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

**Project Details of 7 HKUST Projects Securing Funding in RAISe+ Second Round**

| Project Title | Description |
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| **3.3 KV High Power GaN Devices on 8 Inch Novel Substrates** | By 2030, it is estimated that up to 80% of electric power worldwide will rely on power. This makes power electronics crucial for improving energy efficiency, reducing power consumption, and enabling the integration of renewable energy sources into the electrical grid. **Prof. Kei-May LAU** led a research team that identified a novel 8-inch aluminum nitride(AlN)-based.<br><br>Recognizing gallium nitride's (GaN) critical role in enabling next-generation power systems that improve energy efficiency and reduce costs across transportation, data centers, consumer markets, and residential solar applications, the research team advances high-performance GaN power semiconductor devices through this novel aluminum nitride (AlN)-based substrate. This breakthrough enables the growth of high-quality, thick GaN layers on 8-inch wafers, with scalability potential to 12-inch formats. The cost is approximately HK$1,000 per wafer, which is competitive given its performance.<br><br>Companies like Zhiming Microelectronics, HiWAFER, AscenPower, Raysolve, Hi-sea Tech and others have already expressed strong interest in the team's solutions. Leveraging funding from the RAISe+ Scheme, alongside the expertise of HKUST's Photonics Technology Center in vertical GaN devices and HKSTP/MRDI's manufacturing capabilities at its pilot line, the team will demonstrate cost-effective, high-performance 3.3kV GaN devices on 8-inch substrates for market deployment. |
| **Developing tissue / cell specific AAV capsids by AI-and data-driven approaches** | At present, more than 500 million people worldwide are affected by genetic disorders, with gene therapy being their only cure. However, FDA-approved therapies using natural types of AAV capsids face significant limitations, including poor assembly efficiency, restricted biodistribution, low specificity, and high neutralization rates. A team led by **Prof. Bonnie ZHU**, Assistant Professor of the Department of Chemical and Biological Engineering, has established the large AI model combined with high-throughput library screenings to overcome these issues.<br><br>By analyzing vast viral protein sequences and pre-training the AI model through advanced self-supervised learning, the team uses deep learning to identify complex patterns within viral proteins. This enables the design of artificial sequences that far surpass the wild-type AAVs' performance. The approach achieves more efficient AAV designs, enhances target-cell specificity with fewer off-target effects, boosts therapeutic efficacy, reduces side effects, and makes previously inaccessible treatments feasible. It significantly reduces AAV Screening & Testing iterations from 6 rounds to 1 round, paving the way for a more effective, safer, and accessible gene therapies for patients with genetic disorders. |

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| | Through the RAISe+ project, the team will validate its large AI model via animal studies and expand research to organs such as the heart and central nervous system (CNS). Validated AAV capsids will be offered for collaborative development with international pharmaceutical partners, accelerating a pipeline of CGT drugs—particularly for CNS disorders such as Huntington's Disease (HD) and Parkinson's Diseases (PD). |
| **Development of a Highly Efficacious First-in-Class Vaginal Gel Targeting DRIPs for Cervical Cancer and Precancerous Lesions** | Current treatments for cervical precancerous lesions rely solely on invasive surgeries, risking premature birth, miscarriage, and high recurrence. These limitations exacerbate healthcare disparities—especially in developing countries—and leave critical unmet medical needs. Addressing this challenge, a team led by **Prof. LIANG Chun** from the Division of Life Science, has developed a first-in-class vaginal gel targeting DNA replication-initiation proteins (DRIPs).<br><br>This novel therapy selectively disrupts cancer cell proliferation at its root, inducing apoptosis in abnormal cells while sparing healthy tissue. It offers a safe, highly effective, affordable, and non-invasive alternative to surgery, poised to transform cervical cancer care globally. The gel has advanced to preclinical studies, the results of which demonstrated 96% tumor growth inhibition in vivo and nearly 100% eradication of cervical cancer and precancerous cells in clinical tissue samples. This non-invasive treatment also exhibits a high safety profile, with minimal systemic side effects.<br><br>Currently, seventeen patents covering the DRIPs technology have been granted across 24 countries/regions, including China, the US, the EU, and Australia. With funding from the RAISe+ Scheme, the team will seek US Food and Drug Administration (FDA) Fast Track Designation, Accelerated Approval (AA), and Breakthrough Therapy Designation (BTD) to expedite product launch by 2031. |
| **High Energy-Efficient Edge Chip & System for Large AI Models** | In recent years, large AI models have empowered next-generation AI agents with embodied intelligence capabilities, enabling human-like interaction with the physical world. However, current GPU-based devices face high power consumption and costs, while lacking flexible configurations for complex computing demands. A team led by **Prof. TSUI Chi-Ying**, Associate Director of AI Chip Center for Emerging Smart Systems (ACCESS) and Professor of the Division of Integrative Systems and Design, will develop a high energy-efficient edge chip and system that can effectively process large AI models while tackling these challenges. |

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| | This project integrates a software-hardware co-design platform for system optimization, unique model compression techniques for large AI models, and world-leading digital in-memory computing technology. This innovative approach significantly boosts edge AI computing performance by enabling real-time processing, adaptive storage bandwidth, and sustainable power efficiency. It enables fast development of flexible and scalable systems that can meet the diverse needs of embodied AI applications.<br><br>This research has already generated breakthrough advancements featured in international award, top-tier international conferences and journals. Moving forward, the team aims to revolutionize embodied AI by developing highly energy-efficient, low-cost, and scalable intelligent inference hardware system. This core "brain" technology will empower embodied AI, driving tangible societal benefits. |
| **Materials for next generation displays and optoelectronic devices** | Current display technologies often struggle with slow response times and motion blur, leading to a less enjoyable viewing experience. A team led by **Prof. KWOK Hoi-Sing**, Executive Director of State Key Laboratory of Advanced Displays and Optoelectronics Technologies and Visiting Professor of the Department of Electronic and Computer Engineering, aims to revolutionize displays and optoelectronic devices using ferroelectric liquid crystal (FLC) materials. These materials enable microsecond-level response speeds—hundreds of times faster than conventional liquid crystals—and higher brightness, addressing limitations in today's displays while enhancing energy efficiency and image clarity.<br><br>The newly developed FLC technology enables transformative advancements across multiple optoelectronic domains. It powers ultra-high-resolution displays with 3 times greater light efficiency than conventional LCDs, reducing motion blur and dizziness while rivaling OLED visual quality. In LiDAR and optical communications, FLCs achieve 100 times faster response speeds, enhancing automotive safety through precise obstacle detection and reducing signal jitter. The materials further enable microsecond-speed optical switching for seamless video playback and multi-focus AR/VR lenses for immersive experiences. Collectively, these innovations deliver superior speed, efficiency, and stability—positioning FLC-based solutions as competitive upgrades for displays, automotive systems, and extended reality applications.<br><br>The project has already attracted interest from major companies such as TCL-CSOT, AUO, REALFICTION, BOE, Hisense, and Meta. FLC materials and their manufacturing processes have successfully passed mass-production |

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| | testing on TCL-CSOT's G4.5 production line, confirming readiness for scaling. The team aims to replace existing technologies with its FLC innovation and commence mass production in the near future. |
| **Multi-centers clinical development of blood biomarker panels for detection of prodromal, mild cognitive impairment and early Alzheimer's disease** | Amid the global aging trend, Alzheimer's disease (AD) is emerging as a public health crisis, with over 55 million patients worldwide and projections of 139 million by 2050. Despite AD was first recognized more than a century ago, disease-modifying drugs to slow the disease progression were just recently available—with emphasis on treating patients early.<br><br>Building on groundbreaking research by HKUST **President Prof. Nancy IP'**s team at HKUST and Hong Kong Center for Neurodegenerative Disease (HKCeND), **Dr. JIANG Yuanbing**, Post-doctoral Fellow of the Division of Life Science, has developed Hong Kong's first-in-class multi-protein blood test for AD. The innovative solution, licensed to Cognitact, features two offerings: the PlasmarkAD® Pro Series—a comprehensive blood test delivering world-leading accuracy as high as 96%, and map distinct AD biological processes; and PlasmarkAD® Lite, a highly cost-effective, accessible blood test enabling timely AD risk evaluation, particularly in low-income regions and communities. These advancements significantly reduce testing costs by up to 80% compared to traditional brain PET scans, and have garnered recognition from healthcare professionals and established partnerships with 10 private hospitals and over 40 clinics.<br><br>Supported by the RAISe+ Scheme from the Hong Kong SAR Government, Cognitact is launching global clinical trials with over 1,000 participants to validate and optimize this innovative diagnostic tool in order to extend to a global adoption. This initiative aims to transform AD prevention and treatment, enhancing patient care and aligning with national "Healthy Aging" policies, ultimately benefiting healthcare systems and society at large. |
| **Next-Gen High-End Eco-Semiconductor Chiplets for Empowering Tomorrow's Data Centers and 6G Networks** | The development of next-generation data centers and 6G networks demands semiconductors with high-speed, high-power efficiency, high-linearity, high-integration, and high-quality factor (High-SPLIQ) capabilities. However, achieving these benchmarks faces hurdles such as complex material processing, thermal management challenges, and stringent reliability requirements. To address these demands, **Prof. Patrick YUE**, Associate Director of Institute of Integrated Circuits and Systems (IICS), and his team have founded Hi5Semi and developed a breakthrough semiconductor chip integrating silicon CMOS and GaN chiplets for next-gen communication systems. |

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| | Hi5Semi's innovation lies in integrating CMOS and GaN circuits, along with passive components, on interposer substrates, forming a heterogeneous integrated system-in-package (HISiP). This advanced design enables faster data processing, improved energy efficiency, and precise control over signal quality. The combination of these technologies effectively bridges the performance gap that single-technology solutions are unable to achieve.<br><br>For future development, Hi5Semi will focus on the optical communication market for data centers in the short term, delivering ultra-high-speed, low-power-consumption data interconnection solutions. In the long term, this technology is expected to play a critical role in 6G networks, enabling high-frequency, long-distance communication for applications such as low-orbit satellite systems. With RAISe+ funding, the team will accelerate the commercialization of these breakthrough products and drive technological advancements in the data center and satellite communications industries. |