

Research Assessment Exercise 2020
Impact Overview Statement

University: |The Hong Kong Polytechnic University |

Unit of Assessment (UoA): |13 Computer studies/science (incl. information technology) |

Total number of eligible staff of the university in the UoA: |30 |

(1) Context

The Department conducts high quality interdisciplinary research to create advanced computing related knowledge and to have impact on the world. Our research profile reflects our belief that computer science can and should play a major part in advancing the field, in securing the economic health of HK and China Mainland, in tackling key global issues and in contributing to improvements in the quality of life. The sectors on which we exert impact include:

Industry: Our relationships are with companies in Information Technology, Transportation, Supply chain, Finance and Security. We engage with them through various collaborations, e.g. joint research labs with Microsoft, IBM, Yonyou, and Collinstar Capital. Between 2013 and 2019, we have engaged in research collaborations with more than 7 companies in HK, Mainland China and overseas. Substantial indirect impact arises from PhD students and researchers who take up employment in industry as a result of their expertise gained from research in the Department.

Public Transportation: The Department has conducted research in big data analytics and AI-driven innovative applications for smart transportation systems. With the support of HK ITF and the collaboration with Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies (LSCM), Prof. Cao's Big Data-Driven Airport Resource Management (BigARM) system was used by Hong Kong International Airport (HKIA) for airport resource management such as baggage carousel allocation and aircraft stand management.

Public Privacy and Security: Our research on protecting user privacy in popular cryptocurrencies has been incorporated in CryptoNote, Monero and ZCash with a total market cap of 40 Billion USD. Our research has also developed novel solutions to detect and analyze mobile malware targeting on Android systems and vulnerabilities in mobile apps. |

(2) Approach to impact

The Department has made the impact of its research on industry, the public, and the wider community a key priority. This is in accordance with PolyU's publicly stated mission: "To pursue impactful research that benefits the world". To fulfill this mission, the Department employs a wide range of mechanisms to support the dissemination and transfer of knowledge and technology:

Intellectual Property Generation. PolyU provides staff and students with advice and support on intellectual property generation, protection, technology transfer, company incubation and investment. Since 2013 staff from the Department of Computing (COMP) have filed 22 patents (including 11 US patents).

Industrial Collaboration. Most of our research includes collaboration with industry, e.g. through partnership in ITF projects and direct industrial funding. We give three examples: Prof. Cao's demand-supply management in on-demand logistics was used by GoGoVan, a leading on-demand logistics company in Hong Kong; Prof. Zhang's "3D Data Convert and Repair Ecosystem" was adopted by Sony Corporation, Japan; and Dr. Au's prototype using Blockchain technologies for tracking goods along a supply chain has been commercialized by UBI.

Joint Research Centres. Our research excellence has attracted significant attention from both academia and industry, and we have been approached by many local and non-local institutions and companies for partnership and collaboration. The Department has established several joint laboratories with industry companies, including "PolyU-Microsoft Smart Computing Laboratory", "PolyU-Yonyou Joint Laboratory on Smart Cloud Computing", and "Joint IBM/PolyU Enterprise Data Analytics Laboratory". In addition, we are one of the key participating departments for the joint research lab between Huawei and PolyU. We are now working with Alibaba Group to establish a joint research lab of "AI in City Brain".

Staff Engagement in Industry. The Department actively encourages staff to exploit their inventions. For example, Prof. Lei Zhang, a **Clarivate Analytics** Highly Cited Researcher by Thomson Reuters consecutively from 2015 to 2018, took leave from the department to join Alibaba for two years.

Department-driven innovation initiatives (D^2I^2). The Department has planned and implemented the D^2I^2 scheme since 2014 to carry out research along the strategic directions and themes. A working group discusses and explores the potential topics in line with societal and industrial needs. The Department then provides research funds to initiate high-impact research projects on those identified topics. In the last five years, the Department has initiated D^2I^2 projects on smart IoT, smart vision, and smart aging, some of which have led to excellent industrial and societal impact. For example, with the D^2I^2 support, Prof. Zhang later on successfully bid the prestigious Research Impact Fund (Hong Kong Research Grants Committee) on smart vision and produced practical systems with industrial partners (in Case Study 2).

(3) Strategy and plans

The Department has developed a structure of initiatives, infrastructures, funds and incentive schemes to support our staff for impactful research.

Common research infrastructure construction. To consolidate and make better use of resources to support high impact research, the Department has established common research infrastructure with advanced facilities, including a private cloud (240 cores, 5T RAM, 120T storage), a 128-channel EEG system, and a series of high-end VR/AR systems (projection VR, walking VR, standing VR, mobile VR). The Department now is working on GPU clusters to support deep learning research. The investment will support the emerging strategic research on AI, big data, blockchain, and smart IoT.

Internal fund and incentive schemes. The Department sets the Department GRF scheme to encourage staff to propose and conduct impactful projects in the department's strategic areas. The Department also provides financial support to encourage staff members to establish labs to conduct inter-disciplinary research. Additional support is provided to junior staff, including start-up fund, PhD quota, etc. With these funded research, staff will develop bigger and promising ideas to bid for grand funding opportunities at both university fund (e.g., Strategic Importance Project) and government fund (e.g., Theme-based Project) levels.

DaSAIL. Recently, both the Central Government of China and the Hong Kong SAR Government have strategically put these up as key areas of R&D in the coming years. At COMP, the new lab called Data Science and AI Lab (DaSAIL) is established to foster interdisciplinary research crossing various groups within COMP as well as outside of the Department, and to conduct a number of strategically important research projects related to AI and big data, by collaborating with the top researchers and research committees in Hong Kong and internationally.

(4) Relationship to case studies

The success of all the submitted case studies benefits substantially from our approach to impact.

- Our joint lab on Cryptocurrency and Blockchain Technology with Monash University (see Case Study 1), funded by Collinstar Capital, demonstrated the effectiveness of our approach of “partnership with industry”. We collaborate with universities and industry companies with common research interest to establish joint labs, through which the developed technologies can be effectively and promptly transferred to industry to generate real impact.
- Our collaboration with Alibaba (in Case Study 2) comes from our approach “reach out and reach high”. In June 2016 we helped to organize the Alibaba Technology Forum (ATF) in Hong Kong. We then actively visited Alibaba's headquarter in Hangzhou in August 2016 for idea exchange and discussions. Several collaborative projects between COMP and Alibaba were then initiated, and the research outputs have been adopted in Alibaba's City Brain project. Currently, Alibaba is in discussion with us to deepen the collaboration and build its first research joint lab in HK.