NEWSBYTES

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CORPORATE NEWS

Singapore's quantum ecosystem gets a boost from three national platforms

Singapore's Quantum Engineering Programme (QEP) has launched three national platforms to grow the country's capabilities in quantum computing, quantum-safe communication and the manufacturing of quantum devices. NSCC will be a key partner in Singapore's new National Quantum Computing Hub.

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LET'S BEGIN

The three national quantum platforms, which are hosted across the National University of Singapore (NUS), Nanyang Technological University, Singapore (NTU Singapore), the Agency for Science, Technology and Research, (A*STAR), and the National Supercomputing Centre (NSCC) Singapore, will coordinate activities across research organisations and build public-private collaborations to put Singapore at the cutting edge in quantum technologies. The platforms are:

- **National Quantum Computing Hub (NQCH)** - which will develop quantum computing capabilities and explore applications through industry collaborations;
- **National Quantum Fabless Foundry (NQFF)** - which will support microfabrication techniques for quantum devices and enabling technologies;
- **National Quantum-Safe Network (NQSN)** - which will conduct nationwide trials of quantum-safe communication technologies that aim to enhance network security for critical infrastructure.

The NQCH will pool expertise and resources from the Centre for Quantum Technologies' (CQT) teams at NUS and NTU Singapore, A*STAR's Institute of High Performance Computing (IHPC) and NSCC in building a quantum computing ecosystem in Singapore. Researchers at CQT and IHPC will develop quantum computing hardware and middleware. They will also explore applications with industry collaborators in fields such as finance, supply chain, and chemistry. Meanwhile, NSCC will host a quantum computing facility and provide the supercomputing power needed to develop and train the algorithms that could eventually be used on quantum computers. The hub will also build international collaborations and train new talent to address a skills shortage in this emerging industry.

The NQFF, hosted at A*STAR's Institute of Materials Research and Engineering (IMRE), will support micro and nanofabrication of quantum devices in QEP's three pillars of quantum computation, communication and sensing. It will also develop enabling devices related to Singapore's strategic needs in the quantum technology ecosystem.

The NQSN, which was announced in February 2022, will conduct nationwide trials of quantum-safe communication technologies that promise robust network security for critical infrastructure and companies handling sensitive data. The initiative, led from CQT, as well as NUS and NTU, has over 15 private and government collaborators. The Infocomm Media Development Authority (IMDA) is one of the collaborators. NSCC is a use case partner of the Network.

For more information, please refer to the media release.

Applications open for the EU-ASEAN High-Performance Computing (HPC) School

First held virtually in July 2021, the EU-ASEAN HPC School is now back with intensive courses on HPC technology and applications.

The EU-ASEAN HPC School is the first regional HPC school in ASEAN that cooperates with European and international experts. The school was first announced at the SupercomputingAsia (SCA) 2021 conference during the EU-ASEAN-Japan Symposium and the first instalment was held virtually in July 2021.

60 selected participants from all ASEAN Member States will be able to develop their skills in fundamental HPC technology and programming from 5 to 10 December 2022 at Kasetsart University in Bangkok, Thailand, and

learn how to access local and international HPC platforms with proficiency. The students will also gain exposure to international collaboration opportunities within the EU-ASEAN framework. On the last day of the programme, students will be invited to an industrial event organised by Kasetsart University to meet potential employers from across the region.

The school's curriculum will be taught by international luminaries in HPC technology from Japan, Europe, and ASEAN, including last year's A.M. Turing Laureate, Prof Jack Dongarra, and Prof Satoshi Matsuoka, Director of RIKEN, R-CCS, Japan, which houses Fugaku, one of the world's fastest supercomputers.

Applications are open from now till 31 July, 23:59 (+7 GMT). Head over to www.hpcschool.net for more information about the EU-ASEAN HPC School and apply now!

Monitoring the health of trees with supercomputer-enabled deep learning tools

Researchers from NTU leverage high-performance computing to develop tools to assess tree health in order to prevent tree falls.

For Singapore's thriving, lush greenery, the number of incidents of falling trees or 'tree failure' — the structural deterioration or breakage of any part of a tree — has tumbled by almost nine-fold over the last two decades, from 3,100 in 2000 to 339 in 2020. While it is impossible to completely prevent tree-related incidents, researchers are working on new technologies to minimize the number of incidents.

Radar, ultrasound and electrical resistivity technologies are currently being used for non-destructive tree health assessments to detect structural defects such as cracks, decays and cavities inside tree trunks. However, these technologies are both labour and time-intensive therefore limiting their use for regular health monitoring of trees and may not be optimal for screening tree health on a massive scale.

To overcome the current drawbacks of regular tree health assessments, a team of researchers from Nanyang Technological University (NTU) Singapore's School of Electrical and Electronic Engineering are tapping on NSCC's supercomputing resources to develop a deep learning-augmented microwave radar system for rapid detection of tree defects and imaging of tree interiors.

"Training a convolutional neural network for classifications of tree health conditions on NSCC is accomplished 15 times faster than what we can do on conventional computer systems."

ASST PROF ABDULKADIR C. YUCEL

Unlike the current technologies that leverage circular scans around tree trunks, the developed radar allows scans to be performed in a straight trajectory centimetres away from the tree trunks. This reduces the time and labour costs involved in conventional measurement techniques. The system then processes the measured signal strengths through advanced signal processing and deep learning techniques to assess the health condition of the tree, i.e. whether it is healthy or has a cavity or decay inside. Once trees with defects are spotted, the developed radar would then image the tree interior via image processing and deep learning techniques and provide information on the severity of defects, which helps the arborists determine the next stage of action, i.e. whether to treat it or cut it down.

"NSCC's supercomputing resources have made significant contributions to our research and play an important role in our project's progress. The HPC resources help to speed up the process of both synthetic data generation and neural network training. For example, training a convolutional neural network for classifications of tree health conditions on NSCC is accomplished 15 times faster than what we can do on conventional computer systems. The unprecedented speed for obtaining the results have assisted us in allocating more time to the process of developing and fine-tuning the deep neural networks. NSCC's resources have also helped us generate a large amount of synthetic data, yielding the successful classification of tree health conditions with very high accuracy."

Project Team:

Asst Prof Abdulkadir C. Yucel   **Assoc Prof Yee Hui Lee**   **Dr Shawn Lum**
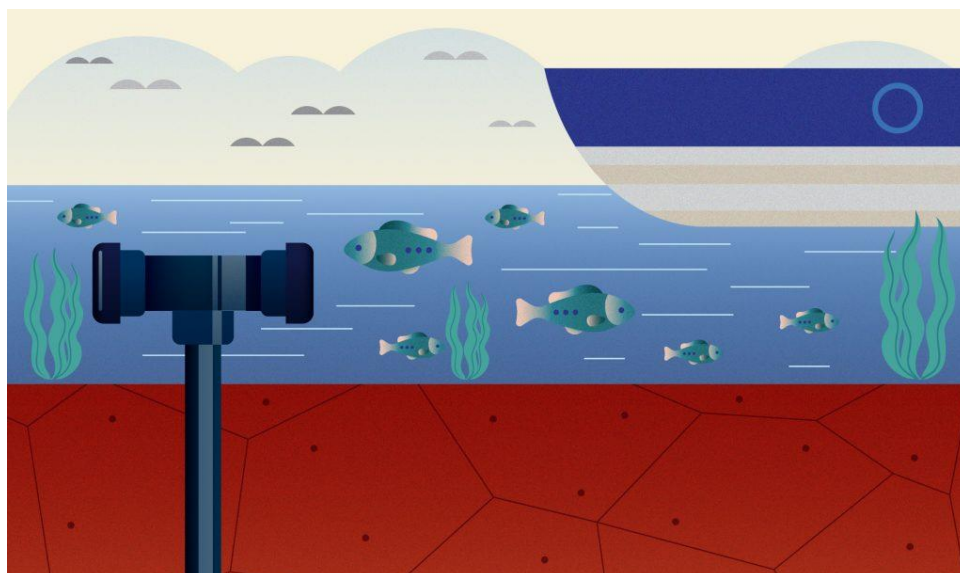
PhD Students: Jiwei Qian, Kaixuan Cheng, Qiqi Dai

To find out more about how NSCC's HPC resources can help you, please contact e-news@nscc.sg.

Averting Asia's Water Crisis

Through high-speed, high-resolution exascale computing, researchers and citizen scientists are tackling water stress across Asia by discovering better ways to treat water and monitor its flow.

For many communities around the world, rivers and seas are their lifelines. To meet nutritional needs, fisherfolk haul in marine catches, while farmers need constantly flowing water to irrigate their agricultural lands. For sanitation, drinking and livelihood security, access to clean water is arguably the most vital resource. Asia, however, is facing a snowballing water crisis.

More than half of the global population resides in Asia, with urban population growth expected to rise by a staggering 60 percent by 2025. Yet the region has less freshwater, just under 4,000 cubic meters allocated to

each person per year, than every other continent on the planet, barring Antarctica. By 2030, the demand for freshwater will far surpass supply by 40 percent if interventions are not put in place.

As climate change and water shortage collide, communities may become increasingly burdened by frequent disasters, worsening health and a planet sinking in untreated waters. Urgently, scientists and innovators are looking towards the pinnacle of high-performance computing (HPC)—exascale computing—to turn the tide in Asia and the globe's water crisis.

Head over to www.nscc.sg/supercomputing-asia-magazine/ to read the full article published in the January 2022 issue of NSCC's Supercomputing Asia Magazine to find out more about how HPC is used as a tool to combat emerging threats such as infectious diseases and climate change.

To find out more about the NSCC's HPC resources and how you can tap on them, please contact e-news@nscc.sg.

Visit www.nscc.sg/case-studies to learn more about how supercomputers are helping Singapore.

This article was first published in the print version of Supercomputing Asia, January 2022.
Credit: Erinne Ong, Writer, Asian Scientist Magazine

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Shared articles and news from the HPC world.

NTU spin-off firm to help transform data centres into energy-efficient set-ups
Scientists in Singapore are using artificial intelligence (AI) to help transform typically energy-sapping data centres into energy-efficient ones.

Following successful trials, the team from Red Dot Analytics, a spin-off company from Nanyang Technological University (NTU), is now looking to commercialise the technology. With data centre operations accounting for 7 per cent of Singapore's total electricity consumption in 2020, and more data centres projected to be located in Singapore, there is greater impetus to reduce energy usage in data centres. Read more at The Straits Times here.

Credit: NTU

Europe's most powerful supercomputer unveiled in Kajaani
LUMI, the Europe's most powerful supercomputer was inaugurated in Kajaani.

LUMI is owned by the EuroHPC Joint Undertaking, and it is run by a consortium of 10 countries with long traditions and knowledge of scientific computing. Researchers all over Europe can apply for access to LUMI's resources, which means that all of Europe can benefit from this new research instrument. LUMI is Europe's most powerful supercomputer. LUMI was ranked third on the latest Top500 list of the world's fastest supercomputers, which was released at the end of May. Read more at Daily Finland here.

Credit: CSC-IT Center for Science

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Why you might have a digital twin within a decade

Imagine if you could create your very own twin, an exact copy of yourself, but one that lived a purely digital life?

We are living in an age where everything that exists in the real world is being replicated digitally - our cities, our cars, our homes, and even ourselves. And just like the hugely-hyped metaverse - plans for a virtual, digital world where an avatar of yourself would walk around - digital twins have become a new, talked-about tech trend. A digital twin is an exact replica of something in the physical world, but with a unique mission - to help improve, or in some other way provide feedback to, the real-life version. Read more at MSN here.

Credit: BBC News

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