NEWSBYTES

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In this issue

CORPORATE NEWS

Powering AI activities in collaboration with healthcare partners

*The AI Health Summit, jointly organized by SingHealth, Ministry of Health (MOH), Agency of Science, Technology and Research (A*STAR), and the National Supercomputing Centre (NSCC) Singapore, was held at W Singapore - Sentosa Cove on 23 and 24 November 2023.*

Dr Janil Puthucheary (centre) and co-organiser representatives launching the AI Health Summit 2023.

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Themed "AI Race in Health – Deep Learning and Large Language Models", the AI Health Summit 2023 brought together over 60 local and international experts from healthcare institutions, academia, government, industry, and journal publications to delve deep into the opportunities and challenges of applying Deep Learning and Large Language Models in healthcare.

The event was launched by the Guest-of-Honour, Dr Janil Puthucheary, the Senior Minister of State for the Ministry of Communications and Information, and Ministry of Health, together with stakeholders from SingHealth, A*STAR and NSCC.

Conference attendees finding out more about Singapore's HPC resources at the NSCC booth.

The 2-day summit covered 4 engaging symposiums and 8 thought-provoking discussion panels, including topics on the advancements in AI and Deep Learning healthcare technologies, harnessing data-driven insights for population health management and regulatory roadmap for AI in healthcare. It also featured a scientific poster exhibition with over 70 presentations spanning various scientific disciplines, allowing attendees to gain deep insights into cutting-edge research, discoveries, and innovations from established and emerging researchers.

The summit aimed to position Singapore amongst the global frontrunners in advancing AI in healthcare, aligning with the nation's goals of becoming a smart nation.

For more information, visit: https://healthsummit.ai/.

Promoting computational bioinformatics and biomedical data science in Singapore

NSCC was a key supporter of the international GIW ISCB Asia 2023, which was held at the Lee Kong Chian School of Medicine in Singapore from 18 to 21 November.

Professor Bertil Schmidt teaching a workshop on GPU Programming with CUDA for beginners.

This year, the Lee Kong Chian School of Medicine, International Society for Computational Biology (ISCB) hosted the joint conference of Genome Informatics Workshop (GIW) 2023 and ISCB-Asia VI, which brought together leading experts in the fields of bioinformatics computational biology, health informatics and biomedical data science to discuss and present the latest research in these areas.

Together with the key organisers, the Association of Asian Societies for Bioinformatics (AASBi) and ISCB, NSCC co-organised a keynote by Professor Bertil Schmidt from the Institute of Computer Science, JGU Mainz in Germany, titled "Bioinformatics: Big Data and AI meets HPC". Professor Schmidt's keynote covered the design of scalable AI-enabled algorithms for metagenomics and sequence reading error correction together with enabling technologies for GPU systems.

NSCC also hosted a workshop on GPU Programming with CUDA for beginners where the hands-on session offered the participants a chance to work on some programming exercises using HPC and Google Collab.

For more information about the conference, please visit: https://www.giw-sg.com/.

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NTU Student Team holds their own at the annual international HPC Cluster Competition

The new NTU student team gained valuable experience from their foray against other teams on an international stage.
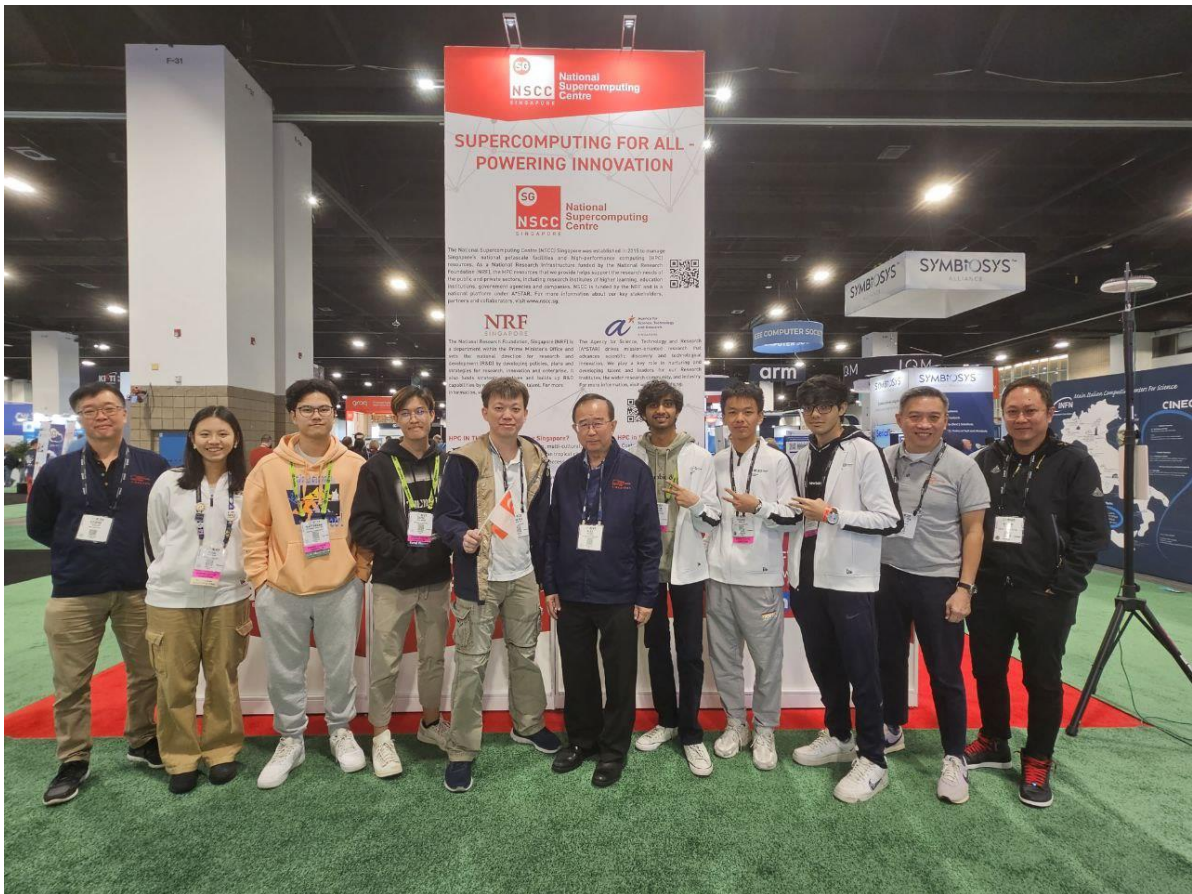
The NSCC team and the NTU Team Supernova at the SC23 Student Cluster Competition.

Inaugurated in 2007, the Student Cluster Competition (SCC) aims to empower undergraduates with hands-on experience in high-performance computing (HPC). This year, 11 teams from top-tier universities, including Nanyang Technological University (NTU), participated in the competition. This year's crop of SCC contesting teams featured fierce competition between new and veteran teams. Each team worked towards the goal of proving their skills by building and operating a modern, functional HPC cluster using specific hardware, all within a fixed power limit, all within 48 hours.

Participants competed with three primary benchmarks: High-Performance Linpack (HPL), HPC Conjugate Gradient (HPCG), and MLPerf Inference. Among the tasks was a reproducibility challenge derived from the SC22 paper on "Symmetric Block-Cyclic Distribution: Fewer Communications Leads to Faster Dense Cholesky Factorization", demanding meticulous attention to detail and research depth. The pressure of the competition was raised even higher with a mystery cybersecurity application unveiled on the competition day, challenging the students' adaptability and problem-solving skills.

This year, NTU's Team Supernova came in fifth at SC23 Denver after an intense competition with top competitors from Peking University, ETH Zürich, Tsinghua University, Brown University and many more. The team comprises 6 students doing an undergraduate degree in Computer Science (CS) as well as Business and Computer Engineering (BCE), guided by Dr Loke Yuan Ren. The NTU students team comprised Wang Ruisi (CS, Year 4), Saeng-nil Natthakan (BCE, Year 2), Maison Sapol (CS, Year 2), Lakshya Agarwal (CS, Year 3) Luo Yihang (CS, Year 4) and Aryan Sharma (CS, Year 3).

"Participating in the SC23 Student Cluster Competition has been an incredibly enriching experience. With limited time and resources, I gained hands-on experience with our cluster and forged lifelong friendships with

fellow participants. I got the opportunity to link up with domain experts and vendors during the conference and attend tutorials and workshops on cutting-edge technologies." said Supernova's team leader, Wang Ruisi. "It was challenging at times to figure out hardware and network issues onsite, and coordinate overnight shifts with our team members, but nonetheless we managed to get it done! The kind of exposure we got at the conference, with different companies like Microsoft, Google Cloud, and NVIDIA displaying the latest trends in HPC on their booths, this was a great learning experience for me" added Aryan Sharma, a team member of Supernova.

Enhancing Weather Prediction in Singapore: Leveraging Climate Model Simulations for Precision

Researchers from NUS Tropical Marine Science Institute are leveraging supercomputing to fine-tune Weather Research and Forecasting (WRF) Model and downscale hundreds of years of global climate projections for a national project with National Environmental Agency (NEA).

Over the years, researchers from the Climate and Weather cluster at the Tropical Marine Science Institute (TMSI) of National University of Singapore have revolutionized research in weather climate science. Leveraging high-performance computing resources (HPC) from NSCC Singapore, the research team has undertaken several research projects utilizing high-resolution numerical modelling methods to capture the characteristics of the tropical convective system.
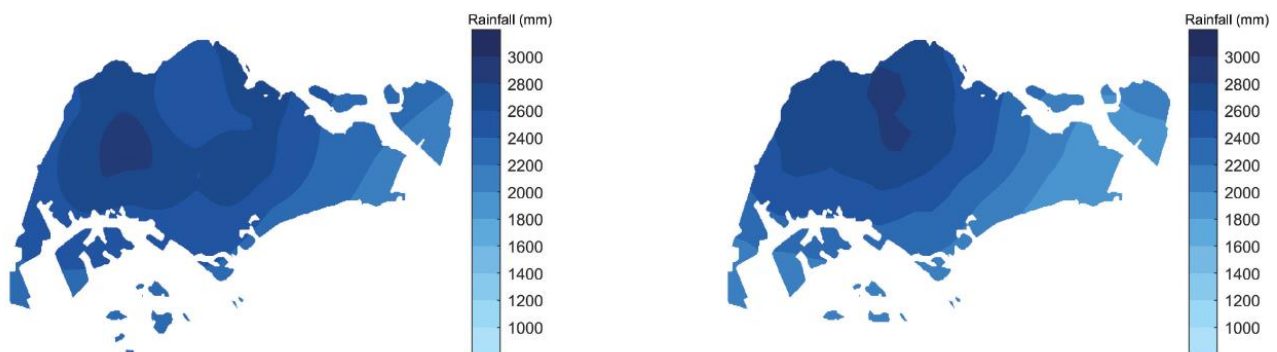
Observations   WRF model @ 2 km resolution

Annual Mean Rainfall

By harnessing the capabilities of cutting-edge climate model simulations, Singapore is poised to transform weather predictions with reliable forecasting methodologies.

The Research

The geographical location of Singapore exposes the island to diverse large-scale atmospheric, oceanic, and coupled climate systems. Even with the state-of-the-art climate models, predicting the climate variability of Singapore Maritime Continent and its relation to large-scale atmospheric circulation patterns has proven challenging. However, through high-resolution numerical simulations, TMSI researchers have successfully forecasted daily weather at very high spatial resolution of 400 metres.

NSCC was instrumental in supporting these significant research endeavours. Weather and climate research demands extensive data storage and CPU core-hours for analysis and for delivering vast amounts of model simulations necessary for real-time weather predictions, model fine-tuning and dynamic downscaling purposes.

Notably, the research team dynamically downscaled hundreds of years of global climate projections for a national project that was done in collaboration with National Environmental Agency.

The Technology

WRF model: Physical principles are represented as equations, with the current weather setting the initial and boundary conditions. These are used to solve the atmospheric variables such as wind, temperature, humidity, and precipitation.

Faster computing speed: This enables the WRF model to be simulated at extra fine temporal-spatial resolution to enhance forecast accuracy.

Multiple parallel computing jobs: This allows for decadal or century scale complex simulations.

Large storage space: More data can then be used and assimilated into the real-time weather system and for long term climate simulations.

The Impact

Numerous milestones have been accomplished over the years. Daily high-resolution weather forecasts are shared with national agencies, ensuring timely updates for the public. Furthermore, the team has is planning to roll out AI applications for weather and climate. The model outputs derived from the research have benefited scientific understanding, downstream impact assessments, and even brought about practical applications. Moving forward, the next phase involves broadening the scope of numerical modelling studies through projects commissioned by various government agencies and industries.

> "The ability to perform billions of calculations per second from the HPC resources from NSCC Singapore allows us to simulate climate processes at high level of details (spatial-temporal resolution) in relatively shorter time. Millions of CPU core-hours and several terabytes of storage have been a boon for TMSI's suite of projects."
>
> *Dr Srivatsan V Raghavan*
> *Principal Research Fellow and Deputy Director*
> *Head, Climate and Water Research Cluster*
> *Tropical Marine Science Institute*
> *National University of Singapore*

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

Building Cities in the Clouds

What does it take to build smart cities on a cloud? High-performance computing promises to grant the massive computational power needed to support the cloud and edge infrastructures revolutionizing daily life in Asia.

USB flash drives are quickly becoming relics of the past despite only being on the market for about two decades. Those who use USB flash drives as data storage devices likely have more than one, as their memory capacity quickly becomes obsolete compared to newer models, and they are easily misplaced or forgotten.

Platforms like Dropbox and Google Drive have offered a novel solution to these struggles: store files on a massive supercomputer through a remote server—known as the cloud—and access them anytime, from anywhere. The cloud also grants users the ability to run computationally demanding applications, such as artificial intelligence (AI)-based programs, on their own devices via the internet. This on-demand access to high-performance computing (HPC) has far-reaching implications beyond data storage.

Despite its utility, however, cloud computing has several limitations, such as slow response time over long distances and bandwidth constraints, particularly in areas with limited connectivity. To help overcome some of these limitations, edge computing is being employed to expand and enhance cloud computing capabilities. Edge devices—ranging from smartphones to firewall systems—serve as contact points or connection nodes to transmit data from the ground locally to a central cloud network. This method has many advantages, including reducing costs that would have otherwise been used to maintain expensive servers, preserving data privacy, and allowing scalability with increasing demand.

In Asia, these developments in HPC-backed cloud and edge services are starting to take effect on people's daily lives—from faster download speeds to advanced healthcare services. To be at the forefront of the digital revolution, industry leaders are seeking a foothold in Asia's burgeoning markets.

Head over to the July 2023 issue of NSCC's Supercomputing Asia Magazine to read the full article.

This article was first published in the print version of Supercomputing Asia, July 2023.
Credit: Chen Li Ting, Writer, Asian Scientist Magazine

Shared articles and news from the HPC world.

Intel unveils new AI chip to compete with Nvidia and AMD

Intel unveiled Gaudi3, an artificial intelligence chip for generative AI software, which will launch next year and will compete with rival chips from Nvidia and AMD that power big and power-hungry AI models.

While the company was light on details, Gaudi3 will compete with Nvidia's H100, the main choice among companies that build huge farms of the chips to power AI applications, and AMD's forthcoming MI300X, when it starts shipping to customers in 2024. Intel has been building Gaudi chips since 2019, when it bought a chip developer called Habana Labs. Read more here.

Credit: Bloomberg via Getty Images

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ASEAN continues High-Performance Computing (HPC) School programme after successful partnership with EU and Japan

For the third year in a row, the week-long High-Performance Computing (HPC) School for South-East Asian researchers kicked-off in Bogor, Indonesia.

The Indonesian National Research and Innovation Agency (BRIN) led the organisation of the ASEAN HPC School 2023. More than 80 carefully selected participants addressed HPC applications in Life Sciences, Urgent Computing, Climate Science, and Computer Science in Bogor, Indonesia, from 11 to 16 December 2023. The growing dependence on technology for addressing global challenges emphasises the significance of enhancing HPC skills and knowledge within the ASEAN region. Read more here.

Credit: EEAS Europa

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Singapore pioneers S$70m flagship AI initiative to develop Southeast Asia's first large language model ecosystem catering to the region's diverse culture and languages

*Singapore's Infocomm Media Development Authority (IMDA) is partnering with AI Singapore (AISG) and the Agency for Science, Technology and Research (A*STAR) to launch the National Multimodal LLM Programme (NMLP).*

This effort will enhance the nation's capabilities in Artificial Intelligence (AI) research and innovation, leveraging high-performance computing (HPC) resources by the National Supercomputing Centre (NSCC). This programme marks a significant leap forward in building the next bounds of AI capabilities for Singapore and the region. Read more here.

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Credit: Image by iuriimotov on Freepik

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