National Supercomputing Centre (NSCC) Singapore e-newsletter

NEWSBYTES

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CORPORATE NEWS

NSCC's Inaugural HPC Innovation Challenge for the Environment kicks off on a high note

More than 20 teams comprising students, researchers and companies from across Singapore will be presenting high-performance computing (HPC) themed solutions that address today's challenges related to the environment and sustainability.

Representatives from the top 10 teams attending the HPC & SDS Access Workshop on 15 August 2022

Organised by NSCC and supported by GeoWorks, SGTech and SGInnovate, the HPC Innovation Challenge (HPCIC) aims to enable local organisations and students to innovate using HPC and apply HPC to address one or more of the following areas for our environment – 1) Enabling a Data-Centric Approach to Manage Our Environment, 2) Reducing Carbon Footprint, 3) Planning Our Urban Environment Better and 4) Building Greater Resilience for Climate Change. Open to research and development communities from government agencies, local enterprises and students from institutes of higher learning, the challenge provides innovators

an opportunity to access NSCC's HPC resources and build transformational solutions to key environmental challenges.

The challenge was officially launched in April this year and has since garnered submissions from 24 teams across both the open and school category. Of the 24 submissions, the top 5 teams from each category were shortlisted by HPCIC's esteemed panel of judges.

HPC Innovation Challenge Finalists

Category	Company Name	Submission Title
Open Category	Aleph Digital Technologies Pte. Ltd.	Reduce CO2 by lowering energy consumption through AI-powered platform
	Digital Blue Foam Pte. Ltd, Singapore	Synthetic Data Generation to Reduce the Carbon Footprint of New & Existing Buildings in Singapore
	HSC Pipeline Engineering Pte Ltd	Automated Subsurface Utility Mapping
	Newcastle Research & Innovation Institute (NewRIIS)	TriboElectric, NanoGenerator: Optimization of recycled plastics microstructure for high-energy harvesting efficiency using molecular dynamics
	Newcastle Research & Innovation Institute (NewRIIS)	Proposing the Future E-Mobility Charging System to Rejuvenate the Central Area for EV-ready City
School Category	Nanyang Technological University & SMU	Enabling a Greener Singapore
	Nanyang Technological University	End2End ASR model for Sg English under noisy condition for medical transcriptions (Automatic speech recognition in Healthcare)
	National University of Singapore	FarmBox – Automated garden in Household, Community & Carpark
	NUS & Singapore University of Technology & Design	Towards sustainable urban solutions – automated urban scale simulation models from open-source data
	Singapore University of Technology & Design	Computer-aided Molecular Engineering of Fluorophores toward Sustainable Dye Chemistry

The shortlisted teams were given 7 weeks to develop their solutions with a mentor allocated to each team to help the teams refine their ideas. The group of mentors comprise researchers and industry subject matter experts from A*STAR's Institute of High Performance Computing, Urban Redevelopment Authority (URA) of Singapore, SGTech, PTV Group and Nanyang Technological University (NTU). Teams will also have access to NSCC's HPC experts for technical questions.

The HPCIC demo day will take place on 16 Sep 2022 from 2pm-6pm. The six winning teams (three from each category) stand to win:

- Up to SGD5,000 in cash prizes
- A chance to showcase their solution on an international stage
- A chance to be featured in Supercomputing Asia magazine
- Commercialisation and market access opportunity for their solution
- An internship opportunity at NSCC (Student category only)

For more information on the HPCIC and to follow the progress of the teams, please visit the Challenge Site. Stay tuned to our LinkedIn and Facebook for more updates as well as how you can attend the demo day.

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The annual APAC HPC-AI Competition returns to challenge the next generation of HPC experts

22 teams from more than 20 universities and educational institutions from across the Asia Pacific region have registered for the annual student competition.

The 5th annual APAC HPC-AI Competition, co-organised by the HPC-AI Advisory Council (HPCAIAC), NSCC and National Computational Infrastructure (NCI) Australia, was launched at the SupercomputingAsia 2022 (SCA22) conference in March this year. Spanning six intensive months, the annual competition hosts graduate, advanced degree and undergraduate students from across the APAC region to develop their skillsets and challenge their understanding of high-performance computing (HPC) and AI technologies as well as showcase their mastery of the two disciplines in a spirited international competition.

The 2022 APAC HPC-AI Competition will see more than 100 students representing 22 teams from 12 countries and regions in APAC vying for the coveted crown of this year's best team. The competition includes tasks and challenges focusing on three of the hottest research topics and mission critical issues that leverage the power of HPC and AI technologies to further understanding and find solutions for the improvement of human health and sustainability of our planet's resources and environment. These topics include developing future green energy mechanisms using HPC technology; analysing and training satellite data with AI technology for better climate modelling and weather forecasting, and; using deep learning technology to perform DNA Sequence Fast Decoding for enhanced disease prevention and medical care.

The specific tasks of the 2022 competition include:

- **The HPC Task – Quantum ESPRESSO**. Hydrogen (H2) is considered as a promising and sustainable solution for future energy storage and dispatch. Quantum ESPRESSO can be used to simulate hydrogen separation through thermochemical water splitting.
- **The AI Task – Dask**. Data science, such as Extract, Transform, Load (ETL), and Machine Learning and Graph Analytics, leverage high-level programming languages to accelerate Dask performance in distributed CPU and GPU system. Teams will be specialized in OpenUCX-based Dask-CUDA to provide increased performance and scalability in a GPU cluster.
- **The Innovation Task – Deep Learning Based DNA Sequence Fast Decoding**. Transcription factors (TF) play a key role in the gene expression regulation network. Teams will use Deep Learning-based AI models to decode the Transcription factor binding site in high resolution to better understand transcription factors' regulatory mechanisms.

HPC-AI Advisory Council, NSCC Singapore and NCI Australia will provide support in the form of HPC and AI fundamental education and competition task training for all participants. Additionally, NSCC Singapore and NCI Australia will provide the CPU and GPU clusters from their HPC centres to allow the teams to practice their code.

"The human health and environment related tasks of the 2022 competition are especially relevant to the APAC region that hosts some sixty percent of the world's population. The annual HPC-AI Competition is a crucial training ground that nurtures the next generation of HPC and AI professionals, and prepares them to meet such challenges head on," said Associate Professor Tan Tin Wee, Chief Executive of NSCC Singapore. "Our collaboration with the HPC-AI Advisory Council and our close partners from NCI Australia will help accelerate the advancement of HPC and AI skillsets of the region's student communities."

The winning teams will be announced in November 2022 followed by an official award ceremony to be held at the annual SupercomputingAsia 2023 (SCA23) conference in Singapore from the 27 February – 2 March 2023.

For more information on the competition, please visit www.hpcadvisorycouncil.com.

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NSCC-NCI Introduction to MPI Workshop

Registration is open from now till 9 Sep 2022.

The Message Passing Interface (MPI) is arguably the primary programming model used for applications' internode parallelism. Jointly hosted by the National Computational Infrastructure (NCI) Australia and NSCC Singapore, the Introduction to MPI workshop is designed to demonstrate a broad set of fundamental inter-node communication mechanisms based on the latest MPI Standard, 4.0. This workshop provides a gateway for NCI and NSCC users to learn MPI operations in HPC programming. In this workshop, participants will be shown various MPI communication mechanisms to achieve exchanging boundary information of parallel finite difference method. Additionally, MPI-IO and MPI profiling will also be discussed.

Held online via Zoom from 21-22 September 2022, the workshop will consist of lectures on selective MPI standards and hands-on practice running on NCI's supercomputer Gadi. The training is designed to be the first MPI programming course for scientists. As such, it aims to help attendees understand the MPI programming model, familiarise with the semantic terms in MPI Standard and perform various MPI communication operations.

The workshop demonstrates examples in C. Only basic experience with C/C++ is required. Knowledge about C functions, pointers and memory management is sufficient. Serial codes will be provided for the exercises. The training will focus on MPI programming and C programming is secondary. The training session will be driven on the Australian Research Environment (ARE) and Gadi.

Find out more information about the workshop here.

Seats are limited! Register for the workshop here. Registration closes on 9 Sep 2022.

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The women changing the face of HPC

Against all odds, women are taking the world of high performance computing by storm.

Augusta Ada Byron, more commonly known as Ada, Countess of Lovelace, was a mathematician widely lauded as the first computer programmer. Despite naysayers doubting her contribution to Charles Babbage's Analytical Engine machine, today, her name and legacy stand out as a shining celebration of women in science, technology, engineering and mathematics (STEM).

Despite computing being significantly male dominated, women pioneers have made their mark in the history of the field. An all-woman team programmed ENIAC, the first large-scale electronic machine that sparked the computer age, with Admiral Grace Hopper inventing the first high-level computer language.

As recently as 2017, however, women have represented only ten percent of all high performance computing paper authors. While there is not yet an abundance of women in HPC, their contributions have been impactful and far-reaching. Supercomputing Asia spoke to two female researchers, Dr Freda Lim, Deputy Department

Director of the Materials Science & Chemistry Department, A*STAR Institute of High Performance Computing (IHPC), and Dr Christine Ouyang, Distinguished Engineer and Master Inventor, IBM Systems CTO Lead, who have made a name for themselves in the sector, not solely as women in computing, but as distinguished specialists in their fields.

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 how these two stellar researchers are advancing commercial computing and driving collaboration in the region.

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

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THE LAST BYTE...

<SHARED CONTENT>

Shared articles and news from the HPC world.

Singapore looks to drive AI research, capabilities with Google Cloud pact

Touted as the Singapore government's first private-sector partnership in artificial intelligence, the collaboration will see both sides jointly develop and testbed applications as well as work on issues pertaining to AI governance and ethics.

Singapore has announced plans to work with Google Cloud to drive the country's research and competencies in artificial intelligence (AI). Both sides also will work on issues pertaining to AI governance and ethics. The pact between Smart Nation and Digital Government Group's (SNDGG) National AI Office and Google Cloud is pitched as the Singapore government's first private-sector AI partnership with a global technology vendor. Read more at ZD Net here.

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Australia's newest supercomputer details supernova remnant

Australia's newest supercomputer, Setonix, has produced a highly detailed image of a supernova remnant immediately after the computing system's first stage was made available to researchers.

Credit: Pawsey Supercomputing Centre

Data used to create the image was collected with CSIRO's ASKAP radio telescope, which is owned and operated by Australia's national science agency, on Wajarri Yamatji Country in Western Australia. That data was then transferred to the Pawsey Supercomputing Research Centre in Perth via high-speed optical fibre. Read more at Scientific Computing World here.

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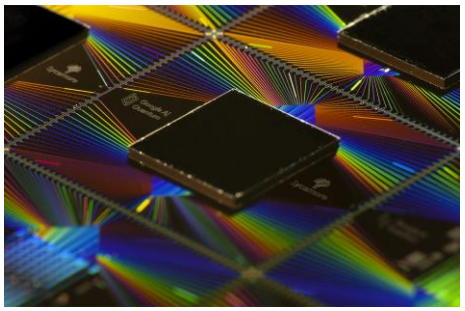
Ordinary computers can beat Google's quantum computer after all

Superfast algorithm put crimp in 2019 claim that Google's machine had achieved "quantum supremacy"

If the quantum computing era dawned 3 years ago, its rising sun may have ducked behind a cloud. In 2019, Google researchers claimed they had passed a milestone known as quantum supremacy when their quantum computer Sycamore performed in 200 seconds an abstruse calculation they said would tie up a supercomputer for 10,000 years. Now, scientists in China have done the computation in a few hours with ordinary processors. A supercomputer, they say, could beat Sycamore outright. Read more at Science here.



Credit: Google

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