National Supercomputing Centre (NSCC) Singapore e-newsletter

NEWSBYTES

January 2021

In this Issue…

CORPORATE NEWS

2020 was a challenging year for everyone.

The pandemic disrupted economies, societies and all our best laid plans. However, COVID-19 also taught us to adapt, to be nimble and to expect the unexpected. One thing is certain - accelerated digitalisation and the role that high performance computing (HPC) plays in a smarter and more connected world will be in focus in 2021 and the years to come.

At NSCC, we want you to know that we've been working hard in 2020, and will continue to do so in the New Year! We are doubling our efforts to ensure that our national supercomputing resources and HPC infrastructure are well positioned, better prepared and ready to support Singapore's smart nation drive into the new normal!

Here is a recap of the 2020 highlights for NSCC and some of the new initiatives we pushed out:

- **Supercomputers vs COVID-19**

Special Call for Projects
16 million core compute hours of HPC resources fast-tracked for 11 Singapore anti-COVID research projects.

- **New Stakeholders**

CCRS, NEA
The Centre for Climate Research Singapore, NEA, becomes NSCC's latest stakeholder. CCRS will use HPC to accelerate their climate research work.

- **Reaching Out to More**

New Webinar Series
Broadcasting new virtual seminars in collaboration with our partners to introduce HPC and its use cases.

Enablement Sessions
Targeted seminars that reached out to new HPC partners and users.

- **HPC in Education**

Seeding HPC in education
Launched new Educational HPC resources for use by all local education institutions.

- **Growing HPC resources**

New supercomputing resources
Despite pandemic delays, the development of new HPC resources are on track and will be coming to you soon!

- **New Partnerships**

Plug into Fugaku
RIKEN-RIST-NSCC tie-up allows Singapore scientists to access world's fastest supercomputer.

Supercomputing in Polytechnics
Singapore Polytechnic becomes first local polytechnic to partner with NSCC on HPC resources.

HPC Everywhere
ITE and NSCC ink partnership to introduce HPC to ITE students and staff.

- **Nurturing HPC Talent**

Powering global competitions
Global student competition at ISC2020 went digital for the first time ever because of NSCC's resources and expertise.

Biggest competition to date
HPCAIAC and NSCC organised the largest edition of the annual APAC HPC-AI Competition in 2020 with more than 30 regional teams.

- **Enhanced Business Continuity**

Safeguarding our users' data
NSCC, NTU and HPE deployed a new backup system and Disaster Recovery Platform that strengthens data resilience and business continuity planning.

As we enter into a new year, we would like to thank all of you - our users, stakeholders, partners and friends for your continued support. We look forward to working closely with you in 2021 to build a stronger HPC community in Singapore.

NSCC wishes you all the best for the New Year and have a safe 2021 ahead!

Back to main content list

Yves Poppe - New Internet IPv6 Hall of Fame inductee

Congratulations to Mr Yves Poppe on being inducted into IPv6 Forum's 2020 New Internet IPv6 Hall of Fame!

The Internet Protocol version 6 (IPv6) is the current version of the Internet Protocol (IP), which is the identification and location system for computers linked to the internet. The IPv6 Hall of Fame was launched to recognise and celebrate the experts and evangelists of IPv6 who have made extraordinary contributions to the design and large-scale deployment of IPv6 around the world.

Mr Yves Poppe who has been a Consultant with NSCC Singapore since 2017, advises on transcontinental supercomputing connectivity. His current focus is on facilitating the Asia Pacific Research Platform (APRP), an international platform which is modelled on the *ScienceDMZ* and DTN concept. The platform was initially developed by *Esnet* and links to a Global Research Platform (GRP) for Research Collaboration. The genesis of APRP involving Australia, Japan, South Korea and Singapore was successfully demonstrated at SC18 and SC19. Yves represents NSCC at Geant, Internet2, Canarie, GRP, ASREN and APAN where he is Chair of the BackBone Committee. Yves has also been an ardent promoter of IPv6 since its inception and is co-founder of the International IPv6 Forum.

"It is a great honour to be inducted in this August assembly which includes some of the finest IPv6 experts and evangelists who have, with determination and persistence, cleared the road towards the New Internet," said Yves Poppe, New Internet IPv6 Hall of Famer.

Back to main content list

Visitors from Singapore LNG (SLNG) Corporation

NSCC hosted visitors from SLNG for a tour of the data centre and for a briefing on the ASPIRE 1 supercomputer. The visitors were keen to find out about the operations and facilities needed to maintain and optimise the national supercomputing infrastructure.

Back to main content list

Balancing skin bacterial composition for healthier skin

NSCC's supercomputer help analyse the Asian skin microbiome in order to develop products to improve skin treatments and maintain skin health.

Our skin harbours a complex microbial community that includes bacteria, fungi and viruses. Many of these organisms play critical roles in maintaining skin health and are the cause of many inflammatory skin diseases such as atopic dermatitis and psoriasis, dandruff and seborrheic dermatitis, as well as malodour and diaper rash. Therefore, it is important to understand the microbial composition to develop better skin treatments and improve skin health.

However, technological identification and product development face substantial challenges due to a lack of foundational knowledge and tools. These challenges include the definition of what constitutes healthy Asian skin microbiome; adequate knowledge of its functional role in skin inflammation/homeostasis to enable rational material identification and product design; and how the efficacy of treatments can be demonstrated to support IP disclosures and claims.

A team of researchers at the Asian Skin Microbiome Programme (ASMP) at A*STAR aims to address these critical unmet needs by delivering an integrated platform of assets and technologies which generate new functional understanding of the skin microbiome and can be flexibly employed by companies for their research and clinical needs.

"The project requires us to generate and analyse tens of terabytes of multi-body-site skin microbiome sequencing data from almost one thousand volunteers. NSCC's supercomputing resources provide us with the computing power to mine the complex and massive sequencing data sets and allows us to speed up analysis through distributed and parallelised data processing."

Aarthi Ravikrishnan
Postdoctoral Fellow
Laboratory of Metagenomic Technologies & Microbial Systems
A*STAR

The team is leveraging on NSCC's supercomputing resources to establish the skin microbiome signatures of the Asian population and to innovate technologies to investigate this data in order to enable rational modulation of skin microbes and provide opportunities for the development of clinical interventions.

To find out more about the NSCC's HPC resources and how you can tap on them, please contact e-news@nscc.sg.

Back to main content list

Better AI for safer self-driving

Strengthening the safety and robustness of AI in self-driving vehicles using NSCC's high performance computing resources.

Artificial Intelligence (AI) technologies are gaining wider adoption in recent years and are being increasingly deployed in critical applications such as cybersecurity and self-driving vehicles.

For self-driving cars, where safety is of the utmost importance, the AI is expected to be robust and reliable. However, research has revealed that deep

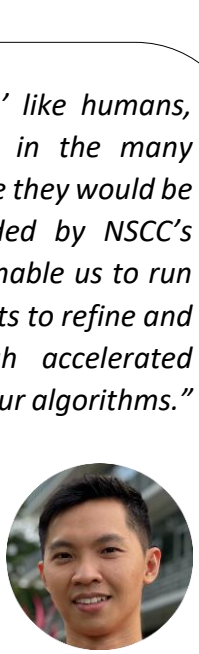
learning, which powers the latest AI advancements, is prone to adversarial noise whereby the AI misclassifies images when imperceptible noises are added.

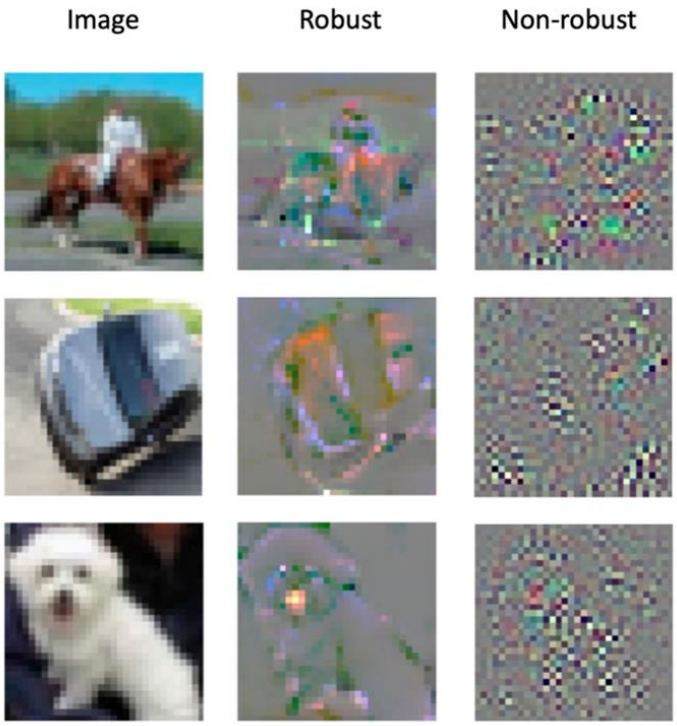
To make deep learning models robust against such noise, a team of researchers at NTU's School of Computer Science and Engineering is utilising NSCC's supercomputing resources to study the algorithms to train these models to rely on image features relevant to human eyes such as meaningful lines and edges of objects rather than superficial signals in images.

The team demonstrates that training a model to focus on salient features such as lines and edges of the object improves the model's robustness against adversarial noise compared to non-robust models that rely on superficial features.

"Our work trains AI to 'see' like humans, making them more robust in the many important applications where they would be deployed. The GPUs provided by NSCC's supercomputing resources enable us to run our deep learning experiments to refine and validate our ideas through accelerated feedback and evaluation of our algorithms."

Alvin Chan
Ph.D Student
School of Computer Science and Engineering
NTU





Improving the robustness of AI in self-driving cars using supercomputer-enabled deep learning models.

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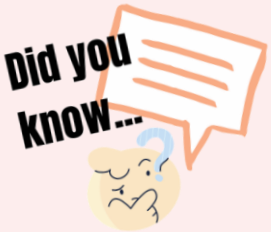
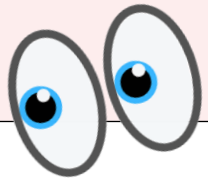
Back to main content list

TECHNICAL NEWS

Monitoring job progression in Linux

Let the commands work for you!





Monitoring of one or more job progression is possible.

Use a "tail" command to monitor one or more job progress in the output files.
New outputs appear in the console as they are generated in the output files.

```
$ tail -f out*.txt
==> out1.txt <==

==> out2.txt <==

==> out1.txt <==
hello world1
hello world2

==> out2.txt <==
happy day1
```

For more information and FAQs on ASPIRE 1, please visit:

https://help.nscc.sg

Back to main content list

THE LAST BYTE...

<SHARED CONTENT>

Shared articles and news from the HPC world.

Predicting a pandemic

What if we could find out how bad a COVID-19 patient's sickness will be?

One of the worst parts of the current epidemic, other than the loss of life, has to be the uncertainty. Symptoms can take up to two weeks to present, so being exposed to a COVID-positive person can mean days of waiting. Even for those who remain uninfected, it's still impossible to know when life will go back to normal. Read more at Science Node here.

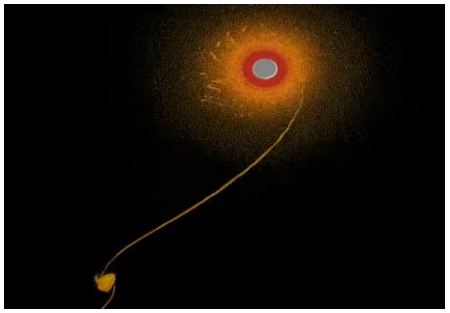
Credit: Science Node

Back to main content list

Supercomputer simulations could unlock mystery of moon's formation

Astronomers have taken a step towards understanding how the Moon might have formed out of a giant collision between the early Earth and another massive object 4.5 billion years ago.

Scientists led by Durham University, UK, ran supercomputer simulations on the DiRAC High-Performance Computing facility to send a Mars-sized planet – called Theia – crashing into the early Earth. Their simulations produced an orbiting body that could potentially evolve into a Moon-like object. Read more at HPC Wire here.



Credit: Sergio Ruiz-Bonilla

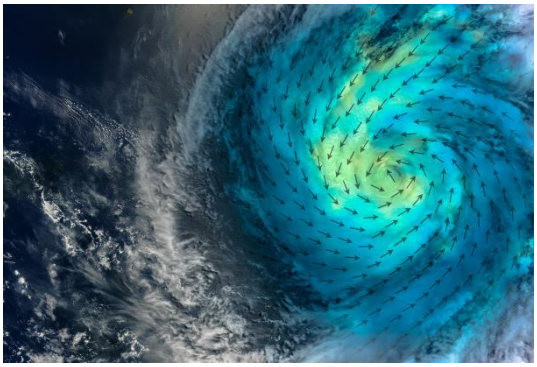
Back to main content list

How do climate models predict global warming?

Climate models use complex equations, mountains of data and supercomputers to help us understand global warming and future changes on planet Earth.

When it's raining in the morning, and you plan to leave the house to do some grocery shopping in the afternoon, you may think to grab an umbrella. You take it because you've noticed that it's raining and chances are, it will rain later, too. You've gathered information about your surroundings and reached a conclusion that reasonably predicts your afternoon: It will probably rain. When scientists make climate models, they do this — with an upgrade in complexity. Read more at Discover here.

Back to main content list



Credit: Discover