

NTU Singapore Renewing Collaborative Research

Yen Ocampo October 30, 2023

The Nanyang Technological University, Singapore (NTU Singapore) is **strengthening** its bonds with French organisations, forging ahead to explore the frontiers of science and innovation. This initiative involves a diverse range of fields, from quantum physics and nuclear energy to satellite engineering, remote sensing, sustainability, artificial intelligence (AI), machine learning (ML), and neural networks.



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aims to expand these projects in collaboration with industry partners.

To usher in a cleaner future with reduced emissions from fossil fuels, NTU and CEA have joined forces to research fusion technologies through the Singapore Alliance with France for Fusion Energy (SAFE). Fusion, the process of producing energy by combining two atoms, holds the promise of emissions-free energy. By harnessing CEA's expertise in plasma physics and NTU's deep knowledge of AI and ML, this collaboration may pave the way for the development of fusion reactors.

In the field of quantum technologies, a joint project titled N-GAP will unite Singapore and France in the pursuit of quantum logic gates, a vital component of advanced computing. This collaboration, hosted by the French National Centre for Scientific Research (CNRS) @ Campus for Research Excellence and Technological Enterprise (CREATE), will leverage the unique properties of exciton-polaritons, particles that are both half-light and half-matter. These tiny structures at the nanoscale offer a pathway to revolutionise computing.

The JCSI also marked the renewal of Majulab, a joint research laboratory involving CNRS, Sorbonne University, University Cote de Azur, NTU, and NUS. Through Majulab, scientists have secured European grants to develop exciton-polaritons neural networks, which draw inspiration from the interconnected neurons in the human brain. These networks **hold the potential for advanced ML, data processing, and pattern recognition**, applicable to both classical and quantum physics.

The collaboration between NTU and Université PSL also signifies a significant development in the form of a joint PhD degree programme. This initiative aims to train scientists and engineers in fields such as electrical and electronic engineering, materials science and engineering, physics, photonics, quantum technologies, and sustainable technologies.

At the heart of this collaboration lies the 3rd Singapore-France Joint Committee on Science and Innovation (JCSI), a platform designed to foster research cooperation between France and Singapore in the field of science and technology.

Deputy Prime Minister Heng Swee Keat, the Coordinating Minister for Economic Policies, and the Chairman of the National Research Foundation, Singapore witnessed the signing of several groundbreaking agreements that were a testament to the dedication to the pursuit of knowledge, a cornerstone of academic and scientific partnerships.

One noteworthy partnership, geared towards sustainability, involves a renewed injection of S\$20 million into the NTU Singapore-CEA Alliance for Research in Circular Economy (SCARCE). This joint research centre, established in 2018, has already made significant strides in developing eco-friendly methods to recycle e-waste, including lithium-ion batteries, silicon solar panels, and printed circuit boards.

This Phase 2 funding, supported by Singapore's National Environment Agency (NEA), NTU, and the French Alternative Energies and Atomic Energy Commission (CEA)

Further enhancing the spirit of collaboration, NTU together with technology corporations signed a collaboration agreement to renew the Smart Small Satellite Systems Thales in NTU (S4TIN) joint lab. S4TIN, the only Franco-Singapore academic-industry joint lab on space technologies, aims to tackle the challenges of space weather, specifically ionospheric effects, which impact the accuracy of the Global Navigation Satellite System (GNSS).

Also, by improving models to predict ionospheric conditions, this research will provide crucial support to aviation and maritime operations. Also, by developing compact satellite payloads and data processing techniques, S4TIN will contribute to more accurate environmental models, benefiting applications like haze forecasts, volcanic threat prediction, and ocean and coast monitoring.
