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GitHub Website: github.com/ZitongLu1996

Zitong Lu 路子童

(Update by 01/2025)

Education & Training

Massachusetts Institute of Technology — Boston, MA, USA
Postdoctoral Research Fellow, McGovern Institute of Brain Research — 2025 –
*Supported by Lore Harp McGovern 25th Anniversary Postdoctoral Fellowship
Advised by Nancy Kanwisher & Evelina Fedorenko

The Ohio State University — Columbus, OH, USA
Ph.D. in Cognitive Neuroscience, Dept of Psychology — 2021 – 2025
Graduate Minor in Statistics, Dept of Statistics
M.S. in Psychology, Dept of Psychology
Advised by Julie Golomb

East China Normal University — Shanghai, China
M.S. in Cognitive Neuroscience, School of Psychology and Cognitive Science — 2018 – 2021
Advised by Yixuan Ku, Yong-Di Zhou & Huimin Wang

Northeastern University — Shenyang, China
B.E. in Software Engineering, Dept of Software Engineering — 2014 – 2018

Research Interests

(1) **Neural and behavioral mechanisms of visual perception**:
(A) Behavioral mechanisms of object-location binding across eye-movements; (B) Neural mechanisms of depth and 3D perception; (C) Visual and semantic representations in human brains.

(2) **Mapping representations between human brains and artificial neural networks**:
(A) Brain-like artificial neural networks via neural alignment; (B) Image-to-Brain encoding models; (C) Inter-individual neural converters; (D) Reverse engineering to interpret neural mechanisms.

(3) **Shared representations between visual and language**.

Using behavior, Eye-tracking, EEG, fMRI and computational methods (MVPA, RSA, IEM), and artificial deep neural networks (CNN, VAE, GAN, CLIP, Diffusion Model).

Publications

(Google Scholar: https://scholar.google.com/citations?hl=en&user=bE5VCKsAAAAJ)
*: (co-)first author; Ψ: corresponding author

Manuscripts under review / preprints:

18. **Lu, Z*Ψ**., & Wang, Y. (In revision in *Cognitive Neurodynamics*). Teaching CORnet human fMRI representations for enhanced model-brain alignment. Preprint on ***Arxiv***: https://doi.org/10.48550/arXiv.2407.10414

17. **Lu, Z*Ψ**., Wang, Y., & Golomb, J.D. (In revision in *Communications Biology*). Achieving More Human-Brain Like Vision via Human EEG Representational Alignment. Preprint on ***Arxiv***: https://doi.org/10.48550/arXiv.2401.17231

16. Zhang, M*., **Lu, Z**., Lin, Q., Weng, X., Zhou, Y., Ma, W., Li, X., Otani, SΨ., & Wang, ZΨ. (Submitted). Transcultural differences in neural representations of the Theory of Mind between Chinese and Japanese.

15. Zhang, M*., **Lu, Z***., Su, H., Kwok, S.CΨ., Li, XΨ., & Wang, ZΨ. (Submitted). Musical expertise attenuates cross-modal fast-"same" effect of pitches: an ERP study. Preprint on ***PsyArXiv***: https://doi.org/10.31234/osf.io/w74n

Published / accepted articles:

14. Ran, M*., **Lu, ZΨ**., & Golomb, J.D. (In press). The influence of a moving object's location on object identity judgements. ***Journal of Experimental Psychology: Human Perception and Performance***. Preprint on ***PsyArXiv***: http://doi.org/10.31234/osf.io/dcrhu

13. **Lu, Z*Ψ**., & Golomb, J.D. (2024 Accepted, Reviewed Preprint). Human EEG and artificial neural networks reveal disentangled representations of object real-world size in natural images. ***eLife***. Reviewed preprint: https://doi.org/10.7554/eLife.98117.1

12. **Lu, Z*Ψ**., Li, W., Nie, L., & Zhao, K. (2024). A Best Practices Handbook for EEG Data Analysis with Python. ***Brain-X***, 2(2), e64. https://doi.org/10.1002/brx2.64

11. **Lu, Z*Ψ**., & Golomb, J.DΨ. (2024). Dynamic saccade context triggers more stable object-location binding. ***Journal of Experimental Psychology: General***, 153(4), 873-888. (**APA "Editor's Choice" paper!**) https://doi.org/10.1037/xge0001545

10. Clayson, P.E., …, **Lu, Z**., …, Langer. N. (2023 Accepted, Stage 1 Registered Replication). Contralateral delay activity as a marker of visual working memory capacity: a multi-site registered replication. ***Cortex***. Preprint on *PsyArXiv*: https://doi.org/ 10.31234/osf.io/shdea

9. **Lu, Z***., & Ku, YΨ. (2023). Bridging the Gap between EEG and DCNNs Reveals a Fatigue Mechanism of Facial Repetition Suppression. ***iScience***. 26(12), 108501. https://doi.org/10.1016/j.isci.2023.108501

8. **Lu, Z*Ψ**. (2023). Visualizing the Mind's Eye: A Future Perspective on Applications of Image Reconstruction from Brain Signals to Psychiatry. ***Psychoradiology***. kkad022. https://doi.org/10.1093/psyrad/kkad022

7. **Lu, Z***., & Ku, YΨ. (2020). NeuroRA: A Python toolbox of representational analysis from multi-modal neural data. ***Frontiers in Neuroinformatics***. 14: 563669. https://doi.org/10.3389/fninf.2020.563669

Proceedings papers:

6. Chen, Z*Ψ., Chen, S*Ψ., …, **Lu, Z.**, …, & Sun, HΨ. (2025). ScienceAgentBench: Toward Rigorous Assessment of Language Agents for Data-Driven Scientific Discovery. ***Proceedings of the 12th International Conference on Learning Representations (ICLR 2025).*** https://openreview.net/forum?id=6z4YKr0GK6
5. **Lu, ZΨ.**, Wang, Y., & Golomb, J.D. (2024). ReAlnet: Achieving More Human Brain-Like Vision via Human Neural Representational Alignment. ***Proceedings of the Conference on Cognitive Computational Neuroscience 2024 (CCN 2024).*** https://2024.ccneuro.org/pdf/88_Paper_authored_ReAlnet_CCN2024_Authored.pdf
4. **Lu, Z*Ψ.**, & Golomb, J.D. (2024). Probing Human Vision via an Image-to-EEG Encoding Model. ***Proceedings of the Conference on Cognitive Computational Neuroscience 2024 (CCN 2024).*** https://2024.ccneuro.org/pdf/337_Paper_authored_Img2EEG_CCN2024_Authored.pdf
3. **Lu, Z*.**, & Golomb, J.D. (2023). Object real-world size representations in human brains and artificial neural networks. ***Proceedings of the Conference on Cognitive Computational Neuroscience 2023 (CCN 2023).*** https://2023.ccneuro.org/proceedings/0000909.pdf
2. **Lu, Z*.**, & Golomb, J.D. (2023). Generate your neural signals from mine: individual-to-individual EEG converters. ***Proceedings of the 45th Annual Meeting of the Cognitive Science Society (CogSci 2023)***. https://escholarship.org/uc/item/5xn0885t
1. **Lu, Z*.**, Shafer-Skelton, A., & Golomb, J.D. (2022). Gaze-centered spatial representations in human hippocampus. ***Proceedings of the Conference on Cognitive Computational Neuroscience 2022 (CCN 2022)***. https://2022.ccneuro.org/proceedings/0000614.pdf

In preparation:

Lu, Z*Ψ., & Golomb, J.D. (in preparation). The influence of task-irrelevant landmarks on spatiotopic localization and object-location binding.

Zeng, Y*Ψ., **Lu, Z.**, & Osher, D.E. (in preparation). Isolated Configuration: Holistic Processing Beyond the Realm of Faces.

Chiu, T-Y*Ψ., **Lu, Z.**, & Golomb, J.D. (in preparation). Dynamic Read-Out of Transsaccadic Attentional Remapping from Alpha Band Oscillation.

Lu, Z*Ψ., & Golomb, J.D. (in preparation). Exploring human vision through Img2EEG: An encoding framework generating high-resolution temporal EEG signals from visual inputs.

Lu, Z*Ψ., & Golomb, J.D. (in preparation). Unfolding spatiotemporal representations of 3D perception based on a large fMRI-EEG dataset.

Presentations

05/2025 Vision Sciences Society (VSS) 2025
[Submitted] Unfolding the spatiotemporal neural mechanisms of 3D perception in the human brain: an fMRI-EEG fusion study
05/2025 Vision Sciences Society (VSS) 2025
[Submitted] Dynamic Read-Out of Transsaccadic Attentional Remapping from Alpha Band Oscillation
12/05/2024 OSU CCBBI Research Day 2024
[Poster] Unfolding the spatiotemporal neural mechanisms of 3D perception in the human brain: an fMRI-EEG fusion study

11/22/2024 CogNeuro Prosem, OSU
[Talk] Bridging the Gap between Brain and AI in Visual Perception
10/11/2024 CogPsy Colloquium, Vrije Universiteit Amsterdam
[Invited Talk (Virtually)] Probing Human Vision: Mapping Representations between Human Brains and Artificial Neural Networks
10/02/2024 EvLab, MIT
[Invited Talk (Virtually)] Mapping Representations between Visual Inputs, Human Brains, and Artificial Neural Networks
09/13/2024 OSU CCBS Retreat 2024
[Poster] ReAlnet: Achieving More Human Brain-Like Vision via Human Neural Representational Alignment
08/09/2024 Cognitive Computational Neuroscience (CCN) 2024
[Poster] ReAlnet: Achieving More Human Brain-Like Vision via Human Neural Representational Alignment
08/07/2024 The Kanwisher Lab, MIT
[Invited Talk] Cognitive Computational Neuroscience in Visual Perception from Experiments and Computations
08/06/2024 Cognitive Computational Neuroscience (CCN) 2024
[Poster] Probing Human Vision via an Image-to-EEG Encoding Model
07/29/2024 ZJU Cognition & AI Summer School 2024
[Invited Talk (Virtually)] Exploring Human Visual Mechanisms: Integrating Human EEG and Artificial Neural Networks
06/30/2024 SJTU Brain Facts Summer School 2024
[Invited Talk (Virtually)] Bridging the Gap between Neuroscience and AI in Visual Perception
06/17/2024 School of Psychology and Cognitive Science, East China Normal University
[Invited Talk] Bridging the Gap between Neuroscience and AI in Visual Perception
06/15/2024 TCCI-NeuroChat 神聊 2024
[Invited Talk] Exploring human vision through Img2EEG: An encoding framework generating high-resolution temporal EEG signals from visual inputs
06/14/2024 School of Science, Zhejiang Sci-Tech University
[Invited Talk] Exploring Human Visual Mechanisms: Integrating Human EEG and Artificial Neural Networks
06/13/2024 School of Psychology, Nanjing Normal University
[Invited Talk] Bridging the Gap between Neuroscience and AI in Visual Perception
06/05/2024 School of Psychology, South China Normal University
[Invited Talk] Bridging the Gap between Neuroscience and AI in Visual Perception
06/04/2024 Faculty of Arts and Sciences, Beijing Normal University (Zhuhai)
[Invited Talk] Spatiotopic and retinotopic object-location binding across saccades in a more dynamic context
06/03/2024 Memory and Emotion Lab, Sun Yat-sen University
[Invited Talk] Spatiotopic and retinotopic object-location binding across saccades in a more dynamic context
05/31/2024 School of Psychology, Shenzhen University
[Invited Talk] Exploring Human Visual Mechanisms: Integrating Human EEG and Artificial Neural Networks
05/20/2024 Vision Sciences Society (VSS) 2024
[Talk] Human EEG and artificial neural networks reveal disentangled representations of object real-world size in natural images
05/19/2024 Vision Sciences Society (VSS) 2024
[Poster] Object size and depth representations in human visual cortex
03/22/2024 CogNeuro Prosem, OSU
[Talk] Exploring human vision through Img2EEG: An encoding framework generating high-resolution temporal EEG signals from visual inputs
12/07/2023 OSU CCBBI Research Day 2023
[Talk] Object size and depth representations in human visual cortex
12/07/2023 OSU CCBBI Research Day 2023
[Poster] Human EEG and artificial neural networks reveal disentangled representations of object real-world size in natural images
10/18/2023 Dept of Biomedical Engineering, Tsinghua University
[Invited Talk (virtually)] Generate your neural signals from mine: individual-to-individual EEG converters
09/22/2023 OSU CCBS Retreat 2023
[Poster] Examining Hering's theory for color responses in human V1 and V4
09/22/2023 OSU CCBS Retreat 2023
[Poster] The influence of a moving object's location on object identity judgments
09/22/2023 OSU CCBS Retreat 2023
[Poster] The influence of task-irrelevant landmarks on spatiotopic localization and object-location binding
09/14/2023 Advanced Computational Neuroscience Network (ACNN) 2023
[Poster] Generate your neural signals from mine: individual-to-individual EEG converters

08/26/2023 Cognitive Computational Neuroscience (CCN) 2023
[Poster] Object real-world size representations in human brains and artificial neural networks
07/2023 Annual Meeting of the Cognitive Science Society (CogSci) 2023
[Poster (virtually)] Generate your neural signals from mine: individual-to-individual EEG converters
07/2023 Eye Movements Gordon Research Conference 2023
[Poster] Dynamic saccade context triggers more stable object-location binding
07/2023 Eye Movements Gordon Research Seminar 2023
[Poster] Dynamic saccade context triggers more stable object-location binding
05/23/2023 Vision Sciences Society (VSS) 2023
[Poster] A novel framework to study configural and holistic processing
05/23/2023 Vision Sciences Society (VSS) 2023
[Poster] Examining Hering's theory for color responses in human V1 and V4
05/21/2023 Vision Sciences Society (VSS) 2023
[Poster] The influence of a moving object's location on object identity judgments
05/20/2023 Vision Sciences Society (VSS) 2023
[Poster] The influence of task-irrelevant landmarks on spatiotopic localization and object-location binding
04/21/2023 OSU CCBBI Student Workshop
[Talk] Decode brain representations based on Python
03/31/2023 CogNeuro Prosem, OSU
[Talk] Generate your neural signals from mine: individual-to-individual EEG converters
03/08/2023 CogPsy Prosem, OSU
[Talk] Object real-world size representations in human brains and artificial neural networks
12/31/2022 The 2nd Neural Network Interdisciplinary Forum 2022
[Talk (virtually)] Facial representation comparisons between human brain and hierarchical deep convolutional neural network reveal a fatigue repetition suppression mechanism
11/12/2022 Society of Neuroscience (SFN) 2022
[Poster] Dynamic saccade context triggers more stable object-location binding
10/22/2022 OSU CCBS Retreat 2022
[Talk] Dynamic saccade context triggers more stable object-location binding
08/27/2022 Cognitive Computational Neuroscience (CCN) 2022
[Poster] Gaze-centered spatial representations in human hippocampus
05/17/2022 Vision Sciences Society (VSS) 2022
[Talk] Dynamic saccade context triggers spatiotopic object-location binding
04/15/2022 CogNeuro Prosem, OSU
[Talk] Dynamic saccade context triggers spatiotopic object-location binding
12/06/2021 OSU CCBBI Research Day 2021
[Talk] Gaze-centered spatial representations in human hippocampus
11/11/2021 Society of Neuroscience (SFN) 2021
[Poster (virtually)] Representation comparisons between human brain and hierarchical deep convolutional neural network in face perception reveal a fatigue mechanism of repetition suppression
08/27/2021 The European Conference on Visual Perception (ECVP) 2021
[Poster (virtually)] Representation comparisons between human brain and hierarchical deep convolutional neural network in face perception reveal a fatigue mechanism of repetition suppression
06/27/2021 Centre for Cognition and Brain Science, University of Macau
[Invited Talk (virtually)] Using computational methods to explore the neural representational mechanism in cognitive neuroscience
06/08/2021 UNIQUE Student Symposium 2021
[Talk (virtually)] Representation comparisons between human brain and hierarchical deep convolutional neural network in face perception reveal a fatigue mechanism of repetition suppression
12/28/2020 Dept of Biomedical Engineering, UESTC
[Invited Talk (virtually)] Representational Analysis for Cognitive Neuroscience based on NeuroRA
12/17/2020 Dept of Biomedical Engineering, Shenzhen University
[Invited Talk] Representational Analysis for Cognitive Neuroscience based on NeuroRA

Toolboxes & Tutorials

NeuroRA toolbox:

https://zitonglu1996.github.io/NeuroRA (177 stars on GitHub!)

Citation: Lu, Z., & Ku, Y. (2020). NeuroRA: A Python toolbox of representational analysis from multi-modal neural data. *Frontiers in Neuroinformatics*. 14:563669. https://doi.org/10.3389/fninf.2020.563669

Python EEG data analysis handbook:

https://github.com/ZitongLu1996/Python-EEG-Handbook (54 stars on GitHub!)

Chinese version:

https://github.com/ZitongLu1996/Python-EEG-Handbook-CN (400 stars on GitHub!)

EEG2EEG:

https://github.com/ZitongLu1996/EEG2EEG (25 stars on GitHub!)

Citation: Lu, Z., & Golomb, J.D. (2023). Generate your neural signals from mine: individual-to-individual EEG converters. *Proceedings of the 45th Annual Meeting of the Cognitive Science Society (CogSci 2023)*. https://escholarship.org/uc/item/5xn0885t

Programming & Experiment Skills

Computer Languages: Python, C, C++, MATLAB, Java, Julia
Software & Toolboxes: EEGLAB, MNE, SPM, FSL, Nibabel, Nilearn, NeuroRA, PyTorch
Experimental Experience: EEG, fMRI, Eye tracker and TMS

Working Experience

08/2022-
OSU EEG lab manager — Dept of Psychology, OSU

01/2024-
EEG Tech Search Committee — Dept of Psychology, OSU

08/2023-
CCBBI Technical Committee — Center for Cognitive and Behavioral Brain Imaging, OSU

08/2023-12/2023
Teaching Assistant (Co-Instructor) (PSYCH 5621 - Intro to ERP) — Dept of Psychology, OSU

08/2023-12/2023
Teaching Assistant (PSYCH 3310 – Sensation and Perception) — Dept of Psychology, OSU

08/2022-04/2023
Teaching Assistant (PSYCH 4510 - Cognitive Psychology Lab) — Dept of Psychology, OSU

09/2020-06/2021
Research Assistant — Brain-Like Memory Group, Peng Cheng Laboratory

05/2017-08/2017
Programmer (as Project Leader) — iSoftStone corporation

Mentoring

Mengxin Ran (undergrad student at The Ohio State University; now lab manager at Brown University w/ Oriel Feldmanhall)

Wanru Li (undergrad student at East China Normal University; now PhD student at Peking University w/ Pinglei Bao)

Honors & Awards

01/2025	Lore Harp McGovern 25th Anniversary Postdoctoral Fellowship (USD 100,000 * 2 years, MIT)
04/2024	Summer Research Excellence Awards (USD 6,500, OSU Dept of Psychology)
04/2022	CCBBI Gibson Research Award (USD 3,000, OSU CCBBI)
08/2021	University Fellowship (USD 30,000, OSU)
04/2021	Outstanding Graduate Student (3%, Department of Education of Shanghai City)
12/2019	Short-Term Overseas Research Scholarship (about USD 7,000, by ECNU)
12/2018	Third prize (30%, China Graduate Student Mathematical Contest in Modeling)
12/2017	Outstanding Graduate Student (3%, Department of Education of Liaoning Province)
11/2017	Second-Class Merit Scholarship (13%, by NEU)
04/2017	Meritorious Winner (13%, Mathematical Contest in Modeling, by the U.S COMAP)
12/2016	First-Class Liu Dajie & Fang Wenyu's Scholarship (<1%, USD 1500, by NEU)
11/2016	Provincial First Prize (3%, China Undergraduate Mathematical Contest in Modeling)
11/2016	First-Class Merit Scholarship (3%, by NEU)
04/2016	Honorable Mention (30%, Mathematical Contest in Modeling, by the U.S COMAP)
11/2015	Second-Class Merit Scholarship (13%, by NEU)

Ad Hoc Reviewer

Scientific Reports, Advances in Psychological Science, Conference on Cognitive Computational Neuroscience (CCN) 2022, Annual meeting of the cognitive science society (CogSci) 2023, Conference on Cognitive Computational Neuroscience (CCN) 2023, Cerebral Cortex, Experimental Brain Research, Heliyon, Neural Networks.

Collaborators & Close Friends

Yile Wang – The University of Texas at Dallas
Wanru Li – Peking University
Dr. Fan Cheng – Columbia University
Tzu-Yao Chiu – The Ohio State University
Yong Min Choi – The Ohio State University
Tianyu Zhang – The Ohio State University
Dr. David Osher – The Ohio State University
Yuxuan Zeng – The Ohio State University
Dr. Jin Li – Georgia Institute of Technology
Dr. Jiaqi Li – Peking University & University of Birmingham
Xianhui He – University of Oxford
Mengxin (AvA) Ran – Brown University
Eva Lout – University of Texas at Austin
Mingmin Zhang – University of Groningen
Dr. Yixuan Ku – Sun Yat-sen University
Lu Nie – Sun Yat-sen University
Dr. Qingrong Chen – Nanjing Normal University
Dr. Jingjing Zhang – Nanjing Normal University
Dr. Dongwei Li – Beijing Normal University