

Haoyang Lu

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Research interest

I am deeply engaged in computational psychiatry, using the methods of computational cognitive science to understand mental disorders. My doctoral research applied these methods to investigate information sampling in autistic individuals, for both children and adults. Currently, I am exploring why people develop and maintain superstitions despite encountering contradictory evidence. Looking ahead, I hope to advance computational psychiatry by developing sound and interpretable models and leveraging state-of-the-art AI to unravel the intricacies of mental disorders.

Employment

School of Psychological and Cognitive Sciences, Peking University

Postdoctoral Research Fellow, PI: Dr. Hang Zhang

2022 – Present

Conduct large-scale online experiments and use computational models to investigate the cognitive processes and influencing factors involved in the formation and updating of superstitious beliefs and the relationship with clinical/personality traits.

Education

Peking University

Beijing, China

PhD in Integrated Life Sciences (Psychology)

2016 – 2022

- Dissertation Title: *Inference and Decision-making in People with Autism Spectrum Disorder or Broader Autism Phenotype*
- Advisors: Dr. Li Yi, Dr. Hang Zhang
- Introduction: The core features of autism spectrum disorders (ASD) are believed to be pertinent to how individuals interact with and sample the world. Therefore, it is crucial to understand the outcome of atypical information sampling in ASD. For this interdisciplinary project, I conducted a series of studies on information sampling in both autistic children and adults with a broader autism phenotype. Using behavioral tasks, eye-tracking/pupillometry, and computational modeling, I uncovered distinct behavioral, attentional, and cognitive processes in autistic individuals compared to neurotypical people for both instrumental and non-instrumental information sampling.

Sun Yat-Sen University

Guangzhou, China

BSc in Psychology

2012 – 2016

- GPA: 3.98/4.00

Publications

Preprints or under review

1. **Lu, H.**, Zhang, H., & Yi, L. (2024). Beyond over- or under-sampling: Autistic children's inflexibility in sampling costly information (p. 2024.02.04.578786). bioRxiv. <https://doi.org/10.1101/2024.02.04.578786>
Submitted

Peer-reviewed journal articles

10. Ni, W., **Lu, H.**, Wang, Q., Song, C., Yi, L. (2023). Vigilance or avoidance: How do autistic traits and social anxiety modulate attention to the eyes? *Frontiers in Neuroscience*, 16, 1081769.
9. Hu, Y., Xiong, Q., Wang, Q., Song, C., Wang, D., **Lu, H.**, Shi, W., Han, Y., Liu, J., Li, X., & others. (2022). Early development of social attention in toddlers at high familial risk for autism spectrum disorder. *Infant*

Behavior and Development, 66, 101662.

8. Wang, Q., **Lu, H.**, Feng, S., Song, C., Hu, Y., & Yi, L. (2021). Investigating intra-individual variability of face scanning in autistic children. *Autism*, 136236132110643.
7. Feng, S., **Lu, H.**, Wang, Q., Li, T., Fang, J., Chen, L., & Yi, L. (2021). Face-viewing patterns predict audiovisual speech integration in autistic children. *Autism Research*.
6. Feng, S., **Lu, H.**, Fang, J., Li, X., Yi, L., & Chen, L. (2021). Audiovisual speech perception and its relation with temporal processing in children with and without autism. *Reading and Writing*, 1–22.
5. **Lu, H.**, Yi, L., & Zhang, H. (2019). Autistic traits influence the strategic diversity of information sampling: Insights from two-stage decision models. *PLoS Computational Biology*, 15(12), e1006964.
4. **Lu, H.**, Li, P., Fang, J., & Yi, L. (2019). The perceived social context modulates rule learning in autism. *Journal of Autism and Developmental Disorders*, 49(11), 4698–4706.
3. Zhang, Y., Song, W., Tan, Z., Zhu, H., Wang, Y., Lam, C. M., Weng, Y., Hoi, S. P., **Lu, H.**, Chan, B. S. M., & others. (2019). Could social robots facilitate children with autism spectrum disorders in learning distrust and deception? *Computers in Human Behavior*, 98, 140–149.
2. Li, T., Hu, Y., Song, C., **Lu, H.**, & Yi, L. (2018). The measurements and mechanisms of restricted and repetitive behaviors in autism spectrum disorders. *Chinese Science Bulletin*, 63(15), 1438–1451.
1. Yang, Y., Tian, Y., Fang, J., **Lu, H.**, Wei, K., & Yi, L. (2017). Trust and deception in children with autism spectrum disorders: A social learning perspective. *Journal of Autism and Developmental Disorders*, 47(3), 615–625.

Conference abstracts.....

8. **Lu, H.**, Yi, L., & Zhang, H. (2024). Oversampling of Costly Non-Instrumental Information in Autistic Children. Panel presentation at the International Society for Autism Research 2024 Annual Meeting.
7. **Lu, H.**, Teng, T., & Zhang, H. (2023). Reward-Driven Superstitions in Uncontrollable Environments. Poster presentation at the Society for Neuroeconomics 21st Annual Meeting.
6. **Lu, H.**, Teng, T., & Zhang, H. (2023). The formation of superstitions in an uncontrollable environment. *Proceedings of the Annual Meeting of the Cognitive Science Society*, 45. Retrieved from <https://escholarship.org/uc/item/5fx4t61x>. Poster presentation.
5. **Lu, H.**, Yi, L., & Zhang, H. (2022). Adults with more autistic traits are more willing to pay for "useless" information. Poster presentation at International Society for Autism Research 2022 Annual Meeting.
4. **Lu, H.**, Yi, L., & Zhang, H. (2020). Inefficient information sampling under explicit costs in children with ASD. Poster presentation at International Society for Autism Research 2020 Virtual Meeting.
3. Song, C., Wang, Q., Xu, J., **Lu, H.**, Qin, S., & Yi, L. (2020). Baseline arousal modulates face scanning in autism spectrum disorder. Poster presentation at International Society for Autism Research 2020 Virtual Meeting.
2. **Lu, H.**, Zhang, H., Yi, L. (2018). Adults with high autistic traits are reluctant to trade accuracy for monetary reward: a probabilistic reasoning experiment. Poster presentation at International Society for Autism Research 2018 Annual Meeting.
1. **Lu, H.**, Li, P., Yi, L. (2017) Impaired Rule Learning in Social Context of Children with Autism. Poster presentation at Society for Research in Child Development 2017 Biennial Meeting.

Research experience

Peking University

Research Assistant at Child Cognition Lab & Computation and Decision Lab

Beijing, China

2016 – 2022

- Conduct a series of behavioral and eye-tracking studies on information sampling in children and adults using MATLAB and Psychtoolbox.
- Fit behavioral data with hierarchical Bayesian models in R and Stan.
- Implement ACE models to estimate the heritability of autistic traits and information sampling.
- Administrate standardized psychological tests and questionnaires to children and parents.
- Build a set of tools for eye-tracking data analysis in R, including packages for I-VT fixation filter and pupil data preprocessing.
- Develop a toolbox for generating reports of questionnaires and Wechsler Intelligence Scale in R.
- Mentor undergraduate students in data analysis and programming for a study on implicit perspective-taking.

Sun Yat-Sen University

Guangzhou, China

Research Assistant at Dr. Ying Lin's lab

2015 – 2016

- Build and train a deep autoencoder neural network from scratch in MATLAB
- Achieve satisfactory performance in predicting the Big-Five personality traits from user data of Weibo, a Chinese social media platform.

Sun Yat-Sen University

Guangzhou, China

Research Assistant at Child Cognition Lab

2014 – 2016

- Conduct parallel-group randomized controlled studies on the effect of intranasal oxytocin on learning of distrust and deception in adults.
- Conduct experiments on social learning of distrust and deception behaviors in autistic children.
- Analyze the learning behaviors of children and adults with survival analysis in R.
- Assist behavioral coding of children's looking patterns.

Teaching experience

R for Eye-tracking Data Analysis

Chongqing, Nanjing, Shanghai, Beijing

Workshop lecturer

2018 – 2023

Design and deliver a 2-day workshop for learning to use R for data analysis, particularly eye-tracking data.

Effective Writing and Communication in Science

Peking University

Teaching assistant

2021 – 2023

Design, tutorial delivery, and marking. Also deliver a 1~2 hr lecture on how to do scientific data visualization.

Introduction to Cognitive Modeling

Peking University

Guest lecturer

2020

Delivery a one-hour tutorial on Reproducibility and Literate Programming in R

Child Psychopathology

Peking University

Teaching assistant

2018

Marking and organizing group projects.

Topics in Autism Research

Peking University

Teaching assistant

2017

Design, marking, and organizing class discussion.

Honors and awards

2022: Boya Postdoctoral Fellowship

Peking University

2022: PKU Outstanding Graduate

Peking University

2020: National Scholarship for PhD Students

Peking University

2020: Pacemaker to Merit Student

Peking University

2019: Merit Student

Peking University

2016: SYSU Outstanding Graduate

Sun Yat-Sen University

2016: SYSU Outstanding Undergraduate Thesis

Sun Yat-Sen University

2013 – 2015: SYSU Scholarship for Outstanding Students

Sun Yat-Sen University

2013, 2015: National Scholarship for Undergraduate Students

Sun Yat-Sen University

Professional membership and service

Membership: Society for Research in Child Development; International Society for Autism Research; Cognitive Science Society; Society for Neuroeconomics

Ad hoc reviewer: Autism Research; Journal of Autism and Developmental Disorders; eLife; OpenMind

Professional skills and languages

Research: Eye-tracking, Hierarchical Bayesian modeling, \LaTeX

Statistics: Linear mixed model, Bayesian statistics, Generalized additive model, Machine learning methods

Programming: R, MATLAB, Stan, Python, Git

Languages: Chinese, English