Ziyang Li

Assistant Professor, Johns Hopkins University

ziyang@cs.jhu.edu | +1-858-699-3237 | https://cs.jhu.edu/~ziyang

Positions

Johns Hopkins University — Baltimore, MD
Assistant Professor, Tenure Track — *Jul 2025 – Present*

Education

University of Pennsylvania — Philadelphia, PA
Ph.D. Computer and Information Science, Advisor: Mayur Naik (GPA: 4.0/4.0) — *Jul 2019 – Jun 2025*

University of California – San Diego — La Jolla, CA
B.S. Computer Science (GPA: 3.9/4.0); B.S. Mathematics (GPA: 3.7/4.0) — *Sep 2015 – Jun 2019*

Research Interest

Ziyang Li is an Assistant Professor of Computer Science at Johns Hopkins University, affiliated with the Data Science and AI Institute (DSAI) and the Information Security Institute (ISI). He received his Ph.D. in Computer Science from the University of Pennsylvania under the supervision of Prof. Mayur Naik. His research spans programming languages and machine learning, with a focus on neurosymbolic learning and program synthesis, as well as applications in security and software engineering. He is broadly interested in logics, programming language design, agentic systems, cybersecurity, and software engineering. His dissertation developed Scallop, a general-purpose neurosymbolic programming language and compiler toolchain, as part of a broader agenda on trustworthy AI systems. His dissertation was awarded the Morris and Dorothy Rubinoff Award by the University of Pennsylvania School of Engineering and Applied Science in 2025. For this work on trustworthy AI, he was awarded the AWS Fellowship in 2023.

Publications

Monographs:

Neurosymbolic Programming with Scallop: Principles and Practice
Ziyang Li, Jiani Huang, Jason Liu, Mayur Naik
Invited Monograph, Foundations and Trends in Programming Languages, 2024

Thesis:

Neurosymbolic Programming in Scallop: Design, Implementation, and Applications
Ziyang Li
Ph.D. Thesis, University of Pennsylvania, 2025. Awarded the Morris and Dorothy Rubinoff Award

Preprints:

Beyond Crash: Hijacking Your Autonomous Vehicle for Fun and Profit
Qi Sun, Ahmed Abdo, Luis Burbano, Ziyang Li, Yaxing Yao, Alvaro Cardenas, Yinzhi Cao
2026, [arXiv]

Does the Proof Prove It That Way? Faithful Formalization of Elements Proofs
Tadd Mao, Tianjun Zhong, Dhruva Arekar, Yuming Feng, One An, Jiani Huang, Xujie Si, Ziyang Li
2026, [arXiv]

From Chains to DAGs: Probing the Graph Structure of Reasoning in LLMs
Tianjun Zhong, Linyang He, Ziyang Li, Nima Mesgarani
2026, [arXiv]

Privy: From Fine Print to Fair Practice in Privacy Rights Exercise

Qi Sun, Ziyang Li, Yinzhi Cao, Yaxing Yao
2026, [arXiv]

BODHI: Precise OS Kernel Specification Inference
Zhiming Chang, Ziyang Li
2026, [arXiv]

Buzz to Boom: Detecting Message Progression Vulnerabilities in Electron Applications via Segmented Directed Fuzzing
Jianjia Yu, Zhengyu Liu, Ziyang Li, Yu Sun, Yinzhi Cao
2026, [arXiv]

Vision Language Models Cannot Plan, but Can They Formalize?
Muyu He, Yuxi Zheng, Yuchen Liu, Zijian An, Bill Cai, Jiani Huang, Lifeng Zhou, Feng Liu, Ziyang Li, Li Zhang
WMEAI Workshop @ ECCV 2026, Oral, **Best Paper Award**, [arXiv]

Advances in RNA Secondary Structure Prediction and RNA Modifications: Methods, Data, and Applications
Shu Yang, Nhat Truong Pham, Ziyang Li, Jae Young Baik, Joseph Lee, Tianhua Zhai, Weicheng Yu, Bojian Hou, Tianqi Shang, Weiqing He, Duy Duong-Tran, Mayur Naik, Li Shen
2025, [arXiv]

Towards Faithful and High-Fidelity Synthesis of Driving Scene Videos
Jiani Huang, Siyang Zhang, Ziyang Li, Ser-Nam Lim, Mayur Naik
2024, Preprint

Conferences:

Mystra: Declarative Dynamic Taint Analysis via Shadow Virtual Machine
Zhuohao Zhang, Junkun Liu, Rui Yang, Yinzhi Cao, Ziyang Li
ICSE 2027, [arXiv]

Call Back Later: Studying and Detecting Reentrant Interpretation Vulnerability in Python Interpreters
Zhengyu Liu, Zhuohao Zhang, Jiacheng Zhong, Yu Sun, Jianjia Yu, Ziyang Li, Yinzhi Cao
IEEE S&P 2027

Theory-Scale Auto-Formalization of Logics for Computer Science
Yuming Feng, Frederick Pu, One An, Osbert Bastani, Li Zhang, Jiani Huang, Xujie Si, Ziyang Li
NeurIPS 2026, [arXiv]

QLCoder: A Query Synthesizer For Static Analysis of Security Vulnerabilities
Claire Wang, Ziyang Li, Saikat Dutta, Mayur Naik
ICLR 2026, [arXiv]

Locus: Agentic Predicate Synthesis for Directed Fuzzing
Jie Zhu, Chihao Shen, Ziyang Li, Jiahao Yu, Yizheng Chen, Kexin Pei
ICSE 2026, [arXiv]

Lobster: A GPU-Accelerated Framework for Neurosymbolic Programming
Paul Biberstein, Ziyang Li, Joseph Devietti, Mayur Naik
ASPLOS 2026, [arXiv]

Unifying Inference-Time Planning Language Generation
Prabhu Prakash Kagitha, Bo Sun, Ishan Desai, Andrew Zhu, Cassie Huang, Manling Li, Ziyang Li, Li Zhang
ACL 2026 Findings, [arXiv]

ESCA: Contextualizing Embodied Agents via Scene-Graph Generation
Jiani Huang, Matthew Kuo, Amish Sethi, Mayank Keoliya, Neelay Velingker, JungHo Jung, Ser-Nam Lim, Ziyang Li, Mayur Naik
NeurIPS 2025, **Spotlight**, [arXiv]

TurnaboutLLM: A Deductive Reasoning Benchmark from Detective Games
Yuan Yuan, Muyu He, Muhammad Adil Shahid, Jiani Huang, Ziyang Li, Li Zhang
EMNLP 2025, [arXiv]

Challenges and Paths Towards AI for Software Engineering
Alex Gu, Naman Jain, Wen-Ding Li, Manish Shetty, Yijia Shao, Ziyang Li, Diyi Yang, Kevin Ellis, Koushik Sen, Armando Solar-Lezama
VerifAI Workshop @ ICLR 2025, [arXiv]

NeuroStrata: Harnessing Neurosymbolic Paradigms for Improved Design, Testability, and Verifiability of Autonomous CPS
Xi Zheng, Ziyang Li, Ivan Ruchkin, Ruzica Piskac, Miroslav Pajic
FSE 2025 IVR Track, [arXiv]

IRIS: LLM-Assisted Static Analysis for Detecting Security Vulnerabilities
Ziyang Li, Saikat Dutta, Mayur Naik
ICLR 2025, [arXiv]

LASER: A Neuro-Symbolic Framework for Learning Spatio-Temporal Scene Graphs with Weak Supervision
Jiani Huang, Ziyang Li, Mayur Naik, Ser-Nam Lim
ICLR 2025, [arXiv]

Understanding the Effectiveness of Large Language Models in Detecting Security Vulnerabilities
Avishree Khare, Saikat Dutta, Ziyang Li, Alaia Solko-Breslin, Rajeev Alur, Mayur Naik
ICST 2025, [arXiv]

Data-Efficient Learning with Neural Programs
Alaia Solko-Breslin, Seewon Choi, Ziyang Li, Neelay Velingker, Rajeev Alur, Mayur Naik, Eric Wong
NeurIPS 2024, [arXiv]

Crowd-sourced machine learning prediction of Long COVID using data from the National COVID Cohort Collaborative
Timothy Bergquist et al., . . . , Neelay Velingker, Ziyang Li, Yinjun Wu, Jiani Huang, Adam Stein, Emily J. Getzen, Qi Long, Mayur Naik, Ravi B. Parikh, . . .
eBioMedicine 2024, **NIH L3C Honorable Mention Award**

TYGR: Type Inference on Stripped Binaries using Graph Neural Networks
Ziyang Li, Chang Zhu*, Anton Xue, Ati Priya Bajaj, William Gibbs, Yibo Liu, Hanjun Dai, Mayur Naik, Rajeev Alur, Tiffany Bao, Adam Doupé, Yan Shoshitaishvili, Ruoyu Wang, Aravind Machiry*
USENIX Security 2024

DISCRET: Synthesizing Faithful Explanations For Treatment Effect Estimation
Yinjun Wu, Mayank Keoliya, Kan Chen, Neelay Velingker, Ziyang Li, Emily J Getzen, Qi Long, Mayur Naik, Ravi B Parikh, Eric Wong
ICML 2024, **Spotlight**, [arXiv]

Relational Programming with Foundation Models
Ziyang Li, Jiani Huang, Jason Liu, Felix Zhu, Eric Zhao, William Dodds, Neelay Velingker, Rajeev Alur, Mayur Naik
AAAI 2024, [arXiv]

Improved Logical Reasoning of Language Models via Differentiable Symbolic Programming
Jiani Huang, Hanlin Zhang*, Ziyang Li, Mayur Naik, Eric Xing*
ACL-Findings 2023, [arXiv]

Scallop: a Language for Neurosymbolic Programming
Ziyang Li, Jiani Huang, Mayur Naik
PLDI 2023, [arXiv]

Scallop: From Probabilistic Deductive Databases to Scalable Differentiable Reasoning
Jiani Huang, Ziyang Li*, Binghong Chen, Karan Samel, Mayur Naik, Le Song, Xujie Si*
NeurIPS 2021

ARBITRAR: User-Guided API Misuse Detection
Ziyang Li, Aravind Machiry, Binghong Chen, Ke Wang, Mayur Naik, Le Song
IEEE S&P 2021

HOPPITY: Learning Graph Transformations to Detect and Fix Bugs in Programs

Elizabeth Dinella, Hanjun Dai, Ziyang Li, Mayur Naik, Le Song, Ke Wang
ICLR 2020, **Spotlight**

Workshop Papers:

Numerical Reasoning over Legal Contracts via Relational Database
Jiani Huang, Ziyang Li, Ilias Fountalis, Mayur Naik
DBAI Workshop @ NeurIPS 2021

Fundings

Hierarchical Neuro-Symbolic Synthesis of Verifiable Computational Physics Code for Scientific Discovery
PI: Ziyang Li, Co-PIs: Yinzhi Cao, Nengkun Yu, Meifeng Lin
Department of Energy Genesis Mission, Aug 2026, $750K

Compartmentalized Red Teaming and Secure-by-Principle Development for Web Applications
PI: Chaowei Xiao, Co-PI: Yinzhi Cao, Ziyang Li
Amazon NOVA AI Challenge, Jan 2026, $250K

A Protocol Stack for Resource-Bound Multi-Agent AI
PI: Ziyang Li, Co-PI: Krishan Sabnani
Amazon Research Awards, 2026, $70K cash + $50K promotional credits

Video-to-Scenario Programs: Neurosymbolic Specification Learning for Autonomous Vehicle Testing
PI: Ziyang Li
Toyota Research Institute North America, Dec 2025, $85K

Students

Qi Sun	(Co-advised with Yinzhi Cao and Yaxing Yao)	PhD	Jan 2026 –
Rui Yang	(Co-advised with Yinzhi Cao)	PhD	Jan 2026 –
Tianjun Zhong		PhD	Aug 2026 –

Master and Undergraduate Students:

Yuming Feng		Master	Oct 2025 –
Zhuohao Zhang		Master	Nov 2025 –
Jason Liu	(While at University of Pennsylvania)	UGrad	2023 – 2025

Invited Talks and Tutorials

Invited Talk on Scallop *Cornell SE Seminar* — Online, *Sep 2025*

Invited Talk on Neurosymbolic CPS *Toyota Research Institute* — Online, *Aug 2025*

Invited Talk on Neurosymbolic CPS *TACPS @ CAV'2025* — Zagreb, Croatia, *July 2025*

Invited Talk on IRIS *Trail of Bits* — Online, *Jun 2025*

Invited Talk on Scallop *TACPS* Raleigh, NC, *Nov 2024*

Invited Talk on Scallop *Columbia University PL Seminar* New York, NY, *Oct 2024*

Invited Talk on Scallop *HKUST SEPL Seminar* Hong Kong, *Dec 2024*

Invited Talk on Scallop *UT Austin PL Seminar* Austin, TX, *Sep 2024*

Scallop Tutorial *Summer School of Neurosymbolic Programming (SSNP)* Salem, MA, *Jun 2024*

Neurosymbolic AI *Guest lecture in Trustworthy AI, UPenn CIS* Philadelphia, PA, *Apr 17, 2024*

Invited Talk on Scallop *Peking University PL Seminar* Peking, China, *Dec 10, 2023*

Invited Talk on Scallop *Purdue University PL Seminar* West Lafayette, IN, *Nov 9, 2023*

Invited Talk on Scallop *KDD'2023* Los Angeles, CA, *Aug 7, 2023*

Tutorial on Scallop *PLDI'2023* Orlando, FL, *Jun 17–19, 2023*

Tutorial on Neurosymbolic Methods *LOG'2022* Online, *Oct, 2022*

Invited Talk on Scallop *MIT Neurosymbolic Reading Group* Cambridge, MA, *Apr 2023*

Tutorial on Scallop *Summer Shool of Formal Techniques (SSFT)* Mountain View, CA, *Jun 1–2, 2022*

Working Experiences

Relational AI *Research Intern, Mentor: Hung Q. Ngo* Virtual, *May 2021 – August 2021*

Visa, Inc. *Research Intern, Mentor: Ke Wang* Virtual, *May 2020 – July 2020*

Coursera, Inc. *Front-end Engineer Intern* Mountain View, CA, *Jun 2018 - Sep 2018*

Fellowships

Amazon Web Service Fellowship *For work on Trustworthy AI* Amazon, *May 2023*

KPCB Fellows 2018 *Engineering Fellows (<2%)* San Francisco, *June 2018*

Teaching

Instructor *EN.601.727, Machine Programming* JHU, *Fall 2025, Fall 2026*

Instructor *EN.601.426/626, Principles of Programming Languages* JHU, *Spring 2026*

Teaching Experience (*Prior to Faculty Appointment*):

Teaching Assistant *CIS 7000, Large Language Models* University of Pennsylvania, *2024*

Teaching Assistant *CIS 5470, Software Analysis* University of Pennsylvania, *2020;21;22;23;25*

Tutor *CSE 190, Virtual Reality Technology* University of California – San Diego, *Spring 2019*

Tutor *CSE 165, 3D User Interaction* University of California – San Diego, *Winter 2019*

Tutor *CSE 130, Programming Language* University of California – San Diego, *Fall 2018*

Tutor *CSE 163, Advanced Computer Graphics* University of California – San Diego, *Spring 2018*

Tutor *CSE 167, Intro to Computer Graphics* University of California – San Diego, *Winter 2018*

Tutor *CSE 12, Data Structure* University of California – San Diego, *Winter 2017*

Academic Service

Conference Program Committee *PLDI 2026*

Workshop Organizer *PLMW 2026, TACPS Workshop 2025*

Workshop Program Committee *LLM4Code 2026, LMPL 2025*

Reviewer *ICLR 2024-2026, NeurIPS 2023-2025, ICML 2024-2025, AAAI 2024-2025, ACL ARR 2023-2024*

Artifact Evaluation Committee *USENIX Security 2025*

Selected Side-Projects

Programming Languages and Program Analysis Tools

Probabilistic DataLog Engine: A probabilistic datalog engine with high performance optimizations oriented towards machine learning applications. Written in Rust.

Under-constrained Symbolic Execution Engine: High performance under-constrained symbolic execution engine for LLVM IR written in Rust. Used in Arbitrar.

LLVM IR Binding for Rust: Safe LLVM Binding for Rust. Used in Arbitrar. [Github]

Menhera: A TypeScript-like functional programming language compiler written in OCaml. [Github]

Rendering, Animation, and Simulations:

Fourier Depth of Field: Fourier transform based depth of field analysis for RayTracer. [Github]

Rotamina: Character animator and simulator with GUI. Written in C++. [Github]

MPM-RS: Material point method for simulating fluid and soft-body dynamics. Written in Rust. [Github]

Geometry Sketchpad: Geometry sketching GUI application written in Rust. [Github]

AoSoA Storage: Array-of-struct-of-array storage system for high performance parallel computing with Kokkos and Cabana. Designed for physics simulation applications. Used by UPenn CG Group. [Github]

Video Games and VR Applications:

VR Piano: VR Application for recording virtual characters playing the Piano, connecting MIDI keyboards and body tracking systems. Written in Unity.

Naruhodo: An 3D story puzzle game engine made in Unity for easy level design. [Github]

Neon Ping Pong: VR Ping Pong Game written in C++. [Website] [Video]

Space Escape: VR Room Escape Puzzle Game settled in Space Station. Developed in Unity. [Website] [Video]

Web Applications:

inso.link: A mirror download site for OSU! beatmaps for Chinese players. Hosted and maintained since 2016 and has 30K users while supporting >2M downloads. [Website] [Status Site]

saemanga.com: A minimalistic online manga reader. Had >1K users. (2016-2020, currently out-of-service)

Skills

Languages: Rust, C++/C, Python, C#, TypeScript/JavaScript, OCaml, Java, Haskell, Coq

Libraries/Engines/Tools: PyTorch, Unity, Unreal Engine 4/5, React, ExpressJs, Asp.net

Design: Adobe Photoshop, Final Cut Pro, Premiere, After Effects, Illustrator, Blender, Cinema 4D

Audio/Music: Logic Pro, Ableton

Last update: Sep 10, 2026