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NTT Corporation

Okinawa Institute of Science and Technology School Corporation

NTT and OIST Agree on Comprehensive Research Collaboration to Create a Sustainable Society with AI

Collaborations in a wide range of scientific areas including Environmental Science, Quantum Science, Brain/Neuroscience

NTT Corporation (NTT) and the Okinawa Institute of Science and Technology School Corporation (OIST) have agreed to collaborate in research areas such as environmental science, quantum science, and brain/neuroscience to drive innovation and create a more sustainable society. OIST and NTT share a vision for a sustainable society grounded on the understanding that humanity, technology, and the natural world are inextricably linked. Currently, technological advancements, represented by AI, are progressing rapidly. However, this rapid progress in technology may disrupt the balance between humanity, technology, and the natural world. It is imperative to avoid a situation where environmental issues worsen, leading to a decline in well-being. NTT and OIST are committed to solving environmental problems and enhancing well-being by exploring the fundamental principles of natural phenomena and the mechanisms underlying humanity.

NTT and OIST are considering social implementation. We are integrating the results of fundamental research into AIs. We aim to pave the way for a new era of sustainability by applying AIs to various social challenges.



NTT Senior Executive Vice President (CTO) Katsuhiko Kawazoe (left),
and OIST President & CEO Karin Markides (right)

1. Background

The U.N. Intergovernmental Panel on Climate Change Working Group I Sixth Assessment Report (*2) indicates that if emissions of greenhouse gases such as CO₂ are not significantly reduced, the global average temperature will increase by about 2 degrees by 2100 compared to the current level. As a leading research university ranked No. 1 in Japan and No. 9 in the world in the 2019 Nature Index (*1), OIST is addressing issues such as climate change and biodiversity conservation by conducting environmental research on land and in the marine ecosystems of Okinawa. OIST is also engaged in research in a wide range of other areas, including nano- and quantum science, materials science, photonics, neuroscience and more. In developing IOWN (Innovative Optical and Wireless Network), NTT is working to significantly reduce the amount of electricity used in the past. NTT is also replacing all electrical processing in the telecommunications path with optical signal; NTT is also replacing computer processing with optical signal; and NTT is working to reduce greenhouse gas emissions by researching technologies aimed at zero environmental impact.

NTT group and OIST have a long-standing, productive relationship, having collaborated on several pioneering research projects, including: improving typhoon prediction accuracy by optimizing marine and atmospheric observation and data analysis methods (*3); conducting eDNA analysis of corals through deployment of cutting-edge drone technology (*4), advancing quantum computing, communications, and information processing; and developing algorithms for federated machine learning.

Through this new agreement for comprehensive collaboration, NTT and OIST will collaborate on research in areas such as environmental science, quantum science and technology, and brain/neuroscience with the aim of achieving a sustainable society.

To realize a sustainable society, environmental problems must be addressed while maximizing human well-being. Studying the environment and ecological systems advances our understanding of the mechanisms of climate change and its effects on biodiversity. Similarly, advancements in quantum science will aid in reproducing the behavior of natural phenomena such as chemical reactions. Clarifying the underlying fundamental principles will enable precise simulations of the environment and environmental stressors, while studying brain/neuroscience can elucidate the mechanisms of human emotion and thought. Modelling these processes will accelerate the path towards a sustainable society.

NTT and OIST aim to solve environmental issues and maximize well-being by clarifying the principles of natural phenomena and the mechanisms of human emotions. We consider not only foundational research but also social implementation, aiming to model the outcomes of each foundational research as AIs. NTT strives for an architecture where diverse AIs connect and interact with each other. This architecture, envisioned as stars connecting to

form constellations, is named “AI Constellation” by NTT. By coordinating multiple AI models that replicate various natural phenomena and emotions, we aspire to apply them to social challenges and achieve a sustainable society.

2. Overview of the Collaboration

Looking ahead, OIST and NTT will leverage their complementary strengths to expand research collaborations into critical new areas including.

- (1) Environmental Science: Combining genomics, optical sensors and other advanced technologies.
- (2) Quantum Science and Technology: Converging quantum physics, information processing, communications, and optical devices.
- (3) Brain/neuroscience: Combining neurosciences, brain sciences, and bio-device research.

Based on researchers desires to collaborate on cutting edge scientific projects with top executive level endorsement, both parties are committed to seeking out new cross-disciplinary research avenues aligned with their respective missions. In the future, we aim to translate our theoretical knowledge into AI models. We aim to return the results of our research to build a sustainable society.

3. Endorsement

○NTT Senior Executive Vice President (CTO) Katsuhiko Kawazoe

NTT envisions “AI Constellation” where diverse AIs are interconnected. By connecting AIs via IOWN, we anticipate the rapid generation of collective knowledge. Through foundational research in collaboration with OIST, we will be able to clarify the principles of natural phenomena and human emotions. At that point, we can create a group of AIs that accurately replicate various natural phenomena and human experiences based on these principles. By achieving this diversity of AIs and enabling their mutual interactions, we can create 'digital twins' that capture the truth and fact of the real world and accurately replicate it.

○OIST President & CEO Karin Markides

OIST is thrilled to embark on this partnership with NTT, a globally leading telecommunications company renowned for its extensive R&D activities. Both of our institutions recognize that fundamental research across diverse scientific fields serves as the foundation for new discoveries that can solve pressing global problems. The convergence of advanced technologies, from genomics to AI to quantum computing and sensors, has opened a multitude of avenues for scientific inquiry, enabling us to study the planet and ourselves in



a holistic and interconnected manner. With our combined expertise through this top level, institutional partnership, OIST and NTT can pursue a portfolio of collaborative projects that will have far greater potential impact than any single research effort alone. OIST looks forward to a long and prosperous partnership with NTT.

- *1 IPCC WGI Sixth Assessment Report: Published by the IPCC, a United Nations organization whose members are scientists from around the world. It is a report on global warming.
- *2 Nature Index: An index that calculates the influence of each research institution based on articles published in 145 prominent scientific journals. A database is also available to view rankings of countries and research institutions based on this value. The normalized ranking indicates the percentage of high quality papers and is a ranking of excellence for a research institution.
- *3 NTT and OIST: “NTT and OIST make the First Simultaneous Atmospheric and Marine Observations Directly beneath a violent, Category 5 Typhoon in the North-West Pacific”, NTT Press Release, May 23, 2023.
- *4 OIST: “Diving deeper into our oceans: Underwater drones open new doors for global coral reef research”, OIST Research Updates, Feb. 15, 2024.

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