NEWSBYTES

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ASPIRE2A

In this issue…

CORPORATE NEWS

Cooling Singapore 2.0: NSCC Singapore's Resources Key in Building a Digital Twin of Singapore for Climate Resilience

The development of the Digital Urban Climate Twin (DUCT) to evaluate urban heat and devise cooling strategies was made possible with NSCC Singapore's high-performance computing (HPC) resources.
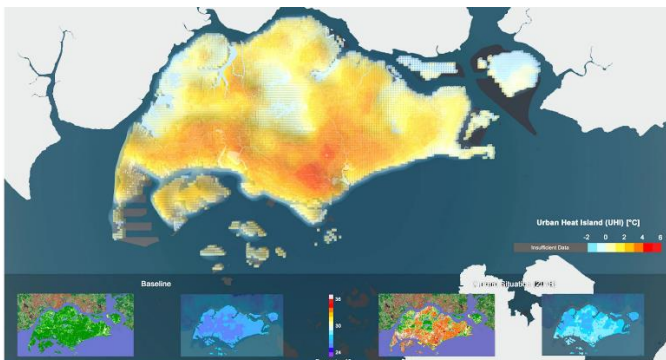
An urban heat island representation of Singapore shown on the Digital Urban Climate Twin. Photo: Cooling Singapore 2.0

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Like many other cities worldwide, Singapore faces a problem of high temperatures arising from a combination of the urban heat island effect and greenhouse gas emissions driving global climate change.

Over the last four years, more than 20 researchers have worked to develop a "digital twin" of Singapore. This digital twin allows users to simulate scenarios for research to make living spaces cooler in tropical climates like Singapore. The digital twin can conduct what-if analyses and perform in silico experiments with a city that would otherwise not be possible in the real world.

This virtual system - DUCT, is one of the flagship projects under the multi-institute Cooling Singapore 2.0 research initiative. The project aims to observe and assess microclimatic variations occurring within Singapore's complex urban landscape and uncover the types of land cover features that contribute to reducing urban heat in the built environment and urban greenspaces.

The project is led by the Singapore-ETH Centre, in partnership with other institutions including the Singapore Management University, the National University of Singapore and the Singapore-MIT Alliance for Research and Technology.
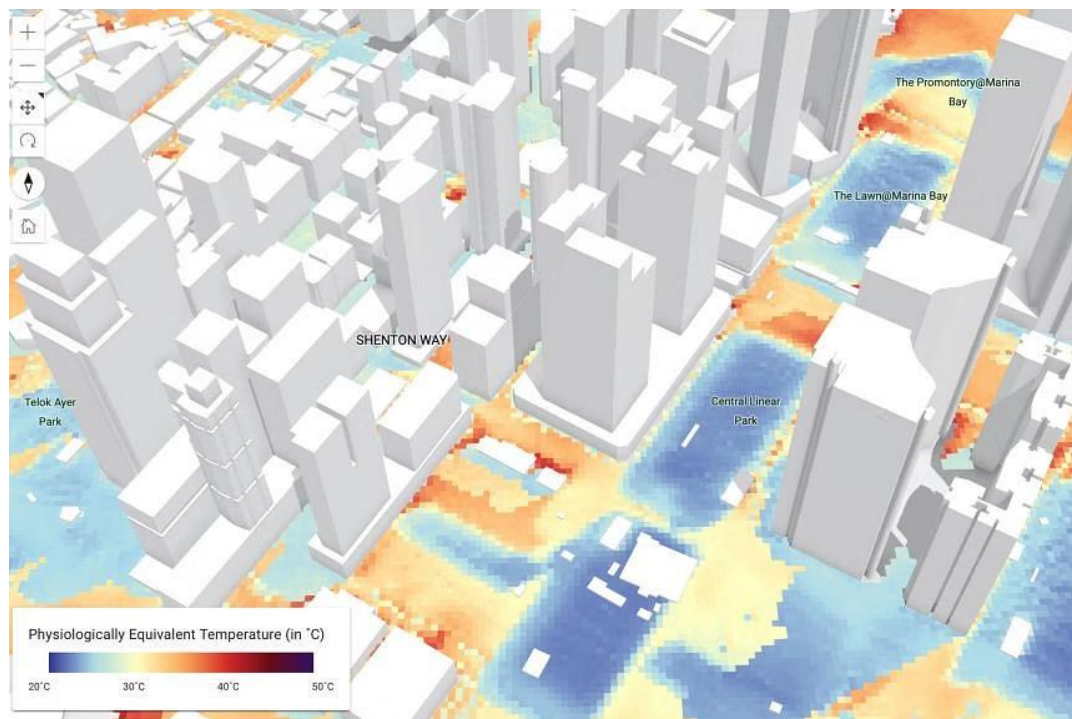
Temperature-related data at a section of the Central Business District, as displayed by the digital twin. Photo: Cooling Singapore 2.0

At the core of the virtual system are a paramount set of computational models and data sets, some of which the researchers had to build from scratch. These data sets include islandwide vegetation cover, traffic patterns, heat emitted from industries, and weather-related data such as wind flow.

Cooling Singapore 2.0 leveraged NSCC Singapore's ASPIRE 2A supercomputing capabilities, allowing the DUCT to complete up to 80 hours of climate model simulations within 24 hours, making 3.3 times faster than before. The digital twin was also able to run several climate models using NSCC Singapore's parallel computing, effectively increasing the research project's scalability.

The development of DUCT will aid built environment stakeholders and policymakers in Singapore in assessing effective adaptation solutions to enhance the city's climate resilience to urban overheating.

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Convergence of AI and HPC at the IEEE Conference of Artificial Intelligence 2024

To advance Large Language Models capabilities in the AI-HPC community, NSCC Singapore supported the conference as a technology partner and brought in topic experts to conduct workshops.

NSCC Singapore's workshop at IEEE Conference on Artificial Intelligence

Held at the Marina Bay Sands from 25 to 27 June 2024, the IEEE Conference on Artificial Intelligence (AI) 2024 gathered the AI-HPC user community to facilitate insightful discussions on AI-related topics with specific industry applications. In line with our mission to facilitate knowledge sharing on optimising the use of HPC resources, NSCC Singapore organised three informative workshops on large language models (LLM) optimisation during the conference.

The workshops on "How to Train Foundation Language Models (LLM)", and "Navigating AI's Frontiers: Overcoming Challenges in LLM Data Engineering, Foundational Models Application and Acceleration Strategies", covered topics such as identifying data sources, constructing pre-training datasets, selecting a model architecture for developing foundation models, exploring the challenges of LLM data engineering and its potential impact on industries, and optimising strategies for LLMs using high performance computing. Industry and academic speakers included Mr Jupinder P., Senior Research Scientist at FM Model Training, Enterprise Group; Mr Walter Teng, AI Engineer at AI Singapore; Assistant Prof Shou Zheng Mike, NRF Fellow Electrical and Computer Engineering at the National University of Singapore (NUS); and Associate Prof Lu Wei, Associate Head of Pillar (Research) Information Systems and Technology Design at Singapore University of Technology and Design (SUTD).

A separate workshop by NSCC Singapore gave attendees a preview of the upcoming national supercomputing resources - ASPIRE 2A+ - which can support AI, Machine Learning, and Large Language Model workloads. Led by an industry expert trainer, the session showcased some of ASPIRE 2A+ capabilities and its ready-to-use, fully supported Nvidia base command software stack, which will accelerate developer success.

To find out more about NSCC and how our HPC resources can support your national AI-relevant programmes, please contact us at contact@nscc.sg.

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NSCC Singapore renews BCA Platinum Green Mark Award

NSCC Singapore's i4.0 Data Centre @ NUS continues to be recognised for its sustainability efforts.

NSCC Singapore has once again been conferred the BCA Platinum Green Mark Award this year. The BCA Green Mark certification is a green building rating system designed to evaluate a building's environmental impact and performance based on key criteria such as climatic-responsive design, building energy performance, resources stewardship, smart building, and advanced green efforts.

The BCA Platinum Green Mark was awarded to NSCC Singapore's purpose-built data centre, located at the National University of Singapore (NUS) Innovation 4.0 (i4.0). The data centre features an aircon-less computer area with locally designed cooling racks and is warm water-cooled. It also boasts an estimated power usage effectiveness (PUE) of less than 1.18, which is the standard efficiency metric for power consumption in data centres. The lower the PUE, the more energy-efficient the data centre.

Congratulations to NSCC Singapore and our close partners from NUS for this achievement.

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Nurturing HPC-AI Talents in Asia Pacific (APAC)

The 7th APAC HPC-AI Competition saw representation from 39 teams across 9 countries and regions.

High performance computing (HPC) and artificial intelligence (AI) are essential tools fueling the scientific advancements. To handle the ever-growing demands for higher computational performance and the increase in the complexity of research problems, the world of scientific computing continuously re-innovate itself at a rapid pace.

Jointly organised by the HPC Advisory Council, NSCC Singapore, and the National Computational Infrastructure (NCI) Australia, the 7th HPC-AI competition saw applications from 39 teams representing 22 schools across 9 countries and regions in the APAC.

Two Singaporean teams from the Agency for Science, Technology and Research (A*STAR) and Nanyang Technological University (NTU) respectively, will be participating in the competition.

This year's competition includes the following HPC and AI tasks, which will be run on the supercomputers from NSCC Singapore and NCI Australia:

1. HOOMD-blue: A general-purpose particle simulation toolkit that performs Molecular Dynamics and hard particle Monte Carlo simulations. It can model nanoparticles, bead-spring polymers, active matter, and many other types of systems.
2. Llama 2: A family of pre-trained and fine-tuned large language models (LLMs) from Meta AI. Llama 2 is an open source, free-of-charge resource for research and commercial use, including both base foundation models and fine-tuned "chat" models. The options include seven billion (7B), 13 billion (13B), and 70 billion parameters (70B) models.

The final result of the competition will be announced during the Supercomputing Conference in November 2024, with the award ceremony to be held during the SupercomputingAsia conference in March 2025.

Defining The Future of AI

In an interview with Supercomputing Asia, Professor Torsten Hoefler covers HPC education, regulation and international collaboration. Professor Torsten is the Director of the Scalable Parallel Computing Laboratory at ETH Zurich and Chief Architect for Machine Learning at the Swiss National Supercomputing Centre (CSCS), Switzerland
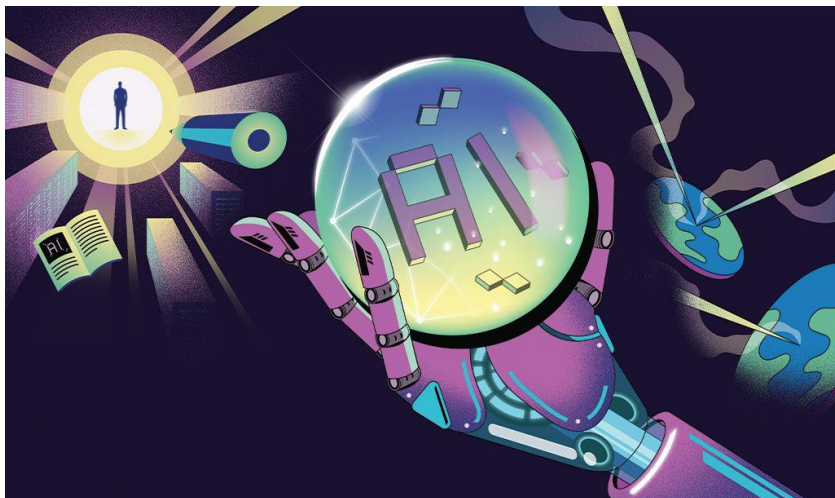
Though not originally designed to function in tandem, high performance computing (HPC) and artificial intelligence (AI) have coalesced to become a cornerstone of the digital era, reshaping industry processes and pushing scientific exploration to new frontiers.

The number-crunching prowess and scalability of HPC systems are fundamental enablers of modern AI-powered software. Such capabilities are particularly useful when it comes to demanding applications like planning intricate logistics networks or unravelling the mysteries of the cosmos. Meanwhile, AI similarly enables researchers and enterprises to do some clever workload processing—making the most out of their HPC systems.

A master of stringing various HPC components together—from hardware and software to education and cross-border collaborations—Hoefler has spent decades researching and developing parallel computing systems. These systems enable multiple calculations to be carried out simultaneously, forming the very bedrock of today's AI capabilities. He is also the newly appointed Chief Architect for Machine Learning at the Swiss National Supercomputing Centre (CSCS), responsible for shaping the centre's strategy related to advanced AI applications.

Collaboration is central to Hoefler's mission as a strong AI advocate. He has worked on many projects with various research institutions throughout the Asia-Pacific region, including the National Supercomputing Centre (NSCC) in Singapore, RIKEN in Japan, Tsinghua University in Beijing, and the National Computational Infrastructure in Australia, with research ranging from pioneering deep-learning applications on supercomputers to harnessing AI for climate modelling.

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THE LAST BYTE...
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Shared articles and news from the HPC world.

ST Explains: Why is S'pore investing $700m in quantum computing?

More firepower, led by a $300 million investment top-up by the Government over the next five years, will be added to fuel quantum technology research and talent grooming in Singapore.

The $300 million injection, announced on May 30 by Deputy Prime Minister Heng Swee Keat, adds to the initial $400 million research and development budget that the National Research Foundation has poured into quantum technology since 2002. Due to high costs, among other reasons, only a handful of other nations – including the United States, China, France, Finland, Germany, South Korea and Japan – are on this quest to build a national quantum computer to gain first-hand experience with the technology.

Credit: The Straits Times

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European Commission Launches Destination Earth System in Finland

The European Commission has activated the initial Destination Earth (DestinE) system, a flagship initiative of the Commission, aiming to develop a highly accurate digital twin of the Earth.

DestinE is using unprecedented modeling capabilities thanks to EuroHPC computers and Artificial Intelligence capacity. The initiative also represents a key component of the European strategy for data by consolidating access to valuable sources of data across Europe. DestinE is now operational and it is expected to continuously evolve, extending operations and developing further components. By 2030, DestinE should complete a full digital replica of the Earth.
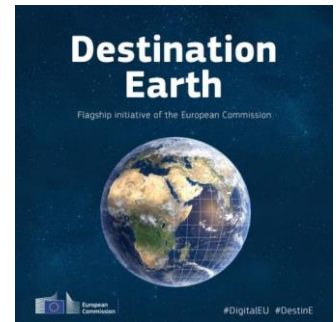
Credit: HPC Wire

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Germany Launches Its 1st Hybrid Quantum Computer at Leibniz Supercomputing Centre

In collaboration with the Leibniz Supercomputing Centre (LRZ) of the Bavarian Academy of Sciences and Humanities, the Q-Exa consortium, led by IQM Quantum Computers (IQM), has integrated a 20-qubit quantum computer into a supercomputer, SuperMUC-NG in Germany.

Credit: HPC Wire

The 20-qubit quantum processor unit from IQM, based on superconducting circuits, has been combined with conventional computer technology. Connected to each other, SuperMUC-NG and the quantum system are already exchanging orders on a trial basis, proving that the two technologies can work together and be linked even more closely. The hybrid system is now being prepared for everyday operation at the LRZ, and selected researchers will soon be able to access and experiment with it.

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