Appendix

RGC Senior Research Fellow Scheme (SRFS)

Professor Michael Lyu Rung-tsong, Choh-ming Li Professor of Computer Science and Engineering
Project title: Evaluation, Exploration, and Application of Large Language Models on Code Intelligence

Advancements in technology, including nanotechnology and the ubiquity of the internet, have driven down the marginal cost of computing and communications to near-zero levels. Similarly, the emergence of large language models (LLMs) like ChatGPT will greatly reduce the marginal cost of realising creativity in software development. This project aims at releasing LLMs' power to generate software code, minimising development costs and maximising reliability. More specifically, the name "code intelligence" refers to using technology to help developers produce better code more easily and creatively. By unleashing the potential of LLMs in software development, the project seeks to reduce the overall cost of code production, while simultaneously enhancing code quality. The project will focus on three main areas: evaluation, exploration and application of LLMs in the context of code intelligence.

Professor Zhao Ni, Professor, Department of Electronic Engineering
Project title: Development of Optical Sensing Technologies for Early Detection and Ambulatory Monitoring of Cardiovascular and Cerebral Diseases

Population ageing has become a global public health issue. According to a recent report from the World Health Organization (WHO), by 2030, one in six people in the world will be aged 60 years or over. Such a demographic shift calls for fundamental changes in existing models of healthcare and social support. In particular, to reduce the economic and societal burden of medical treatment for ageing-related chronic conditions, such as cardiovascular diseases (CVDs) and dementia, it is crucial to provide mobile health monitoring devices to individuals, allowing for early prognosis and medical intervention. This proposal aims to develop new optical sensing-based wearable platforms and clinical application methods for them, to facilitate the detection of and intervention in cardiovascular and ageing-related brain diseases. A multidisciplinary research direction will combine device innovation with physiological modelling and clinical applications, aiming to provide new healthcare solutions to combat CVD and ageing-related brain diseases like dementia.

RGC Research Fellow Scheme (RFS)

Professor Yu Bei, Associate Professor, Department of Computer Science and Engineering
Project title: Machine Learning Driven VLSI Mask Optimisation

In the ever-evolving landscape of very large-scale integration (VLSI) systems, where scaling down is a constant, the challenges posed by lithographic proximity effects are becoming increasingly pronounced. These effects lead to a significant degradation in integrated circuit manufacturing yield. Mask optimisation techniques can combat this. This project delves into the use of generative deep learning structures, known for their efficiency in image generation and style transformation tasks. The research will focus on adapting these structures to enhance the VLSI mask optimisation process. This proposal outlines two critical machine learning-based mask optimisation techniques. Building on the advancements proposed in the current research, future work in mask optimisation will aim to incorporate even more sophisticated techniques, such as Source Mask Optimisation (SMO), the integration of hotspot detection, and pattern generation-aided enhanced mask optimisation.

Professor Lu Xinhui, Associate Professor, Department of Physics
Project title: Exploring the Critical Amorphous and Crystalline Morphology of Organic Optoelectronic Thin Films by Neutron and X-ray Scattering

Organic semiconducting molecules or polymers, based on conjugated π bonds, typically form semicrystalline thin films with broad applications in modern optoelectronics, such as organic photovoltaics (OPVs), organic photodetectors, and more. This project aims to uncover the ideal active layer morphology for organic optoelectronic devices, particularly OPVs, and enhance device performance for practical applications. The team has been focusing on studying the complex BHJ morphology of OPVs and developing strategies to control morphology for improved device performance. By employing advanced grazing-incidence neutron and X-ray scattering methods, they will explore the intricate interplay between amorphous and crystalline structures, key to charge generation, recombination and collection. This initiative promises significant advancements in microstructure understanding and morphology control strategies for organic semiconducting thin films, paving the way for the commercialization of high-performance optoelectronic devices.