Yixuan Li

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LLMs, Programming Languages, Automated Reasoning, Verification, Strong Technical Communication

Education

2022 – 2025 **PhD (with Fully-Funded Scholarship)**, *The University of Edinburgh, UK*,
Computer Science,
Supervisor: Dr. Elizabeth Polgreen & Dr. Michael O'Boyle.

2020 – 2021 **MSc (Distinction Award)**, *University of Bristol, UK*,
Image and Video Communications and Signal Processing.

2014 – 2018 **BEng**, *Xidian University, China*,
Electronic Information.

Experience

Nov 2024 – present **Research Internship**, *Heriot-Watt University*, EPSRC-AISEC,
Focused on LLMs for verification research within the EPSRC-funded project AISEC: AI Secure and Explainable by Construction, led by *Professor Ekaterina Komendantskaya*.

Jan 2024 – Oct 2024 **Teaching Assistant**, *The University of Edinburgh*, System Design Project (INFR09032),
As a teaching assistant, I advise and guide all aspects of tasks within the broad theme of robotics (both software and hardware), helping students build robots capable of performing autonomous tasks in the real world.

Papers

Under Review **Unlocking Hardware Verification with Oracle Guided Synthesis**,
*Leiqi Ye, **Yixuan Li**, Jianyi Cheng, Elizabeth Polgreen*.

Under Review **Guided Tensor Lifting**,
***Yixuan Li**, José Wesley De Souza Magalhães, Alexander Brauckmann, Michael F. P. O'Boyle, and Elizabeth Polgreen*.
Developed STAGG, a framework combining LLMs and enumerative synthesis, achieving 98% lifting accuracy, outperforming state-of-the-art tool. STAGG also reduces the average solving time to 3.32 seconds compared to 23.05 seconds for state-of-the-art.

AAAI 2025 Rank: A* **Online Prompt Selection for Program Synthesis**,
***Yixuan Li**, Lewis Frampton, Federico Mora, and Elizabeth Polgreen*.
Choosing the right prompt and the right LLM to use for a given problem is hard for a novice user. Framed this problem as a multi-armed bandit problem and demonstrated that simple online learning methods can ease these decisions for the user.

CAV 2024 Rank: A* **Guiding Enumerative Program Synthesis with Large Language Models**,
***Yixuan Li**, Julian Parsert, and Elizabeth Polgreen*.
Developed a novel integration of Large Language Models (LLMs) with enumerative algorithms to enhance inductive synthesis, significantly outperforming state-of-the-art synthesiser by 18%.

SYNT 2023 **Genetic Algorithms for Searching a Matrix of Metagrammars for Synthesis**,
***Yixuan Li**, Federico Mora, Elizabeth Polgreen, and Sanjit A. Seshia*.
Developed a metagrammar (grammar of grammars) framework for syntax-guided synthesis, utilizing a matrix of syntactic rules to effectively constrain the search space.

Talks

Nov 2024 **Program Synthesis with LLMs**, Programming Languages Research Group Seminar, University of Bristol, UK.

May 2024 **Guiding Enumerative Program Synthesis with Large Language Models**, Heriot-Watt LAIV AI Verification Seminar, UK.

Mar 2024 **Guiding Enumerative Program Synthesis with Large Language Models**, EuroProofNet, Austria.

Jul 2023 **Genetic Algorithms for Searching a Matrix of Metagrammars for Synthesis**, Workshop on Synthesis, France.

Skills

Programming Python, MATLAB, Java, C, Assembly, SystemVerilog Assertions, LaTeX.

Electronics Filter Design, Image/Video Processing, Information Theory, Communication Systems

Language Chinese (native), English (professional proficiency), French, Japanese.

Service

2024 **Reviewer**, *TACAS 2024*.

2015 – 2016 **Student President**, *Association for Science and Technology*, Xidian University.
As the student president, I organized electronics design contests and science competitions.

2016 **Student Volunteer Team Leader**, *Shaanxi Xingzhi Charity Association*.
As a team leader of 25 volunteers, I provided support to rural junior high school students for educational equity and community development.

Scholarship & Awards

May. 2024 **CAV 2024 VMW Scholarship**, *CAV 2024 Conference*.

2021 – 2025 **Fully Funded PhD Scholarship**, *The University of Edinburgh*.

Mar. 2016 **Third Grade Scholarship (top 15%)**, *Xidian University*.

Dec. 2015 **Excellent Chairman of Association for Science and Technology**, *Xidian University*.

Jul. 2015 **Tech Star(top 5%)**, *Xidian University*.

Mar. 2015 **Xidian Science and Technology Scholarship (top 1%)**, *Xidian University*.

Dec. 2014 **Outstanding Science and Technology Committee Member**, *Xidian University*.

References

Dr Elizabeth Polgreen,
Assistant Professor,
The University of Edinburgh.

Dr Michael O'Boyle,
Professor,
The University of Edinburgh.