

Yuxin (Shirley) Li

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Education

The Hong Kong University of Science and Technology (HKUST)

2022 - 2026

Bachelor of Engineering in Computer Science

Hong Kong, China

Core Courses: Machine Learning, Large-Scale Machine Learning for Foundation Models, Fundamentals of Artificial Intelligence, Design and Analysis of Algorithms, Computer Architecture, Electro-Robot Design, Electronic and Information Technology

Research Experiences

** denotes co-first authorship*

Natural-Formal Hybrid Reasoning Enhances LLM's Math Capability

2025

Advisor: Yi R.(May) Fung, The Hong Kong University of Science and Technology

- **Preprint (Under EMNLP Review):** Wang, R.*, Li, Y.*, Fung, Y. & Zhang, T. (2025). Let's Reason Formally: Natural-Formal Hybrid Reasoning Enhances LLM's Math Capability. arXiv preprint arXiv:2505.23703.
- Proposed an end-to-end framework that augments natural-language mathematical reasoning with formal-language verification.
- Designed NL-FL Problem Alignment to reformulate NL QA tasks as FL existence theorems, enabling direct interaction with a formal prover.
- Developed a Mixed Problem Input mechanism allowing the formal agent to solve QA and existence problems concurrently.
- Achieved **89.80%** on MATH-500 and **84.34%** on AMC, outperforming the NL baseline; solved several problems unreachable by the NL baseline even with more trials.

Model-Collaboration Lean-based Long Chain-of-Thought Reasoning enhances Formal Theorem Proving

2025

Advisor: Tong Zhang, University of Illinois Urbana-Champaign

- **Publication (Accepted by ICML 2025):** Wang, R.*, Pan, R.*, Li, Y.*, Zhang, J., Jia, Y., Diao, S., Pi, R., Hu, J. and Zhang, T. (2025). MA-LoT: Model-Collaboration Lean-based Long Chain-of-Thought Reasoning enhances Formal Theorem Proving. <https://arxiv.org/pdf/2503.03205>.
- Proposed MA-LoT, a next-generation formal theorem proving framework based on Lean4, which coordinates a prover and a corrector model via Long Chain-of-Thought (Long CoT) interactions.
- Decoupled cognitive subtasks: natural language whole-proof generation (prover) and iterative formal error correction (corrector), unified through structured role collaboration.
- Introduced a novel LoT-Transfer Learning pipeline that enables Long CoT reasoning in domain-specific settings without requiring task-specific annotations.
- Achieved **61.07%** accuracy on the Lean4 MINIF2F-TEST benchmark, outperforming DeepSeek-V3 (33.61%), InternLM-Step-Prover (50.70%), and Godel-Prover (55.33%).

Explore Selective Disclosure Bias with Networks of LLM-based Agents

2024

Advisor: Yongren Shi, The University of Iowa

- Built simulation environments to model how LLM-based agents form and update opinions under selective information sharing.
- Designed experiments to examine the effects of disclosure patterns on opinion clustering and polarization in agent networks.

- Contributed to the development of agent interaction protocols and logging mechanisms for traceable reasoning and response behaviors.
- Assisted in analyzing emergent dynamics using metrics from computational social science (e.g., homophily, information entropy).

Knowledge Discovery over Machine Learning

2023

Advisor: Minhao Cheng, The Pennsylvania State University

- Investigated how abstract mathematical theorems can be translated into practical machine learning algorithms and model behaviors.
- Assisted in formalizing mathematical insights (e.g., convexity, generalization bounds) to guide model design and optimization strategies.
- Conducted literature reviews bridging theoretical machine learning and mathematical foundations (e.g., functional analysis, information theory).
- Supported implementation and experimentation to evaluate theoretical insights using standard ML benchmarks.

Miscellaneous

- **Peer Mentor**, Computer Science and Engineering Department, HKUST 2025
- **Deep Learning Certification**, NVIDIA Deep Learning Institute 2024
- **Peer Mentor**, Peer-Mentoring Program, Mainland Students and Scholars Society (UG), HKUST 2023
- **Member**, China Entrepreneur Network, HKUST 2022
- **Member**, Mainland Students and Scholars Society (UG), HKUST 2022

SKILLS

Languages: English (Advanced), Mandarin (Native)

Technical: : Python, C++, Java, Scala, RISC-V, LaTeX.