MEDIA RELEASE

Fujitsu, SMU, and A*STAR Launch Digital Platform Experimentation Project Using Quantum-Inspired Computing and Deep Learning Technology
Project to explore new methodologies and use cases in the fields of quantum-inspired computing and artificial intelligence with the world's 1st on-premises installation of Fujitsu Digital Annealer at SMU in Singapore

Singapore and Tokyo, October 21st, 2019 — Fujitsu Limited, the Singapore Management University (SMU) and the Agency for Science, Technology and Research (A*STAR)'s Institute of High Performance Computing today announced the launch of the **Digital Platform Experimentation Project**. This new initiative forms part of the joint research and development activities at the Singapore Urban Computing and Engineering Centre of Excellence (UCE CoE).

The Digital Platform Experimentation Project was initiated under the guidance of the Urban Computing and Engineering Centre of Excellence, which was set up in 2014 by A*STAR, SMU, and Fujitsu. The CoE and the Digital Platform Experimentation Project are supported by the National Research Foundation Singapore (NRF) under its Urban Computing and Engineering Corporate Lab@SMU, one of the corporate laboratories that it has set up to encourage public-private R&D partnerships between universities and companies.

The project will nurture local talent and capabilities at the intersection of AI, deep learning, and quantum-inspired computing. A*STAR's Institute of High Performance Computing (IHPC) will play a key role in the deep learning and related AI capabilities for the project. SMU's School of Information Systems will strengthen the quantum-inspired computing and related AI optimization capabilities. Combining deep learning, AI, and quantum-inspired computing technologies into a single computational service-delivery platform will help solve very complex, large-scale, real-world problems —particularly combinatorial optimization problems at the core of planning and scheduling scenarios.

The project also taps on the CoE's research and development capabilities to implement Fujitsu technologies and accelerate the development of commercial applications using high performance optimization. This will further establish Fujitsu's global quantum-inspired and artificial intelligence (AI) eco-system, with the SMU installation marking the first-in-the-world on-premises deployment of the Fujitsu Digital Annealer platform.

As the project progresses, Fujitsu, A*STAR, and SMU will work with key institutions and stakeholders in Singapore's quantum computing community.

Further details of the Joint Project can be found in **ANNEX A.**

Comments from each party

Fujitsu Limited
Jo Oda, Corporate Executive Officer EVP, Head of Co-Creation Business Group, Japan Sales at Fujitsu Limited said "The Digital Platform Experimental Project will make use of Fujitsu's next generation Digital Platform which is strategically very important for Fujitsu, from both research and development and business perspectives. Fujitsu's technological contributions to the project will serve as a key enabler to realizing high performance solutions with quantum-inspired computing and AI, beyond what is currently available in the market. Upon successful implementation, Fujitsu will commercialize these solutions for the global market."

SMU
Professor Steven Miller, Vice Provost (Research) of SMU said, "Through this joint project, SMU looks forward to applying our research strengths in Data Science, Artificial Intelligence, and applied optimization to create intelligent resource planning and scheduling solutions. These new capabilities will make it possible to solve large-scale real-world challenges more efficiently. This will reinforce SMU's contributions to the Smart Nation and sustainability efforts of Singapore."

A*STAR's IHPC
Dr Lim Keng Hui, Executive Director of IHPC, said, "We expect to see quantum-inspired computing exceed the limits of conventional computing in this modern age of digitalization. Through our collaboration with Fujitsu and SMU, A*STAR will develop algorithms and methodologies for resource-efficient machine learning. This will reduce memory footprint, complexity and demonstrate real world use cases for industry applications. In the longer term, we aim to deploy these technologies to address complex challenges faced in experimental and computational science."

NRF
Mr George Loh, Director (Services & Digital Economy) of NRF, said, "The R&D work being conducted in our Corporate Laboratories is maturing. This new collaboration between Fujitsu, SMU and A*STAR signifies a move towards the commercialisation of research in data science and artificial intelligence for quantum-inspired computing. We are excited to see how the good progress in this collaboration will further allow Singapore to develop expertise in this field for a wide variety of practical applications in computing devices."

ANNEX A

Details of the Joint Project

The Digital Platform Experimentation Project marks the world's 1st on-premises installation of the Fujitsu Quantum-Inspired Computing Digital Annealer. The Digital Annealer provides an alternative to quantum computing technology, which is at present both very expensive and difficult to run. Using a digital circuit design inspired by quantum phenomena, the Digital Annealer focuses on rapidly solving complex combinatorial optimization problems without the added complications and costs typically associated with quantum computing methods. The Digital Annealer will play an important role in this initiative by allowing the partners to explore novel problem-solving approaches and methodologies for a wide variety of potential real-world applications. Use cases to date include portfolio optimization, drug discovery, factory optimization, inventory management, and digital marketing.

Another important aspect of the Digital Platform Experimentation Project is the demonstration of machine learning technology through Fujitsu's Digital Transformation (DX) Services and Platforms, which include technologies that accelerate deep learning for new applications and solutions in a variety of industries. These deep learning capabilities will prove increasingly important with the growth of edge computing and IoT devices.

In this project, SMU will benchmark Digital Annealer with exact commercial solvers (such as CPLEX and Gurobi) as well as other heuristic methods to solve complex combinatorial optimization problems. Classical methods will be combined with quantum-inspired methods to discover new hybrid algorithms that run on conventional computers to tackle practical use cases in resource planning and scheduling, such as designing daily schedules for ambulance and police cars to respond to crimes and emergencies in a congested city. This research will help to optimize resources toward a smart, safe and sustainable city.

A*STAR's Institute of High Performance Computing (IHPC) will contribute capabilities in developing deep learning models on real-life use cases with video data analysis for security applications, such as video anomaly detection, video action classification and real-time crowd analysis. The research focus aims to shorten video training time and significantly reduce memory footprint requirements.

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About Fujitsu

Fujitsu is the leading Japanese information and communication technology (ICT) company, offering a full range of technology products, solutions, and services. Approximately 132,000 Fujitsu people support customers in more than 100 countries. We use our experience and the power of ICT to shape the future of society with our customers. Fujitsu Limited (TSE: 6702) reported consolidated revenues of 4.0 trillion yen (US $36 billion) for the fiscal year ended March 31, 2019. For more information, please see www.fujitsu.com.

About Singapore Management University

A premier university in Asia, the Singapore Management University (SMU) is internationally recognised for its world-class research and distinguished teaching. Established in 2000, SMU's mission is to generate leading-edge research with global impact and produce broad-based, creative and entrepreneurial leaders for the knowledge-based economy.

Home to around 10,000 undergraduates and postgraduates, SMU comprises six schools: School of Accountancy, Lee Kong Chian School of Business, School of Economics, School of Information Systems, School of Law and School of Social Sciences. SMU offers a wide range of bachelor's, master's and PhD degree programmes in the disciplinary areas associated with the six schools, as well as in interdisciplinary combinations of these areas.

SMU has an emphasis on generating rigorous, high-impact, and relevant multi-disciplinary research that addresses Asian issues of global relevance, SMU faculty collaborate with leading international researchers and universities from USA, Europe, China and India as well as with partners in the business community and public sector, through its research institutes, centres and labs. SMU's city campus is a state-of-the-art facility located in the heart of downtown Singapore, fostering strategic linkages with business, government and the wider community. www.smu.edu.sg

About Institute of High Performance Computing

A*STAR's Institute of High Performance Computing (IHPC) was established in August 1998 to provide leadership in high performance computing as a strategic resource for scientific inquiry and industry development. It seeks to power discoveries through advanced methodologies, techniques and new tools in modelling, simulation and artificial intelligence.

Its core research areas are in the realm of complex-coupled systems, mechanics and fluid dynamics, large-scale systems, digital modelling, adaptive and collaborative computing, data mining and analysis, computational electronics and electromagnetics, computational materials science and chemistry. For more information about IHPC, please visit www.a-star.edu.sg/ihpc.

About the Agency for Science, Technology and Research (A*STAR)

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector agency that spearheads economic oriented research to advance scientific discovery and develop innovative technology. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit society.

As a Science and Technology Organisation, A*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by contributing to societal benefits such as improving outcomes in healthcare, urban living, and sustainability.

We play a key role in nurturing and developing a diversity of talent and leaders in our Agency and research entities, the wider research community and industry. A*STAR's R&D activities span biomedical sciences and physical sciences and engineering, with research entities primarily located in Biopolis and Fusionopolis. For ongoing news, visit www.a-star.edu.sg.

About National Research Foundation Singapore

The National Research Foundation (NRF) is a department within the Prime Minister's Office. The NRF sets the national direction for research, innovation and enterprise (RIE) in Singapore. It seeks to invest in science, technology and engineering, build up the technological capacity of our companies, encourage innovation by industry to exploit new opportunities that drive economic growth, and facilitate public-private partnerships to address national challenges.

Under RIE2020, NRF is committed to create greater value in Singapore from our investment in research, innovation and enterprise through 1) closer integration of research thrusts, 2) stronger dynamic towards the best teams and ideas, 3) sharper focus on value creation, and 4) better optimised RIE manpower.

For more information, visit www.nrf.gov.sg/RIE2020.