# 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 **HyGenar: An LLM-Driven Hybrid Genetic Algorithm for Few-Shot Grammar Generation**,
*Weizhi Tang,* ***Yixuan Li****, Chris Sypherd, Elizabeth Polgreen, Vaishak Belle.*

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 by 1.14 times. 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.