

# Colloquium d'Informatique de Sorbonne Université

## What can we further learn from the brain for AI?

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Deep learning is a prime example of how brain-inspired computing can benefit AI. But what else can we learn from the brain for bringing AI to the next level? Energy efficiency and data efficiency are the major features of the brain and human cognition that today's deep learning has yet to deliver. The brain can be seen as a multi-agent system of heterogeneous learners using different representations and algorithms. The flexible use of reactive, model-free control and model-based "mental simulation" appears to be the basis for computational and data efficiency of the brain. How the brain efficiently acquires and flexibly combines prediction and control modules is a major open problem in neuroscience and its solution should help developments of more flexible and autonomous AI.

Kenji Doya is a Professor of Neural Computation Unit, Okinawa Institute of Science and Technology Graduate University. He aims to understand how we learn motor skills, make decisions, imagine the future, and communicate and collaborate with others. He studies reinforcement learning and probabilistic inference, and how they are realized in the brain. He took his PhD in 1991 at the University of Tokyo and worked as a postdoc at U. C. San Diego and the Salk Institute. In 1994, he joined Advanced Telecommunications Research International as a Senior Researcher and then served as a Group Leader of Kawato Dynamic Brain Project. In 2004, he was appointed as a Principal Investigator of the OIST Initial Research Project and started Okinawa Computational Neuroscience Course as the chief organizer. As OIST established itself as a Graduate University in 2011, he became a Professor and served as the Vice Provost for Research till 2014. He served as a Co-Editor in Chief of Neural Networks from 2008 to 2021 and a Chairperson of Neuro2022 Conference in Okinawa. He is a board member of International Neural Network Society and Asia Pacific Neural Network Society, and the President of Japanese Neural Network Society. He received INNS Donald O. Hebb Award in 2018, APNNS Outstanding Achievement Award and JNNS Academic Award in 2019, and the age-group 2nd place at Ironman Malaysia in 2022.

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