

NEWSBYTES

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CORPORATE NEWS

A Message from NSCC Singapore's Chief Executive

Dear Readers,

Since its establishment in 2015, NSCC Singapore has been at the forefront of providing supercomputing resources to support Singapore's research ecosystem. Our nation's continued investment in high performance computing (HPC) has positioned NSCC Singapore to play a crucial role in powering Singapore's R&D needs and driving our Research, Innovation, and Enterprise (RIE) efforts.

We are proud to have supported research in critical areas such as genetics, advanced simulations, digital twins, and climate change. A prime example of the importance of sovereign supercomputing resources is the Third National Climate Change Study (V3) report.

Leveraging the computational power secured by NSCC Singapore, the V3 report provides critical insights into the implications and potential mitigations of climate change topics, including future sea level rise, water resource dynamics, and global warming.



As technology continues to advance, especially in the field of AI science, more compute power will be needed to keep Singapore competitive on the global stage. NSCC Singapore is already deploying some of the latest computational resources and chips to support significant efforts in Large Language Models (LLMs) and other AI research areas.

Over the next few years, we will continue to expand our HPC capacity while optimizing and prioritizing national HPC resources to support impactful and nationally significant research. NSCC Singapore will expand its capabilities beyond supercomputing infrastructure to advancing HPC research and operations, accelerating research innovation and exploring cost-effective and eco-friendly use of HPC resources. We will also explore, develop and offer emerging technologies such as quantum and hybrid computing.

I would like to express my gratitude to our academic and industry partners for their invaluable contributions to the development of the HPC ecosystem. As we embark on the exciting journey ahead, we anticipate a HPC-driven transformation in the way we do research and innovation that will deliver exceptional economic impact and social good. We are committed to this vision and look forward to your continued support in this endeavour.

Dr Terence Hung

Chief Executive, NSCC Singapore

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Singapore Inks Memorandum of Understanding (MoU) with Quantinuum, Enabling Access to their Advanced Quantum Computer

*Singapore's National Quantum Office (NQO), Agency for Science, Technology and Research (A*STAR), National University of Singapore (NUS), NSCC Singapore and Quantinuum signed a MoU on 24 July 2024, which enables access to Quantinuum's advanced quantum computer and fosters collaboration on quantum computing use cases.*

The Singapore quantum ecosystem will leverage Quantinuum's H-Series and Helios quantum computers, to promote joint research and development (R&D) activities in various quantum computing applications. Helios is Quantinuum's next generation quantum processor that could exponentially increase the computing power of quantum computers.



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LET'S BEGIN



Dr Terence Hung, Chief Executive of NSCC Singapore was one of the signatories of the MoU, together with representatives from A*STAR, Centre for Quantum Technologies, NQO and Duke-NUS Medical School. The MoU signing was witnessed by NSCC Singapore's Steering Committee Chairman, Mr Quek Gim Pew.

The MoU enables collaborations on the development of hybrid computing solutions that include both classical and quantum computing infrastructures as well as training and outreach activities through seminars, workshops and bespoke programmes to nurture quantum talent. Quantinuum also plans to establish a dedicated R&D presence in Singapore, where researchers from both Quantinuum and Singapore could better exchange knowledge and expertise for further developments in quantum applications and algorithms.

The collaboration is part of Singapore's National Quantum Strategy, which aims to strengthen Singapore's position as a leading hub in the development and deployment of quantum technologies by bolstering scientific excellence in high impact areas of quantum research; strengthening Singapore's engineering capabilities in quantum technologies to accelerate translation into real world solutions; attracting, developing and retaining quantum talent; and anchoring company partnerships to build a vibrant and resilient quantum industry.

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Top Innovators Recognised at the High Performance Computing Artificial Intelligence Innovation Challenge 2023 (HPCIC23)

Students and startups put their best foot forward and showcased their innovative HPC-AI solutions at HPCIC23's solution day.



HPCIC23 concluded with an exciting Solution Day, where finalists presented their HPC-AI innovations to a panel of distinguished judges.

Co-organised by NSCC Singapore, the Infocomm Media Development Authority (IMDA) and AI Singapore (AISG), the annual HPCIC23 was held to provide top innovators access to exclusive high performance computing power to bring their vision to life and accelerate solutions. The challenge concluded on 5 July 2024 after an exhilarating 5-month journey.

From a pool of 110 applications, 16 outstanding finalist teams were selected and participated in a series of workshops. These sessions focused on effectively leveraging HPC to scale AI solutions, balancing AI with business ethics and integrity, and enhancing their pitching skills.

Congratulations to the HPCIC winners:

- **Student (Junior) Category:**
Team Water from Singapore Polytechnic, for their innovative solution on a Natural Language Processing platform to simplify healthcare operations.
- **Student (Senior) Category:**
Team OwlShield from NUS and Singapore Management University, for their outstanding solution in AI Safety firewall for Large Language Models providing heuristic checks.
- **Open Category:**
Team WeavInsight, for their exceptional solution in AI business intelligence and remote audit solution to track and measure energy efficient operations.

The achievements of all finalists highlight the transformative impact of collaboration and ingenuity in today's technological landscape. Participating teams were matched with industry partners to deepen industry understanding and improve their solutions.

NSCC Singapore would like to thank all judges, organising committee members, mentors and participants for the successful run of HPCIC23!

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NSCC Singapore, AMD and Xanadu organised workshops for AMD GPUs in AI/LLM and Quantum workloads

Aligning with the latest HPC technology trends and users' interests, NSCC Singapore curated this workshop to focus on the use of AMD ROCm for AI/LLM programming and Xanadu's PennyLane for quantum simulation.

NSCC Singapore hosted an engaging three-day workshop from 22 to 24 June 2024 in collaboration with AMD and Xanadu.



Attendees working on a ROCm application task using the remote compute environment provided by AMD.

The AMD AI-LLM ROCm Workshop featured Greg Oakes, Senior HPC and Artificial Intelligence Specialist at AMD as a trainer for the 28 attendees from A*STAR, AI Singapore, Singapore-ETH Centre and various institutes of higher learning such as the NUS, Nanyang Technological University (NTU), Singapore University of Technology and Design (SUTD) and Temasek Polytechnic. Participants were provided with an opportunity to access remote clusters equipped with AMD GPUs. The participants used virtual environments and container technologies to familiarize themselves with ROCm and deployed machine learning and large language models on AMD GPUs.



Attendees of the AMD PennyLane/Quantum Simulator Workshop

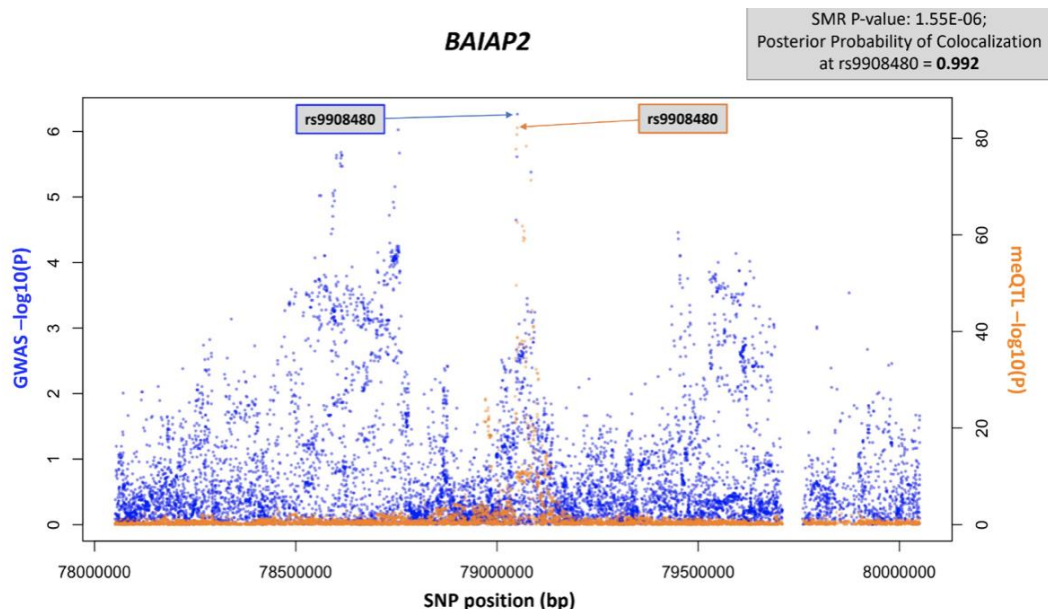
The AMD PennyLane/Quantum Simulator Workshop was scheduled for the third day, with Catalina Albornoz, the Quantum Community Manager from Xanadu, joining as an instructor. The instructors guided the 27 participants from NUS, NTU, SUTD, A*STAR, CQT and National Quantum Computing Hub (NQCH) through running PennyLane and Qulacs on AMD GPUs.

For more information about NSCC Singapore and how our HPC resources and training workshops can support and add value to your research endeavours in AI and Quantum, please contact us at contact@nscc.sg.

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Taking a stratified approach to the prevention of Type 2 diabetes in the Asian population

Researchers from the NTU and their collaborators are investigating the molecular regulatory disturbances underlying development of Type 2 diabetes amongst Asian populations.



Type 2 diabetes (T2D) is a chronic disease typically characterised by the presence of adiposity, insulin resistance and impaired glucose metabolism, with the burden of diabetes especially high in Asia. This increased risk for T2D is not fully accounted for by traditional risk factors or by genetics. Recent studies have highlighted the presence of disturbances in genome regulatory mechanisms as early manifestations of T2D risk.

To address this issue, through investigation of the prospective relationships between DNA methylation and future diabetes amongst Asian populations, researchers at NTU and their collaborators aim to advance the understanding of molecular regulatory disturbances underlying the development of diabetes amongst high-risk Asian populations. They also aim to investigate the development of novel predictive molecular markers based on genomic regulatory features to identify high-risk individuals who may benefit from early intervention for diabetes prevention.

The Research

The researchers first carried out epigenome-wide association for incident T2D using baseline samples collected at enrolment for 5,709 Asian individuals, from three prospective population-based cohorts. To further explore potential genetic and environmental factors influencing methylation, the researchers used data from an independent multi-ethnic Asian population cohort with deep clinical and molecular phenotyping. This was supplemented by functional genomic analyses and fine-mapping via targeted sequencing of selected top loci. The researchers then tested the potential utility of DNA methylation for prediction of T2D via a Methylation Risk Score (MRS) approach

The Technology

DNA methylation array: DNA methylation was quantified in genomic DNA from whole blood, using the Illumina® EPIC or 450K array which covered 2-3% of the epigenome. This allowed the scientists to identify genomic loci that were associated with incident T2D.

Whole genome bisulfite sequencing (WGBS): DNA methylation across the entire epigenome was analyzed using libraries construction with the Accel-NGS® Methyl-Seq DNA Library Kit (Swift Biosciences), and sequenced on the Illumina® NovaSeq platform. WGBS made possible the identification of correlated regions in the epigenome, which further informs the design of the targeted methylation sequencing.

Targeted methylation sequencing: Fine-mapping of regions of interest were interrogated by using a custom array (TWIST Biosciences). The targeted methylation sequencing allowed the researchers to investigate these regions of interest in a high resolution fashion.

HPC resources used: This project was allocated 1,320,959 CPU hours on NSCC Singapore's supercomputing resources

The Results

The researchers identified 420 CpG sites across 314 independent loci to be significantly associated with incident T2D. Fine-mapping also identified multiple additional CpG sites that were more strongly predictive of T2D than evaluation based on low-coverage microarray alone.

“Type 2 Diabetes (T2D) poses a heavy burden not only globally, but especially amongst people from Asia and the Pacific countries. The increased risk for T2D is not fully accounted for by traditional risk factors or by genetics. We embarked on this work to advance understanding of the molecular regulatory disturbances underlying development of diabetes, and to develop predictive molecular markers that could work better in Asians. NSCC Singapore's HPC resources has empowered us to perform the computationally intensive data analyses in a timely and efficient fashion.”

Marie Loh Chiew Shia
*Assistant Professor, Lee Kong Chian School of Medicine
Senior Research Scientist, Laboratory of DNA methylation
and Population Epigenetics*



Shared articles and news from the HPC world.

New research programme to strengthen cybersecurity in a post-quantum world

NTU is setting up a new research programme to strengthen cybersecurity in a post-quantum world, where advancements in quantum computing pose a looming threat to conventional encryption algorithms.

The Quantum Sovereignty and Resilience (QUASAR) programme is enabled by a gift from the Dieter Schwarz Foundation, a German non-profit charitable foundation. NTU will collaborate with the Technical University of Munich (TUM) on this programme and is also strengthening its existing collaboration with TUM with the signing of a Flagship Partnership.

[Read more](#)



Credit: NTU Singapore

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MAS Commits up to S\$100 Million to Support Quantum and Artificial Intelligence Capabilities in the Financial Sector

The Monetary Authority of Singapore (MAS) today announced that it will commit an additional S\$100 million under the Financial Sector Technology and Innovation Grant Scheme

Quantum technology is a rapidly advancing field that holds significant potential to transform the financial industry and broader economy. MAS has been collaborating with the National Quantum Office following the announcement of the National Quantum Strategy by Deputy Prime Minister Heng Swee Keat in May 2024. MAS will establish a Quantum track under FSTI 3.0 to support financial institutions' interests to build quantum capabilities in Singapore.

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EuroHPC and AQT Sign Procurement Contract for EuroQCS-Poland Quantum Computer

The procurement contract of EuroQCS-Poland, the EuroHPC quantum computer to be located in Poland, has been signed by the European High Performance Computing Joint Undertaking (EuroHPC JU) and AQT, the selected vendor.

EuroQCS-Poland will be a digital, gate-based quantum computer, based on trapped-ions offering 20-plus physical qubits. This quantum computer will primarily target research and innovation and will be available to a wide range of European end-users, spanning from the scientific community to industry and the public sector.

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Credit: HPC Wire

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