Yuji Kawai, Ph.D.

Associate Professor

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Dr. Yuji Kawai has been studying mechanisms of neural information processing in the brain and cognitive development of children by constructing them using computer simulators and robots. He designs recurrent neural networks inspired by structure and function of the human brains for understanding of the brains and applications to artificial intelligence and robots.

Career

April 2023 – present	**Associate Professor**, Institute for Open and Transdisciplinary Research Initiatives, Osaka University
April 2021 – March 2023	**Specially Appointed Associate Professor**, Institute for Open and Transdisciplinary Research Initiatives, Osaka University
April 2020 – March 2021	**Specially Appointed Associate Professor**, Office of Management and Planning, Osaka University
April 2019 – March 2020	**Specially Appointed Lecturer**, Institute for Open and Transdisciplinary Research Initiatives, Osaka University
April 2017 – March 2019	**Assistant Professor**, Graduate School of Engineering, Osaka University
April 2016 – March 2017	**Specially Appointed Assistant Professor**, Graduate School of Engineering, Osaka University
April 2013 – March 2016	**Research Fellow of the Japan Society for the Promotion Science (DC1)**, Graduate School of Engineering, Osaka University

Education

April 2013 – March 2016	**Ph.D. course**, Department of Adaptive Machine Systems, Graduate School of Engineering, Osaka University
April 2011 – March 2013	**Master course**, Department of Adaptive Machine Systems, Graduate School of Engineering, Osaka University
April 2009 – March 2011	**Bachelor course**, Division of Mechanical, Materials and Manufacturing Science, School of Engineering, Osaka University
April 2004 – March 2009	**High school – Bachelor course**, Department of Control Engineering, National Institute of Technology, Matsue College

Societies

- IEEE.
- The Robotics Society of Japan.
- The Japanese Society of Artificial Intelligence.
- Japanese Neural Network Society.
- Japanese Cognitive Science Society.

Awards

2023 **Young Researcher Award (IEICE Neurocomputing)**, IEEE Computational Intelligence Society Japan Chapter

2019 **JSAI Annual Conference Award**, The Japanese Society for Artificial Intelligence

2018 **JSAI Annual Conference Award**, The Japanese Society for Artificial Intelligence
Research Award, Japanese Neural Network Society
Babybot Challenge Paper Award, The 8th IEEE Joint International Conference on Development and Learning and on Epigenetic Robotics

2017 **Babybot Challenge Participation Award**, The 7th IEEE Joint International Conference on Development and Learning and on Epigenetic Robotics
The 1st Place for RoboCup Japan Open 2017 Soccer SPL League, RoboCup Japan

2014 **Best Presentation Award**, The 31st Annual Conference of the Japanese Cognitive Science Society

2013 **JSAI Incentive Award**, The Japanese Society for Artificial Intelligence
RoboCup Research Award, RoboCup Japan

2012 **Best Paper Award Finalist**, The 16th Annual RoboCup International Symposium
AI Award, The 35th JSAI SIG Challenge
Microsoft Student Travel Award, The 1st Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics

2008 **Hatakeyama Award**, The Japan Society of Mechanical Engineers

Competitive Research Funds

Principal Investigator

October 2023 – March 2027 **JST PRESTO**, Computational studies of movements, cognition, and emotion by whole-brain prediction of the cerebellum.

April 2013 – March 2016 **Grant-in-Aid for JSPS Fellows**, Mirror neuron system by sensorimotor abstraction based on reward, Project number: 25-756.

Co-Investigator

October 2018 – September 2021 **JSPS Topic-Setting Program to Advance Cutting-Edge Humanities and Social Sciences Research (Responding to Real Society)**, Creating fundamental concepts of society and value based on technology and brain science, Project number: JSPS00118070707, Project leader: Kazuya Matsuura.

October 2017 – March 2024 **JST CREST**, An exploration of the principle of emerging interactions in spatiotemporal diversity, Project number: JPMJCR17A4, Project leader: Ichiro Tsuda.

June 2017 – March 2020 **MIC**, R&D for Computing Platform Inspired by Human Brain Cognition, Project number: 17936067, Project leader: Masayuki Murata.

Publications

Articles in Journals

Yuji Kawai, Jihoon Park, and Minoru Asada, "Reservoir computing using self-sustained oscillations in a locally connected neural network," Scientific Reports, Vol. 13, 15532, 2023.

Yuji Kawai and Minoru Asada, "Spatiotemporal motor learning with reward-modulated Hebbian plasticity in modular reservoir computing," Neurocomputing, Vol. 558, 126740, 2023.

Yuji Kawai, Tomohito Miyake, Jihoon Park, Jiro Shimaya, Hideyuki Takahashi, and Minoru Asada, "Anthropomorphism-based causal and responsibility attributions to robots," Scientific Reports, Vol. 13, 12234, 2023.

Yuji Kawai, Jihoon Park, Ichiro Tsuda, and Minoru Asada, "Learning long-term motor timing/patterns on an orthogonal basis in random neural networks," Neural Networks, Vol. 163, pp. 298-311, 2023.

Jihoon Park, **Yuji Kawai**, and Minoru Asada, "Spike timing-dependent plasticity under imbalanced excitation and inhibition reduces the complexity of neural activity," Frontiers in Computational Neuroscience, Vol. 17, 1169288, 2023.

Yuji Kawai, Kazuki Tachikawa, Jihoon Park, and Minoru Asada, "Compensated integrated gradients for reliable explanation of electroencephalogram signal classification," Brain Sciences, Vol. 12, No. 7, 849, 2022.

Yuji Kawai, Yuji Oshima, Yuki Sasamoto, Yukie Nagai, and Minoru Asada, "A computational model for child inferences of word meanings via syntactic categories for different ages and languages," IEEE Transactions on Cognitive and Developmental Systems, Vol. 12, No. 3, pp. 401-416, 2020.

Jihoon Park, Koki Ichinose, **Yuji Kawai**, Junichi Suzuki, Minoru Asada, and Hiroki Mori, "Macroscopic cluster organizations change the complexity of neural activity," Entropy, Vol. 21, No. 2, 214, 2019.

Yuji Kawai, Jihoon Park, and Minoru Asada, "A small-world topology enhances the echo state property and signal propagation in reservoir computing," Neural Networks, Vol. 112, pp. 15-23, 2019.

Yuji Kawai, Yukie Nagai, and Minoru Asada, "Prediction error in the PMd as a criterion for biological motion discrimination: A computational account," IEEE Transactions on Cognitive and Developmental Systems, Vol. 10, No. 2, pp. 237-249, 2018.

Yuji Kawai, Yuji Oshima, and Minoru Asada, "Errors in children's speech originating from undifferentiated grammatical categories: A model for overproduction of an English past-tense morpheme and a Japanese case particle," Cognitive Studies, Vol. 24, No. 1, pp. 52-66, 2017.

Yuji Kawai, Yuji Oshima, Yuki Sasamoto, Yukie Nagai, and Minoru Asada, "A model for syntactic development of children: Acquisition processes of syntactic categories reflecting structure of Japanese, English, and Chinese languages," Cognitive Studies, Vol. 22, No. 3, pp. 475-479, 2015.

Noriaki Kouda, **Yuji Kawai**, and Nobuyuki Matsui, "RCE neural network with a RBF output function and its performance," Transactions of the Society of Instrument and Control Engineers, Vol. 45, No. 11, pp. 620-627, 2007.

Peer-Reviewed International Conferences (Full Paper)

Yuji Kawai, Jihoon Park, Ichiro Tsuda, and Minoru Asada, "Self-organization of a dynamical orthogonal basis acquiring large memory capacity in modular reservoir computing," In Artificial Neural Networks and Machine Learning – ICANN 2022, pp. 635-646, Sep. 2022.

Tomohito Miyake, **Yuji Kawai**, Jihoon Park, Jiro Shimaya, Hideyuki Takahashi, and Minoru Asada, "Mind perception and causal attribution for failure in a game with a robot," In Proceedings of the 28th IEEE International Conference on Robot and Human Interactive Communication, TuCT1.2, Oct. 2019.

Yuji Kawai, Tatsuhiko Inatani, Takako Yoshida, and Kazuya Matsuura, "Exploring future rules for AIs with citizens using a fictitious case video: A workshop report," In Proceedings of the International Workshop on Envision of Acceptable Human Agent Interaction based on Science Fiction at HAI 2019, Oct. 2019.

Kazuki Tachikawa, **Yuji Kawai**, Jihoon Park, and Minoru Asada, "Effectively interpreting electroencephalogram classification using the Shapley sampling value to prune a feature tree," In Proceedings of the 27th International Conference on Artificial Neural Networks, pp. 672-681, Oct. 2018.

Yuji Kawai, Tomohiro Takimoto, Jihoon Park, and Minoru Asada, "Efficient reward-based learning through body representation in a spiking neural network," In Proceedings of the 8th Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics, pp. 198-203, Sep. 2018.

Yuji Kawai, Tatsuya Tokuno, Jihoon Park, and Minoru Asada, "Echo in a small-world reservoir: time-series prediction using an economical recurrent neural network," In Proceedings of the 7th Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics, pp. 126-131, Sep. 2017.

Tomohiro Takimoto, **Yuji Kawai**, Jihoon Park, and Minoru Asada, "Self-organization based on auditory feedback promotes acquisition of babbling," In Proceedings of the 7th Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics, pp. 120-125, Sep. 2017.

Koki Ichinose, Jihoon Park, **Yuji Kawai**, Junichi Suzuki, Minoru Asada, and Hiroki Mori, "Local over-connectivity reduces the complexity of neural activity: toward a constructive understanding of brain networks in patients with autism spectrum disorder," In Proceedings of the 7th Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics, pp. 233-238, Sep. 2017.

Yuji Kawai, Minoru Asada, and Yukie Nagai, "A model for biological motion detection based on motor prediction in the dorsal premotor area," In Proceedings of the 4th Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics, pp. 241-247, Oct. 2014.

Yuji Kawai, Yuji Oshima, Yuki Sasamoto, Yukie Nagai, and Minoru Asada, "Computational model for syntactic development: Identifying how children learn to generalize nouns and verbs for different languages," In Proceedings of the 4th Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics, pp. 78-84, Oct. 2014.

Yuji Kawai, Yukie Nagai, and Minoru Asada, "Perceptual development triggered by its self-organization in cognitive learning," In Proceedings of the 2012 IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 5159-5164, Oct. 2012.

Yuji Kawai, Jihoon Park, Takato Horii, Kazuaki Tanaka, Hiroki Mori, Yukie Nagai, Takashi Takuma, and Minoru Asada, "Throwing skill optimization through synchronization and desynchronization of degree of freedom," In Proceedings of the 16th Annual RoboCup International Symposium, Jun. 2012.

Yukie Nagai, **Yuji Kawai**, and Minoru Asada, "Emergence of mirror neuron system: Immature vision leads to self-other correspondence," In Proceedings of the 1st Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics, Aug. 2011.