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Qihong Lu

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Research Interests

Using artificial neural networks as model organisms to study computational principles of learning and memory.

Academic Positions

2023/12-present **Alan Kanzer Postdoctoral Fellow**
The Mortimer B. Zuckerman Mind Brain Behavior Institute, Columbia University
Center for Theoretical Neuroscience, Columbia University .
Advisors: Daphna Shohamy, Stefano Fusi

2023/06-12 **Postdoctoral Research Associate** (transitional position)
Princeton Neuroscience Institute (PNI), Princeton University.
Advisor: Kenneth A. Norman

Education

2017-2023 **Ph.D. & M.A., Cognitive Psychology**
Princeton University.
Advisors: Kenneth A. Norman, Uri Hasson
Dissertation Committee: Thomas L. Griffiths, Samuel J. Gershman, Jeffrey M. Zacks

2013-2017 **B.S., Mathematics & Psychology; Certificate in Computer Science**
University of Wisconsin-Madison.
Graduated with Comprehensive Honors (college-level highest honors)
Advisor: Timothy T. Rogers

Research Internships

2022/05-09 **Research Scientist Intern**, **CTRL-labs, Reality Labs, Meta**.
Computational modeling and machine learning for wrist-based EMG neural interfaces.
Managers: Abigail Russo, Diogo Peixoto & David Sussillo

2015/05-09, 2016/05-09 **Research Intern**, **The Parallel Distributed Processing Lab, Stanford University**.
Neural network modeling of mathematical cognition.
Advisor: James L. McClelland

Papers & Preprints (∗: undergraduate mentee)

Dong, V. C., **Lu, Q.**, Norman, K. A. & Michelmann, S. (under revision). Towards Large Language Models with Human-Like Episodic Memory.

Lu, Q., Hummos, A., & Norman, K. A. (2024). Episodic memory supports the acquisition of structured task representations. Proceedings of the Annual Meeting of the Cognitive Science Society 46 (46).

Lu, Q., Nguyen, T., Zhang, Q., Hasson, U., Griffiths, T. L., Zacks, J. M., Gershman, S. J., & Norman, K. A. (2024). Reconciling shared versus context-specific information in a neural network model of latent causes. Scientific Reports. 14(1), 1-15.

Lu, Q., Hasson, U., & Norman, K.A. (2022). A neural network model of when to retrieve and encode episodic memories. eLife, 11, e74445.

Kumar, M., Anderson, M.J., Antony, J.W., Baldassano C., Brooks, P.P., Cai, M.B., Chen, P.H.C., Ellis, C.T., Henselman-Petrusek, G., Huberdeau, D., Hutchinson, J.B., Li, P.Y., **Lu, Q.**, Manning, J.R., Mennen, A.C., Nastase, S.A., Hugo, R., Schapiro, A.C., Schuck, N.W., Shvartsman, M., Sundaram, N., Suo, D., Turek, J.S., Vo, V.A., Wallace, G., Wang, Y., Zhang, H., Zhu, X., Capota, M., Cohen, J.D., Hasson, U., Li, K., Ramadge, P.J., Turk-Browne, N.B., Willke, T.L. & Norman, K.A. (2022). BrainIAK: The Brain Imaging Analysis Kit. Aperture Neuro, 1(4).

Rogers, T. T., Cox, C., **Lu, Q.**, Shimotake, A., Kikuch, T., Kunieda, T., Miyamoto, S., Takahashi, R., Ikeda, A., Matsumoto, R., & Lambon Ralph, M. A. (2021). Evidence for a deep, distributed and dynamic semantic code in human ventral anterior temporal cortex. eLife, 10, e66276.

Chen, C.*, **Lu, Q.**, Beukers, A., Baldassano, C., & Norman, K. A. (2021). Learning to perform role-filler binding with schematic knowledge. PeerJ, 9, e11046.

Kumar, M., Ellis, C. T., **Lu, Q.**, Zhang, H., Capotă, M., Willke, T. L., Ramadge, P. J., Turk-Browne, N. B., & Norman, K. A. (2020). BrainIAK tutorials: User-friendly learning materials for advanced fMRI analysis. PLoS Computational Biology, 16(1), e1007549.

Lu, Q., Chen, P. H., Pillow, J. W., Ramadge, P. J., Norman, K. A., & Hasson, U. (2018). Shared representational geometry across neural networks. Workshop on Integration of Deep Learning Theories, 32nd Conference on Neural Information Processing Systems (NeurIPS).

McClelland, J. L., Mickey, K., Hansen, S., Yuan, X., & **Lu, Q.** (2016). A Parallel-Distributed Processing approach to mathematical cognition. Manuscript, Stanford University.

External Talks

2025/04 Department of Psychology, The University of Hong Kong. Host PI: Xiaoqing Hu

2025/04 Affective, Neuroscience, and Decision-making Lab, University of Macau. PI: Haiyan Wu

2025/04 Department of Psychology, Chinese University of Hong Kong. Host PI: Xiaonan Liu

2025/03 Laboratory of Cognitive Computational Neuroscience and Neuroimaging, Shanghai Jiao Tong University. PI: Ru-Yuan Zhang

2025/03 NYUConcats seminar, Psychology Department, New York University

2025/02 Department of Neuroscience, City University of Hong Kong

2024/12 The School of Psychology and Cognitive Science, East China Normal University

2024/12 Kwok Lab, Duke Kunshan University, PI: Sze Chai Kwok

2024/10 Nanosymposium on Value-Based Decision Making Across Model Systems, Society for Neuroscience (SfN)

2024/07 Annual Meeting of the Cognitive Science Society (Cogsci)

2024/06 Manhattan Area Memory Meeting, Yale University

2024/05 Context and Episodic Memory Symposium (CEMS), University of Pennsylvania

2024/04 Tianqiao and Chrissy Chen Institute, Shanghai. Host: Haiyang Geng

2023/11 Mattar Lab. New York University. PI: Marcelo Mattar

2023/10 Department of Psychology, The University of Hong Kong. Host PI: Xiaoqing Hu

2023/09 Shohamy Lab. Columbia University. PI: Daphna Shohamy

2022/03 Computational Cognitive Neuroscience Lab. University of Pennsylvania. PI: Anna Schapiro

2022/02 State Key Laboratory of Cognitive Sciences and Learning. Beijing Normal University. PI: Yunzhe Liu

2022/02 Mila Neural-AI Reading Group. Mila - Quebec AI Institute

2021/07 Honey Lab & Chen Lab. Johns Hopkins University. PI: Chris Honey & Janice Chen

2021/07 Contextual Dynamics Lab. Dartmouth College. PI: Jeremy Manning

2021/06 Oxford Neurotheory Lab. University of Oxford. PI: Andrew Saxe

2021/03 Google DeepMind. PI: Matthew Botvinick

2021/03 Invited Symposium on How Prior Knowledge Shapes Encoding of New Memories. Cognitive Neuroscience Society Annual Meeting (CNS)

2021/02 Dynamic Memory Lab. University of California, Davis. PI: Charan Ranganath

2020/08 Context and Episodic Memory Symposium (CEMS), University of Pennsylvania

2020/03 Neuromatch Conference (NMC)

Conference Proceedings (∗: undergraduate mentee)

Li, M., Jensen T.K., **Lu, Q.**, Mattar M.G. (2025). A neural network model of flexible decision-making with episodic memory. Multidisciplinary Conference on Reinforcement Learning and Decision Making.

Lu, Q., Norman, K. A., & Shohamy, D. (2024). A Normative Account of the Influences of Contextual Familiarity and Novelty on Episodic Memory Policy. Conference on Cognitive Computational Neuroscience.

Li, M., Jensen T.K., **Lu, Q.**, Zhang, Q., Mattar M.G. (2024). Modeling Multiplicity of Strategies in Free Recall with Neural Networks. Conference on Cognitive Computational Neuroscience.

Lu, Q., Hummos, A., & Norman, K. A. (2024). Episodic memory supports the acquisition of structured task representations. Proceedings of the Annual Meeting of the Cognitive Science Society 46 (46).

Lu, Q., Nguyen, T., Hasson, U., Griffiths, T. L., Zacks, J. M., Gershman, S. J., & Norman, K. A. (2023). Toward a more neurally plausible neural network model of latent cause inference. Conference on Cognitive Computational Neuroscience.

Dong, C., **Lu, Q.**, & Norman, K. A. (2023). Strategic control of episodic memory through post-gating. Conference on Cognitive Computational Neuroscience.

Lu, Q., Fan, Z. Y.*, Hasson, U., & Norman, K. A. (2019) Optimal timing for episodic retrieval and encoding for event understanding. Conference on Cognitive Computational Neuroscience.

Lu, Q., Chen, P. H., Pillow, J. W., Ramadge, P. J., Norman, K. A., & Hasson, U. (2018). Shared Representational Geometry Across Neural Networks. The workshop on Integration of Deep Learning Theories, Neural Information Processing Systems (NeurIPS).

Lu, Q., Hasson, U., & Norman, K. A. (2018). Modeling hippocampal-cortical dynamics during event processing. Conference on Cognitive Computational Neuroscience.

Yu, J.* **Lu, Q.**, Hasson, U., Norman, K. A., & Pillow, J. W. (2018). Performance optimization is insufficient for building accurate models for neural representation. Conference on Cognitive Computational Neuroscience.

Chen, C.*, **Lu, Q.**, Beukers, A. Baldassano, C., & Norman, K.A. (2018). Generalized schema learning by neural networks. Conference on Cognitive Computational Neuroscience.

Honors, Awards & Fellowships

2023-2026 **Alan Kanzer Postdoctoral Fellowship**, Columbia University.
$80,000 annual costs

2021-2022 **Graduate Student Fellowship in Cognitive Science**, Princeton University.

2021 **Certificate of Excellence**, for teaching a Deep learning course, NeuromatchAcademy.

2018 **Charles W. Lummis Scholarship**, Princeton University.

2017 **First Year Fellowship in Natural Sciences and Engineering**, Princeton University.

2017 **College of Letters & Science Dean's Prize**, UW-Madison.
The highest undergraduate honor awarded by the dean to the three most academically outstanding students of the 2017 class.

2017 **Undergraduate Academic Achievement Award**, UW-Madison.

2017 **Outstanding Undergraduate Research Scholar Award**, UW-Madison.
Department level nomination-based award; Department of Psychology

2016 **David H. Durra Scholarship**, UW-Madison.
High achieving student in physical sciences or mathematics.

2016 **Undergraduate Travel Awards**, UW-Madison.

2015 **Hilldale Undergraduate Research Fellowship**, UW-Madison.
$4,000 of research funds

2015 **Phi Beta Kappa as a Junior**, UW-Madison.

2015 **Bromley Research Conference Travel Grant**, UW-Madison.

2015 **Stanford CSLI Summer Research Internship**, Stanford University.

2014, 2015 **Undergraduate Research Scholar Award**, UW-Madison.
Nominated by Dr.Maryellen MacDonald & Dr.Timothy Rogers

2014 **Welton Summer Sophomore Research Grant**, UW-Madison.
$2,500 of research funds

2014 **International Undergraduate Writing Contest 3rd Place**, UW-Madison.

2014 **Margaret E. and Allard Smith Scholarship**, UW-Madison.
High achieving first-year student

Teaching

2025/04 **Guest lecturer**, Neural network models of human memory.
Memory model workshop at Hong Kong University

2021/07-08 **TA**, Deep Learning.
Neuromatch Academy

2021 Spring, 2018 Fall **TA**, ELE|NEU|PSY 480 fMRI Decoding: Reading Minds Using Brain Scans.
Prof: Ken Norman & Peter Ramadge; Princeton University

2020 Spring, 2018 Spring **TA**, NEU 350 Laboratory in Principles of Neuroscience (2-week fMRI lab).
Prof: Alan Gelperin & Anthony Ambrosini; Princeton University

2019 Spring **TA**, NEU|PSY 330 Computational Modeling of Psychological Function.
Prof: Jon Cohen; Princeton University

2019/11, 2019/01 **Guest lecturer**, Functional Alignment for fMRI data.
BrainIAK workshop at Princeton University

2018/08 **Guest lecturer**, Introduction to Multivariate Pattern Analysis.
BrainIAK workshop at Princeton University

Research Mentoring

PhD students, co-mentored with other PIs

2024- Christopher Iyer, PhD student in Psychology, Columbia University

2023- Moufan Li, PhD student in Psychology, NYU

2023- Yukang Yang, PhD student in Electrical and Computer Engineering, Princeton

2023- Ariadne Letrou, PhD student in Psychology, Princeton

2022-2023 Cody Dong, PhD student in Psychology, Princeton

Undergraduate students

2020-2021 Carson Wardell, undergraduate senior thesis in Neuroscience, Princeton.

2018-2019 Kathy Fan, undergraduate senior thesis in Computer Science, Princeton.

2018 Noam Miller, summer research intern, Princeton.

2017-2018 Catherine Chen, undergraduate senior thesis in Computer Science, Princeton.

Ad Hoc Review

Journal
- Nature Communications
- Communications Psychology
- Journal of Cognitive Neuroscience
- Scientific Reports
- Neurobiology of Learning and Memory
- ReScience

Conference
- Conference on Cognitive Computational Neuroscience (CCN)
- Annual Meeting of the Cognitive Science Society (CogSci)
- Neural Information Processing Systems (NeurIPS)
- International Conference for Learning Representations (ICLR)
- Conference on the Mathematical Theory of Deep Neural Networks (DeepMath)

Service

2024, 2025 **Judge**, Princeton Research Day, Princeton.

2024 **Organizer**, Manhattan Area Memory Meeting, Yale University.

2023 **Application Mentor**, Graduate Program Application Support Group, Empowering Diversity and Promoting Scientific Equity, Princeton Neuroscience Institute.

2020-2023 **Contributor/Code reviewer**, Brain Imaging Analysis Kit, PNI-Intel collaboration.
Contributed to the shared response model and intersubject correlation methods; code review

2019-2023 **Photographer**, in collaboration with the Princeton Office of Communications.
Works featured at Princeton University Website (e.g., 1, 2, 3), Official Princeton Social Media (e.g., 1, 2, 3), Princeton Alumni Weekly (e.g., 1, 2, 3), etc. Here's my online gallery.

2020-2021 **Committee Member**, Psychology Graduate Student Committee, Princeton.
Co-initiated a peer-mentoring program to support first-year graduate students during COVID19.

2018-2021 **Organizer**, The Parallel Distributed Processing (PDP) meeting, Princeton.

2020 **Organizer**, Conference on the Mathematical Theory of Deep Neural Networks.

2014-2017 **Student Representative**, Faculty Honors Committee, UW-Madison.
Reviewed scholarship, research grant applications, and updates in Honors program policy.

2013-2014 **Tutor for Mathematics**, Greater University Tutoring Service, UW-Madison.

Open Source Contributions

Software
- BrainIAK: Advanced neuroimaging data analyses in python
- PsyNeuLink: Neuro/cognitive computational modeling in python

Dataset
- META: a controlled naturalistic video dataset for studying event cognition

Technical Skills

Python (pytorch), Psychopy and Pavlovia, Git, bash script, LaTeX,
Adobe Photoshop & Lightroom

Languages

Mandarin Chinese (native), English

References

Kenneth A. Norman[1,2] Ph.D. advisor, primary
knorman@princeton.edu
Huo Professor in Computational and Theoretical Neuroscience
Princeton University

Uri Hasson[1,2] Ph.D. advisor, secondary
hasson@princeton.edu
Professor
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Daphna Shohamy[3, 4, 5] Postdoctoral advisor
ds2619@columbia.edu
Director and CEO of Zuckerman Institute; Kavli Professor of Brain Science
Columbia University

Stefano Fusi[3, 4, 6, 7] Postdoctoral advisor
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4: Kavli Institute for Brain Science, Columbia University
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