

ZILONG JI

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Room 204, Institute of Cognitive Neuroscience, University College London
Alexandra House, 17-19 Queen Square, London, WC1N 3AZ, United Kingdom

EDUCATION

State Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University, China *2014 - 2021*

Ph.D. in Computational Neuroscience

Dissertation: Brain-inspired deep neural networks: research and applications

Advisor: Prof. Si Wu

School of Mathematical Sciences, Xiamen University, China *2010 - 2014*

B.Sc. in Applied Mathematics

POSITIONS

Department of Clinical & Experimental Epilepsy, University College London, UK. *2023 - present*

Postdoc Research Fellow in Computational and Cognitive Neuroscience

Advisor: Prof. Neil Burgess

Institute of Cognitive Neuroscience, University College London, UK. *2021 - 2023*

Visiting Research Fellow in Computational and Cognitive Neuroscience

Advisor: Prof. Neil Burgess

Academy for Advanced Interdisciplinary Studies, Peking University, China. *2021 - 2023*

Postdoc in Computational Neuroscience

Advisor: Prof. Si Wu

Advanced Institute of Information technology, Hangzhou, China *2018 - 2019*

Research Intern. in deep learning and computer vision

AWARDS

2025: The Royal Society's Kan Tong Po Visiting Fellowship (£3,000)

2025: The Crick and University Partnership Networking Fund (£4,000)

2025: Travel Award to Spring Hippocampus Conference in Verona from the Guarantors of Brain (£800)

2021-2023: International Postdoctoral Exchange Fellowship (£35,000)

2022: Travel grant from the 19th Computational and Systems Neuroscience (COSYNE) (\$1,000)

2018: Best paper award from the 25th International Conference on Neural Information Processing (ICONIP) (\$1,000)

2017: First Prize in the First National Undergraduate Brain-Inspired Computing Innovation and Application Competition and International Invitational Tournament (\$12,000)

PUBLICATIONS

Papers in preprint/review/revision

- [1] **Ji, Z.***, Zhang, H.*, Stonis, R., & Burgess, N. (2026). Dorsoventral gradient of theta sweeps in medial entorhinal cortex. bioRxiv, 2026-03. (Under review in Science Advances)
- [2] Yao, L.*, Shang, Z.*, **Ji, Z.***, Meng, M., Wang, F., Gu, X., ... & Zhang, X. (2025). Systematic microcircuit reconfigurations underlie early experience-induced visual cortical plasticity. bioRxiv, 2025-12.
- [3] Yu, C., **Ji, Z.**, Ormond, J., O’Keefe, J., & Burgess, N. (2025). Hippocampal theta sweeps indicate goal direction. bioRxiv, 2025-08. (Under review in Nature Neuroscience)

Neuroscience Journal papers (* for co-first authors)

- [1] Wang, C., Dong, X., **Ji, Z.**, Xiao, M., Jiang, J., Liu, X., ... & Wu, S. (2026). Model-agnostic linear-memory online learning in spiking neural networks. Nature Communications.
- [2] **Ji, Z.***, Chu, T., Dong, X., Yu, C., Bush, D., Burgess, N., & Wu, S. (2026). Dynamical modulation of hippocampal replay through firing rate adaptation. Nature Communications.
- [3] **Ji, Z.***, Lomi, E.*, Jeffery, K., Mitchell, A. S., & Burgess, N. (2025). Phase Precession Relative to Turning Angle in Theta-Modulated Head Direction Cells. Hippocampus, 35(2), e70008.
- [4] **Ji, Z.***, Chu, T.*, Wu, S., & Burgess, N. (2025). A systems model of alternating theta sweeps via firing rate adaptation. Current Biology.
- [5] Chu, T.*, **Ji, Z.***, Zuo, J., Mi, Y., Zhang, W. H., Huang, T., ... & Wu, S. (2024). Firing rate adaptation affords place cell theta sweeps, phase precession, and procession. Elife, 12, RP87055.
- [6] Castegnaro, A.*, **Ji, Z.***, Rudzka, K., Chan, D., & Burgess, N. (2023). Overestimation in angular path integration precedes Alzheimer’s dementia. Current Biology, 33(21), 4650-4661.
- [7] Zou, X.*, **Ji, Z.***, Zhang, T., Huang, T., & Wu, S. (2023). Visual information processing through the interplay between fine and coarse signal pathways. Neural Networks, 166, 692-703.
- [8] Liu, X., Zou, X., **Ji, Z.**, Tian, G., Mi, Y., Huang, T., ... & Wu, S. (2022). Neural feedback facilitates rough-to-fine information retrieval. Neural Networks, 151, 349-364.
- [9] Lin, X., Zou, X., **Ji, Z.**, Huang, T., Wu, S., & Mi, Y. (2021). A brain-inspired computational model for spatio-temporal information processing. Neural Networks, 143, 74-87.
- [10] **Ji, Z.**, Zou, X., Huang, T., & Wu, S. (2020). Unsupervised few-shot feature learning via self-supervised training. Frontiers in computational neuroscience, 14, 83.

Top AI Conference papers (* for co-first authors; # for co-corresponding authors)

- [1] Chu, T., Wu, Y., Burgess, N., **Ji, Z.**, & Wu, S. Unfolding the Black Box of Recurrent Neural Networks for Path Integration. In The Thirty-ninth Annual Conference on Neural Information Processing Systems (NeurIPS2025).
- [2] Chu, T.*, **Ji, Z.***, Zuo, J., Zhang, W., Huang, T., Mi, Y., & Wu, S. (2022). Oscillatory tracking of continuous attractor neural networks account for phase precession and procession of hippocampal place cells. Advances in Neural Information Processing Systems, 35, 33159-33172 (NeurIPS2022).
- [3] Dong, X., **Ji, Z.**, Chu, T., Huang, T., Zhang, W., & Wu, S. (2022). Adaptation accelerating sampling-based bayesian inference in attractor neural networks. Advances in Neural Information Processing Systems, 35, 21534-21547 (NeurIPS2022).

- [4] Dong, X., Chu, T., Huang, T., **Ji, Z.**, & Wu, S. (2021). Noisy adaptation generates lévy flights in attractor neural networks. *Advances in Neural Information Processing Systems*, 34, 16791-16804 (NeurIPS2021).
- [5] **Ji, Z.**, Zou, X., Lin, X., Liu, X., Huang, T., & Wu, S. (2020, August). An attention-driven two-stage clustering method for unsupervised person re-identification. In *European Conference on Computer Vision* (pp. 20-36). Cham: Springer International Publishing (ECCV2020).
- [6] Liu, X., Zou, X., **Ji, Z.**, Tian, G., Mi, Y., Huang, T., ... & Wu, S. (2019). Push-pull feedback implements hierarchical information retrieval efficiently. *Advances in neural information processing systems*, 32 (NeurIPS2019).

Other papers

- [1] Marshall, C.*, **Ji, Z.***, & Burgess, N. (2025) Efficient Spatial Learning in the Hippocampus via Left-Right Theta Sweeps in the Entorhinal Cortex. *Cognitive Computational Neuroscience Conference (CCN2025)*.
- [2] Wang, C., Jiang, Y., Liu, X., Lin, X., Zou, X., **Ji, Z.**, & Wu, S. (2021). A just-in-time compilation approach for neural dynamics simulation. In *Neural Information Processing: 28th International Conference, ICONIP 2021, Sanur, Bali, Indonesia, December 8–12, 2021, Proceedings, Part III 28* (pp. 15-26). Springer International Publishing.
- [3] Zou, X.*, **Ji, Z.***, Liu, X., Huang, T., Mi, Y., Wang, D., & Wu, S. (2018). Learning, storing, and disentangling correlated patterns in neural networks. In *Neural Information Processing: 25th International Conference, ICONIP 2018, Siem Reap, Cambodia, December 13–16, 2018, Proceedings, Part III 25* (pp. 506-514). Springer International Publishing. (Best paper award).
- [4] **Ji, Z.**, Zou, X., Liu, X., Huang, T., Mi, Y., & Wu, S. (2018). Neural information processing in hierarchical prototypical networks. In *Neural Information Processing: 25th International Conference, ICONIP 2018, Siem Reap, Cambodia, December 13–16, 2018, Proceedings, Part III 25* (pp. 603-611). Springer International Publishing.
- [5] Zou, X.*, **Ji, Z.***, Liu, X., Mi, Y., Wong, K. M., & Wu, S. (2017). Learning a continuous attractor neural network from real images. In *Neural Information Processing: 24th International Conference, ICONIP 2017, Guangzhou, China, November 14–18, 2017, Proceedings, Part IV 24* (pp. 622-631). Springer International Publishing.
- [6] Rasch, M. J., Shi, A., & **Ji, Z.** (2016). Closing the loop: tracking and perturbing behaviour of individuals in a group in real-time. *bioRxiv*, 071308.

CONFERENCE POSTERS

Cosyne26, Lisbon: Dorso-ventrally increasing theta-sweep angles reflect firing rate adaptation and efficient sampling.

Cosyne26, Lisbon: A hierarchical attractor network of the subicular-entorhinal-hippocampal circuitry explains goal-directed hippocampal theta sweeps

Cosyne26, Lisbon: Goal-directed theta sweeps explain field shifts in vector trace cells

Cosyne26, Lisbon: Cognitive map restructuring along the hippocampal-entorhinal pathway in goal-directed navigation

CCN25, Amsterdam: An Entorhinal-hippocampal Systems Model for Spatial Navigation and Memory.

CCN25, Amsterdam Alternating left-right theta sweeps in the entorhinal cortex as a candidate mechanism for efficient learning of hippocampal spatial maps.

UKNC25, London Theta sweeps along the Papez's circuit

BernsteinConference22, Berlin An encoding-production model for disentangling linear and angular errors in path integration in healthy ageing and Alzheimer's disease.

Cosyne24, Lisbon More Diffusive Replay Sequences Correlate with Longer Theta Sequences in the Hippocampus.

NeurIPS22, Virtual Oscillatory Tracking of Continuous Attractor Neural Networks Account for Phase Precession and Procession of Hippocampal Place Cells

Cosyne22, Lisbon Computational modeling of generating fruitful spatiotemporal dynamics during hippocampal replay

NeurIPS21, Virtual Noisy Adaptation Generates Lévy Flights in Attractor Neural Networks

INVITED TALKS

2026.5 Hippocampal Green Meeting, Barcelona, Spain

2026.2 Gordon Research Seminar (GRS) on Thalamocortical Interactions, Lucca, Italy

2025.12 Exploring the frontiers of brain science and brain-inspired intelligence (organized by Nature Portfolio), Beijing, China.

2025.10 UCL Sainsbury Wellcome Centre lunch lab meeting, London, UK

2025.6 The Gerald Choa Neuroscience Institute(GCNI) Rising Stars Symposium, Hongkong

2025.5 The Spring Hippocampal Research Conference, Verona, Italy

2022.6 The 4th Chinese Computational & Cognitive Neuroscience Conference, Virtual

AD HOC REVIEWER

Journals Nature Communications, Science Advances, PLOS Computational Biology, eLife, Alzheimer's & Dementia, Scientific Reports

Conferences NeurIPS, ICML, ICLR, AAAI, CCN, COSYNE.

SUPERVISED STUDENTS

2025.10 – present Krishna Gorantla — MSc student, UCL Division of Psychology and Language Sciences (1 month). Machine learning project.

2025.5 – present Huiwen Zhang — MRes student, UCL Division of Psychiatry (6 months). Large-scale neural data analysis project.

2025.6 – 9 Rokas Stonis — PhD student, UCL Sainsbury Wellcome Centre (3 months). Computational neuroscience project.

2025.8 – 11 Athina Apostolelli — PhD student, UCL Sainsbury Wellcome Centre (3 months). Computational neuroscience project.

2024 – 2025 Callum Marshall — MSc student, UCL Research Department of Neuroscience, Physiology and Pharmacology (1 year). Computational neuroscience project.

2024 – 2025 William Swift — MSc student, UCL Division of Psychology and Language Sciences (1 year). Computational neuroscience project.

2021 – 2025 Tianhao Chu — PhD student, Peking University (5 years). Computational neuroscience project.

TEACHING

2025/26 Teaching NEUR0016: Neural Computation: Models of Brain Function 25/26, University College London.

2024/25 Hosting student presentation for NEUR0016: Neural Computation: Models of Brain Function 24/25, University College London.

2023/24 Hosting student presentation for NEUR0016: Neural Computation: Models of Brain Function 23/24, University College London.

June 2021 Teaching at Computational and Cognitive Neuroscience Summer School, Cold Spring Harbor Asia, Suzhou, China

ACTIVITIES

2025 Co-organizer of the UCL NeuroAI Annual Meeting.

PROFILES

Twitter	https://x.com/zilong_ji
Bluesky	@zilong-j.bsky.social
Github	https://github.com/ZilongJi
Homepage	https://profiles.ucl.ac.uk/94615-zilong-j/publications

REFEREES

Neil Burgess, Professor, UCL, n.burgess@ucl.ac.uk (Postdoctoral mentor)

Si Wu, Professor, Peking University, si.wu@pku.edu.cn (PhD supervisor)