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## SCA20 - HPC Powering Intelligent Cities

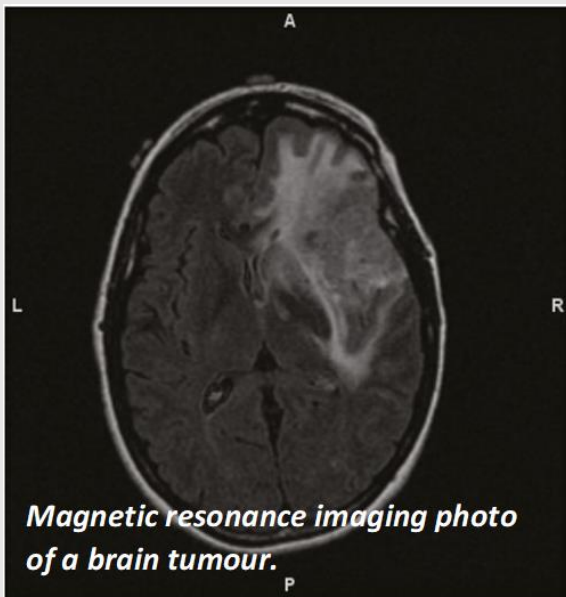
SupercomputingAsia 2020 (SCA20) is at Suntec Singapore Convention & Exhibition Centre from 24-27 February 2020.



Mark your calendars! The annual SupercomputingAsia (SCA) conference that gathers the best of HPC in Asia is back. There is no better place for SCA20 and its theme, “HPC Powering Intelligent Cities”, than in Singapore. Like many other cities around the world, Singapore’s ongoing digital transformation has changed the city state. Through industrial transformation and HPC-enabled research, new integrated information & services platforms and applications provide greater convenience for the population. Find out how HPC can power your intelligent cities at SCA20!

Find out more at [SupercomputingAsia 2020 \(SCA20\)](https://www.supercomputingasia.com/2020)!

SCA is an international conference that encompasses an umbrella of notable supercomputing and allied events relevant to the region, and beyond with the goal to promote a vibrant and shared high performance computing (HPC) ecosystem in Asia.



## Tailoring brain tumour treatments for better patient outcomes

*Doctors and researchers at the [National Neuroscience Institute \(NNI\)](#) are using a supercomputer to analyse the brain tumour genome of individual patients. The data could eventually be used to match these patients to drugs that could be more effective in treating their specific cancers.*

The care treatment regimen for brain tumour patients has been established for more than a decade. However, new discoveries in genomics suggests that different patients respond differently to these standard care treatments. Such differences have been traced to the molecular heterogeneity, or genetic composition of their respective brain tumours. By leveraging the genetic data, individual patients can then be matched to drugs and therapies that are better suited to their profiles.

The neuro-oncology programme at NNI hopes that this will lead to more personalised treatments for their patients. The tumour genomic data was deciphered using the processing power of a petascale supercomputer at the National Supercomputing Centre (NSCC) Singapore and could lead to more targeted and effective treatments for a patients, and produce fewer side effects.

“Not all cancer drugs affect patients in the same way nor do they produce similar outcomes,” said Dr Carol Tang who leads the NNI team that is developing new treatments for glioblastoma, or brain tumours, by studying the tumours at the molecular level. “The potential benefits of this research include higher efficacy of the drugs to particular patients, better outcomes, and reduced side effects.”

Dr Tang added that the programme built automated pipelines to speed up the analysis of the large amounts of next-generation sequencing (NGS) data from brain tumors and patient-derived animal models. To do this, the team relied on NSCC’s ASPIRE1 petascale system to run the parallel processing of the NGS data. “We have also managed to accelerate the translational efforts of our research by deploying machine learning models and leveraging high performance computing resources to stratify patient cohorts,” announced Dr Tang.

“Moving forward, the team is planning to incorporate the findings in an initial precision oncology clinical trial,” said A/Prof Ang Beng Ti, Head & Senior Consultant for the Department of Neurosurgery at NNI, SGH campus. The team will monitor the patient’s tumour and molecular subtype switching during the course of the disease to analyse tumour progression and the patient’s responses to the tailored treatment.

The team had also recently integrated multi-omics data from patient databases, and established connections with the Library of Integrated Network-Based Cellular Signatures (LINCS) programme to better understand the interactions of candidate drugs with the standard of care treatment for glioblastoma patients. The results of this study were recently published in Nature Communications. The neuro-oncology programme at NNI was awarded an NMRC Translational and Clinical Research Flagship Programme grant in 2016 to pursue research in the clinical management of glioblastoma.

Reference publications: <https://www.nature.com/articles/s41467-019-11614-x#Sec29>



Team NTU V were crowned the Overall Champions at the Supercomputing (SC) 2017 student cluster competition edging out sixteen other teams from around the world.

## Holding their own against the best in the supercomputing world

A team of students from Singapore's [Nanyang Technological University \(NTU\)](#) has been quietly making their mark on the supercomputing world's student competition circuit.

Annually, there are three main global supercomputing competitions for students around the world. These are held in conjunction with major supercomputing conferences, namely the Asia Supercomputer Community (ASC), the International Supercomputing Conference (ISC) and the Supercomputing Conference (SC).

The competitions attract university teams from well-established high-performance computing (HPC) schools from across the globe. The challenge? To test their skills in high performance computing, usually by setting up server-grade clusters and execute designated HPC applications without exceeding the prescribed power limits. The winners get to present their ideas on a global stage and bragging rights for being the world's top university supercomputing team.



Enter Singapore's Team NTU. Made up of undergraduate students from the [School of Computer Science and Engineering, Nanyang Technological University \(NTU\)](#), teams of students have been taking part in the competitions over the last five years. On their maiden venture, Team NTU I struck silver, coming in second overall at ASC14. Since their first forays at ASC14 and ASC15, subsequent NTU teams have been a constant feature in the top ten rankings of these student competitions. Successive teams won fifth place at SC16 and fourth placing at ISC17. Their determination culminated in Team NTU V being crowned the Overall Champion at SC17. Keeping their footing at the leading edge, Team NTU came in second overall at both the ISC18 and SC18 conferences. Along the way, Team NTU V & VI captured the Linpack benchmark (one of the competition segments) record for two consecutive years at SC17 (51.77TFlops) and SC18 (56.51 TFlops).

"A lot of planning goes into preparation work as the competition is basically 'live' and we are up against much more established HPC universities," said Mr Liu Siyuan, the former team captain of Team NTU V which took the top prize at SC17. "In the end, even if we did not make it to the top spot, the experience of being able to compete against some of the top teams in the world is something far more valuable."



Mr Liu Siyuan, Team NTU V's team captain and Overall Champion at SC17. Siyuan who graduated with a degree in Computer Science from NTU joined NSCC as a Research Engineer helping to optimise HPC codes and the supercomputer system operations.

The secret behind the various NTU teams' success boils down to the continuity from one generation to the succeeding generation with the support from the school and university. This was augmented by the training and equipment given by public and private partners like the National Supercomputing Centre (NSCC) Singapore, Nvidia, Mellanox, Dell EMC and Jardine OneSolution (JOS).

"Exposing our students to this level of competition helps hone their skills and develops their ability to think on their feet so that they are able to better compete on a global platform now and in any future workforce," said Associate Prof Francis Lee from NTU. A/Prof Lee has been mentoring the NTU teams since 2016. "It is impressive to see how the expertise and confidence of our young HPC teams grow which each competition."

"The demand for high performance computing talent in a digitally-enabled Singapore is extremely crucial if Singapore is to keep its technological edge, especially in sectors like research, analytical science, advanced manufacturing and data centre operations. Hence, it is important to give our young talent the opportunity to achieve and excel with the best in the world," said Mr Jerry Lim, Director (Corporate Services), NSCC. NSCC has been sponsoring the NTU competition teams since its first competition to help develop and support such talent. *Find out more about the team's achievements [here!](#)*



NSCC @ 'Quantum: The Exhibition'.

## Supercomputing and Quantum Computing

NSCC was invited to be a part of the new 'Quantum: The Exhibition' which was recently launched at the Science Centre Singapore.

In quantum computing, supercomputers are helping researchers create and develop new computations and algorithms that will enable real-world quantum computing applications in future. The Centre for Quantum Technologies (CQT) and NSCC share similar goals – to raise the awareness, provide education and pave the way for the fast-developing field of quantum computing. 'Quantum: The Exhibition' introduces quantum computing to a wide audience and helps the public gain a better understanding of what the new technology is capable of. The exhibition was officially launched on 19 August 2019 by the Guest-of-Honour, Mr Ong Ye Kung, Minister for Education.



## Nurturing future HPC and AI talent

The 2019 edition of the annual [APAC HPC-AI Competition](#) saw 26 teams from 22 universities across the Asia-Pacific (APAC) region compete in a showcase of HPC and AI expertise. The competition is designed to build critical skills and nurture next generation talent in these areas. The competition is co-organised by the HPC-AI Advisory Council and NSCC.

The competing teams were judged on their solutions and competencies in both the HPC and the AI categories by an international panel of HPC and AI professionals.

“AI and HPC are very much a part of daily life in Singapore, and globally... we partner industry leaders and ecosystem drivers, like the HPC-AI Advisory Council, to hone the skillsets of our young people and to raise them to a level of expertise that allows them to compete with the best in the region, and the world,” said Prof Tan Tin Wee, Chief Executive, NSCC.



The delegation from the CSC IT Center for Science at NSCC's data centre.

## Visitors from national Finnish HPC centre

The [CSC IT Center for Science](#) is a national centre that helps host and manage Finland's supercomputers.

Dr Kimmo Koski, Managing Director and Mr Pekka Uusitalo, Director, Partnerships from CSC IT Center for Science, Finland paid a visit to NSCC to learn more about the ASPIRE 1 supercomputer, and held discussions with NSCC about potential areas of collaboration.



Prof Tan Tin Wee (left), Chief Executive of NSCC with Ms Julie Faure-Lacroix (right) from Calcul Quebec.

## Bringing Singapore and Canadian HPC closer

NSCC recently hosted Ms Julie Faure-Lacroix, a scientific liaison agent with Canada's [Calcul Québec](#). Julie gave an overview of supercomputing activities in Canada at Computing Canada, Calcul Québec and Canada's newest supercomputer, Beluga.

Beluga's CPU subsection compute power has been measured at about 1.676 PFlops while its GPU clocks in at about 2.278 PFlops, making it one of the fastest supercomputers in Canada. The event was also an opportunity for NSCC to learn about [Compute Canada](#) and explore synergies for cooperation and collaboration between Singapore and Canada.

### Julie 'Batgirl' Faure-Lacroix

With both a bachelors and masters degree in biology from Laval University, Canada, Julie's primary role is to promote high-performance computing and its benefits to academic researchers. Apart from being involved in a variety of projects, from statistical models in R to geospatial analyses in ArcGIS, Julie focuses on optimising the software requirements of researchers and helping guide new and potential users on using the HPC resources at Compute Canada.



Ms Julie Faure-Lacroix.



3D model of a bat femur created using photogrammetry.

When she's not actively helping other research groups, she uses her own research field as a starting point to explore new opportunities. For example, she collaborates with American researchers on a project that uses micro CT-scans to study the hyoid bones in bats which produces echolocation calls. These calls can be recorded and used to identify different bat species in an area. The code and software used in such applications can also be relevant to medical science and music research. She also uses photogrammetry and high performance computing simulation and modelling to reconstruct 3D models of bat femurs from photos, a process that is used in a similar fashion in fields like landscape ecology, architecture, and marine science.



Powering Innovation  
Supercomputing in Asia

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