Lily Zihui Zhu

PhD Student · Harvard Psychology

lilyzhu@fas.harvard.edu | lilyzihuizhu.github.io | lilyzihuizhu

Education

Harvard University *Cambridge, MA*

Ph.D. in Psychology *2024 - 2029 (expected)*

- Advisors: Dr. Jesse Snedeker, Dr. Elika Bergelson

Johns Hopkins University *Baltimore, MD*

M.S.E. in Data Science *2022 - 2024*

- Thesis: "Modeling the acquisition of generative principles: the mapping between cross-linguistic number words and symbols"
- Cumulative GPA: 4.0/4.0

B.S. in Applied Mathematics and Statistics & B.A. in Cognitive Science *2019 - 2023*

- Minor in Linguistics
- Cumulative GPA: 4.0/4.0

Publications

Yuan, L., Singell, E., **Zhu, L. Z.**, Mix, K. S., & Smith, L. B. (under review). How are compositional systems learned? Four Hypotheses and Insights from Symbolic Numbers.

Hochmann, J.-R., **Zhu, L. Z.**, Kroupin, I., & Carey, S. (under review). Hard Words Despite Early Concepts: The Acquisition of "Same" and "Different".

Zhu, L. Z. & Yuan, L. (under review). From Components to Compositionality: A Case Study of Cross-Linguistic Differences in Number Learning Without Cross-Cultural Confounds.

Zhu, L. Z., Amatuni, A., Egan-Dailey, S., Garrison, H., Kalenkovich, E., Koorathota, S., Righter, L., Tor, S., & Bergelson, E. (revise & resubmit). Experience Shapes Early Noun Comprehension from 8-18 Months: The Roles of Word Frequency and Referent Familiarity.

Zhu, R., Kilonzo, T. N., **Zhu, L. Z.**, Fan, J. E., & Frank, M. C. (2026). Cross-Contextual Variability in Children's Early Understanding of Visual Media. *Topics in Cognitive Science*, 18, e70034.

Zhu, R., Goddu, M. K., **Zhu, L. Z.**, & Gopnik, A. (2024). Preschoolers' comprehension of functional metaphors. *Open Mind*, 8, 924-949.

Zhu, L. Z., & Nguyen, A. (2022). The interaction between structure, discourse, and prosody in wh-questions in English. *Proceedings of the Fifty-eighth Annual Meeting of the Chicago Linguistic Society*, Chicago, IL, 501-517.

Presentations

Conference Presentations

Dong R. Y., Moore C., **Zhu, L. Z.**, & Bergelson E. (2026). Parent-reported noun frequency predicts infants' online noun comprehension in an eyetracking task. Poster presented at *the Cognitive Development Society Biennial Conference 2026*, Montréal, Canada.

Zhu, L. Z., Bergelson E., & Snedeker, J. (2026) Compositional Thought Before Compositional Language: Evidence from 9-11-Month-Olds. Poster presented at *the 16th Budapest CEU Conference on Cognitive Development*, Budapest, Hungary.

Zhu, L. Z., Kalenkovich, E., Dong Y., Righter L., & Bergelson E. (2025). Experience Shapes Early Noun Comprehension from 8-18 Months: The Roles of Word Frequency and Referent Familiarity. Oral presentation at *the 50th Annual Boston University Conference on Language Development*, Boston, MA. Acceptance rate: 54%.

Dong R. Y., Moore C., **Zhu, L. Z.**, & Bergelson E. (2025). Measuring early word exposure in infants: a low-cost parent-report survey captures individual language input and predicts vocabulary outcomes. Poster presented at *the 50th Annual Boston University Conference on Language Development*, Boston, MA. Acceptance rate: 54%.

Zhu, Z., Nguyen, A. (2022). The interaction between structure, discourse, and prosody in wh-questions in English. Oral presentation at *the 58th Annual Meeting of the Chicago Linguistic Society*, Chicago, IL.

Invited Talks

July 2025. Experience Shapes Early Noun Comprehension from 8-18 Months: The Roles of Word Frequency and Referent Familiarity. Language & Cognition Lab Meeting (PI: Dr. Michael C. Frank), Standard University.

Fellowships, Grants, & Awards

2026	**Interdisciplinary Mind Grant**, Mind Brain Behavior Initiative, Harvard University *Learning from Experience: Leveraging Machine Learning and Vision Science to Understand Infant Category and Word Learning*	*$ 9,700*
2025	**Norman Anderson Fund**, Dept. of Psychology, Harvard University *The Developmental Origins of Compositional Thought and Compositional Language*	*$ 6,500*
	Departmental Travel Fund, Dept. of Psychology, Harvard University	*$ 750*
2024	**Stimson Research Fund**, Dept. of Psychology, Harvard University	*$ 1,000*
2023	**Applied Mathematics & Statistics Achievement Award**, Johns Hopkins University	*$ 500*
	Intuitive Surgical Best Project Award, Deep Learning Course, Johns Hopkins University	*$ 400*
	General Honors, Johns Hopkins University	
	Departmental Honors, Dept. of Applied Mathematics & Statistics, Johns Hopkins University	
	Departmental Honors, Dept. of Cognitive Science, Johns Hopkins University	
	Phi Beta Kappa, Alpha of Maryland at Johns Hopkins University	
2021	**"Design Your Summer Experience" Grant**, Johns Hopkins University	*$ 1,000*
	JHU Student Employee of the Year (Nomination), Johns Hopkins University	
2020	**Bloomberg Distinguished Professors Summer Research Award**, Johns Hopkins University	*$ 4,000*
2019-2023	**Dean's List x 6**, Johns Hopkins University	

Research Experience

DEL Lab, University of Colorado Boulder - Research Assistant *Boulder, CO*

Principle Investigator/Advisor: Dr. Lei Yuan *Jan 2022 - May 2024*

- Contributed 700+ hours to 3 projects investigating children's learning mechanisms (e.g., language-guided relational attention, associative learning) and knowledge structure (e.g., place value).
- Implemented and trained deep image captioning models (CNN + LSTM) in PyTorch to name multi-digit number symbols, assessed their sensitivity to the consistency of visual-verbal mappings in learning input.
- Conducted systematic literature review on children's early knowledge of place value concepts.
- Modeled the structure of components of mathematical knowledge using partial correlation networks and co-occurrence networks and created network visualizations in R and Python.
- Performed hypothesis testing in R using mixed effect models to assess effectiveness of various place value training paradigms.
- Implemented Hidden Markov Model in Python to model eye gaze patterns and reduce noise in behavioral data.
- Analyzed and visualized eye-tracking data in R via growth curve analysis, onset-contingent analysis, and divergence analysis.

Gopnik Lab, University of California, Berkeley - Research Assistant *Berkeley, CA*

Principle Investigator: Dr. Alison Gopnik | Advisor: Dr. Rebecca Zhu *June 2021 - May 2024*

- Contributed 600+ hours to 4 projects studying how children comprehend, produce, and learn from various types of symbols (e.g., non-literal language, pictures, and relational words).
- Extracted 250+ million utterances from CHILDES using R to study the distribution of abstract relational words (e.g., same, different) in child-directed speech and children's production.
- Trained 5 research assistants on study-specific procedures and supervised their experimental data collection processes.
- Collected data from 50+ preschoolers (i.e., 3-5 year-olds) and 30+ adults on studies investigating how children acquire and learn from non-literal expressions.
- Administered standardized experiments online over Zoom, e.g., checking consent forms, collecting demographic information, running experimental scripts, and coding behavioral data.

Language Acquisition Lab, Johns Hopkins University - Research Assistant *Baltimore, MD*

Principle Investigator: Dr. Géraldine Legendre | Advisor: Dr. An Nguyen *Jan 2021 - Dec 2022*

- Contributed 300+ hours to 2 projects investigating linguistic cues that guide children to acquire syntactic variations.
- Analyzed 10 children's corpora on CHILDES using CLAN to study the distribution of different wh-questions.
- Designed and launched controlled linguistic production experiments on Prolific.
- Collected, cleaned, and analyzed 600+ recordings to extract phonetic information such as pitch and word duration.
- Applied statistical models to understand prosodic differences of English wh-questions in different contexts.
- Abstract on wh-question prosody in English was accepted as an oral presentation at the Chicago Linguistic Society annual conference in 2022.

Teaching Experience

Johns Hopkins University *Baltimore, MD*

EN.553.432/632 Bayesian Statistics *Spring 2024*

- Instructor: Dr. Sergey Kushnarev, Dept. of Applied Mathematics and Statistics
- Role: Head Teaching Assistant. *Coordinated logistics, graded assignments, and held weekly office hours.*

EN.553.431 Honors Introduction to Statistics *Fall 2022, Spring 2023*

- Instructor: Dr. Avanti Athreya, Dept. of Applied Mathematics and Statistics
- Role: Teaching Assistant. *Taught lecture materials, led discussion sessions, graded assignments, and held weekly office hours.*

EN.553.291 Linear Algebra and Differential Equations *Fall 2021*

- Instructor: Dr. Mario Micheli, Dept. of Applied Mathematics and Statistics
- Role: Teaching Assistant. *Led problem-solving sessions, graded assignments, and held weekly office hours.*

Work Experience

Handshake *San Francisco, CA*

Data Engineer Intern, Data Infrastructure *June 2022 - Aug 2022*

- Developed Python SDK for third-party API service, integrated it to existing data pipelines on Google Cloud Platform, simplified data team messaging workflow.
- Refactored Terraform module for scalable access control on cloud service, wrote Bash script for automated module deployment, migrated 1k+ Google Secret Management resources.

Johns Hopkins School of Public Health *Baltimore, MD*

Student Intern, Child and Adolescent Health Measurement Initiative *Jan 2020 - Aug 2021*

- Collected, cleaned, and input annual national child health survey data into SPSS database.
- Created codebook in SPSS, SAS, Stata to generate summary statistics and visualizations to describe the data on the Data Resource Center for Child & Adolescent Health dashboard.

Mentorship and Outreach

2024-	**Harvard Prospective Ph.D. & RA Event in Psychology (PPREP) Program**, Mentor
2022-2023	**Women Mentoring Whiting at Johns Hopkins Whiting School of Engineering**, Mentor
2021-2023	**Mentorship Program at Johns Hopkins Omega Psi Cognitive Science Society**, Mentor
2020-2021	**Johns Hopkins University Counseling Center**, Counseling Center Advisory Board Member

Research Assistants

- Joey Zobel (Pomona, Summer 2025): PhD student at NYU Linguistics
- Ellen Tong (HGSE, 2025-2026): Lab manager at UIUC Psychology
- Imogen Phillips (Bath, 2025-2026)

Skills

Programming Python, PyTorch, Java, R, Julia, SQL, Matlab, Bash, Gen

Data Analytics statistical analysis (regression, network, time series), eye-tracking data analysis, deep learning, probabilistic Bayesian modeling

Natural Languages Mandarin (native), English (fluent), Cantonese (fluent)

Coursework

Computation: Data Structures, Algorithms, Machine Learning, Deep Learning, Natural Language Processing, Computational Cognitive Science

Mathematics: Multivariate Calculus, Discrete Mathematics, Linear Algebra, Differential Equations, Probability, Statistics, Optimization, Applied Statistics & Data Analysis, Time Series Analysis, Bayesian Statistics, Information Theory

Linguistics: Psychosemantics, Syntax, Phonology, Research Seminar in OT Syntax, Research Seminar in Minimalist Syntax

Psychology: Research Methods in Psychology, Design & Analysis for Experimental Psychology, Developmental Psychology, Social Psychology, Foundations of Brain, Behavior, and Cognition, Developmental Proseminar

Other relevant courses: Foundations of Cognitive Science, Research Seminar in Language Acquisition, First Language Acquisition, Second Language Acquisition, Theories of Learning