Masafumi Oizumi

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Education

- **Ph.D.** (2007-2010)
  Department of Complexity Science and Engineering, The University of Tokyo
- **M.S.** (2005-2007)
  Department of Complexity Science and Engineering, The University of Tokyo
- **B.S.** (2001-2005)
  Department of Physics, The University of Tokyo

Work History

- **Associate Professor** (Apr, 2019 - present)
  The University of Tokyo, Graduate School of Arts and Sciences, Department of General Systems Studies
- **Manager** (Mar, 2017 - Mar, 2019)
  Araya Inc., Basic Research Group
- **Visiting Researcher** (Sep, 2014 - Oct, 2016)
  Monash University, Monash Biomedical Imaging, Prof Naotsugu Tsuchiya's Lab
- **RIKEN Special Postdoctoral Researcher** (Apr, 2014 - Feb, 2017)
  RIKEN, Brain Science Institute, Prof Shun-ichi Amari's Lab
- **Visiting Researcher** (Oct, 2011 - Oct, 2013)
  University of Wisconsin-Madison, Prof Giulio Tononi's Lab
- **JSPS Superlative Postdoctoral Fellow (SPD)** (Apr, 2011 - Mar, 2014)
  RIKEN Brain Science Institute, Prof Shun-ichi Amari's Lab

Grants

- 2021-: JST Moonshot R&D
- 2023-2028: Grant-in-Aid for Transformative Research Areas (A), The Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT)
- 2020-2023: Grant-in-Aid for Transformative Research Areas (B), The Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT)
- 2018-2024: CREST, Japan Science and Technology Agency (JST)
- 2018-2022: Grant-in-Aid for Scientific Research (B), The Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT)
- 2014-2017: Grant-in-Aid for Young Scientists (B), The Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT)

Fellowships

- 2014-2017: RIKEN, Special Postdoctoral Researcher
- 2011-2014: The Japan Society for the Promotion of Science (JSPS), Research Fellow SPD
- 2008-2011: The Japan Society for the Promotion of Science (JSPS), Research Fellow DC1

Awards

- The First Prize NIKON JOICO AWARD 2021
- Asican Pacific Neural Network Assembly Young Researcher Award 2012
- Dean Prize, Graduate School of Frontier Sciences (Doctor Course) 2010
- Japanese Neural Network Society Research Award 2008
- Dean Prize, Graduate School of Frontier Sciences (Master Course) 2007
- IEEE CIS Japan Chapter Young Researcher Award 2007
- Japanese Neural Network Society Young Researcher Award 2006

Publications

49. Soh Takahashi*, Sasaki Masaru*, Ken Takeda, Masafumi Oizumi (2026). Investigating Fine-and Coarse-grained Structural Correspondences Between

Deep Neural Networks and Human Object Image Similarity Judgments Using Unsupervised Alignment. *Neural Networks, 195, 108222*. *: equal contribution.

48. Elise Rowe, Ken Takeda, Masafumi Oizumi, Joanita D'Souza, Jeroen van Boxtel, and Naotsugu Tsuchiya (2026). Qualia Structures Collapse for Geometric Shapes, but Not Faces, When Spatial Attention Is Withdrawn. *Neuroscience of Consciousness, in press*

47. Daiki Kiyooka*, Ikumi Oomoto*, Jun Kitazono, Yoshiki Saito, Midori Kobayashi, Chie Matsubara, Kenta Kobayashi, Masanori Murayama**, Masafumi Oizumi** (2026). Single-cell resolution functional networks during sleep are segregated into spatially intermixed modules. *Cell Reports, in press*. *, **: equal contribution

46. Taguchi, Tomoya, Jun Kitazono, Shuntaro Sasai, and Masafumi Oizumi (2025). Association of bidirectional network cores in the brain with conscious perception and cognition. *The Journal of Neuroscience, 45(17), e0802242025*

45. Tononi G, Albantakis L, Barbosa L, Boly M, Cirelli C, Comolatti R, Ellia F, Findlay G, Girardi Casali A, Grasso M, Haun AM, Hendren J, Hoel E, Koch C, Maier A, Marshall W, Massimini M, Mayner WGP, Oizumi M, Szczotka J, Tsuchiya N, Zaeemzadeh A (2025). Consciousness or pseudo-consciousness? A clash of two paradigms. *Nature Neuroscience, 28, 694–702*

44. Haruka Asanuma, Naoko Koide-Majima, Ken Nakamura, Takato Horii, Shinji Nishimoto, Masafumi Oizumi (2025). Correspondence of High-Dimensional Emotion Structures Elicited by Video Clips Between Humans and Multimodal LLMs. *Scientific Reports, 15, 32175*

43. Asaki Kataoka, Yoshihiro Nagano, and Masafumi Oizumi (2025). Exploring internal representation of self-supervised networks: few-shot learning abilities and comparison with human semantics and recognition of objects. *Frontiers in Computational Neuroscience, in press*

42. Genji Kawakita*, Ariel Zeleznikow-Johnston*, Ken Takeda*, Naotsugu Tsuchiya**, Masafumi Oizumi** (2025). Is my "red" your "red"?: Evaluating structural correspondences between color similarity judgments using unsupervised alignment. *iScience, 28, 3, 112029*. *, **: equal contribution

41. Ken Takeda*, Masaru Sasaki*, Kota Abe, Masafumi Oizumi (2025). Unsupervised Alignment in Neuroscience: Introducing a Toolbox for Gromov-Wasserstein Optimal Transport. *Journal of Neuroscience Methods, 419, 110443*. *: equal contribution. The Toolbox is available on [GitHub](https://oizumi-lab.github.io/GWTune/)

40. Ken Takeda*, Kota Abe*, Jun Kitazono and Masafumi Oizumi (2025). Unsupervised alignment reveals structural commonalities and differences in neural representations of natural scenes across individuals and brain areas. *iScience, 28, 5112427*. *: equal contribution.

39. Shunsuke Kamiya, Taiga Mitamura, Muneki Ikeda, Masafumi Oizumi (2025). Unsupervised Neuronal Matching with Spontaneous Neuronal ActivityUnsupervised Neuronal Matching with Spontaneous Neuronal Activity. *In ICLR 2025 Workshop on Representational Alignment*

38. Daiki Sekizawa, Sosuke Ito, Masafumi Oizumi (2024). Decomposing thermodynamic dissipation of linear Langevin systems via oscillatory modes and its application to neural dynamics. *Physical Review X 14 (4), 041003*

37. Genji Kawakita, Ariel Zeleznikow-Johnston, Naotsugu Tsuchiya, Masafumi Oizumi (2024). Gromov–Wasserstein unsupervised alignment reveals structural correspondences between the color similarity structures of humans and large language models. *Scientific Reports 14 (1), 15917*

36. Shunsuke Kamiya, Jun Kitazono, Masafumi Oizumi (2024). Koopman Operator Based Dynamical Similarity Analysis for Data-driven Quantification of Distance between Dynamics. *In ICLR 2024 Workshop on Representational Alignment*

35. Shunsuke Kamiya, Genji Kawakita, Shuntaro Sasai, Jun Kitazono, Masafumi Oizumi (2023). Optimal Control Costs of Brain State Transitions in Linear Stochastic Systems. *The Journal of Neuroscience, 43 (2), 270-281*

34. Jun Kitazono, Yuma Aoki, Masafumi Oizumi (2022). Bidirectionally connected cores in a mouse connectome: Towards extracting the brain subnetworks essential for consciousness. *Cerebral Cortex, bhac143*

33. Genji Kawakita, Shunsuke Kamiya, Shuntaro Sasai, Jun Kitazono, Masafumi Oizumi (2022). Quantifying brain state transition cost via Schrödinger's bridge. *Network Neuroscience, 6 (1), 118–134*

32. Keisuke Ota, Yasuhiro Oisi, Takayuki Suzuki, Muneki Ikeda, Yoshiki Ito, Tsubasa Ito, Kenta Kobayashi, Midori Kobayashi, Maya Odagawa, Chie Matsubara, Yoshinori Kuroiwa, Masaru Horikoshi, Junya Matsushita, Hiroyuki Hioki, Masamichi Ohkura, Junichi Nakai, Masafumi Oizumi, Atsushi Miyawaki, Toru Aonishi, Takahiro Ode, Masanori Murayama (2021). Fast scanning high optical invariant two-photon microscopy for monitoring a large neural network activity with cellular resolution. *Neuron, 109(11), 1810-1824*

31. Kotaro Ishizu, Tomoyo I. Shiramatsu, Rie Hitsuyu, Masafumi Oizumi, Naotsugu Tsuchiya, Hirokazu Takahashi (2021). Information flow in the rat thalamo-cortical system: spontaneous vs. stimulus-evoked activities. *Scientific Reports, 11(19252)*

30. Dror Cohen, Shuntaro Sasai, Naotsugu Tsuchiya, Masafumi Oizumi (2020). A general spectral decomposition of causal influences applied to integrated information. *The Journal of Neuroscience Methods, 330, 108443*

29. Akihiro Eguchi, Takato Horii, Takayuki Nagai, Ryota Kanai, Masafumi Oizumi (2020). An Information Theoretic Approach to Reveal the Formation of Shared Representations. *Frontiers in Computational Neuroscience*

28. Jun Kitazono, Ryota Kanai, Masafumi Oizumi (2020). Efficient search for informational cores in complex systems: Application to brain networks. *Neural Networks, 132, 232-244*

27. Sosuke Ito, Masafumi Oizumi, and Shun-ichi Amari (2020). Unified framework for the entropy production and the stochastic interaction based on information geometry. *Physical Review Research, 2, 033048*

26. Shun-ichi Amari, Ryo Karakida, Masafumi Oizumi (2019). Fisher Information and Natural Gradient Learning in Random Deep Networks. *Proceedings of Machine Learning Research, in PMLR 89:694-702*

25. Shun-ichi Amari, Ryo Karakida, Masafumi Oizumi, Marco Cuturi (2019). Information Geometry for Regularized Optimal Transport and Barycenters of Patterns. *Neural Computation, 31(5), 827-848*

24. Shun-ichi Amari, Ryo Karakida, Masafumi Oizumi (2019). Statistical Neurodynamics of Deep Networks: Geometry of Signal Spaces. *Nonlinear Theory and Its Applications, IEICE, 10(4), 322-336*

23. Jun Kitazono, Ryota Kanai, Masafumi Oizumi (2018). Efficient Algorithms for Searching the Minimum Information Partition in Integrated Information Theory. *Entropy, 20(3), 173*

22. Shohei Hidaka, Masafumi Oizumi (2018). Fast and exact search for the partition with minimal information loss. *PLoS ONE, 13(9), e0201126*

21. Shun-ichi Amari, Ryo Karakida, Masafumi Oizumi (2018). Information Geometry Connecting Wasserstein Distance and Kullback-Leibler Divergence via the Entropy-Relaxed Transportation Problem. *Information Geometry, 1(1), 1-25*

20. Andrew M. Haun, Masafumi Oizumi, Christopher K Kovach, Hiroto Kawasaki, Hiroyuki Oya, Matthew A Howard, Ralph Adolphs, Naotsugu Tsuchiya (2017). Contents of Consciousness Investigated as Integrated Information in Direct Human Brain Recordings. *eNeuro, ENEURO-0085-17*

19. Shun-ichi Amari, Naotsugu Tsuchiya, Masafumi Oizumi (2016). Geometry of information integration. *Information Geometry and its Applications IV (pp. 3-17). Springer, Cham*

18. Masafumi Oizumi, Shun-ichi Amari, Toru Yanagawa, Naotaka Fujii, Naotsugu Tsuchiya (2016). Measuring Integrated Information from the Decoding Perspective. *PLoS Comput Biol, 12(1), e1004654*

17. Masafumi Oizumi, Naotsugu Tsuchiya, Shun-ichi Amari (2016). Unified Framework for Information Integration Based on Information Geometry. *Proceedings of the National Academy of Sciences, 113(51), 14817-14822*

16. Melanie Boly, Shuntaro Sasai, Olivia Gosseries, Masafumi Oizumi, Adenauer Casali, Marcello Massimini, Giulio Tononi (2015). Stimulus Set Meaningfulness

and Neurophysiological Differentiation: A Functional Magnetic Resonance Imaging Study. *PLoS ONE, 10(5): e0125337*

15. Masafumi Oizumi*, Larissa Albantakis*, Giulio Tononi (2014). From the Phenomenology to the Mechanisms of Consciousness: Integrated Information Theory 3.0. *PLoS Computational Biology, 10, e1003588*. *: equal contribution

14. Akinori Mitani, Ryo Sasaki, Masafumi Oizumi, Takanori Uka (2013). A leaky-integrator model as a control mechanism underlying flexible decision making during task switching. *PLoS ONE, 8, e59670*

13. Masafumi Oizumi, Ryota Satoh, Hokto Kazama, Masato Okada (2012). Functional differences between global pre- and postsynaptic inhibition in the Drosophila olfactory circuit. *Frontiers in Computational Neuroscience, 6:14*

12. Yasuhiko Igarashi, Masafumi Oizumi, Masato Okada (2012). Theory of correlation in a network with synaptic depression. *Physical Review E 85, 016108*

11. Yosuke Otsubo, Kenji Nagata, Masafumi Oizumi, and Masato Okada (2011). Influence of synaptic depression on memory storage capacity. *Journal of the Physical Society of Japan, 80, 084004*

10. Masafumi Oizumi, Masato Okada, Shun-ichi Amari (2011). Information loss associated with imperfect observation and mismatched decoding. *Frontiers in Computational Neuroscience, 5:9*

9. Masafumi Oizumi, Keiji Miura, Masato Okada (2010). Analytical investigation of the effects of lateral connections on the accuracy of population coding. *Physical Review E, 81, 051905*

8. Yosuke Otsubo, Kenji Nagata, Masafumi Oizumi, Masato Okada (2010). Instabilities in associative memory model with synaptic depression and switching phenomena among attractors. *Journal of the Physical Society of Japan, 79, 084002*

7. Yasuhiko Igarashi, Masafumi Oizumi, Masato Okada (2010). Mean field analysis of stochastic neural network models with synaptic depression. *Journal of the Physical Society of Japan, 79, 084001*

6. Ryota Satoh*, Masafumi Oizumi*, Hokto Kazama, Masato Okada (2010). Mechanisms of maximum information preservation in the Drosophila antennal lobe. *PLoS ONE, 5, e10644, 2010*. *: equal contribution

5. Masafumi Oizumi, Toshiyuki Ishii, Kazuya Ishibashi, Toshihiko Hosoya, Masato Okada (2010). Mismatched decoding in the brain. *The Journal of Neuroscience, 30, 4815-4826*

4. Masafumi Oizumi, Toshiyuki Ishii, Kazuya Ishibashi, Toshihiko Hosoya, Masato Okada (2009). A general framework for investigating how far the decoding

process in the brain can be simplified. *Advances in Neural Information Processing Systems, 21, 1225-1232*

3. Yasuhiko Igarashi, Masafumi Oizumi, Yosuke Otsubo, Kenji Nagata, Masato Okada (2009). Statistical mechanics of attractor neural network models with synaptic depression. *Journal of Physics Conference Series, 197, 012018*

2. Masafumi Oizumi, Yoichi Miyawaki, Masato Okada (2008). Rate reduction for associative memory model in Hodgkin-Huxley-type network. *Journal of the Physical Society of Japan, 77(6), 064802*

1. Masafumi Oizumi, Yoichi Miyawaki, Masato Okada (2007). Higher order effects on rate reduction for networks of Hodgkin-Huxley neurons. *Journal of the Physical Society of Japan, 76(4), 044803*