

Research Assessment Exercise 2020

Impact Overview Statement

University: The University of Hong Kong

Unit of Assessment (UoA): 13, computer studies/science (incl. information technology)

Total number of eligible staff of the university in the UoA: 18

(1) Context

The Department of Computer Science has an excellent record of translating research into practical applications and transferrable technologies. Its research on bioinformatics and medical imaging has contributed to improving human health and well-being, its research on information security and video surveillance has translated into public and professional services (including law enforcement), and its research on artificial intelligence, big data and Fintech has found commercial applications.

The department's research creates impact through the software technologies it develops. These often translate into innovative applications and functionalities or breakthrough improvements in terms of speed and cost-effectiveness, and benefit a wide range of people (examples include sequencing data analysis for patients with genetic disorders, E-Guide for the visually impaired, Scala Implicits for programmers, and deep learning algorithms for lung cancer screening). The department's pioneering software technologies have streamlined the operations of a number of public sector organizations, including the Department of Health, HK Police Force, HK Customs and Excise Department, MTR Corporation and HK Society for the Blind. Other prominent beneficiaries include high-end technology companies such as Huawei, Baidu and BGI.

The two submitted case studies are concerned with bioinformatics and information security.

(2) Approach to impact

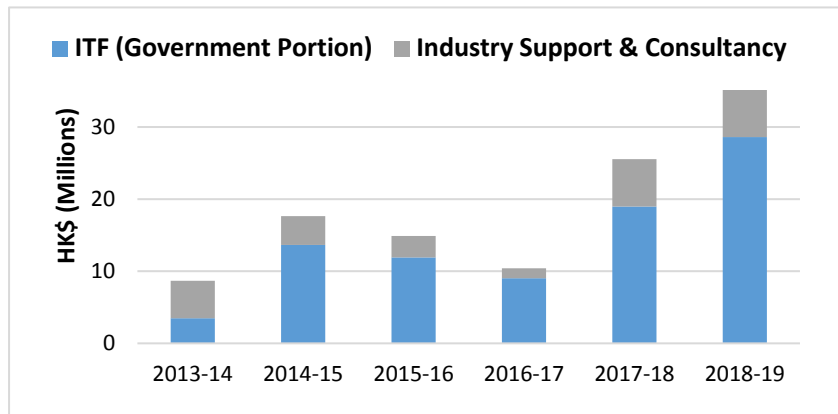
Over the years, the department has built up its research reputation through top-venue or highly-cited publications. Its approach to impact is characterized by active engagement with industry partners which can elevate or even transform their business by the application of state-of-the-art research.

Through joint projects, contract research and consultancies, the department works closely with its industrial partners to formulate the core research problems that challenge their disciplines. In order to obtain the necessary domain knowledge and data to channel research where it is needed, staff invest considerable time and effort in understanding the needs of industrial partners and users. They then work with those partners to turn research outputs into practical solutions. The department often involves its industrial partners as research team members when applying for technology funding. Its three latest ITF (Innovation and Technology Fund) projects (with total funding of over HK\$20M) on bioinformatics, RegTech and AI in Dentistry involved co-investigators from the Department of Health, HK Securities and Futures Commission, and Mondontics (a private dental technology company) respectively. In some cases, the department and its industrial partners have released or open-sourced the resulting software technologies for public benefit (e.g., SOAPdenovo2 & SOAP3 for BGI, Implicits for Scala, FCL (Flexible Collision Library) for Willow Garage).

Several staff members have, with the Department's support, taken leave to pursue work attachments with industrial partners. Y Yu, an expert in computer vision, worked full-time in Baidu (Beijing) and another AI company during 2018-19. KP Chow took a half-year's sabbatical leave in 2015-16 to work on an ITF project hosted by LSCM (Logistics and Supply Chain MultiTech R&D Center) in Cyberport and developed our partnership with the HK Police Force and HK Monetary Authority. These attachments have considerable educational value for both the department and its partners.

To commercialize their technologies and attain a wider impact, several staff members have founded their own spin-off companies since 2004. Examples include Brain Investing Ltd (SM Yiu, AI and algorithmic trading), CISC Ltd (KP Chow, financial technology), L3 Bioinformatics Ltd (TW Lam, D Cheung & R Luo, bioinformatics) and Throput Ltd (David Cheung, cloud computing).

The department is represented on Government committees and helps to formulate official policy related to the IT industry. Latest examples include the Law Reform Commission Sub-committee on Cybercrime, the Working Group on the Hong Kong Genome Project, and the Board of Directors of the Hong Kong Applied Science and Technology Research Institute (ASTRI).



The department's funding on Software Technology Development

(3) Strategy and plans

Technology Laboratories/Centers. In addition to its six basic research groups, the department has established laboratories or centers to facilitate technology transfer and industrial collaboration. It set up an information security center and an e-commerce infrastructure center over a decade ago. In 2018, it established the FinTech & Blockchain Laboratory and an AI Technology Laboratory, in line with its focus on industrial collaboration and technology development in the coming years. In the past year, the department deployed around HK\$7.5M to support these two laboratories, including building a GPU farm. The FinTech Lab has recently partnered with Tencent Finance, and the AI Tech Lab will likely be granted space and support in Futian, Shenzhen. The department also recently submitted an AIR@InnoHK proposal to the HKSAR Government to establish an applied research center in the Science Park.

Interdisciplinary Research and Joint Professoriate Posts in Technology. As well as partnering with specific industries to obtain relevant domain knowledge and data, the department has recognized the importance of building up its interdisciplinary research competence. It has recently collaborated with HKU's Faculties of Law and Medicine on projects related to regulatory technology and big data in healthcare, respectively. The strategy is to team up with bodies in HKU which have demonstrated strength and excellence in translational research. The department has established joint professoriate posts in technology with the Faculties of Business & Economics, Law and Social Sciences. Recently, a new post is established in collaboration with the Faculty of Dentistry on AI.

Department Seed Funding. Aligning research with topical concerns and attracting substantial funding (beyond GRF) is essential to conducting large-scale R&D. The department continually provides seed funding and postdoctoral subsidies to support staff in preparing applications under the ITF, Research Impact Fund, Collaborative Research Fund and Theme-based Research Scheme. In 2018, the department made five seed-funding awards (total amount of HK\$0.75M), resulting in four major funding awards with a total value of HK\$18M.

(4) Relationship to case studies

The two submitted case studies typify the department's approach to obtaining high-impact results from its research. In both cases, staff established strong relationships with industrial partners. The bioinformatics algorithms case study involved a partnership with BGI (Shenzhen) and interdisciplinary collaboration with the Department of Health and HK Sanatorium & Hospital. The cyber security case study, which exploited the resources of our information security center, involved a partnership with the HK Police Force and HK Customs and Exercise Department. Such partnership has provided strong support for our ITF funding application, and the technologies generated have been commercialized through spin-off companies.