JOINT NEWS RELEASE

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NTU Singapore and Red Dot Analytics lead green revolution to lower energy usage and reduce emissions of data centres

The modern digital economy depends on data centres, which are now facing multiple challenges: rising energy costs, stricter regulations on carbon emissions, and the rapid growth of cloud computing.

Spearheading this green revolution are scientists from **Nanyang Technological University, Singapore (NTU Singapore)** and its spin-off company **Red Dot Analytics (RDA),** who have successfully collaborated to develop new technologies that lower energy usage and reduce emissions of data centres.

Using Artificial Intelligence (AI) and digital twins – a full-scale replica of a data centre, its physics and operations in the virtual realm – RDA can help companies to evaluate the entire life cycle of their operations to ensure a wholistic assessment of carbon emissions and energy usage, and to validate new changes and processes before implementing it in real life.

RDA can optimise the operations of a data centre, improve its reliability and performance, while lowering energy usage by up to 30 per cent, leading to a significant reduction in electricity bills and affiliated carbon emission. [1]

The technologies were developed by **NTU Professor Wen Yonggang, Associate Dean (Research), College of Engineering**, and were successfully test bedded in collaboration with industry partners such as Alibaba Group and Singapore National Supercomputing Centre (NSCC). It has since been patented, commercialised, and licensed to Red Dot Analytics in 2020.

[1] Joint IT-Facility Optimization for Green Data Centers via Deep Reinforcement Learning
Zhou, X., Wang, R., Wen, Y. and Tan, R., 2021. Joint IT-Facility Optimization for Green Data Centers via Deep Reinforcement Learning. IEEE Network, 35(6), pp.255-262.

RDA's Head of Business Development, Mr Calvin Sun, said: "Data centres of the future will be built with AI-powered systems that are connected and can predict future outcomes. Ongoing innovation, such as those by NTU Singapore and RDA, will help to drive the industry towards becoming truly sustainable, which brings about multiple environmental, social and economic benefits to companies and the communities they are in."

Mr Edwin Low, Director of Enterprise & Ecosystem Development, Infocomm Media Development Authority of Singapore, said: "We welcome Red Dot Analytics, a pioneer in developing award-winning Artificial Intelligence and Digital Twin technologies, as our latest addition in the Accreditation@SG Digital programme. We look forward to work with them in driving optimisation and empowering mission-critical data centres globally to work towards energy optimisation and net-zero targets."

Professor Louis Phee, **NTU Vice President (Innovation and Entrepreneurship)**, said the University has prioritised sustainability and innovation in its NTU 2025 strategic master plan and is committed in accelerating the commercialisation of research outcomes.

"Red Dot Analytics (RDA) is a great example of how impactful research from NTU Singapore can be commercialised into real-world solutions. By pairing the needs of Singapore and our industry partners with the ingenuity and expertise of our faculty, we hope to create innovations with economic and sustainable impact that can be adopted by local SMEs and start-ups. We welcome more companies to work with NTU, to develop new solutions through research partnerships, license our innovations and hopefully create more deep tech spin-offs such as RDA," adds Prof Phee, who is also **Dean of the NTU College of Engineering**.

Technologies that drive sustainability

As the premier data centre hub in the region, Singapore has over about 60 data centres occupying about six million square feet of server rack space, accounting for 7 per cent of the country's total electricity consumption in 2020.

The nation is a top choice for locating data centres due to its efficient digital and power infrastructure, minimal natural hazards, a business-friendly climate, and a highly skilled workforce.

However, its warm tropical climate poses daunting challenges for data centre operations, especially with global warming brought about by climate change. Close to half of the energy consumption of the data centres in the tropics goes to the cooling systems.

Using RDA's innovative Performance and Sustainability Lifecycle approach, a data centre's design and its operations will be analysed from start to end. With the multitude of data gathered, RDA can then improve operation efficiency through methods such as predictive maintenance, capacity planning and dynamic workload and cooling allocation.

For example, if server loads can be distributed evenly in real time using AI optimisation, lesser heat will be generated by the servers and energy can be saved by abandoning the common practice of over-cooling, which aims to cater for unexpected peak loads.

An overall reduction in electricity usage by data centres will contribute towards reduced carbon emissions for Singapore, which announced its climate ambitions to net zero emissions by mid-century at the Budget 2022 in March.[2]

Singapore also recently lifted its moratorium on new data centres[3] put in place since 2019 and announced a pilot phase of new sustainable data centres, which must include innovations and sustainability solutions. This is aligned with the government's aims of anchoring data centres which are best-in-class for resource efficiency and contributions to economic and strategic objectives.

This evolving regulatory environment represents a great opportunity for Red Dot Analytics, as the company announces a new round of funding by the Asian Development Bank, together with other private investors including IMO ventures, Avior Capital and GSR ventures, which seeks to invest in the development of digital infrastructure and data centre development in Asia.

Pushing the frontiers of data centre science and technology

While Red Dot Analytics is helping clients such as BDx, one of the world's largest data centre operators to optimise their energy usage, research is still ongoing on the NTU Smart Campus to develop a "digital-first" approach for data centre designs.

Instead of designing a prototype data centre and building it in the real world to test its performance as per conventional practice, Prof Wen and his team have developed a framework and software to design, build, test and improve a data centre all in virtual space.

[2] Singapore will raise climate ambition to achieve net zero emissions by or around mid-century, and revises carbon tax levels from 2024. NCCS. https://www.nccs.gov.sg/media/press-release/singapore-will-raise-climate-ambition

[3] New data centres in Singapore to meet higher standards when moratorium lifts in Q2 2022. Businesstimes.com.sg. (n.d.). https://www.businesstimes.com.sg/companies-markets/new-data-centres-in-singapore-to-meet-higher-standards-when-moratorium-lifts-in-q2

AI agents are used to optimise the design and operations to achieve the best version of the virtual data centre, which can then be used as a reference to build the real version and to control it.

Employing such a revolutionary approach could drive down development costs by up to 90 per cent, save time and effort by eliminating trial and error, and minimise construction wastage, explains Prof Wen, who clinched the Tech Lead Award (Digital Achiever) from Singapore Computer Society earlier last month (7 May 2022) and is also the winner of the “Top Asia Pacific Technology Leader” for Data Centres at the W. Media's Asia Pacific Cloud and Datacenter Awards ceremony 2021

“Like the equivalent of the metaverse, I envision a Data Centre metaVerse (DCverse), where all data centres are controlled virtually by AI agents,” Prof Wen adds. “Human operators can remotely operate the physical hardware of a data centre in cyberspace and these changes will then be performed by robots that act as their proxies. This could open endless possibilities for data centres, such as locating them in areas which are cooler, like underground and underwater, since it means lesser energy is needed for cooling.”

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Media contact:

Lester Kok
Assistant Director
Corporate Communications Office
Nanyang Technological University, Singapore
Email: lesterkok@ntu.edu.sg

About Nanyang Technological University, Singapore

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the Engineering, Business, Science, Medicine, Humanities, Arts, & Social Sciences, and Graduate colleges.

NTU is also home to world-renowned autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies, Earth Observatory of Singapore, and Singapore Centre for Environmental Life Sciences Engineering – and various leading research centres such as the Nanyang Environment & Water Research Institute (NEWRI) and Energy Research Institute @ NTU (ERI@N).

Under the NTU Smart Campus vision, the University harnesses the power of digital technology and tech-enabled solutions to support better learning and living experiences, the discovery of new knowledge, and the sustainability of resources.

Ranked amongst the world's top universities, the University's main campus is also frequently listed among the world's most beautiful. Known for its sustainability, over 95% of its building projects are certified Green Mark Platinum. Apart from its main campus, NTU also has a medical campus in Novena, Singapore's healthcare district.

For more information, visit www.ntu.edu.sg