Hardware Accelerator for Financial Computing

Principal Investigator | **Prof. Chi-Ying TSUI**

Technology Readiness Level | **TRL 4**

We offer a hardware accelerator system (AC-CVXPY) for financial computing applications using FPGA and ASIC, implementing software-hardware co-design and reconfigurable circuit technology.



Key Technology Edges:

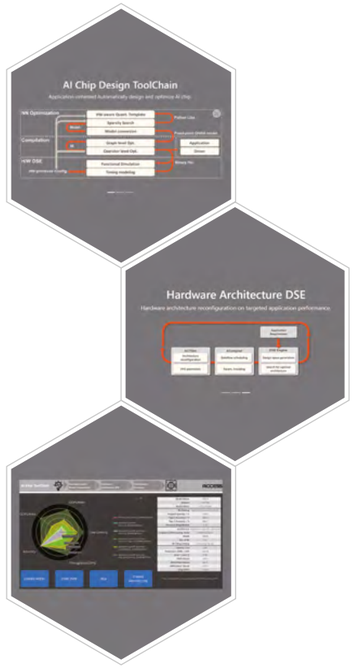
- Customized high-power efficiency and low latency AI core optimized for finance market prediction using co-design technology
- A hardware solver for fast portfolio optimization and trading strategy suggestion
- Reconfigurable circuit technology for flexible algorithm adoption

Potential Applications

- Fintech
- Artificial Intelligent

Applicable Industries

- Finance and Insurance
- Electronics and Semiconductors



EAS 17 Electronic Design Automation (EDA) for Many-Cores Deep Learning Accelerator Design

Principal Investigator | **Prof. Fengbin TU**

Technology Readiness Level | **TRL 6**

Design automation and optimization for high-performance deep learning accelerators based on many-cores architecture

- Algorithm-Toolchains-Hardware co-design and co-optimization
- Hierarchical NAS-DSE co-optimization
- Compilation and scheduling mechanism based on dynamic instruction level parallelism
- NoC resource contention aware architectural simulation

Key Technology Edges:

- Reduce many-cores architecture design cycle by about 70%
- Significantly reduced architecture design resources required by ~80%
- Improved IC power, performance, and area ratio (PPA) by ~30%

Potential Applications

- Artificial Intelligent

Applicable Industries

- Electronics and Semiconductors

EAS 18 Towards Carbon Neutral Cities and Countryside: Smart Colourful Integrated Photovoltaic System

Principal Investigator | **Prof. Changying XIANG**

Technology Readiness Level | **TRL 7** IP status | **Patented**

By combining high-efficiency colored photovoltaic and translucent photovoltaic materials into the building's skin, we work towards the zero- carbon transition of buildings and support the city's carbon neutrality plans.

We provide overall solutions and customized smart photovoltaic building integration systems to provide clean, equal and smart solar energy to all residents, so that every building in the city can take advantage of clean and smart solar energy.

Key Technology Edges:

- High performance color BIPV material
- High-performance translucent photovoltaic windows and curtain walls
- Smart BIPV energy management system

Potential Applications

Smart Cities | Building/ Structural materials

Applicable Industries

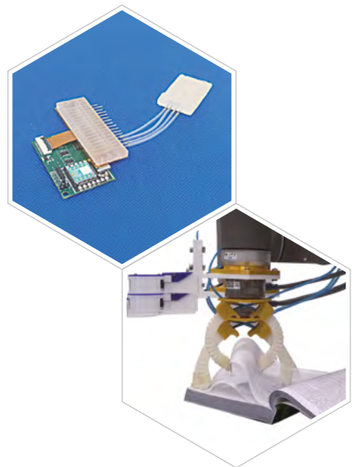
Construction and Property | Energy, Environmental and Utilities

EAS 19 Haptic Sensors for Future Human-Robot Interaction

Principal Investigator | **Prof. Hongyu YU** Technology Readiness Level | **TRL7** IP status | **Patented**

Our cutting-edge technology is dedicated to giving human-like tactile perception to all robotic surfaces, revolutionizing the way humans interact with humans. Highlights include:

- Fusion of vision and tactile for dexterous manipulation
- Large area distributed sensing, cost-effective tactile sensor skin
- Embedded AI to understand and enhance social interactions between humans and robots
- Application coming soon for industrial sorting, agricultural picking, and specialty operations



Key Technology Edges:

- The unique MEMS process enables ultra-thin vision-based tactile sensing, which is adapted to the dexterous robot fingertip sensing
- The smart distributed sensing structure provides the whole body flexible tactile sensor skin for humanoid robots with low cost and high performance
- Fusion of vision, and haptic sensors for full-scale effective human-robot interaction and cooperation
- Embedded AI to understand the gathered information from the sensing system for future social interaction between humans and robots

Potential Applications

Sensor | Robotics

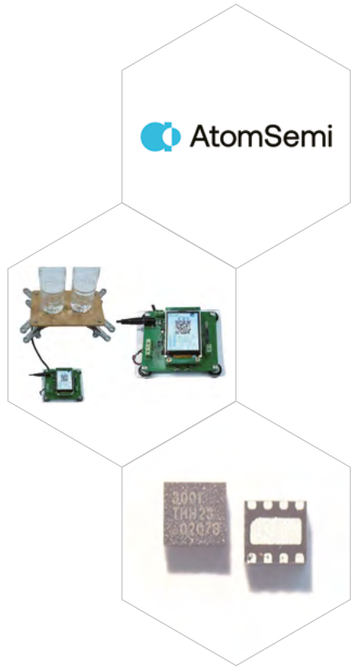
Applicable Industries

Manufacturing and Engineering | Electronics and Semiconductors

EAS 20 High-performance Specialized Digital Sensor Chip for IoE Era

Principal Investigator | **Prof. George YUAN**

Technology Readiness Level | **TRL 8** IP status | **Patented**



AtomSemi is a dynamic fabless semiconductor company that is working to revolutionize the IoT landscape with its high-performance, integrated digital sensing chips.

Designed specifically for consumer and industrial IoT devices, our chips empower businesses to unlock the full potential of a connected world.

At AtomSemi, we integrate the full signal chain into a single semiconductor chip capable of meeting the highest requirements. By integrating the signal chain into a single chip, users can bring new functionalities to applications where space is constrained. As such AtomSemi's chips are a perfect fit for wearables, consumer electronics, industrial electronics, smart homes, and the broader IoT field.

Key Technology Edges:

- Higher level of integration offering smaller form factors for sensing solutions
- Ultra low power consumption enabling IoT applications
- High precision and unmatched stability, enabling high reliability

Potential Applications

3rd Generation Semiconductor | Semiconductor

Applicable Industries

Electronics and Semiconductors | Manufacturing and Engineering

EAS 23 Innovative Full-Color Micro-LED Micro-Display: A Revolutionary Technology for AR/XR Industry

Principal Investigator | **Prof. Wing Cheung CHONG**

Technology Readiness Level | **TRL 7** IP status | **Patented**

The technology offers high-brightness color images with low power consumption, surpassing other micro-display technologies.

By combining a high-brightness light source with an optical waveguide, a new AR glasses experience can be achieved.

Key Technology Edges:

- Achieving full-color display on a single chip while also setting new records for brightness, PPI, and size
- Minimizing the optical module together with the whole display system
- Large-size wafer bonding technology & 100% semiconductor process
- Current Status: 400k nits color output with color gamut over 100% (DCI-P3), 0.5 lm output from projector

Potential Applications

Display Technologies | AR Glasses

Applicable Industries

Electronics and Semiconductors

EAS 24 AINIC: A Streamlined, Scalable, and High-Performance RDMA NIC for AI Clusters

Principal Investigator | **Prof. Kai CHEN**

Technology Readiness Level | **TRL 5**

High-speed networking is increasingly important for efficient training of AI models, particularly for those large language models trained on tens of thousands of GPUs.

However, current high-speed networking technology used in AI clusters, RDMA, is inherited from general datacenter scenarios. It leverages complex yet general design and integrates redundant functionalities to fit those wide-ranging and flexible demands. Instead, we find some deterministic characteristics both in AI clusters and AI workloads. These insights inspire us to redesign RDMA, simplify the transport, remove unused functionalities, and build a streamlined, scalable, and high-performance RDMA NICs dedicated for AI clusters.

Key Technology Edges:

- **Streamlined:** Reduce the design complexity, which decreases the chip area, facilitating expansion and integration, and lowers development difficulty and failure rates
- **Scalable:** Scalable and modular IP design helps improve the NIC bandwidth by realizing multiple processing units or enhance the GPU-to-GPU bandwidth by realizing multiple on-chip NIC modules
- **High-Performance:** Provide superior network services, including ultra-high bandwidth, low tail latency, large-scale communication, and user-friendly verbs

Potential Applications

- Communications Technology
- Artificial Intelligent

Applicable Industries

- Information Technology, Communications and Software Services

EAS 25 AI Agents based on Large Language Model

Principal Investigator | **Prof. Yang WANG**

Technology Readiness Level | **TRL 8** IP status | **Patented**

AI Agents, or Artificial Intelligence Agents, are a system that can act autonomously in a specific environment to achieve predetermined goals.

These agents can learn and make decisions based on the feedback from the environment, optimizing their behavior and improving the efficiency of goal achievement. In different application scenarios, we design customized frameworks, using different large-scale models for different components in the application. These models can work together, achieving an effect where the whole is greater than the sum of its parts, i.e., “1+1>2”. This approach can help us create a real “hexagonal warrior”, which is a multi-faceted, high-performance AI system.

Key Technology Edges:

- **Efficiency and Cost-effectiveness:** Our technology eliminates the need for pre-training and fine-tuning, reducing both time and monetary costs
- **Flexibility:** Our models and APIs can be replaced and updated at any time, offering unparalleled flexibility
- **Superior Performance:** Our Role-playing Agent, Voice Recognition Agent, and Education Agent outperform competitors in role-playing ability, response repetition, time efficiency, recognition accuracy, and precision respectively

Potential Applications

- Artificial Intelligent
- Communications Technology

Applicable Industries

- Information Technology, Communications and Software Services
- Education, Research, and Professional Services

BAUHINIA AI

EAS 26 A Time- and Energy-Efficient Ising Computer for Portfolio Optimization and Risk Management

Principal Investigator | **Prof. Qiming SHAO**

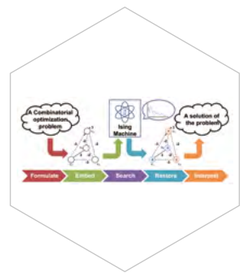
Technology Readiness Level | **TRL 3** IP status | **Patented**

Our project utilizes Voltage-Controlled Magnetic Anisotropy Magnetic Tunnel Junctions (VCMA-MTJs) technology to create a time- and energy-efficient Ising computer for portfolio optimization and risk management.

The Ising model is adept at solving complex optimization problems by mapping multifaceted relationships within a magnetic lattice. By applying this model, our Ising computer will provide faster and more reliable solutions for portfolio optimization and risk management than conventional computing methods. The unique advantage of VCMA-MTJ technology is its ultra-low energy consumption and rapid operation speed. By controlling magnetic states with voltage, we can minimize the energy input required for the Ising system to perform computations. Our project promises to deliver a transformative tool for financial analysts and investors, enabling them to make more informed decisions by evaluating risk and reward scenarios with unprecedented precision and speed.

Key Technology Edges:

- Revolutionary Computational Speed for Optimization Problems
- Unmatched Energy Efficiency & Cost
- First-Mover Advantage with Disruptive Application



Potential Applications

- Fintech
- Smart Cities

Applicable Industries

- Finance and Insurance
- Information Technology, Communications and Software Services

EAS 27 AI-Blockchain Enabled Decentralized Art Title, Asset Authentication & Management Platform

Principal Investigator | **Dr. Daniel CHUN** Technology Readiness Level | **TRL 7** IP status | **Patented**

The art industry is embracing the use of ArtTech to support both title and intellectual property management.

This digital platform will establish the new ART ID Standard (www.artidstandard.org) and will incorporate blockchain technologies along with W3C-approved Decentralized ID (DID:ART) implementation. The generative AI-enabled features allow for smart categorization to support valuations and title curation. Additionally, the platform will facilitate the generation of digital derivatives for artists’ monetization. Patented watermarking technologies, combined with cloaking techniques, will help protect artists’ works from further AI scraping and assist in creating provenance metadata. This DID:ART will be safeguarded by a Layer 2 blockchain registry to authenticate the origin of the artwork. Physical artworks will be further protected by NFC chipsets and Infineon Secora chipsets. Articulator.AI is a one-stop SaaS platform that addresses authenticity, generative AI, and e-commerce issues that plague the art industry.

Key Technology Edges:

- **Blockchain:** Blockchain technology can be used to create a decentralized and transparent system for managing art assets, titles, and ownership. It can ensure secure and tamper-proof transactions and provide a permanent record of ownership and provenance
- **Smart Contracts:** Smart contracts can be used to automate the transfer of ownership and manage the terms of agreements between parties. They can be used to enforce rules and regulations and ensure compliance with legal requirements
- **Generative-AI and Machine Learning:** AI and machine learning can be used to analyze and classify art assets, authenticate artworks, and provide valuations based on market trends and historical data. Gen-AI models and simple to use UX/UI are also developed for artists to create digital derivatives for sale on our platform. They can also be used to generate new artworks and enhance the user experience

Potential Applications

- Art and Philately
- Real World Asset / FinTech

Applicable Industries

- Information Technology, Communications and Software Services
- Finance and Insurance

ARTRACX

EAS 28 Human-friendly Miniature Autonomous Blimp (UST-MAB)

Principal Investigator | **Prof. Fumin ZHANG**

Technology Readiness Level | **TRL 6**

Discover the future of indoor aerial robots with our groundbreaking UST-MAB technology.

Designed to revolutionize human-robot interaction, the UST-MAB offers a range of innovative features:

- **Enhanced safety:** Providing a highly secure environment for human-robot interaction, ensuring peace of mind in indoor settings
- **Extended operation time:** With an impressive maximum operating time of up to 6 hours, the UST-MAB offers exceptional endurance for prolonged missions
- **Versatile control systems:** The advanced control systems developed for the UST-MAB can be replicated for marine robots, expanding the application areas for this cutting-edge technology

Key Technology Edges:

- Provide a highly secure environment for human-robot interaction
- Extremely long operating time (maximum operating time can be up to 6 hours)
- Designed control systems can be replicated for marine robots

Potential Applications

Robotics | Defect Inspection/ Monitoring

Applicable Industries

Information Technology, Communications and Software Services | Education, Research, and Professional Services

EAS 30 SING: Next-Generation AI Cloud

Principal Investigator | **Prof. Kai CHEN** Technology Readiness Level | **TRL 9**

SING (https://singaicloud.com/) is a full-stack GPU cluster management solution designed to accelerate machine learning (ML) research and large-scale AI workloads on the cloud.

On the usability side, it offers a fast, scalable, and operationally efficient platform for managing shared GPU clusters, with an emphasis on simplicity and stability. SING utilizes a four-layer extensible architecture – spanning job profiling, compiling, scheduling, execution – allowing for flexible and efficient management of ML tasks across multi-tenant environments. From a performance perspective, SING leverages advanced AI-centric network transport optimizations and parallelization strategies to accelerate distributed ML workloads, ensuring reduced latency and enhanced throughput. These features optimize resource utilization, making SING highly effective for large-scale AI models in AI clouds. SING has been deployed at HKUST for more than three years since 2021. (https://tacc.ust.hk).

Key Technology Edges:

- Computation Efficiency: SING's simplified architecture leverages advanced AI-centric network transport optimizations and parallelization strategies, minimizing maintenance costs and maximizing resource utilization for large-scale AI workloads
- User-Friendliness: SING supports both scripting and containerized job submission formats, and includes ML-specific features such as job queuing, scheduling, dependency management, and interactive debugging to streamline complex workflow management
- Extensibility: With its extensible architecture, SING enables seamless scaling and supports integration with cloud platforms. Its flexible layers allow for the addition of new features and capabilities, such as enhanced embedding scheduling algorithms, to meet the evolving needs of AI research

Potential Applications

Artificial Intelligent

Applicable Industries

Information Technology, Communications and Software Services

EAS 31 An Open Peer-to-Peer Edge Computing Platform for AI-as-a-Service

Principal Investigator | **Prof. Song GUO**

Technology Readiness Level | **TRL 3**

Reshaping AI ecosystems with open and decentralized computing power.

Key Technology Edges:

- Integrating heterogeneous computing resources and optimizing supply-demand matching
- Trusted computing for privacy and security of data and model
- Sustainable market models benefiting both demanders and suppliers

Potential Applications

Smart Cities | Artificial Intelligent

Applicable Industries

Information Technology, Communications and Software Services

EAS 32 AI-Powered Essay Grading Assistant

Principal Investigator | **Prof. Joon Nak CHOI**

Technology Readiness Level | **TRL 8** IP status | **Patent in progress**

AI essay grading assistant that grades typed and handwritten essays using a teacher's own rubric, reducing time spent grading by 80% while improving consistency, fairness, and the quality of feedback for students.

Key Technology Edges:

- While it is possible to copy and paste essays to foundational AI models to obtain some kind out output, getting good results (i.e., correct grades, quality feedback) is much more difficult in practice. Our solution layers additional technologies on top of foundational models to achieve much better results
- Our UI/UX has been designed and tested with instructors and schools in mind, making it user friendly for instructors. This is a crucial point; teachers and professors are not necessarily familiar with technology and will not use anything that is complex or time-consuming
- Our technology can grade both handwritten and typed essays. This is important because teachers and professors are moving towards in-class essays, as students are transforming themselves into "secret cyborgs" using generative AI for their take-home assignments

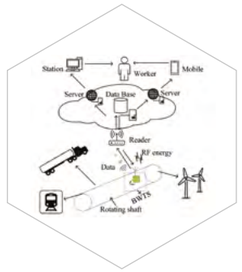
Potential Applications

Research tool / Edu-tech

Applicable Industries

Education, Research, and Professional Services

EAS 33 Wireless and Self-powered Sensor System



Principal Investigator | **Prof. Zhengbao YANG**

Technology Readiness Level | **TRL 8** IP status | **Patented**

Discover our revolutionary wireless and self-powered sensor technology that is set to disrupt industries such as automotive, aerospace, consumer electronics, healthcare, and environmental monitoring. Key highlights include:

- **Stand-alone and batteryless:** Our sensors operate without the need for external power sources, reducing costs and maintenance requirements
- **High reliability:** Built on 10+ years of research and backed by 22 USA/China invention patents, our sensors offer exceptional performance and longevity
- **Data-driven decision-making:** Our sensor technology enables improved transportation safety, reduced operation costs, and supports data-driven decision-making

Key Technology Edges:

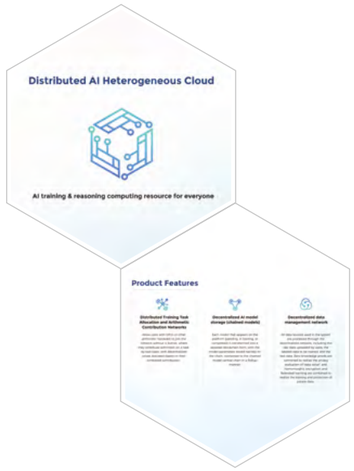
- WIRELESS, self-powered, battery-less operation, long service time and free of maintenance
- SMALL-size and fit-and-forget features, low fabrication and installation cost
- System-level solution

Potential Applications

Energy Harvesting | Flexible Electronics

Applicable Industries

Transportation and Logistics | Manufacturing and Engineering



EAS 35 Distributed AI Heterogeneous Cloud

Principal Investigator | **Prof. Yang WANG**

Technology Readiness Level | **TRL 3** IP status | **Patented**

Solve the current problems of distributed arithmetic network, complete the elastic allocation of computing resources in support of AI model training and reasoning, and improve the resource utilization of the system. Build a distributed system to manage multiple training servers, especially high-performance computing servers with GPUs, pool the computing resources, to make a "GPU cloud".

Key Technology Edges:

- **Integration of AI and Blockchain:** This system combines artificial intelligence with blockchain technology to expand the application possibilities of blockchain
- **Consensus and Consistency:** The introduction of validation nodes to apply predefined consensus algorithms ensures the consistency of initial computation results
- **On-Chain AI Computation**

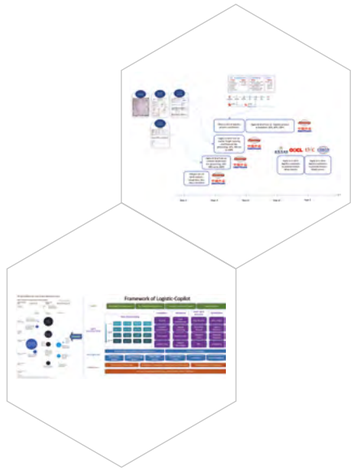
Potential Applications

Blockchain | Data Science

Applicable Industries

Information Technology, Communications and Software Services | Education, Research, and Professional Services

EAS 36 FMLoCo: Foundation Model based Logistics Copilot



Principal Investigator | **Prof. Yike GUO**

Technology Readiness Level | **TRL 6**

Our mission is to create a logistics co-pilot powered by large-scale foundational models and multi-agent intelligence

This system will facilitate the automatic recognition and generation of Bills of Lading (BL), thereby enabling seamless automatic processing.

FMLoCo is meticulously crafted to substantially ease the load of manual labor associated with demanding and repetitive tasks, including BL entry, verification, and complex procedural work. The result is a streamlined and expedited logistics process that opens up fresh business opportunities on a global scale.

Key Technology Edges:

- Multilingual & multimode foundation model, pretrained and finetuned on the largest H800 AI cluster in HK
- Logistics specific optimization based on 90M logistic documents
- Tie-1 customer design-in with GMG and SinoTrans (Top-5 logistic company in the world)

Potential Applications

Artificial Intelligent | Data Science

Applicable Industries

Transportation and Logistics

EAS 39 FinSent - AI-powered Text Analysis for Informed Investment Decisions

Principal Investigator | **Prof. Allen HUANG**

Technology Readiness Level | **TRL 3**

FinSent is not just a financial analysis tool; it's a game-changer powered by FinBERT, a finance-domain specialized NLP model from HKUST Business School that outperforms GPT-4 by 15.2%, with up to 91% sentiment analysis accuracy and an impressive 96% ESG classification accuracy.

Experience a distinctive three-dimensional perspective as it meticulously analyzes sentiments from the company, media, and public viewpoints over a period of more than 20 years. Imagine a financial dashboard that doesn't just show numbers but reveals the emotions behind them, guiding investors with a better understanding.

Key Technology Edges:

- Cutting-Edge NLP Technology Powered by FinBERT Language Model
- Comprehensive Sentiment Analysis and Report Text Highlights
- Web-Based Accessibility on Any Device

Potential Applications

Fintech | Artificial Intelligent

Applicable Industries

Finance and Insurance | Education, Research, and Professional Services

EAS 40 Micro-second Response Ferroelectric Liquid Crystal (FLC) Light Modulator for Time-Sequential-Multiplexed 3D, Vivid-Color Display, and Wavelength Selective Switch (WSS)

Principal Investigator | **Prof. Hoi-Sing KWOK** Technology Readiness Level | **TRL 8** IP status | **Patented**

Field-sequential high resolution displays with high refresh rates are in demand for emerging technologies such as VR, AR, naked-eye 3D, and HUD displays.

To achieve a three-color RGB display, one pixel is divided into three small red, green, and blue pixels. Field-sequential display is a time-sequential multi-pixel multiplexing technology implemented through fast refresh in time sequence. Liquid crystal display technology has huge potential in the field of field sequential display, but it requires the response speed of the liquid crystal to be lower than 1 ms. Ferroelectric liquid crystal (FLC) has microsecond-level response speed and has attracted a lot of attention. DHFLC display technology is one of the most suitable display technologies for realizing high-resolution field-sequential display. Because of its fast response speed, voltage-controlled continuous grayscale, low operating voltage, and no edge field effect, DHFLC can support refresh speed within 2 kHz, high-resolution display with high pixel density.

Key Technology Edges:

- Compatible with existing production technology by testing on the G4.5 production line as a drop-in replacement of IPS LCD
- Self-developed and patented FLC materials that can achieve kg-level mass production
- Balanced electro-optical performance, fast response speed, high transmittance, low birefringence, large phase modulation depth

Potential Applications

- Display Technologies
- Communications Technology

Applicable Industries

- Electronics and Semiconductors
- Information Technology, Communications and Software Services

EAS 41 Mask-free Material Deposition on Arbitrary Substrate by Direct Laser Writing

Principal Investigator | **Prof. Sen YANG**

Technology Readiness Level | **TRL 5** IP status | **Patented**

The photon induced material deposition method uses a focused laser to trigger local photo-catalysis reduction reactions and form patterned material.

The technology enables additive manufacturing of electronics with nanoscale features on various substrates.

Key Technology Edges:

- Low cost, single-step, customized and fast additive manufacturing of functional material structures with nanoscale resolution and high performance
- The deposition method applies to a wide range of conductor, insulator and semiconductor on various substrates, whether stiff or flexible, transparent or opaque
- The material used for fabrication is environmentally friendly, nonhazardous and sustainable

Potential Applications

- Manufacturing Technology/ Process Enhancement
- Semiconductor
- Optical Device

Applicable Industries

- Manufacturing and Engineering
- Education, Research, and Professional Services

EAS 42 CoralSCOP: Segment Any COral Image on this Planet

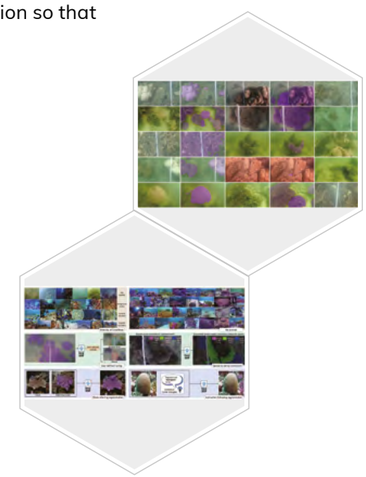
Principal Investigator | **Prof. Sai Kit YEUNG** Technology Readiness Level | **TRL 7**

Coral is one of the key indicators of marine research due to coral's rich biodiversity and sensitivity to small environmental changes.

However, segmenting coral is no easy task due to its irregular boundaries and degraded water quality. Therefore, underwater coral visual understanding has gained increasing attention within the computer vision community. We introduced CoralSCOP, the first foundation model that can segment dense coral reef automatically and has strong generalization ability to project the full image of coral reef. The model also offers user-defined tuning and sparse-to-dense conversion for precise coral statistics. To maximize its usage, our team also incorporated mask-referring segmentation and instruction-following segmentation so that both amateurs and advanced researchers could master the model.

Key Technology Edges:

- The first and effective coral segmentation foundation model and the largest coral reef dataset to date with densely labeled coral masks
- Strong robustness to the low visibility coral reef images
- Best sparse-to-dense conversion performance supporting more accurate coral statistics



Potential Applications

- Artificial Intelligent
- Robotics

Applicable Industries

- Education, Research, and Professional Services
- Information Technology, Communications and Software Services

EAS 43 MarineInst: A foundation Model for Marine Image Analysis with Instance Visual Description

Principal Investigator | **Prof. Sai Kit YEUNG** Technology Readiness Level | **TRL 3**

Analyzing and understanding marine imagery has gained increasing attention within both computer vision and marine communities.

However, it is still challenging to build a foundation model for marine visual analysis. The scarcity of labeled data is the most hindering issue, and marine photographs illustrate significantly different appearances and contents from general in-air images. Based on our previous work MarineGPT, the first vision-language model specifically on the marine domain with extensive marine knowledge, our team created MarineInst20M, the largest marine image dataset to date, with 2.42 million images and 19.2 million masks in total and introduced MarineInst, a foundation model for marine visual analysis which can segment and describe the marine object instances. The dataset and model support a wide range of marine visual analysis tasks, from image-level scene understanding to regional mask-level instance understanding. Besides, the model exhibits strong generalization ability and flexibility to support various downstream tasks with state-of-the-art performance.

Key Technology Edges:

- The largest marine image dataset MarineInst20M and first marine foundation model MarineInst to date
- Powerful Instance-level marine imagery analysis with both instance masks and instance descriptions
- Robust and flexible in supporting various marine visual understanding downstream tasks

Potential Applications

- Artificial Intelligent
- Robotics

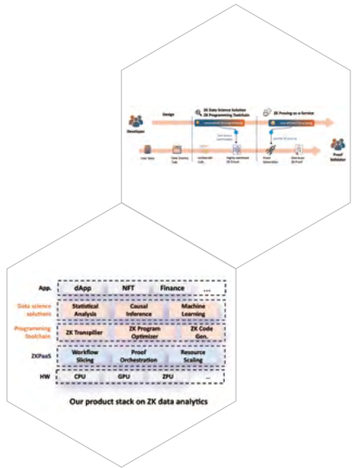
Applicable Industries

- Education, Research, and Professional Services
- Information Technology, Communications and Software Services

EAS 44 Privacy-enhanced Business Intelligence Platform

Principal Investigator | **Prof. Shuai WANG & Dr. Pingchuan Ma**

Technology Readiness Level | **TRL 6** IP status | **Patented**



Introducing a privacy-enhanced business intelligence solution to unlock insights without revealing sensitive data.

Key Technology Edges:

- **Full-Stack Zero-Knowledge (ZK) Shielded Analytics Platform:** CipherInsight provides a comprehensive, production-ready solution that integrates ZK cryptography seamlessly into data science workflows, making it accessible without requiring expertise in cryptography – a significant advantage over competitors offering only partial or niche ZK solutions
- **Scalability and Cost Efficiency:** The platform features advanced ZK proving-as-a-service, enabling task-aware optimization and parallel processing. This dramatically reduces infrastructure costs and supports large-scale data analytics, outperforming traditional approaches and competitors in terms of efficiency
- **GDPR/SOC2 Compliance with Python Integration:** CipherInsight ensures adherence to key global data privacy regulations while offering an intuitive Python-based interface for data scientists. This dual focus on compliance and usability gives it a competitive edge, especially in regulated and cross-border data operations

Potential Applications

Data Science | Fintech

Applicable Industries

Information Technology, Communications and Software Services | Finance and Insurance

EAS 46 Knowledge-as-a-Service Powered by Privacy-Enhanced Distributed LLM

Principal Investigator | **Dr. Jinke Song** Technology Readiness Level | **TRL 7**

Chatchat Technology Limited focuses on delivering Knowledge-as-a-Service (KaaS), enabling enterprises to build fully offline, privacy-enhanced knowledge bases tailored to their domain.

By leveraging distributed LLMs, Chatchat provides scalable, secure, and highly customizable inference services that align closely with business-specific needs.

Key Technology Edges:

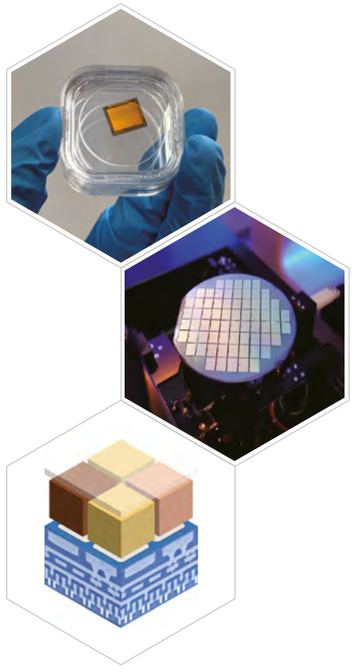
- **Cost-Efficient AI for SMEs:** Distributed inference and speculative sampling reduce hardware dependency, enabling advanced AI capabilities at a fraction of the cost
- **Fully Offline, Privacy-Safe:** Fully offline deployment ensures data security and compliance with privacy regulations like GDPR, while supporting secure knowledge base creation
- **Business-Specific Adaptability:** Domain-specific customization, enhanced by traceable AI responses, ensures alignment with business operations and regulatory requirements

Potential Applications

Artificial Intelligent | Privacy-Preserving AI

Applicable Industries

Information Technology, Communications and Software Services | Finance and Insurance



EAS 45 High-performance Perovskite Image Sensors

Principal Investigator | **Prof. Zhiyong FAN** Technology Readiness Level | **TRL 5**

Our team is developing next-generation image sensors by leveraging an advanced material, perovskite and a filter-free architecture.

These innovations aim to overcome the limitations of traditional image sensors, including limitations with external quantum efficiency, noise reduction, and multidimensional sensing. Our core technologies include developing novel optoelectronic materials, advanced integration methods using nanostructures, and bio-inspired device designs. These advancements enable high-performance, flexible, and scalable solutions. Together, they hold transformative potential across industries such as robotics, autonomous vehicles, and medical imaging.

Key Technology Edges:

- **Material Advantage:** Harness the power of perovskite – a material with exceptional optoelectronic performance and low processing costs
- **Architecture Advantage:** No colour filters are needed, high photon utilization, stronger signals, reduced noise, and lower power consumption
- **Sensing Dimension Advantage:** Unlock new possibilities with advanced capabilities like subdivided spectral sensing and event camera functionality

Potential Applications

Sensor | Robotics

Applicable Industries

Electronics and Semiconductors | Biomedical, Healthcare and Food

Material, Energy and Sustainability (MES)

MES 01 SANI® Process – A Paradigm – Shift Sewage Treatment Technology with a 70% Reduction of Sludge

Principal Investigator I **Prof. Guanghao CHEN**

Technology Readiness Level I **TRL 7** IP status I **Patented**

SANI® process was developed for the removal of organics and nitrogen with sludge minimization in the treatment of saline sewage generated from seawater used for toilet flushing or salt water intrusion.

Key Technology Edges:

- Reduces 60%-70% of biological sludge production
- Saves 30%-40% of space
- Saves 20%-30% of energy consumption and CO2 emission

Potential Applications

- Saline Wastewater Treatment
- High Sulfate-Laden Municipal or Industrial Wastewater

Applicable Industries

- Low C/N Ratio Wastewater
- Energy, Environmental and Utilities

MES 02 Smart Polymer Processing Plant (S-P3) – Open Collaborative Intelligent Platform

Principal Investigator I **Prof. Furong GAO**

Technology Readiness Level I **TRL 7** IP status I **Patented**

The next-generation intelligent injection molding with real-time material and quality monitoring using breakthrough sensors, award-winning control algorithms for superior precision, and a dedicated big-data system for intelligent collaboration.

Key Technology Edges:

- Breakthrough and world first sensor for capturing material and quality changes on line
- Award winning control algorithms for superior precision for injection molding
- Dedicated big-data open system for collaborative intelligent molding

Potential Applications

- A Smart Sensor for a Huge Injection Mold Market (14 Million Molds Annually for Chinese Mainland Alone)
- A Smart Control System for Millions Production Lines
- A World First Real Intelligent System Platform for Thousand Polymer Processing Plants with Collaborative Development Applications

Applicable Industries

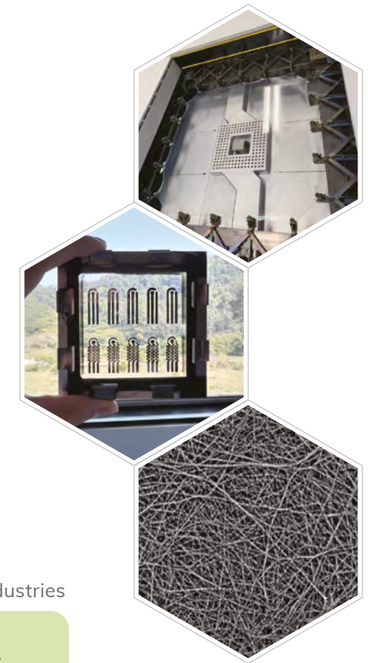
- Manufacturing and Engineering

MES 03 Strength in Thinness: Ultra-Strong Polymer Nanofilm for Cutting-Edge Applications

Principal Investigator | **Prof. Ping GAO**

Technology Readiness Level | **TRL 7** IP status | **Patented**

Ultrathin polymer nanofilm, 25 times stronger than steel with the same mass, transparent, gas-permeable and adjustable porous, ideal for advanced energy separators, wearables, biomedical applications and desalination.



Key Technology Edges:

- **Ultrathin:** 20 nanometers or less than one thousandth the thickness of a hair strand
- **High strength:** 25 times stronger than steel with the same mass
- **Formulation improvement to reduce cost**

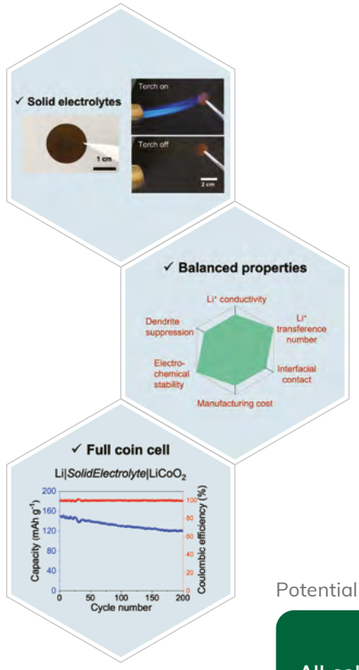
Potential Applications

- Advanced Battery Separator
- Fuel Cell Proton Exchange Membrane
- Liquid/Gas Filtration
- Wound Dressing Patch

Applicable Industries

- Energy, Environmental and Utilities

MES 04 Revolutionizing Energy Storage: Tube transport-Inspired All-solid-state Electrolytes for Li-based Batteries



Principal Investigator | **Prof. Yoonseob KIM**

Technology Readiness Level | **TRL 5** IP status | **Patented**

Composite all-solid-state electrolytes selectively transport Li+ rapidly and reliably. This technology can enable smaller and lighter Li-based rechargeable batteries.

Key Technology Edges:

- Our electrolytes' Li+ conductivity and transference number outperform liquid electrolytes and sulfides
- These all-solid-state electrolytes are fire-proof and economical in large-scale production
- Prototype coin cell, paired with Li metal anode and LCO cathode, shows a capacity of 150 mAh g-1

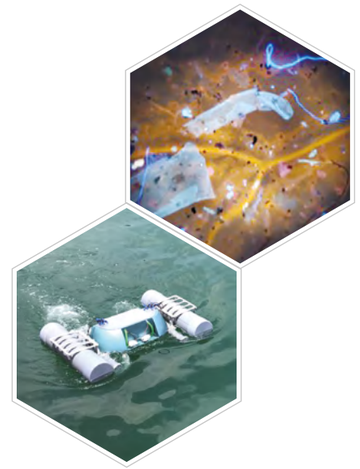
Potential Applications

- All-solid-state electrolytes
- Li-metal batteries
- High-energy-density energy storage devices

Applicable Industries

- Energy, Environmental and Utilities

MES 05 On-Site Microplastic Detection for Rapid and Accurate Waste Effluent Analysis



Principal Investigator | **Prof. Leung Yuk Frank LAM, Prof. Cindy Ka Sin LAM**

Technology Readiness Level | **TRL 5** IP status | **IP Protected**

An innovative and ground-breaking portable device to conduct microplastics and microfiber detections efficiently and effectively for real-time effluent quality monitoring.

Key Technology Edges:

- The first portable device for microfiber/microplastic detection
- Offers a prompt response to reflect process effluents' quality, enabling the engineers to provide an instant solution for process modification
- Builds a solid foundation for efficient and effective microfiber detection technology in the field of related industries

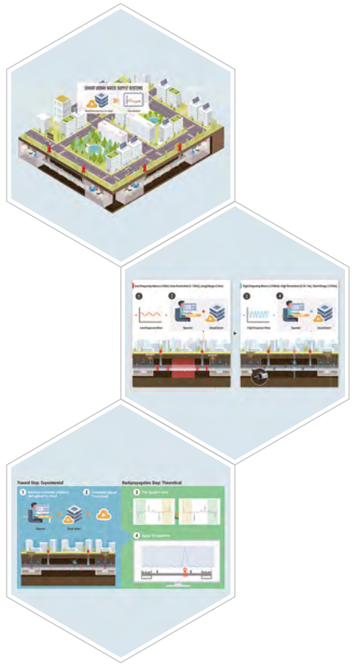
Potential Applications

- Water quality assessment on industrial wastewater qualification
- Microplastics detection for process modification, as well as modifying the life cycle analysis and potential ESG analysis
- Analytical equipment for Education sectors

Applicable Industries

- Manufacturing and Engineering

MES 06 Time-reversal Diagnostic for the Health Monitoring of Pressurized Pipelines



Principal Investigator | **Prof. Moez LOUATI**

Technology Readiness Level | **TRL 5** IP status | **Patented**

The time-reversal diagnostic technology enables a quick and non-disruptive way to identify diverse and multiple defects in pipelines including drainage and potable water mains.

Key Technology Edges:

- The technology uses fast-traveling waves for rapid diagnostic testing, around 1000 times faster than roving sensors
- The TR methodology is non-disruptive and non-intrusive, eliminating service interruption, isolation of mains, and contamination risks
- The technology offers controllable localization resolution and allows for the development of automated and autonomous processes

Potential Applications

- Water supply systems
- Sewage rising mains
- Gas & Oil pipelines

Applicable Industries

- Energy, Environmental and Utilities

MES 07 Cementless Lightweight Materials from CO_2-Sequestering Waste Mixtures for Sustainable Construction

Principal Investigator | **Prof. Charles Wang Wai NG**

Technology Readiness Level | **TRL 4** IP status | **Patented**

Construction and household wastes, including plastic waste and food waste, are recycled and reused to produce sustainable construction materials.

Key Technology Edges:

- Minimize the use of carbon-intensive cement and natural aggregates that are typically required for production of construction materials
- Sequestrate carbon dioxide (CO2) in mixture of wastes to form cementless construction materials
- Enable production of lighter construction materials with different dimensions to improve construction flexibility

Potential Applications

- Produce sustainable and durable materials for construction and earthen structures (e.g., partition walls, pavements, etc.)
- Provide a novel solution to facilitate waste reduction and recycling in the society to achieve sustainable development and carbon neutrality
- Integrated with coating science to provide cooling in surroundings and reduce energy consumption for temperature control

Applicable Industries

- Construction and Property

MES 09 Acoustic Metamaterials: Next-Generation Noise Control and Audio Solution

Principal Investigator | **Prof. Ping SHENG**

Technology Readiness Level | **TRL 8** IP status | **Patented**

Coupling applied physics with intelligent design, the acoustic metamaterials finely construct tiny artificial structures to achieve optimal noise absorption performance.

Key Technology Edges:

- Low frequency noise absorption capabilities covering broadband frequency as well
- Customization of absorption spectrum
- High-efficiency noise absorption while maintaining High ventilation

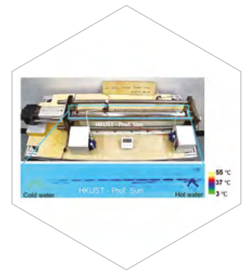
Potential Applications

- HVAC Silencer, Acoustic Panel for Building Noise Reduction
- Noise Control Parts for Home or Daily Appliances, E.g. Mobile Phones, Computers, Refrigerator, Etc., Aerospace, Automotive or Boat
- Audio Functional Parts for Hi-Fi and Speech Recognition

Applicable Industries

- Manufacturing and Engineering

MES 10 Green-House-Gas-Free Elastocaloric Cooling/ Heating Technology – Materials and Devices



Principal Investigator | **Prof. Qingping SUN**

Technology Readiness Level | **TRL 4** IP status | **Patented**

By harvesting the unique phase transformation latent heat of shape memory alloys, the elastocaloric effect is utilized and developed into cooling/heating modules like fridges and air conditioners. This green technology revolutionizes the conventional refrigeration technology that has used harmful refrigerants for decades.

Key Technology Edges:

Compared with the conventional vapor-compression cooling, our elastocaloric cooling technology has the following advantages.

- Completely avoid the usage of greenhouse gas refrigerants. Use solid shape memory alloys instead
- Save electricity consumption and the related carbon emission by at least 10%
- The cooling core material (shape memory alloy) is a typical smart material and is 100% recyclable

Potential Applications

- Fridges
- Air Conditioners
- Homes, Office Rooms, Shopping Malls, Industries. Anywhere in Need of Cooling

Applicable Industries

- Energy, Environmental and Utilities

MES 11 Multi-functional Green Coating Materials for Sustainable Glazing Surface

Principal Investigator | **Prof. Jinglei YANG** Technology Readiness Level | **TRL 6** IP status | **Patented**

Leveraging cutting-edge in-house polymer graft modification, and encapsulation technology, HKUST has developed multi-functional green coating materials with high photocatalytic performance, anti-reflection and durability for various glazing surfaces, including PV panel, curtain wall, automobile rearview mirror.

Notably its application on PV panel can enhance power generation by 15-20%. In contrast to commercial coating, this technology enables the nanocoating to have a unique inorganic micro-nano hierarchical porous structure inside, while maintaining high transparency and promoting superior photocatalysis under visible light radiation. In addition to glazing surfaces, this coating also can be applied to various building cement or metal surfaces.

Key Technology Edges:

- **Efficient photocatalysis:** Doping-modified core materials can expand the photoresponse area to visible light and improve photocatalytic performance
- **Superior anti-reflection:** The unique surface porous core-shell structure makes the coating exhibit extremely high porosity and mechanical durability demanded for practical use, resulting in a low refractive index
- **Strong durability:** The in-house synthesized organic segment allows the coating to have long-lasting wetting properties and resistance against water

Potential Applications

- Sustainable Glazing Surface
- Including PV panel, curtain wall, automobile rearview mirror
- Potential applications on various buildings cement or metal surfaces

Applicable Industries

- Energy, Environmental and Utilities
- Manufacturing and Engineering

MES 12 Material Innovations for a Sustainable World

Principal Investigator | **Prof. Jinglei YANG**

Technology Readiness Level | **TRL 6** IP status | **Patented**

Quantifiable life cycle analysis with considerations of low energy consumption and low carbon emission has been adopted and developed to innovate green materials and composites that contribute to a sustainable world.

Key Technology Edges:

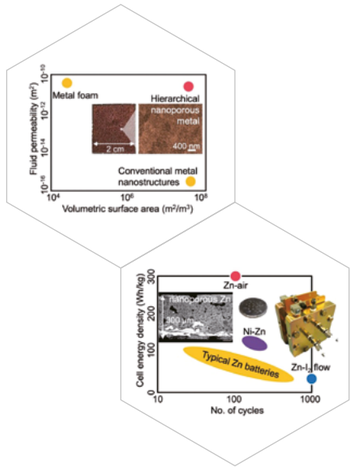
- Fundamental innovation of materials via controllable interfacial science and engineering
- AI+Robotics empowered high throughput discovery of new materials
- Durable and long-lasting performance, low cost, customizable

Potential Applications

- Energy Saving Coatings / Materials
- Sustainable Industrial Adhesives
- Core-shell Materials Technologies

Applicable Industries

- Energy, Environmental and Utilities



MES 13 Safe and Affordable Energy Storage enabled by Self-organized Metallic Nanostructure

Principal Investigator | **Prof. Qing CHEN**

Technology Readiness Level | **TRL 4** IP status | **Patented**

Self-organized Metallic Nanostructure are scalable, robust, conductive, highly permeable to fluids, and abundant in functional surface sites.

We leverage nanoporous zinc to stabilize zinc anodes during the charging and discharging processes of rechargeable zinc batteries, enabling safer and cheaper alternatives to lithium-ion batteries for stationary energy storage.

Key Technology Edges:

- The battery adopts the mature build of commercial alkaline batteries, ready for applications
- The battery electrolyte has water instead of flammable organics as the solvent for intrinsic safety
- The nanoporous structure can be tailored according to the design of a battery to fulfill its potential

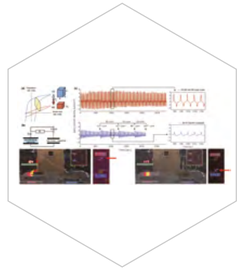
Potential Applications

- Energy Storage
- Energy Efficiency

Applicable Industries

- Energy, Environmental and Utilities
- Manufactirng and Engineering

MES 14 Energy Conversion from Waste Heat to Electricity by Giant Pyroelectric Effect



Principal Investigator | **Prof. Xian CHEN**

Technology Readiness Level | **TRL 5** IP status | **Patented**

Pyroelectric energy conversion has generated huge interest for their ability to turn waste heat energy to electricity, thereby greatly reduce carbon emissions in the power sector.

A series of novel energy materials used for pyroelectric energy conversion with immensely improved performance. In addition, we established a mature material development approach considering both bottom-up lattice design and top-down grain morphology optimization with much broader interests in the field of functional ferroelectric devices.

Key Technology Edges:

- Direct energy conversion: material is an engine
- Conversion by small thermal fluctuations around 100°C – energy harvesting from waste heat
- Solid state energy conversion – clean, simple and compact

Potential Applications

- Energy Harvesting from Waste Heat
- Energy Efficiency

Applicable Industries

- Energy, Environmental and Utilities

MES 15 Redefining Wearables: Skin Patch Sweat Sensor for Non-Invasive & Continuous Health Monitoring

Principal Investigator | **Prof. Ping GAO**

Technology Readiness Level | **TRL 6** IP status | **Patented**

UHMWPE-based nanomembrane skin sensor that detects biomarkers (e.g. hormones, metabolites, proteins) non-invasively and transmits directly to mobile app in real-time for precautionary diagnostics.

Key Technology Edges:

- Ultra-thin (i.e. 1/3000 of human hair), yet having specific tensile strength 25x than stainless steel at the same mass
- Platform material: highly modular biomarker detection with interchangeable biomolecular receptors (i.e. enzymes, MIP, aptamers, etc.)
- Highly porous & breathable (i.e. ~150x faster compared to human sweat secretion rate)

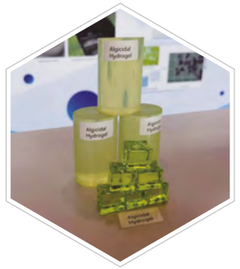
Potential Applications

- Sensor
- Sport performance

Applicable Industries

- Biomedical, Healthcare and Food
- Manufacturing and Engineering

MES 16 Smart EcoClean Matrix



Principal Investigator | **Prof. Wei HAN**

Technology Readiness Level | **TRL 7** IP status | **Patented**

Excessive algal growth poses serious environmental health problems, yet the development of a cost-effective solution for long-term inhibition of algal growth remains a huge challenge.

This invention utilizes algicidal hydrogels comprising safe and environmentally friendly bioactive ingredients for practical applications in fresh water and sea water. The hydrogels can release oxidizing and cell-permeable algicides in a controlled manner to inhibit algal growth for a long time without adverse effects on aquatic organisms. Their controlled release performances and algicidal activities have been verified in laboratories and a 1500 m^3 sea water reservoir in Hong Kong. Real-time monitoring equipment effectively provides data to adjust the amount of hydrogel and perform daily water quality testing.

Key Technology Edges:

- 3D structural hydrogel with evironmental friendly ingredients achieve slow release effect
- Long term effect can constantly inhibit algae growth in the water body without pollutant introduce to the natural water body
- Intelligently and dynamically adjusted to control the concentration of microorganisms and microalgae in the water body within a safe range for a long time

Potential Applications

- Water Quality Maintenance
- Environmental protection

Applicable Industries

- Energy, Environmental and Utilities

MES 17 A Solar Control Film for Glass Window, that Blocks Heat and UV While Maintaining High Visibility and RF/WiFi Transmission

Principal Investigator | **Prof. Baoling HUANG**

Technology Readiness Level | **TRL 4** IP status | **Patented**

This innovative film effectively moderates the environment to a pleasant temperature by selectively dealing with the solar light and infrared of different spectra and filtering out undesired radiation.

Several cooling films for glass windows have been developed for cars, trains and buildings, tailor-designed according to their application scenarios.

Key Technology Edges:

- **Effective cooling and comfort:** it can block over 80% of near infrared solar energy and the majority of UV exposure
- **High visibility:** it can achieve similar visual comfort as other Low-E films, by our developed micron-scale manufacturing techniques
- **Super-high transmission of microwave (WiFi/RF) for communication:** it can significantly reduce film electromagnetic shielding effects, by our novel techniques

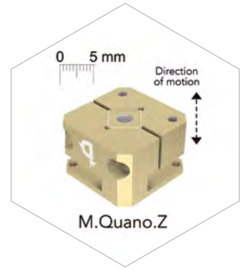
Potential Applications

- Glass windows on cars, trains and buildings

Applicable Industries

- Construction and Property
- Transportation and Logistics

MES 18 Nano Positioning Stage for Applications under Extreme Environmental Conditions



Principal Investigator | **Prof. Berthold JAECK**

Technology Readiness Level | **TRL 5** IP status | **Patented**

Today, advances in artificial intelligence, quantum technologies, and space exploration rest on our ability to fabricate nanometer-sized computer chips and physical components with extreme accuracy.

This makes precision positioning devices a cornerstone of today's high-technology and manufacturing stack. Quano Technologies Ltd. innovates, manufactures, and sells next generation nano positioning devices for technically demanding applications in the high-tech industry and research sector. Our positioning devices use piezoelectric actuation to realize millimeter to centimeter displacements with nanometer accuracy.

Key Technology Edges:

- **Reliable operation.** Our positioning devices can operate at extreme environmental conditions high and low temperatures and pressures
- **Heat Load Management.** Their design affords an efficient heat removal across the positioning device. This is a unique selling point of our technology
- **Mechanical Stability.** Our positioning devices have a reinvented structural design that avoids glue joints, resulting in unmatched mechanical stability

Potential Applications

- Construction of optical and microscopy setups
- Steering, alignment, and focusing of lithography instrumentation

Applicable Industries

- Research Instrumentation
- Semiconductor lithography instrumentation

MES 19 Epitaxial Growth of Mixed-Dimensional Heterostructures for High-Efficient Self-Powered Photodetector

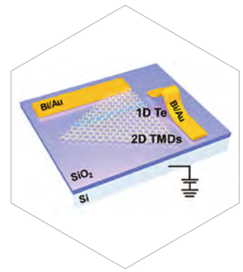
Principal Investigator | **Prof. Zhengtang LUO**

Technology Readiness Level | **TRL 5** IP status | **Patented**

The technology offers a controllable epitaxial growth of highly aligned 1D/2D mixed-dimensional heterostructures with an ultraclean interface and defect-free vdW contact, allowing efficient transfer of photogenerated carriers and self-driven behavior with high performance, including high responsivity, high external quantum efficiency, competitive specific detectivity, and rapid response rate.

Key Technology Edges:

- A series of mixed-dimensional heterostructures with ultraclean interface achieved by in-situ synthesis strategy
- The self-powered photodetector exhibits higher energy efficiency, more portability, and flexibility, as well as enhanced safety
- Offer new opportunities to design and fabricate next-generation functional devices with reduced sizes and high densities, further enabling miniaturization and integration opportunities



Potential Applications

- Semiconductor

Applicable Industries

- Electronics and Semiconductors
- Manufacturing and Engineering

MES 20 Branching in Instant Tissue Adhesives for Softer Mechanical Properties

Principal Investigator | **Prof. Zhengtang LUO**

Technology Readiness Level | **TRL 4** IP status | **Patented**

A tissue adhesive formulation that enables a straightforward branching polymerization method of cyanoacrylate-based tissue adhesives to introduce new properties while maintaining the practical features of these fast-acting, strong adhesives.

Key Technology Edges:

- An adhesive formulation generating branched structure upon application instead of the conventional linear ones
- Soft mechanical properties of the tissue adhesive
- Straightforward method of application that finishes in seconds

Potential Applications

Medical device

Applicable Industries

Biomedical, Healthcare and Food

MES 21 Green Antifouling Solutions Based on Patented Butenolide Technology

Principal Investigator | **Prof. Peiyuan QIAN**

Technology Readiness Level | **TRL 8** IP status | **Patented**

With more than 20 years of innovative and intensive research, David Von Hansemann Professor of Science and Chair professor Pei-Yuan Qian, a distinguished marine biology scientist at HKUST, discovered and elucidated the property of a novel biodegradable antifouling compound from a marine microbe.

The compound shows excellent antifouling efficiency, safe biological profile and green chemical production method. This green antifouling solution can further help to address the global marine pollution, extra energy consumption and carbon emission issues; and to enhance the national maritime power in the sustainable development of maritime industries.

Key Technology Edges:

- Potent against broad-spectra marine fouling organisms while be safe to other marine organisms
- The molecular structure is simple, allowing the easy production of the compounds
- The chemical synthesis methodology is green of minimal environmental impact and biodegradable in seawater and safe to marine environment

Potential Applications

Anti-Fouling

Coating

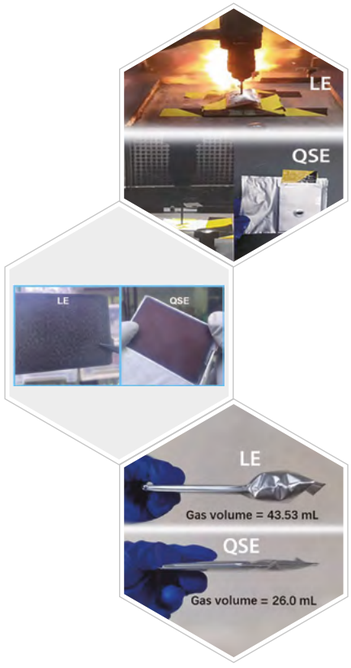
Applicable Industries

Energy, Environmental and Utilities

MES 22 High-Performance Polymer-Based Quasi-Solid Electrolytes for Commercial High-Energy-Density Batteries

Principal Investigator | **Prof. Minhua SHAO**

Technology Readiness Level | **TRL 7** IP status | **Patent in Progress**



Our groundbreaking technology involves the development of polymer gel electrolytes with exceptional conductivity and safety characteristics through in situ polymerization.

This innovation has been successfully implemented in commercial high-loading batteries, addressing critical issues such as graphite exfoliation and silicon pulverization. With its remarkable performance, our technology holds immense potential for commercialization.

Key Technology Edges:

- Compatibility with current commercial electrodes and suitability for high mass loading batteries
- Unique mechanical properties of the quasi-solid electrolyte prevent electrode pulverization, setting it apart from conventional liquid electrolytes
- Elimination of free mobile liquid molecules minimize the risk of battery firing and explosions, especially under harsh conditions

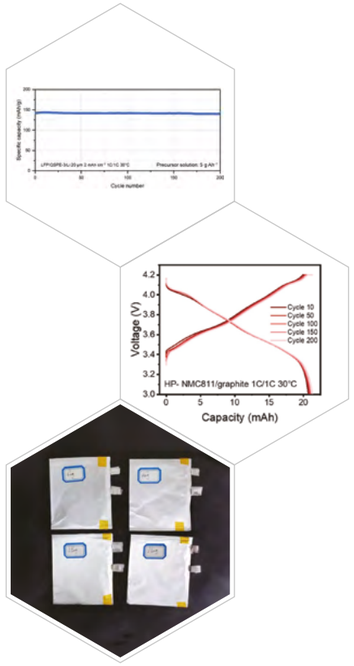
Potential Applications

Energy Storage

Energy Efficiency

Applicable Industries

Energy, Environmental and Utilities



MES 23 High-Energy, Safe Solid-state Lithium Batteries

Principal Investigator | **Prof. Minhua SHAO**

Technology Readiness Level | **TRL 5** IP status | **Patent in Progress**

Through the combination of a conversion-type composite cathode, a composite hybrid electrolyte, and a stable Li-metal anode, HKUST research team aims to develop a solid-state battery with an energy density surpassing 400 Wh/kg.

It is anticipated that the successful research outcome will have a profound impact on the advancement of next-generation solid-state battery technology and the widespread adoption of electric vehicles.

Key Technology Edges:

- Large-scale synthesis of high-energy cathode materials
- Electrolyte optimization through in-situ polymerization
- Systematic application of optimized cathode materials, solid electrolytes, and lithium hosts to pouch cells

Potential Applications

Energy Storage

Energy Efficiency

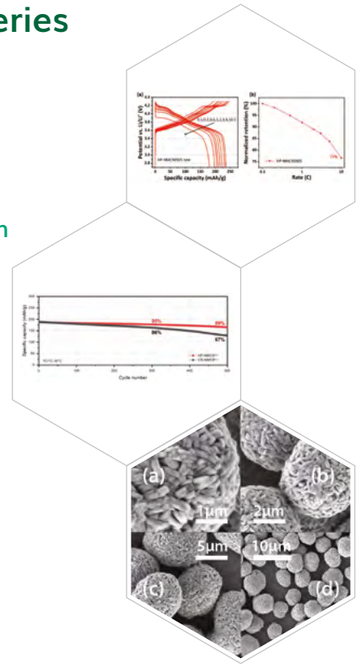
Applicable Industries

Energy, Environmental and Utilities

MES 24 Next-Generation Lithium Metal Batteries with Ultra-High Nickel Cathode Material

Principal Investigator | **Prof. Minhua SHAO**

Technology Readiness Level | **TRL 6** IP status | **Patented**



The next-generation lithium metal batteries utilizing ultra-high nickel content in the cathode material offer a unique combination of benefits from both the anode and cathode components.

These batteries provide higher capacity and energy density while also delivering longer lifespan, making them ideal for applications such as electric aircraft and UAVs. This innovation holds great promise for advancing various energy-related fields.

Key Technology Edges:

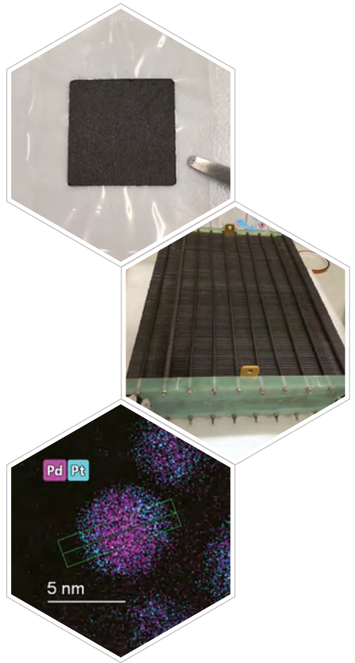
- High capacity: 230 mAh/g, high voltage: 4.6V, high cyclability (long lifespan); 90% capacity retention after 500 cycles, high rate capability (fast charge/discharge): 10C discharge capacity; 170mAh/g
- Good potential for low-temperature performance
- The higher the nickel (Ni) content, the higher the capacity and the lower the cost (Cobalt (Co): RMB 600,000/ton; Nickel (Ni): RMB 100,000/ton; Manganese (Mn): RMB 10,000/ton)

Potential Applications

Energy Storage | Energy Efficiency

Applicable Industries

Energy, Environmental and Utilities



MES 25 High Performance and Long Durability Pd@Pt Core-Shell Fuel Cell Catalysts

Principal Investigator | **Prof. Minhua SHAO**

Technology Readiness Level | **TRL 7** IP status | **Patented**

This technology enables the conversion of hydrogen's chemical energy into electricity, generating only water as a byproduct over an extended period.

The catalyst utilizes a low amount of platinum and demonstrates superior performance and long-lasting durability.

Key Technology Edges:

- High performance and high power density output
- Long-lasting durability, demonstrating excellent performance in two extreme acceleration tests (DOE Standard)
- Reduced costly platinum usage

Potential Applications

Energy Storage | Energy Efficiency

Applicable Industries

Energy, Environmental and Utilities

MES 26 Microcapsule Technologies for High Value-added Industrial Adhesives

Principal Investigator | **Prof. Jinglei YANG**

Technology Readiness Level | **TRL 8** IP status | **Patented**

Industrial adhesives are essential for bonding materials in modern manufacturing. They offer advantages over traditional fastening methods and are used across various industries, including automotive, aerospace, electronics, and construction.

However, traditional industrial adhesives have uncontrollable curing time, limited temperature and chemical resistance, and pose health/safety and environment concerns. HKUST has developed microcapsule technologies for high-value-added industrial adhesives, with a focus on nurturing nationalized related products, autonomous and controllable technologies, and secure supply chain.

Key Technology Edges:

- High performance-price ratio
- Eco-friendly (low VoC, and waterborne)
- High temperature stability
- Fulfill the urgent need for Domestic Replaceable & Customizable microencapsulation technologies

Potential Applications

High-value-added Industrial Adhesives

Applicable Industries

Energy, Environmental and Utilities | Manufacturing and Engineering

MES 27 Zero Carbon GelSoap for a Healthy and Sustainable Living Style

Principal Investigator | **Prof. King Lun YEUNG**

Technology Readiness Level | **TRL 8** IP status | **Patented**

Silica capsules with prolonged release property is designed to extend the usage period of different types of household, personal hygiene or healthcare products.

This unique technology involves the encapsulation of concentrated active ingredients within silica-based capsules. A small amount of the capsule-infused product, when mixed with water, can provide the same functionality as a significantly larger quantity of traditional products, thereby significantly reducing the size and weight of these products, making them more economical and environmentally friendly. Using silica capsule technology, GelSoap has been developed as an alternative environmentally-friendly soap product, and a bundle of related household/personal products is under development.

Key Technology Edges:

- **Environmental Impact:** The manufacture, transport, and disposal of traditional health and hygiene products pose significant environmental challenges. These products typically include a high percentage of water, making them heavy and bulky. This results in high carbon emissions during transportation and significant storage space. The small size and light weight of our silica capsules can significantly reduce these environmental impacts
- **Waste Reduction:** Traditional health and hygiene products often lead to packaging and disposable plastic dispenser. Our silica capsules reduce the packaging wastage by reducing its size and reuse eco-friendly dispenser
- **Cost saving:** The bulk and weight of traditional products lead to high storage and transportation costs. Our silica capsules can revolutionize logistics across the health and hygiene industry by reducing the size and weight

Potential Applications

Personal care products, including hand soaps, shampoos, conditioners, and lotions | Household cleaning products, including surface cleaners, dishwashing liquids, car washing liquid and laundry detergents

Applicable Industries

Energy, Environmental and Utilities | Manufactirng and Engineering

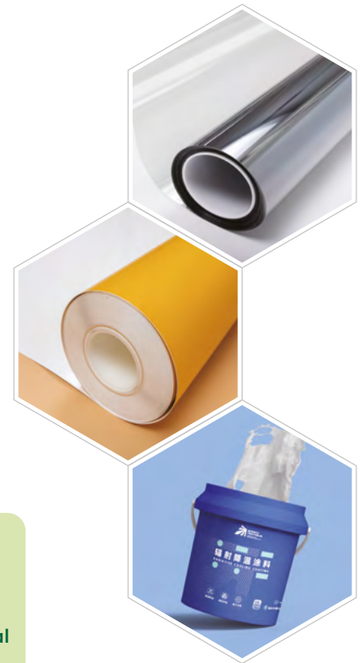
MES 28 Optical Metamaterials: Radiative Cooling for Zero Energy Thermal Management

Principal Investigator | **Prof. Chongjia LIN**

Technology Readiness Level | **TRL 9** IP status | **Patented**

We fabricate nano/micro-engineered surfaces for all-day radiative cooling via high atmospheric mid-infrared emission and strong solar reflection.

The surface temperature can be cooled down up to ~10 degrees lower than the ambient air and ~45 degrees lower than the original surface. It provides efficient passive cooling for buildings, outdoor equipments, facilities or products with zero energy consumption. Our products include film and paint. It can be either opaque or transparent and the color can be customized.



Potential Applications

- Various constructions: like residential and commercial buildings, storehouses, industrial plants
- Various outdoor equipments or facilities: like vehicle, electrical cabinet, container, chemical tank and PV panels

Applicable Industries

- Construction and Property
- Energy, Environmental and Utilities

MES 29 Photoelectrochemical (PEC) System for Low-carbon-Emission Saline Sewage Treatment Coupled with Green H2 Production

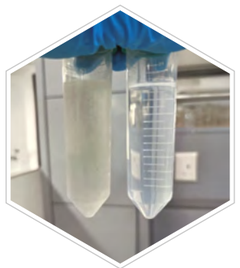
Principal Investigator | **Prof. Irene Man Chi LO** Technology Readiness Level | **TRL 5** IP status | **IP Protected**

This technology integrates saline sewage treatment with green hydrogen production through a BiVO4-based photoelectrochemical system.

It effectively removes organic compounds, ammonia, and bacteria from wastewater while generating zero carbon emissions. This can reduce the need for chemical additives, supporting net-zero carbon goals.

Key Technology Edges:

- **Dual Functionality:** Effectively treats saline sewage by removing organic compounds, ammonia, and bacteria while generating clean hydrogen energy
- **Towards Net Zero Emissions:** Offers a low carbon footprint in both treatment and green energy production
- **Efficiency and Cost-effectiveness:** Utilizes high-efficiency BiVO4-based photoanodes and reduces chemical usage, making it a cost-effective solution



Potential Applications

- Municipal wastewater treatment, Industrial wastewater management, Desalination effluent
- Renewable energy production
- Agricultural and Coastal Applications

Applicable Industries

- Energy, Environmental and Utilities

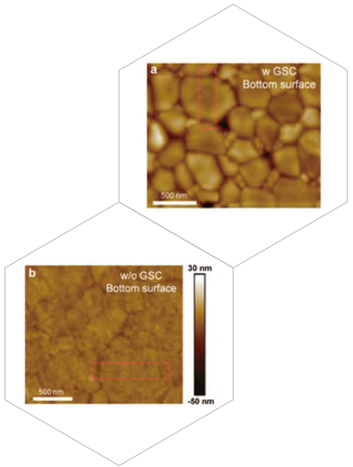
MES 30 Elimination of Grain Surface Concaves in Metal Halide Perovskite Films for Improved Solar Cells

Principal Investigator | **Prof. Yuanyuan ZHOU**

Technology Readiness Level | **TRL 5** IP status | **IP Protected**

Our research team discovered surface concavities on crystal grains in perovskite thin films, affecting their properties and reliability.

We developed a novel method to improve the efficiency and stability of perovskite solar cells by using surfactants to smooth these concavities.



Key Technology Edges:

- Surfactant-regulated grain growth technique
- Power conversion efficiencies (PCEs) of 25.5%
- **Stability:** 83% efficiency after 300 thermal cycles (ISOS-T-3 protocol)
  90% after 660 hours of damp heat (ISOS-D-3 protocol)
  90% after 1290 hours of operation (ISOS-L-1l protocol)

Potential Applications

- Solar energy
- Optoelectronic devices
- Flexible electronics
- Energy storage

Applicable Industries

- Energy, Environmental and Utilities

MES 31 Personalized Real-Time Air Quality Informatic System for Exposure – Hong Kong (PRAISE-HK)

Principal Investigator | **Prof. Alexis Kai Hon LAU, Prof. Jimmy Chi Hung FUNG**

Technology Readiness Level | **TRL 7**

The PRAISE-HK mobile app empowers users to manage and reduce air pollution exposure by offering real-time and forecasted location-specific air quality information, along with personalized daily exposure reviews.

Collaborations with the Hong Kong Asthma Society and Hong Kong Red Cross aim to extend these benefits to vulnerable populations and the broader public, minimizing health risks associated with air pollution.

Key Technology Edges:

- Real-time and forecasted street-level air quality map
- Personalized air pollution daily exposure reviews and health advice
- Cleaner air route suggestions and asthma symptom report

Potential Applications

- Health management
- Daily commuting
- Outdoor activities planning
- Public awareness and policy making

Applicable Industries

- Healthcare

MES 32 A Class of Combined Treatments for Airfoil Trailing Edge Noise Mitigation

Principal Investigator | **Prof. Xin ZHANG, Prof. Peng ZHOU**

Technology Readiness Level | **TRL 6** IP status | **Patented**

We have developed combined treatments for reducing airfoil trailing edge noise.

Each treatment features a serrated base structure covered with porous, velvety, or porous velvety layers on both sides. Compared to conventional serrations, these new treatments offer improved broadband noise reduction across a wider frequency range and are less sensitive to misalignment with local airflow.

Key Technology Edges:

- Broadband noise reduction
- Robust performance

Potential Applications

Wind turbines | Unmanned aerial vehicles (UAVs) | Aircraft design | Ducted fan

Applicable Industries

Manufacturing and Engineering

MES 33 A method for Lithium Resources Extracting from Retired Lithium-ion Battery Wastes

Principal Investigator | **Prof. Dan TSANG**

Technology Readiness Level | **TRL 5** IP status | **IP Protected**

We have developed a method using deep eutectic solvents to extract lithium from retired lithium-ion battery (LIB) waste, addressing the complexities and costs of recovery.

The process separates cathode material from the electrolyte and treats the residual waste, achieving extraction efficiencies of 60-95 wt%. This method is applicable for power battery recycling.

Key Technology Edges:

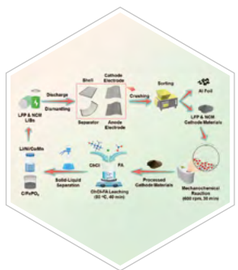
- Efficient lithium extraction
- **Versatility in cathode materials:** the technology allows for the extraction and recovery of residual lithium resources from cathode electrode sheets with different sources, compositions, and lithium residual amounts

Potential Applications

Battery recycling industry | EV supply chain

Applicable Industries

Energy, Environmental and Utilities | Manufacturing and Engineering



MES 34 Articulated Cycling Mannequin for Wind Tunnel Testings

Principal Investigator | **Prof. Xin ZHANG**

Technology Readiness Level | **TRL 7** IP status | **Patented**

This invention presents the development method of a dynamic cycling mannequin for the use of wind tunnel testings.

Compared to normal human testers, the mannequin has a great advantage in measurement repeatability, which is critical for equipment and garment development. The articulated mannequin consists of the inner skeleton and the outer shell. The outer shell of the mannequin is fabricated using additive manufacturing method accurately reflects the geometry of a professional cyclist.The joints of the skeleton in the upper body can be adjusted and fixed to to represent different postures. The knee and hip joints of the mannequin are freely articulated, and can achieve passive pedalling motion. Compared to a conventional 3D printed rigid mannequin, the inclusion of the pedalling motion and posture adjustment capability greatly improves the quality and expandability of wind tunnel tests.

Key Technology Edges:

- The inclusion of the pedalling motion greatly improves the accuracy of wind tunnel tests
- The mannequin can be fitted to bicycles of different geometries
- The posture adjustment capability allows testing of bicycle equipment and apparels at a range of postures at once

Potential Applications

Aerodynamic testing

Applicable Industries

Education, Research, and Professional Services | Manufacturing and Engineering

Bio-Medical and Healthcare (BMH)

BMH 01 Advanced Polymer-Based Therapeutics for Chronic Diseases

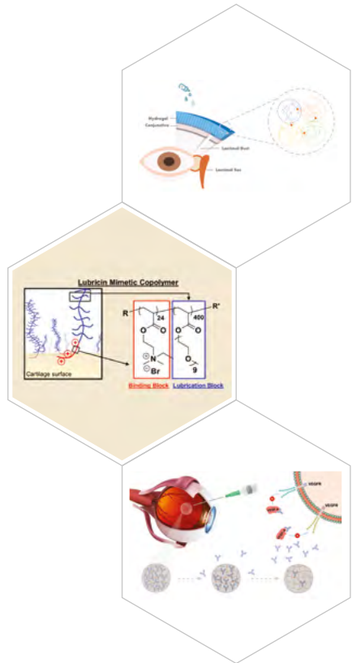
Principal Investigator I **Prof. Ying CHAU**

Technology Readiness Level I **TRL 7** IP status I **Patented**

Pleryon Therapeutics: Innovating next-generation therapeutics with advanced polymers.

Key Technology Edges:

- **Advanced Polymer Therapeutics:** Proprietary technology that controls 2D sequences and 3D structures of extra-large polymers to address complex diseases
- **Targeting Different Diseases:** Combines physical, mechanical, and biological mechanisms for innovative treatments. Targets osteoarthritis, dry eye, and aesthetics, addressing significant global demand and unmet needs

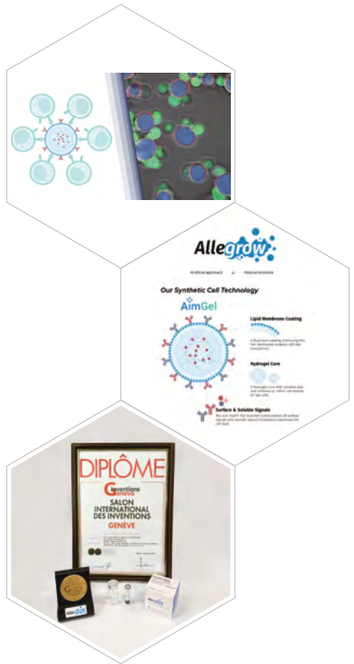


Potential Applications

Device | Innovative Drug

Applicable Industries

Bio-Medical, Healthcare and Food



BMH 02 Biomaterial-based Artificial Cells for Transforming Cell & Gene Therapy Outcomes

Principal Investigator I **Prof. Ying CHAU**

Technology Readiness Level I **TRL 4** IP status I **Patents Pending**

A chemically defiined, animal free reagent to stimulate diverse immune cell growth.

Key Technology Edges:

- **Unreal performance:** 60% yield increase for T cells, 470% yield increase for NK cells compare to current gold standard
- **Versatile platform:** Biomimicry modular design unlocks the applications beyond immune cell stimulation
- **Self-degradable:** Dissolute at preset time, steamline process, semless integration to existing process

Potential Applications

Drug Delivery | Research tool / Edu-tech

Applicable Industries

Biomedical, Healthcare and Food

BMH 03 High-throughput AI-based screening platform for drug discovery

Principal Investigator I **Prof. Tom Hiu Tung CHEUNG**

Technology Readiness Level I **TRL 4** IP status I **Patent in Progress**

Our drug discovery platform combines AI-powered high-throughput screening and cutting-edge motion-based preclinical assessment, expediting drug development by allowing for the rapid evaluation of over 3000 compounds each month.

Key Technology Edges:

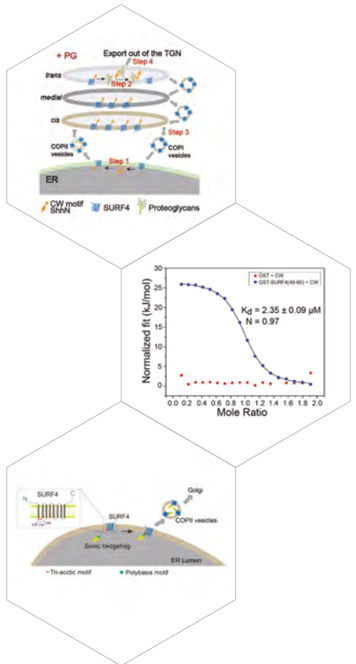
- **High-Throughput Screening:** Leveraging deep learning, our semi-automatic platform can adapt dynamically to diverse disease models, vastly increasing the drug discovery pipeline's efficiency (3000 compounds per month)
- **Unique Biologics Library:** A collection of biologically compounds derived from human cell secretomes provides a rich source for potential therapies
- **Proprietary Targets:** We hold IP for novel targets that enhance mitochondrial function and combat cellular senescence, addressing unmet needs in age-related diseases

Potential Applications

Drug Discovery | Artificial Intelligent

Applicable Industries

Biomedical, Healthcare and Food



BMH 04 Secretion-Management Targeted Skin Cancer Treatment

Principal Investigator I **Prof. Yu Song GUO**

Technology Readiness Level I **TRL 2** IP status I **Patent in progress**

Controlling the secretion of Shh as a new therapeutic target for drug discovery in Melanoma Treatment.

Key Technology Edges:

- Identified a novel target for blocking hedgehog signaling for cancer treatment
- Hedgehog signaling is one of the most important drug target for cancer treatment
- A robust platform to screen drugs to block secretion of sonic hedgehog

Potential Applications

Cancer Treatment | Melanoma | Drug Discovery

Applicable Industries

Bio-Medical, Healthcare and Food

BMH 05 Non-Tolerance Type-1$^{1/2}$ ALK Inhibitor for Cancer Treatment

Principal Investigator | **Prof. Yong HUANG**

Technology Readiness Level | **TRL 3** IP status | **Patented**

Innovative Drug Structure Optimization with AI Structural Fitting.

Key Technology Edges:

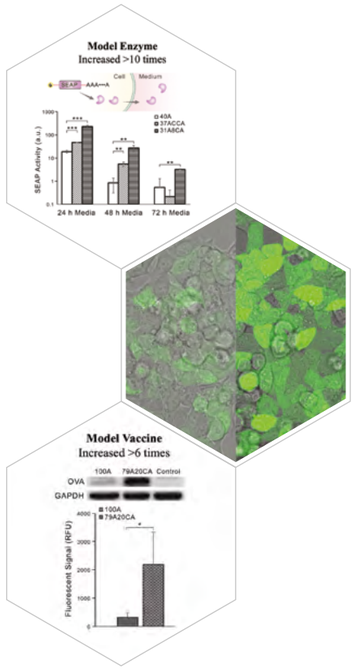
- A bridged inhibitor to combat drug resistance
- Identification of the key linker joining two warheads
- Exceptional efficacy in xenograft mouse models

Potential Applications

- Cancer Therapy
- Drug Structure
- Drug Discovery

Applicable Industries

- Bio-Medical, Healthcare and Food



BMH 06 Triple the mRNA Vaccine Efficacy Via Tailored Tail Sequence

Principal Investigator | **Prof. Becki Yi KUANG**

Technology Readiness Level | **TRL 4** IP status | **Patented**

Optimized tail sequences enalbe mRNA therapeutics and vaccines to have stronger and long-lasting efficacy.

Key Technology Edges:

- Reduce synthesis cost
- Do no need to change synthesis protocol
- Can be combined with existing mRNA enhancement technologies

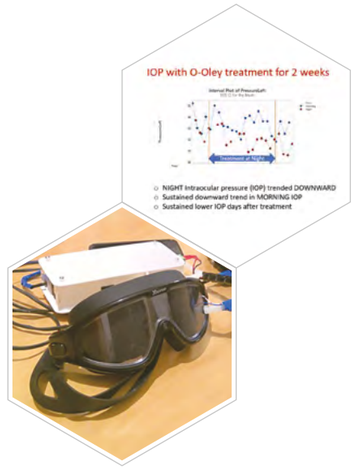
Potential Applications

- Enhanced mRNA Vaccines
- Enhanced mRNA Therapeutics
- Cell Therapy

Applicable Industries

- Bio-Medical, Healthcare and Food

BMH 07 Specializing in Ocular Health, Offering a Hot-yoga Goggle Device to Relieve Dryness and Protect Against Glaucoma, Along with a Mobile App for Early Detection of Ocular Diseases



Principal Investigator | **Dr. Stanely LEUNG**

Technology Readiness Level | **TRL 5** IP status | **Patented**

An ocular hot-yoga goggle device is designed to relieve eye dryness and protect eyes against glaucoma.

Key Technology Edges:

- The O-Oley goggle offers drug-free, non-invasive “hot yoga” therapy to relieve dryness, reduce stress, and prevent glaucoma, enhancing eye health and comfort
- Each O-Oley goggle provides personalized therapy tailored via its app, which monitors ocular disease risks and alerts users to potential issues

Potential Applications

- Relieve symptoms of glaucoma, dry eye syndrome, and other eye conditions
- Reduce Ocular Stress
- Provide personalized therapy through an application

Applicable Industries

- Bio-Medical, Healthcare and Food

BMH 09 Population-Wide Disease Prediction: A Data-Driven Blood Test Health Assessment

Principal Investigator | **Prof. David LAM**

Technology Readiness Level | **TRL 2** IP status | **Patent in progress**

SpectrumCheck - Utilizes routine blood test items for a fast and accessible screening for stroke, heart disease and cancer.

Key Technology Edges:

- Implemented in multiple local public hospitals
- Based on 20 years of Hong Kong Chinese cohort data from Hospital Authorities
- Successfully predicts risk levels for stroke, heart disease, liver health, and Colon/Gaslic Cancer

Potential Applications

- Disease Prediction
- Big Data
- Public Health

Applicable Industries

- Bio-Medical, Healthcare and Food

BMH 10 Drug Development for CNS Regeneration

Principal Investigator | **Prof. Kai LIU**

Technology Readiness Level | **TRL 4** IP status | **Patented**

Our neuroregenerative technology heralds a new era for treating CNS traumas and degenerative diseases, offering new hope for conditions such as glaucoma, stroke, and spinal injury paralysis. By fostering axonal regeneration and neural circuit repair with small molecule therapies, we're reshaping CNS healthcare.

Key Technology Edges:

- **Tailored Therapeutics:** Our treatments are designed for specific neuron diseases, providing targeted and effective remedies for conditions with limited options
- **Innovative Advantage:** With novel small molecules, our platform stands out for its precision and potential
- **Commercial Trajectory:** Currently in the preclinical trial phase with secured funding, our path to market entry is clear, targeting a sector with a projected value of over $120 billion by 2030

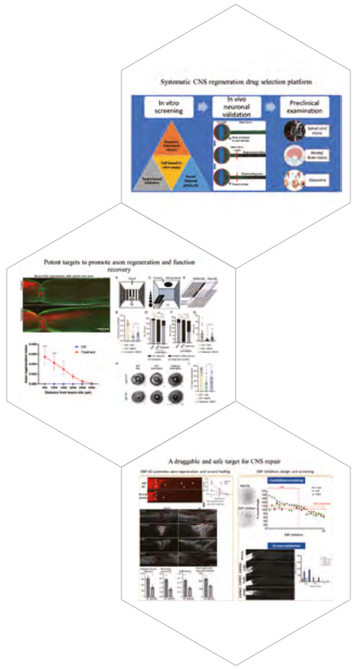
Potential Applications

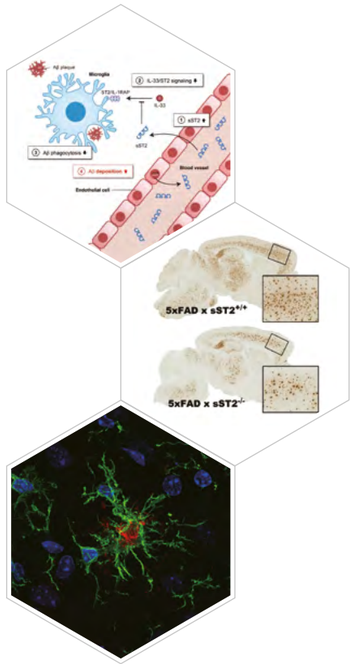
Drug Discovery

Neuron Regeneration

Applicable Industries

Biomedical, Healthcare and Food





BMH 11 sST2 – A Novel Therapeutic Target for Alzheimer's Disease

Principal Investigator | **Prof. Nancy IP**

Technology Readiness Level | **TRL 5** IP status | **Patented**

sST2, a decoy receptor of interleukin-33-ST2 signaling, is a newly identified disease-causing factor and a promising therapeutic target for Alzheimer's disease.

Key Technology Edges:

- **Unique therapeutic target:** sST2 holds potential disease-modifying effects for Alzheimer's disease (AD) treatment. Promising research demonstrated the role of the sST2 pathway in AD pathology and microglial function, offering a novel mechanism that could significantly disrupt the AD treatment market
- **Advanced sST2 drug development:** Preclinical studies have validated that sST2 modulation reduces AD pathology in disease models. Approaches using ASO, siRNA, and small molecules are in progress, with an IND application expected by 2026
- **Broad therapeutic application:** Applicable to other diseases beyond AD that have increased sST2 levels, such as heart failure, Parkinson's disease, etc

Potential Applications

Drug Discovery

Applicable Industries

Biomedical, Healthcare and Food

Medicines for Alzheimer's disease, heart failure and other diseases associated with increased sST2 level

BMH 12 A Blood-Based Biomarker Detection System can Screen Alzheimer's Disease Early, Allowing for Timely Treatment

Principal Investigator | **Prof. Nancy IP**

Technology Readiness Level | **TRL 7** IP status | **Patent in Progress**

In the battle against Alzheimer's disease, early detection is key to effective intervention.

Our cutting-edge diagnostic system employs proteomics and advanced machine learning to identify early-stage Alzheimer's up to a decade before clinical symptoms manifest. By analyzing subtle changes in blood biomarkers, our technology not only detects the disease early but also monitors its progression and response to treatment, enabling timely and personalized therapeutic strategies.

Key Technology Edges:

- **Early Detection:** Capable of identifying Alzheimer's 5-10 years before symptom onset, our system offers a critical head start for disease-modifying treatments
- **Disease Monitoring:** Tracks the pathology of Alzheimer's in the brain through blood biomarkers, facilitating ongoing assessment of disease progression
- **Screening Tool:** Serves as an invaluable screening solution for initiating early-stage Alzheimer's interventions, potentially altering the course of the disease

Potential Applications

Medical device

Applicable Industries

Biomedical, Healthcare and Food

BMH 13 Natural Herbal Products for Treating Memory Loss and Neuronal Degeneration

Principal Investigator | **Prof. Nancy IP**

Technology Readiness Level | **TRL 5** IP status | **Patented**

Blending traditional Chinese medicine with contemporary neuroscience, our team pioneers herbal solutions to enhance synaptic plasticity – key to memory and cognition. Our research yields herbal formulas targeting Alzheimer's, Parkinson's, and stroke-related cognitive deficits, uniting ancient wisdom with modern science.

Key Technology Edges:

- **Synaptic Enhancement:** Natural active ingredients identified to enhance synaptic communication, addressing the early stages of neurodegeneration
- **TCM Integration:** Expertly selected Chinese herbs with a legacy of clinical use, now validated by scientific research
- **Advanced Characterization:** A cutting-edge platform that scientifically pinpoints and utilizes the synaptic benefits of TCM, directly targeting the source of memory loss and neurodegeneration

Potential Applications

Herbal formulations for memory loss

Herbal medicines for Alzheimer's disease, Parkinson's disease, and stroke

Applicable Industries

Biomedical, Healthcare and Food

Retail, Consumer Goods, and Hospitality

BMH 14 Gene Editing for Familial Alzheimer's Disease Treatment

Principal Investigator | **Prof. Nancy IP**

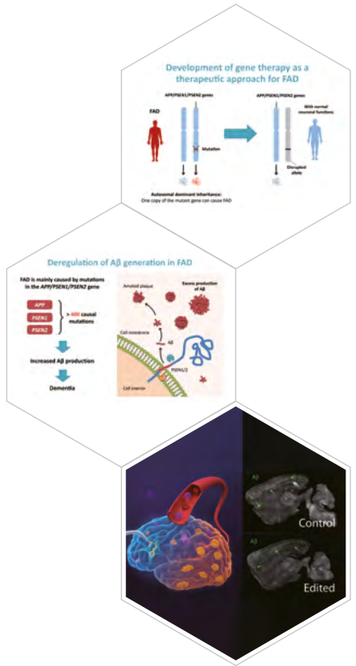
Technology Readiness Level | **TRL 5** IP status | **Patented**

Genome editing-based approaches to delete Alzheimer's risk genes and permanently rescue disease pathologies.

The gene editing technology can be applied to other inherited diseases.

Key Technology Edges:

- 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



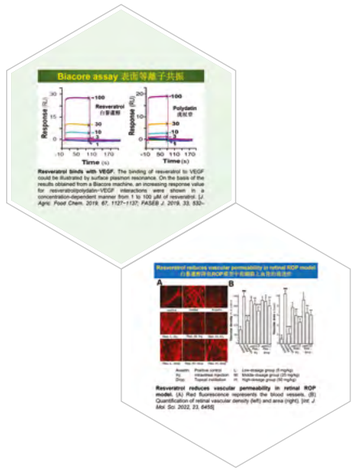
Potential Applications

Drug Discovery

Applicable Industries

Biomedical, Healthcare and Food

BMH 16 Development of Anti-Angiogenic Eyedrop for Eye Disease



Principal Investigator | **Prof. Karl TSIM**

Technology Readiness Level | **TRL 3** IP status | **Patented**

Therapeutic potential of resveratrol, polydatin, and/or their analogues as eye drops for age-related macular degeneration (AMD) through angiogenic inhibition.

Key Technology Edges:

- Solid foundation and clinical applications of VEGF-targeted drugs from traditional Chinese medicines (TCMs), supported by 7 publications and 3 patents (1 filed, 2 in progress)
- Phytochemicals targeting VEGF offering easy administration, low-cost manufacturing, potential for long-term use and simple topical application
- New therapeutic and non-invasive strategy providing advantages over standard treatment options such as argon laser photocoagulation and photodynamic therapy

Potential Applications

Anti-Angiogenic Therapy for Age-Related Macular Degeneration (AMD)

Anti-Angiogenic Therapy for Various Cancers

Prevention of Oxygen Radical Damage

Applicable Industries

Bio-Medical, Healthcare and Food

BMH 17 A Clinical Proven Biologics, SGC, for Unmet Life-threatening Medical Need on Skin Regeneration

Principal Investigator | **Prof. Karl TSIM** Technology Readiness Level | **TRL 6** IP status | **Patented**

The SGC biologic is a groundbreaking innovation in refractory wound care, utilizing patented protein-based regenerative technology.

Clinically validated in top-tier 3A hospitals, it has demonstrated exceptional efficacy in healing stubborn and hard-to-treat wounds. By accelerating the healing process, it significantly reduces treatment time and associated costs, providing an efficient and cost-effective solution for patients and healthcare providers.

Key Technology Edges:

- **Personalized Effectiveness:** Treatments derived from autologous blood demonstrate a remarkable 100% healing success rate, providing a revolutionary solution for the management of stubborn and hard-to-heal wounds. By utilizing the body's own regenerative capabilities, this approach ensures highly personalized and effective care, significantly improving patient outcomes
- **Robust Research Foundation:** With a strong scientific foundation supported by over three peer-reviewed publications and 15 patents, the technology showcases innovation and credibility. Its safety and reliability are validated through rigorous testing, including comprehensive immunogenicity assessments and Ames tests, ensuring its biocompatibility and suitability for medical use
- **Therapeutic Versatility:** This cutting-edge technology offers versatile applications, effectively treating conditions such as diabetic foot ulcers, burns, eczema, and dermatitis. In addition, ongoing research highlights its potential in areas like spinal nerve recovery, arthritis treatment, and anti-aging skin therapies, paving the way for significant advancements in healthcare and aesthetics

Potential Applications

Medical device

BioMedical Aesthetics

Applicable Industries

Bio-Medical, Healthcare and Food

Retail, Consumer Goods, and Hospitality

BMH 19 AI-Enabled Medical Imaging for Next-Gen Histological Imaging

Principal Investigator | **Prof. Terence WONG**

Technology Readiness Level | **TRL 5** IP status | **Patented**

CHAMP (Computational High-throughput Autofluorescence Microscopy by Pattern Illumination) is a transformative diagnostic tool that revolutionizes histological imaging by providing rapid, preparation-free cancer imaging.

Key Technology Edges:

- **Rapid Results:** CHAMP is expected to deliver clinical gold standard images within 3 minutes compared to 3 days for the current clinical method
- **Intraoperative Utility:** CHAMP offers rapid, stain-free and preparation-free, thick tissue histological imaging suitable even during surgery
- **Versatile Application:** CHAMP, unlike current intraoperative method, is applicable to nearly all biological tissues with primary focus on lung and breast cancer

Potential Applications

Medical Imaging

Medical device

Applicable Industries

Biomedical, Healthcare and Food

Education, Research, and Professional Services

BMH 20 Massively Parallel High-Throughput Multi-Omic Single-Cell Sequencing for Target Discovery

Principal Investigator | **Prof. Angela WU**

Technology Readiness Level | **TRL 5** IP status | **Patented**

A versatile platform for multi-modal single-cell biology: proprietary technologies offer innovative solutions for precision medicine and target discovery, enabling multi-modal single-cell profiling and addressing unmet needs in the single-cell technology market.

Key Technology Edges:

- **scONE-seq:** A next-generation single-cell multi-omics method for target discovery, capable of identifying rare tumor cells with high precision
- **OneChip:** A universal platform for target discovery and precision medicine, featuring a massively parallel droplet-array microfluidic device designed for multi-omics single-cell analysis at the million-cell scale
- **OneDrop:** An automated and integrated system that simplifies single-cell analysis, offering a high-throughput "samples in, results out" solution. It features redesigned reaction processes and advanced chip technology for efficient single-cell sequencing

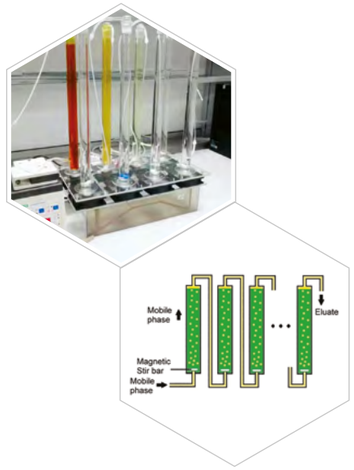
Potential Applications

- Tumor Biology
- Infectious Disease
- Discovery of Novel Cell/Molecular Targets
- Environmental and Microbial Applications

Applicable Industries

- Bio-Medical, Healthcare and Food

BMH 21 DMCC: An Environmental Friendly API Purification System



Principal Investigator | **Prof. Hong XUE**

Technology Readiness Level | **TRL 6** IP status | **Patented**

A highly scalable dispersed mobile-phase countercurrent chromatography platform for purification of commercially valuable chemicals.

Key Technology Edges:

- A breakthrough platform technology with patent protections, for effective purification of commercially valuable chemicals
- Unprecedented scalability for purification of chemical materials at industrial scales unachievable with any existing technologies
- Both user and environmentally friendly, with no solid waste and no irreversible material loss, commonly occurred using competitive technologies

Potential Applications

- Demonstrated Effective Isolation of Active Pharmaceutical Ingredients From Chinese Herbal Medicine Extracts
- Broad Applications in Purification of Organic Chemical Synthesized Materials
- Potential Applications in Petroleum Chemical and Nuclear Industries, with No Radioactive Solid Waste Generated and Hence Environmentally Friendly

Applicable Industries

- Bio-Medical, Healthcare and Food

BMH 22 Portable Device for Quick DNA Testing Using CRISPR/Microfluidic Technology

Principal Investigator | **Prof. Shuhuai YAO**

Technology Readiness Level | **TRL 5** IP status | **Patented**

Next-Generation CRISPR-Enhanced Microfluidic System for At-Home Nucleic Acid-Based Disease Screening

Key Technology Edges:

- **CRISPR-Enhanced Precision:** Patented diagnostic technology with new Cas12 RNA cleavage improves the specificity of isothermal nucleic acid tests, delivering PCR-level performance
- **Multi-Disease Detection:** Capable of simultaneously targeting up to 5 diseases using a disposable plastic cartridge with a reusable reader
- **Rapid and Efficient:** Provides a sample-in to answer-out solution within 35 minutes
- 3 US Patent filed, several others under preparation

Potential Applications

- Flexible High-Performance AI Chip for Market Prediction

Applicable Industries

- Bio-Medical, Healthcare and Food

BMH 23 Painless Microneedles for Transdermal Drug Delivery

Principal Investigator | **Prof. King Lun YEUNG**

Technology Readiness Level | **TRL 3** IP status | **Patented**

A new generation of painless drug delivery system suitable for advanced pharmaceuticals, biomolecules, and stem cells.

Key Technology Edges:

- Uses extremely hard and sharp crystalline zeolites as microneedle materials that are extremely safe
- Easy and inexpensive to fabricate, use, and dispose
- Application flexibility and compatibility

Potential Applications

- Advanced Painless Administration of Drugs, Hormones, Vaccine, and Cell Therapeutics
- Allows Design of Wearable Devices for Long-Term, Controlled Administration
- Potential for Smart and Intelligent Components for Monitoring Health and Well Being

Applicable Industries

- Bio-Medical, Healthcare and Food

BMH 24 AAV - Gene Therapy Delivery Platform for Treatment of Brain Diseases

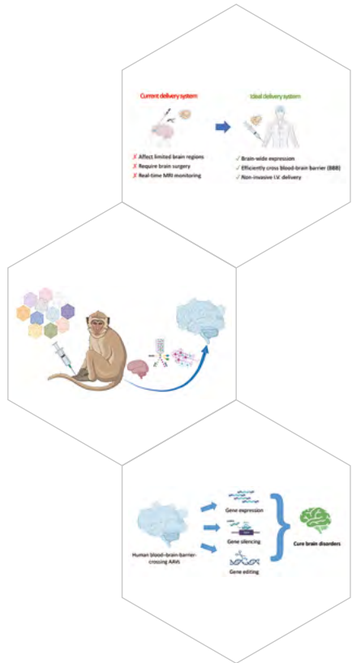
Principal Investigator | **Prof. Nancy IP**

Technology Readiness Level | **TRL 4** IP status | **Patented**

We aim to develop AAVs that can effectively cross the blood-brain barrier and deliver therapeutic genetic materials or tools to target brain cells for the treatment of brain diseases.

Key Technology Edges:

- **Targeted AAV Screening:** Identify AAV capsids capable of crossing the BBB and delivering to specific brain cells while exhibiting limited off-target expression, reduced systemic organ toxicity, and low immunogenicity
- **Non-Invasive Delivery Method:** Achieve non-invasive delivery to brain cells through IV injection, offering a patient-friendly treatment approach
- **Strategic Partnership for AAV Development:** Engage in a strategic partnership with Cure Genetics to co-develop and license AAV(s), utilizing a primate model



Potential Applications

Drug Delivery | Drug Discovery

Applicable Industries

Biomedical, Healthcare and Food

BMH 27 A New Treatment for Amyotrophic Lateral Sclerosis (ALS) and Frontotemporal Dementia (FTD) Targets G4C2 DNA and RNA Tandem Repeats Using Selective Small Molecules

Principal Investigator | **Prof. Guang ZHU**

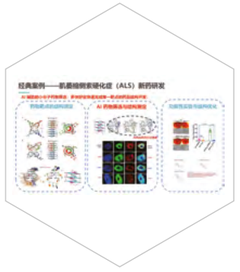
Technology Readiness Level | **TRL 4** IP status | **Patented**

This project leads ALS and FTD research by targeting G4C2 expansions in C9orf72.

Detailed characterization of G4C2 structures and the development of patented molecules that specifically bind to these targets represent a significant step toward a potential cure.

Key Technology Edges:

- **Structural Mastery:** Comprehensive mapping of G4C2 DNA and RNA structures associated with ALS and FTD, providing a robust foundation for targeted drug development
- **Innovative Lead Compounds:** Groundbreaking identification and development of lead compounds that selectively target pathogenic G4C2 DNA/RNA structures
- **Selective Efficacy:** Demonstrated high specificity of small molecules for G4C2 structures, surpassing the selectivity of current anti-G-quadruplex molecules



Potential Applications

Drug Discovery | Drug Optimization

Applicable Industries

Biomedical, Healthcare and Food

BMH 30 MeticTouch – Non-invasive Ultrasound Ocular Drug Delivery Platform

Principal Investigator | **Prof. Ying CHAU**

Technology Readiness Level | **TRL 6** IP status | **Patented**

MeticTouch® is an innovative non-invasive ocular drug delivery technology that offers a patient-friendly approach to administering medications to the eye. By eliminating the need for injections, MeticTouch® improves comfort, convenience, and potentially enhances treatment outcome.

Key Technology Edges:

- **Innovative Delivery:** MeticTouch® is the world's first non-invasive ocular drug delivery technology that has shown a solid safety profile and effectiveness across various ocular conditions
- **Pharma Compatibility:** Designed to seamlessly integrate with both existing and new drug products without requiring reformulation, MeticTouch® is highly adaptable to a broad range of therapeutics
- **Customizable Solutions:** MeticTouch® can be tailored to meet the strategic needs of biopharmaceutical companies, enhancing the value proposition of both new and established drugs

Potential Applications

Drug Delivery | Building/ Structural materials

Applicable Industries

Biomedical, Healthcare and Food | Manufacturing and Engineering

BMH 31 A Revolutionary Approach to Develop Innovative Anticancer Drugs Targeting DNA Replication-Initiation Proteins

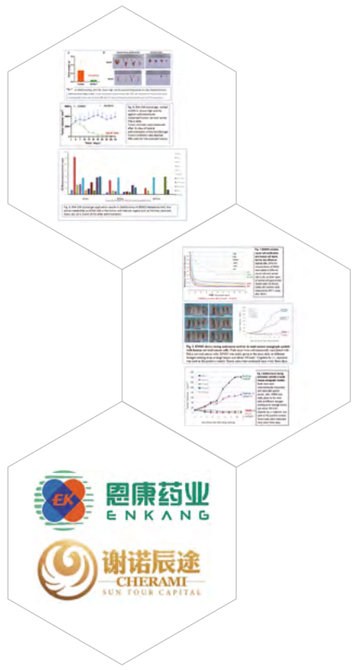
Principal Investigator | **Prof. Chun LIANG**

Technology Readiness Level | **TRL 6** IP status | **Patented**

Our platform targets cancer's pre-RC proteins with DRIPs inhibitors, offering a transformative approach for various cancers and precancerous conditions, with potential in CGT and neurodegeneration. EN002 and EK4-106 show preclinical success; EN002-gel is Phase II-ready after a successful Phase I, highlighting our solution's market promise.

Key Technology Edges:

- **Broad Application:** Pioneering treatments for a wide array of cancers and precancerous lesions, with implications for CGT and neurodegenerative diseases
- **Competitive Advantage:** Exceptional potency and safety, offering significant improvements over current cancer therapies
- **Commercial Progress:** Successful Phase I clinical trials and forthcoming Phase II, signaling rapid progress towards market entry



Potential Applications

Drug Discovery | Chemical Synthesis

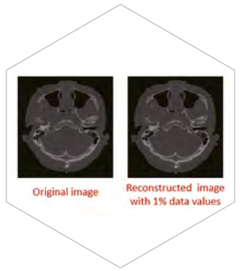
Applicable Industries

Biomedical, Healthcare and Food | Education, Research, and Professional Services

BMH 32 Physics-constrained Dictionary Learning for Medical Image Compression and Denoising

Principal Investigator I **Prof. Yanglong LU**

Technology Readiness Level I **TRL 5** IP status I **Patented**



Our innovative method compresses and denoises medical images using a physics-constrained dictionary, reducing data storage to less than 1% and preserving image integrity with minimal noise.

Key Technology Edges:

- **High Compression Ratio:** Achieves extreme data reduction, compressing three-dimensional medical images to a fraction of their original size
- **Dual Functionality:** Simultaneously compresses and denoises images, enhancing clarity and diagnostic value
- **Versatile Application:** Adapts to various data dimensions and types, ensuring broad utility across medical imaging

Potential Applications

Defect Inspection/ Monitoring | Medical Imaging

Applicable Industries

Information Technology, Communications and Software Services | Biomedical, Healthcare and Food

BMH 33 A Multifunctional Bioprinting Platform for Next-Generation Synthetic Tissues

Principal Investigator I **Prof. Yanglong LU**

Technology Readiness Level I **TRL 4** IP status I **Patent in progress**

Our cutting-edge bioprinting platform excels in precision, printing various materials and featuring real-time monitoring to detect and correct defects instantly, advancing tissue engineering.

Key Technology Edges:

- **Open-source Customization:** Tailor both software and hardware without cost, encouraging innovation and adaptation in various research settings
- **Multi-material Capability:** Print with a minimum of three materials concurrently, allowing the creation of intricate, multi-faceted structures
- **Real-time Quality Assurance:** Immediate monitoring and adjustment during the printing process guarantee superior quality and rapid error mitigation

Potential Applications

Medical device | Manufacturing Technology / Process Enhancement

Applicable Industries

Manufacturing and Engineering | Biomedical, Healthcare and Food

BMH 34 AI-Enabled Development of Tissue/Cell-Specific AAV Capsids for Therapeutic Delivery

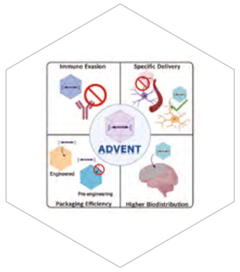
Principal Investigator I **Prof. Bonnie Danqing ZHU** Technology Readiness Level I **TRL 5** IP status I **Patented**

A new technology for cell-specific capsid engineering leverages AI-based protein design to optimize AAV capsid sequences with desirable properties.

This approach integrates the library construction, screening, sequencing and deep learning of diverse AAV capsids, enabling the development of a robust AI framework. High-quality data generated from multiple animal models and human brains have been utilized to fine-tuning the pre-trained foundation model, with the ultimate goal of creating a comprehensive collection of highly efficient AAV capsids for precise and targeted gene delivery to specific cell types.

Key Technology Edges:

- Foundation model (100B) built from evolutionary databases in human virome (largest atlas of life sciences data in pre-trained model)
- Experimental screenings in multiple animal species with high-quality labelled dataset generated from 500M to 1B sequence reads
- Positively and negatively enriched capsids of desired characteristics, selected and validated in multiple animal models and human brain tissues
- Novel capsids designed with
  - Shorter production time: 6X Faster (approx. 5-6 months)
  - Efficiency: 20X higher specificity (>60-70% targeting)
  - Low cost & competitive pricing: 5X higher production

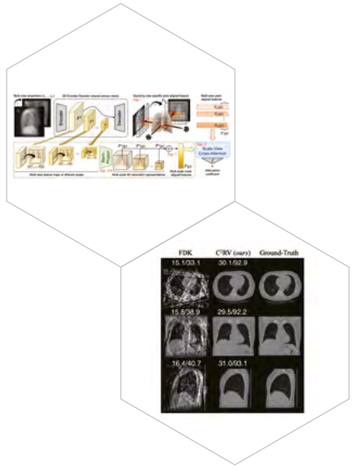


Potential Applications

AAV capsid delivery | Gene Therapy | Cell Therapy | Drug Design

Applicable Industries

Manufacturing and Engineering | Bio-Medical, Healthcare and Food



BMH 35 C2RV: Sparse-View Cone-Beam CT Reconstruction

Principal Investigator I **Prof. Xiaomeng LI**

Technology Readiness Level I **TRL 5** IP status I **Patented**

C2RV is a novel framework for sparse-view cone-beam computed tomography (CBCT) reconstruction that reduces radiation exposure by over 90%.

It uses multi-scale 3D volumetric representations and scale-view cross-attention to generate high-quality 3D images from fewer projections. The technology ensures precision while significantly lowering radiation risk, particularly useful in medical imaging.

Key Technology Edges:

- **Radiation Reduction:** Achieves over 90% reduction in radiation exposure by reconstructing 3D images from fewer projections
- **Advanced Feature Aggregation:** Leverages multi-scale 3D volumetric representations for precise imaging across views and regions
- **Broad Medical Applications:** Enhances imaging for preoperative planning, interventional radiology, and orthopedics with safer, high-quality diagnostics

Potential Applications

CT-based Diagnoses | Interventional radiology | Preoperative planning | Orthopedics (improving imaging for bone and joint analysis)

Applicable Industries

Healthcare | Robotics

BMH 36 Medical Copilot System Based on Generalist-Specialist Collaboration

Principal Investigator I **Prof. Hao CHEN** Technology Readiness Level I **TRL 4** IP status I **Patent in Progress**

The Medical Copilot System is designed to assist doctors in diagnosing medical images more accurately and efficiently through a collaborative framework called Generalist-Specialist Collaboration (GSCo).

This system combines the broad capabilities of generalist foundation models with the specialized expertise of domain-specific models. The system employs two key mechanisms: Mixture-of-Expert Diagnosis (MoED) and Retrieval-Augmented Diagnosis (RAD). MoED integrates specialist insights to refine diagnosis, while RAD enhances decision-making by retrieving similar cases for reference. This collaborative approach ensures that doctors receive precise and contextually enriched information, providing better patient care across a broad medical scope.

Key Technology Edges:

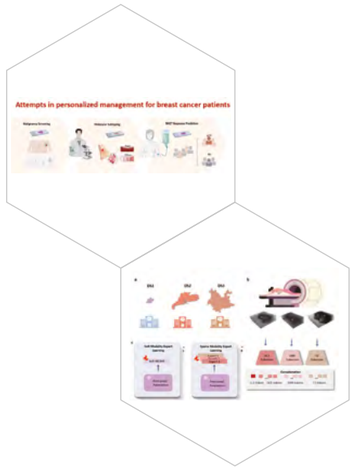
- **Leading Generalist Foundation Model:** Our GFM, MedDr, exhibits exceptional instruction-following and in-context learning capabilities, providing a robust foundation for diverse medical scenarios
- **Cutting-Edge Specialist Models:** We offer high-performance specialist models such as mSTAR for Pathology and VoCo for Radiology, ensuring precise and expert-level analysis across specific medical fields
- **Extensive Medical Collaboration:** We have established partnerships with numerous hospitals and doctors who provide valuable guidance and feedback for the development and refinement of our system and models

Potential Applications

Medical Imaging | Artificial Intelligent

Applicable Industries

Biomedical, Healthcare and Food



BMH 37 Towards Non-invasive and Personalized Management of Breast Cancer Patients from Multiparametric MRI Via A Large Mixture-of-Modality-Experts Model

Principal Investigator I **Prof. Hao CHEN**

Technology Readiness Level I **TRL 6**

This system leverages the advantages of a multi-modality mixture-of-experts model to effectively integrate multi-modality imaging information, enabling precision diagnosis for breast cancer patients.

Key Technology Edges:

- The largest Chinese breast mpMRI dataset (10K+ patients)
- First adaptation of a large foundation model with a mixture-of-modality-experts
- Achieving radiologist-level accuracy in malignancy detection, surpassing junior radiologists

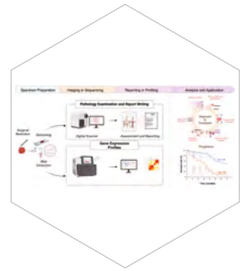
Potential Applications

Artificial Intelligent | Medical Imaging

Applicable Industries

Biomedical, Healthcare and Food

BMH 38 mSTAR: Multimodal Large AI Models Advance Smart Digital Pathology Diagnosis System



Principal Investigator I **Prof. Hao CHEN**

Technology Readiness Level I **TRL 6**

It leverages pathology foundation models pretrained on a vast amount of pathological whole slide images paired with other modalities data, such as pathology reports and gene profiles, for automatic pathological auxiliary diagnosis.

Key Technology Edges:

- Handling diverse pathological diagnostic tasks with one powerful foundation model
- Precisely address pathological diagnostic tasks with insights from various modalities
- Revolutionizing workflow efficiency by directly analyzing entire slides to significantly save the examination time

Potential Applications

Medical device

Applicable Industries

Biomedical, Healthcare and Food

BMH 39 Amplicon Contamination-Depleted CRISPR/Cas-Regulated Isothermal Molecular Assay At Skin Temperature

Principal Investigator I **Prof. I-Ming HSING**

Technology Readiness Level I **TRL 5** IP status I **Patented**

Aim to break the lab-to-home barrier of nucleic acid testing, enabling multi-level, equipment-free, home-based self-testing of viral infections.

Key Technology Edges:

- Cost-effective self-testing molecular assay without the need for power supply or equipment while eliminating false results and amplicon contamination
- Easy sample collection that a quick 2-minute operation enables at-home testing without environmental control requirements
- Build up direct visual readout spontaneous with the detection process without any manual handling
- In-built AI-assisted viral load classification model called BRRS automatically provides risk alerts

Potential Applications

Medical device | Wearable Device | Artificial Intelligent

Applicable Industries

Biomedical, Healthcare and Food | Manufacturing and Engineering

HKUST: Global Recognition

World's No.47

QS World University Ranking 2025

World's No.3, Hong Kong No.1

Young University Rankings 2024 by Times Higher Education

12th in Asia

Times Higher Education Asia University Ranking 2025

Patent Influence Metric No.1 in China and 33rd Globally

Nature's leading 200 academic institutions by patent influence metric published in 2022

Overall No. of Patents Granted No.1 in Hong Kong

Based on UGC's definition under the Common Data Collection Format (CDCF) in 2022/23

Granted US Utility Patents 2023 Top 100 Worldwide Universities

Published by the US National Academy of Inventors

World's Top 50 Hong Kong's Best in Engineering, Computer Science and Business and Economics

Times Higher Education (THE) World University Ranking 2025

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Office: Room 3625B (Office of Knowledge Transfer)

For investment discussion about HKUST DeepTech/startups
Please contact: efund@ust.hk

For collaboration discussion
Please contact: oktbd@ust.hk