Attachment

RGC Senior Research Fellow Scheme

Professor Bryan Mercurio, Simon F.S. Li Professor of Law, Faculty of Law
Project title: Access to vaccines in a post-COVID-19 world: Sustainable legal and policy options

The COVID-19 pandemic has demonstrated the human and economic cost of a lack of preparedness and raised issues over the international legal framework, research and development (R&D) incentives, and equitable access to life-saving medical products. The current innovation and intellectual property (IP) framework has failed to make vaccine R&D profitable and sustainable. As scientists have projected the inevitability of further pandemics, the framework must be improved and global preparedness enhanced. Drawing on lessons from the global response to the COVID-19 pandemic, this project will holistically explore the complex linkages between IP law, public health, trade and economics to provide a strong theoretical and empirical foundation for informed priority setting, resource allocation and policy choices in tackling future public health crises.

Professor Liu Renbao, Professor, Department of Physics, Faculty of Science
Project title: Quantum nonlinear spectroscopy – A new paradigm of quantum sensing

Nonlinear spectroscopy is widely used to study correlations. It uses a classical force to perturb a system and measures the response to extract the correlations. However, most types of correlation in a quantum system do not respond to classical forces and hence are invisible to classical spectroscopy. In this project, the researchers establish quantum nonlinear spectroscopy (QNS) by using a quantum sensor to apply a "quantum force" to a quantum target. Owing to the quantum nature, the response can be pre- and post-selected by initialising and measuring the sensors, respectively, and therefore arbitrary correlations can be extracted. QNS can be used for ultrasensitive detection and to study quantum many-body physics, constituting an example of quantum supremacy in information acquisition.

Professor Raymond Yeung Wai-ho, Choh-Ming Li Professor of Information Engineering, Department of Information Engineering, Faculty of Engineering
Project title: Research and development of network coding technologies

Network coding, the theory proposed by Professor Raymond Yeung in the late 1990s, has become one of the most important breakthroughs in the science of information. However, the complexity of implementing it is too high for most real-world applications. In 2011, Professor Yeung's team invented the BATched Sparse code (BATS), an efficient network coding algorithm that can be implemented on a wide range of computing platforms. BATS has the potential to become a standard in wireless communication and be implemented in every communication device, allowing the internet to reach secluded areas and expanding information access and economic opportunities to many more areas. In this project, the researchers will develop BATS technologies that are ready for mass adoption and deployment.

RGC Research Fellow Scheme

Professor Kathy Lui Oi-lan, Associate Professor, Department of Chemical Pathology, Faculty of Medicine
Project title: Molecular mechanisms underlying T-cell regulation of vascular disease, repair and regeneration

Obesity and diabetes are significant risk factors for the development of micro- and macro-vascular diseases. Through single cell transcriptomic analysis, Professor Kathy Lui's team has previously demonstrated that both CD4+ and CD8+ T-cell subsets inhibit vascular cell proliferation and promote fibrosis, while CD4+ FOXP3+ regulatory T-cells (Treg) facilitate vascular repair and regeneration even in diabetic mice. This previous work suggests that T-cells could be therapeutic targets for controlling vascular disease progression, repair and regeneration. In this project, her team will study the key molecular pathways driven by T-cells in modulating the pathological progression of vascular diseases associated with diabetes and atherosclerosis. They will also generate patient-specific humanised mouse models for in vivo disease modelling and drug screening, and to tailor personalised cardiovascular medicine.

Professor Lu Yi-chun, Professor, Department of Mechanical and Automation Engineering, Faculty of Engineering
Project title: Polysulfide-based aqueous redox flow batteries with high stability and high-power density for low-cost and long-duration energy storage