

Hanliang Zhang

COMPUTER SCIENCE

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Education

University of Bristol

PH.D. COMPUTER SCIENCE

2021 - Now

University of Bristol

RESEARCH ASSISTANT

2020-2021

Peking University

BACHELOR OF COMPUTER SCIENCE

2015 - 2020

- Overall GPA : 3.7 / 4.0

Research

Empirical Study of Static/Dynamic Analysis Tools on Java NPE Bugs

May 2019 - July 2019

RESEARCH STUDENT ADVISED BY ASSISTANT PROFESSOR XUAN BACH D. LE AND DR. QUOC SANG PHAN

- Participated in Google Summer of Code and worked with the Java PathFinder (JPF) organization. Learned techniques of symbolic execution and their application to automated program repair.
- Collected a benchmark of 55 real-world Java NullPointerException bugs with test cases. Summarized categories of those bugs and repair strategies from developers.
- Tested and compared various analysis tools on this benchmark (for example, Facebook Infer, Coverity Scan and Daikon). Concluded weaknesses and strengths of those tools from the analysis result.

Program Calculation for Bidirectional Programs

June 2019 - July 2020

RESEARCH STUDENT 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 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 and outperformed prior works

Publications

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

Zhang, Hanliang, Wenhao Tang, et al. (2023). "Contract Lenses: Reasoning about Bidirectional Programs via Calculation". In: *Journal of Functional Programming*. Ed. by James Cheney. to appear.

Projects

Compiler for an Imperative Programming Language

OCaml

COURSE PROJECT FOR LABS IN COMPILER (HONOR)

- Implemented a compiler for a C-like imperative programming language in OCaml with Lua bytecode as its backend.
- Implemented a generic data flow analysis framework.
- Implemented various analyses including partial redundancy elimination.

CDCL SAT Solver

Rust

PERSONAL PROJECT

- Implemented a *Conflict Driven Clause Learning* SAT solver.
- Implemented optimisation strategies like two-watched-literals, and heuristics like EVSIDS.
- Evaluated the solver over benchmarks with tens of thousands of variables