This talk will be in English.

The 71st Frontier Brain Science Seminar

Sponsored by Research Center for Idling Brain Science (RCIBS)

「知」の創発とその破綻機序の解明に向けて
Learning in intelligent systems

演者: **牧野　浩史　先生**

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日時: 2026. 1月 23日 Fri. 16:30～18:00

場所: 日医工オーディトリアム（医薬イノベーションセンター1F）

Professor Hiroshi Makino explores the mechanisms underlying the emergence of "intelligence" at the intersection of neuroscience and artificial intelligence (AI). His research aims to uncover common learning principles shared by biological and artificial systems through direct comparisons of their behavior and neural representations.

In this seminar, Dr. Makino will present studies in which mice and deep reinforcement learning (RL) agents were trained on identical tasks. Remarkably, learning dynamics in the mouse cortex exhibited key features similar to those of deep RL algorithms. By experimentally testing predictions derived from AI models, his team further revealed that the brain generates novel behaviors through arithmetic combinations of pre-acquired value representations. These findings offer new insights into the shared foundations of learning in intelligent systems.

References

1 Makino, H.*, and Suhaimi, A. 2025. Distributed representations of temporally accumulated reward prediction errors in the mouse cortex. ***Sci Adv*** 11, eadi4782.

2 Makino, H.* 2023. Arithmetic value representation for hierarchical behavior composition. ***Nat Neurosci*** 26, 140-149.

3 Suhaimi, A., Lim, A.W.H., Chia, X.W., Li, C., and Makino, H.* 2022. Representation learning in the artificial and biological neural networks underlying sensorimotor ntegration. ***Sci Adv*** 8, eabn0984.

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Organizer: Tsuyoshi Setogawa (Dept. of System Emotional Science) (Ext.7216)