

Chuqin (Allen) Geng

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Research interests

Mechanistic interpretability of large language models (LLMs); interpretable and reliable learning for graph, vision, and language models; neuro-symbolic AI; neural network robustness and formal verification; AI for science.

Education

University of Toronto Toronto, ON, CA
Visiting scholar Jan 2023 – Present
Advisor: Prof. Xujie Si

McGill University, Mila - Quebec AI Institute Montreal, QC, CA
PhD in Computer Science Sep 2021 – Present
Advisor: Prof. Xujie Si, *GPA: 4.0/4.0*

Georgia Institute of Technology Atlanta, GA, USA
MSc in Computer Science, *GPA: 4.0/4.0* Sep 2019 – Apr 2021

University of Reading Reading, Berkshire, UK
MSc in Finance, *GPA: 4.0/4.0* Sep 2016 – Dec 2017

University of Toronto Toronto, ON, CA
Honours BSc in Math and Statistics Sep 2011 – Aug 2015

Selected Papers

Are We Recovering Mechanisms? Objective-Level Recovery Gaps in Mechanistic Interpretability

Chuqin Geng, Li Zhang, Haolin Ye, Mark Zhang, Luke Zhang, Xujie Si
In submission

Rethinking Circuit Evaluation: Do Circuits Explain Model Errors?

Li Zhang*, **Chuqin Geng***, Mark Zhang, Chen Yang, Luke Zhang, Haolin Ye, Xujie Si
In submission

VisionLogic: Discovering and Grounding Decision-Relevant Visual Concepts

Chuqin Geng, Yuhe Jiang, Li Zhang, Zhaoyue Wang, Haolin Ye, Mark Zhang, Jingkai Xu, Xujie Si
In submission

Beyond Message Passing: A Symbolic Alternative for Expressive and Interpretable Graph Learning

Chuqin Geng, Li Zhang, Haolin Ye, Ziyu Zhao, Yuhe Jiang, Tara Saba, Xinyu Wang, Xujie Si

In submission

CROSSREF-VQA: Benchmarking Cross-modal Reference Resolution in Structured Graphics

Yuhe Jiang, Youyuan Zhang, Hangrui Bi, **Chuqin Geng**, Xujie Si

In submission

Neural Proposals, Symbolic Guarantees: Neuro-Symbolic Graph Generative Modeling

Chuqin Geng, Li Zhang, Mark Zhang, Zhaoyue Wang, Haolin Ye, Xujie Si

NeurIPS 2026

DreamProver: Evolving Transferable Lemma Libraries via a Wake-Sleep Theorem-Proving Agent

Youyuan Zhang*, Jialiang Sun*, Hangrui Bi, **Chuqin Geng**, Wenjie Ma, Zhaoyu Li, Xujie Si

COLM 2026

LogicXGNN: Grounded Logical Rules for Explaining Graph Neural Networks

Chuqin Geng, Ziyu Zhao, Zhaoyue Wang, Haolin Ye, Yuhe Jiang, Xujie Si

ICLR 2026 (Top ~2%)

NEUROLOGIC: From Neural Representations to Interpretable Logic Rules

Chuqin Geng, Anqi Xing, Li Zhang, Ziyu Zhao, Yuhe Jiang, Xujie Si

UCRL @ ICLR 2026

Learning Minimal Neural Specifications

Chuqin Geng, Zhaoyue Wang, Haolin Ye, Xujie Si

NeuS 2025 (Oral)

Towards Robust Saliency Maps

Van Nham Le*, **Chuqin Geng***, Xujie Si, Arie Gurfinkel

ACML 2024

Towards Reliable Neural Specifications

Chuqin Geng*, Van Nham Le*, Xiaojie Xu, Zhaoyue Wang, Arie Gurfinkel, Xujie Si

ICML 2023 (Oral)

Identifying Different Student Clusters in Functional Programming Assignments: From Quick Learners to Struggling Students

Chuqin Geng, Wenwen Xu, Yingjie Xu, Brigitte Pientka, Xujie Si

SIGCSE 2023 TS

TorchProbe: Fuzzing Dynamic Deep Learning Compilers

Qidong Su, **Chuqin Geng**, Gennady Pekhimenko, Xujie Si

APLAS 2023

Scalar Invariant Networks with Zero Bias

Chuqin Geng, Xiaojie Xu, Haolin Ye, Xujie Si

NeuReps @ NeurIPS 2023

Novice Type Error Diagnosis with Natural Language Models

Chuqin Geng, Haolin Ye, Yixuan Li, Tianyu Han, Brigitte Pientka, Xujie Si

APLAS 2022

SAT-DIFF: A Tree Diffing Framework Using SAT Solver

Chuqin Geng, Haolin Ye, Yihan Zhang, Brigitte Pientka, Xujie Si

preprint, arxiv.org/abs/2404.04731

Can ChatGPT Pass An Introductory Level Functional Language Programming Course?

Chuqin Geng, Yihan Zhang, Brigitte Pientka, Xujie Si

preprint, arxiv.org/abs/2305.02230

Selected awards

Top Reviewer (NeurIPS)	2026
SOCS Grad Stimulus Initiative (McGill University)	2025
Mila Research Scholarship (Mila - Quebec AI Institute)	2023–2025
Graduate Excellence Award (McGill University)	2021–2025
Faculty of Science Grad Supplement (McGill University)	2023
Apple Scholars nomination (McGill University)	2023
Computer Science Top-up Award (McGill University)	2022
Academic Distinction Award (University of Reading)	2017
Second prize in mathematics competition (Shaanxi province, China)	2009

**Research
Experience**

Explainable AI, Mechanistic Interpretability, and AI for Science

Advisor: Prof. Xujie Si (University of Toronto) *Jan 2025 – Present*

Developed grounded logical explanations for graph neural networks, revealing molecular substructures associated with their predictions. Combined neural graph generation with symbolic solving to generate molecules satisfying hard constraints, enabling controllable design for drug and materials discovery. Identified limitations in current mechanistic interpretability methods for large language models.

Neural Network Verification, Robustness, and AI Safety

Advisor: Prof. Xujie Si (University of Toronto) *Sep 2022 – May 2025*

Proposed neural activation patterns as verification specifications, extending certifiable input regions beyond hand-chosen local neighborhoods. Developed minimal neural specifications for concise, interpretable verification. Explored methods to improve model robustness, fairness, and safety.

Computer science education research

Sep 2021 – Dec 2022

Advisors: Profs. Xujie Si and Brigitte Pientka (McGill University)

Studied transformer-based language models for diagnosing type errors made by novice programmers and conducted education research using statistical analysis of student activity logs, with the goal of auditing and improving the student learning experience.

Multimodal clinical prediction and reinforcement learning

Graduate research (Georgia Institute of Technology) *Sep 2019 – Apr 2021*

Conducted research projects on multimodal mortality prediction using MIMIC clinical data and reinforcement learning for robot control.

Disproof of a conjecture in biometric security optimization

Mentors: Prof. Steven Rayan (University of Toronto) *Jan 2015 – Aug 2015*

Disproved a conjecture regarding optimal solutions for biometric privacy-security trade-offs, providing new bounds for secure system optimization.

Teaching experience

Head teaching assistant, McGill University

Winter 2022

COMP 302: Programming Languages and Paradigms

Conducted weekly office hours and tutorials, designed and graded exams, developed auto-graders for assignments, implemented mutation testing, and utilized Moss for plagiarism detection.

Industry experience

Cirqvia (startup project)

Founder

May 2026 – Present

Translating mechanistic interpretability research to address the practical need to understand model behavior in high-stakes domains and improve the alignment, safety, and reliability of LLMs and AI agents. Leading research and product development; received early-stage funding.

FITFI Inc. Toronto, CA
Senior Data Scientist Jan 2018 – Sep 2019
Developed deep learning methods for automatic motion and exercise detection through modeling of multimodal biometric data, supporting applications in AI for health. Led the algorithm team, secured a demo opportunity at the 2019 Collision Conference, and helped raise over CAD 2 million in funding.

SHAREWIN SOFTWARE Beijing, China
Algorithm Engineer Sep 2015 – Sep 2016
Developed seismic-interpretation algorithms for oil and gas exploration software, using preprocessing, filtering, and ant-tracking methods to delineate geological faults in 3D seismic volumes.

Talks

Learning Minimal Neural Specifications May 2025
NeuS 2025

Towards Reliable Neural Specifications
ICML 2023 Aug 2023

A study on student performance clusters Mar 2023
SIGCSE 2023, SPLICE Workshop

Novice Type Error Diagnosis with Natural Language Models Dec 2022
APLAS 2022

Service

I contribute to academic service through conference reviewing and student selection:

- **Machine Learning:** ICML (2023–2026), ICLR (2024–2027), NeurIPS (2023–2026), AAAI (2024–2027)
- **Computer Vision:** CVPR (2024, 2025), ECCV 2026
- **Formal Methods:** TACAS 2025
- **HCI & Education:** SIGCSE 2023, CHI 2023
- **Supervision Evaluation Committee Member:** Mila Supervision Request Process 2027

Mentoring

I have mentored students from the following institutions:

- **University of Toronto:** Li Zhang, Mark Zhang, Eric Liang, Luke Zhang
- **McGill University:** Ziyu Zhao, Haolin Ye, Yihan Zhang, Zhaoyue Wang, Xiaojie Xu, Yixuan Li, Tianyu Han, Yingjie Xu
- **McMaster University:** Jingkai Xu
- **Tsinghua University:** Chen Yang