Hanliang **Zhang**

Computer Science

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Education

Ph.D. student in Computer Science — *2021 - Now*

University of Bristol, United Kingdom

Research Assistant — *2020-2021*

Topic: Program Analysis for C to Rust Translation — *University of Bristol, United Kingdom*

Bachelor of Computer Science — *2016 - 2020*

Thesis Title: Calculating Bidirectional Transformations — *Peking University, China*

Industry

Validated LLMs-based Code Translation — *Nov 2023 - Feb 2024*

Applied Scientist Internship @ AWS Amazon Automated Reasoning Group

- Developed a general **Go/C to Rust code translator** based on large language models.
- Devised a **cross language fuzzer** that scales up to handle real-world codebase.
- Evaluated the code translation ability of cutting-edge language models. Results were summarised in a research paper in submission.

Research

Program Calculation for Bidirectional Programs — *June 2019 - July 2020*

Research Advised by Professor Zhenjiang Hu

- Refined a traditional bidirectional transformation (BX) model with specialized predicates so as to solve a crucial problem in the development of BXs: composing *partial* BXs. This new model ensures a **safe and modular** programming environment for BXs.
- Designed several high-order combinators that capture common bidirectional computation patterns, established important properties about those combinators and their compositions.
- **Formally verified** the proposed framework with Agda.

Ownership Guided C to Rust Translation — *July 2021 - March 2023*

Ph.D. project

- Devised an **ownership analysis** based on the novel notion of *ownership monotonicity*.
- Prototyped an automatic **C to Rust translation tool** that is scalable to handle projects over 500k lines of code.
- Evaluated the proposed method over realworld benchmarks. Results show it outperformed prior works.

Automatic Java Deprecation Refactoring – Symbolic v.s. Neural approaches — *July 2022 - Now*

Ph.D. project

- Developed **neural code refactoring engines** based on LLMs.
- Collected a large suite of benchmarks for evaluating code refactoring engines.

Publications

[1] Hanliang Zhang et al. “Contract lenses: Reasoning about bidirectional programs via calculation”. In: *Journal of Functional Programming* 33 (2023), e10. DOI: 10.1017/S0956796823000059.

[2] Hanliang Zhang et al. “Ownership Guided C to Rust Translation”. In: *Computer Aided Verification*. Ed. by Constantin Enea and Akash Lal. Cham: Springer Nature Switzerland, 2023, pp. 459–482. ISBN: 978-3-031-37709-9.

Professional Service

- Artifact Evaluation Committee for *Programming Language Design and Implementation (PLDI) 2024*.