

Guannan Wei

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OBJECTIVE

Research/visiting/postdoctoral position starting in 2023 (flexible)

RESEARCH INTERESTS

Programming Languages & Software Engineering: functional programming; interpretation and compilation; program transformation, generation, analysis, and verification; types and effects; symbolic execution; theorem proving; logic programming

EDUCATION

Purdue University

Ph.D. in Computer Science

Committee: Tiark Rompf (advisor), Suresh Jagannathan, Benjamin Delaware, Xiangyu Zhang

West Lafayette, IN

2017 – present

University of Utah

M.S. in Computer Science

Committee: Matthew Might (advisor), Matthew Flatt, Zvonimir Rakamaric

Salt Lake City, UT

2015 – 2017

China University of Geosciences

B.S. in Management Information Systems

Beijing, China

2010 – 2015

Summer Schools

Summer School on Neurosymbolic Programming

Pasadena, CA, 2022

Oregon Programming Languages Summer School

Eugene, OR, 2016, 2017

Racket School of Semantics and Languages

Salt Lake City, UT, 2017

The Seventh Summer School on Formal Techniques

Menlo Park, CA, 2017

PUBLICATIONS

Drafts (available upon request)

- [1] **Guannan Wei**, Oliver Bračevac, Siyuan He, Yuyan Bao, and Tiark Rompf. Polymorphic Reachability Types: Tracking Aliasing and Separation in Higher-Order Generic Programs. *Submitted, 2022.*
- [2] **Guannan Wei**, Songlin Jia, Ruiqi Gao, Haotian Deng, Shangyin Tan, Oliver Bračevac, and Tiark Rompf. Compilation and Code Generation for Parallel Symbolic Execution. *Submitted, 2022.*
- [3] Oliver Bračevac, **Guannan Wei**, Yuxuan Jiang, Supun Abeysinghe, Songlin Jia, Yuyan Bao, and Tiark Rompf. Graph IRs for Impure Higher-Order Languages – Making Aggressive Optimizations Affordable with Precise Effect Dependencies. *Submitted, 2022.*

Conference

- [4] Anxhelo Xhebraj, Oliver Bračevac, **Guannan Wei**, and Tiark Rompf. What If We Don't Pop the Stack? The Return of Second-Class Values. *The 36th European Conference on Object-Oriented Programming (ECOOP)*, 2022.
- [5] **Guannan Wei**, Shangyin Tan, Oliver Bračevac, and Tiark Rompf. LLSC: A Parallel Symbolic Execution Compiler for LLVM IR. *Proceedings of The 29th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2021)*, 2021.
- [6] Yuyan Bao, **Guannan Wei**, Oliver Bračevac, Yuxuan Jiang, Qiyang He, and Tiark Rompf. Reachability Types: Tracking Aliasing and Separation in Higher-Order Functional Programs. *Proc. ACM Program. Lang.*, 5 (OOPSLA), November 2021.
- [7] **Guannan Wei**, Oliver Bračevac, Shangyin Tan, and Tiark Rompf. Compiling Symbolic Execution with Staging and Algebraic Effects. *Proc. ACM Program. Lang.*, 4 (OOPSLA), November 2020.
- [8] **Guannan Wei**, Yuxuan Chen, and Tiark Rompf. Staged Abstract Interpreter: Fast and Modular Whole-Program Analysis via Meta-Programming. *Proc. ACM Program. Lang.*, 3 (OOPSLA), October 2019.
- [9] Gregory Essertel, **Guannan Wei**, and Tiark Rompf. Precise Reasoning with Structured Heaps and Collective Operations. *Proc. ACM Program. Lang.*, 3 (OOPSLA), October 2019.
- [10] Zhuo Zhang, Wei You, Guanhong Tao, **Guannan Wei**, Yonghwi Kwon, and Xiangyu Zhang. BDA: Practical Dependence Analysis for Binary Executables by Unbiased Whole-Program Path Sampling and Per-Path Abstract Interpretation (**Distinguished Paper Award**). *Proc. ACM Program. Lang.*, 3 (OOPSLA), October 2019.
- [11] **Guannan Wei**, James Decker, and Tiark Rompf. Refunctionalization of Abstract Abstract Machines: Bridging the Gap Between Abstract Abstract Machines and Abstract Definitional Interpreters (Functional Pearl). *Proc. ACM Program. Lang.*, 2 (ICFP), July 2018.

Workshop

- [12] Shangyin Tan, **Guannan Wei**, and Tiark Rompf. Partially Evaluating Symbolic Execution for All (Short Paper). *Workshop on Partial Evaluation and Program Manipulation (PEPM)*, co-located with POPL, 2022.
- [13] Joe Hendrix, **Guannan Wei**, and Simon Winwood. Towards Verified Binary Raising. *Workshop on Instruction Set Architecture Specification (SpISA)*, co-located with ITP, 2019.
- [14] Zhanfu Yang, Fei Wang, Ziliang Chen, **Guannan Wei**, and Tiark Rompf. Graph Neural Reasoning for 2-Quantified Boolean Formula Solvers. *Workshop on Learning and Reasoning with Graph-Structured Representations*, co-located with ICML, 2019.

Journal

- [15] Xiaoqing Hao, Haizhong An, Lijia Zhang, Huajiao Li, and **Guannan Wei**. Sentiment Diffusion of Public Opinions about Hot Events: Based on Complex Network. *PLOS ONE*, 10(10):1–16, 10 2015.

RESEARCH EXPERIENCE

Purdue University

Research Assistant. Advisor: Tiark Rompf

West Lafayette, IN

Aug. 2017 – present

- Research areas: metaprogramming, type systems, program analysis, compilers.

Galois, Inc.

Research Intern. Mentor: Joe Hendrix and Ledah Casburn

Portland, OR

May 2018 – Aug. 2018

- Research project: equivalence verification between X86-64 assembly and decompiled LLVM IR programs.
- Developed a prototype verification condition generator, written in Haskell with CVC4.

University of Utah

Research Assistant. Advisor: Matthew Might

Salt Lake City, UT

Aug. 2015 – May 2017

- Research areas: static analysis for higher-order languages, abstract interpretation, and cybersecurity.
- Research project: Space/Time Analysis for Cybersecurity
- Developed static analysis tools based on abstract interpretation for the JVM bytecode, aiming to discover vulnerabilities of space- or time-based attacks.
- Attended four DARPA engagements and analyzed DoS vulnerabilities of Java programs.

TEACHING EXPERIENCE

Purdue University

Lead Teaching Assistant, CS352 Compilers: Principles and Practice (undergraduate)

Spring 2020

Course instructor: Tiark Rompf; ~100 students

Guest Lecturer & Teaching Assistant, CS502 Compilers: Principles and Practice (graduate)

Fall 2019

Course instructor: Tiark Rompf; ~40 students

Teaching Assistant, CS252 System Programming (undergraduate)

Fall 2017, Spring 2018

Course instructor: Gustavo Rodriguez-Rivera; ~40 students in my lab sessions

UNDERGRADUATE MENTORING

○ Shangyin Tan

Published at PEPM 2022, ESEC/FSE 2021, OOPSLA 2020

CRA Outstanding Undergraduate Researcher 2022 (Honorable Mention)

now PhD student at UC Berkeley

Jun. 2020 - Dec. 2021

○ Yuxuan Chen

Published at OOPSLA 2019

now Software Engineer at Meta's Programming Languages Team

Sept. 2018 - Dec. 2018

INDUSTRIAL EXPERIENCE

SambaNova Systems, Inc.

Compiler Engineer Intern

Remote

May 2020 – Aug. 2020

Memo Robotek (Startup)

Software Engineer Intern

Beijing, China

Jan. 2014 – May 2015

Baidu, Inc.

Software Engineer Intern

Beijing, China

Aug. 2013 – Dec. 2013

Kuwangke Technology (Startup)

Software Engineer Intern

Beijing, China

Nov. 2012 – Jul. 2013

PRESENTATIONS

- Reachability Types: Tracking Aliasing and Separation in Higher-Order Functional Programs (Poster)
SPLASH/OOPSLA 2021. Chicago, IL Oct. 2021
- LLSC: A Parallel Symbolic Execution Compiler for LLVM IR
ESEC/FSE 2021. Online Aug. 2021
- Compiling Symbolic Execution with Staging and Algebraic Effects
SPLASH/OOPSLA 2020. Online Nov. 2020
- Metaprogramming for Program Analyzers
The Purdue PL Center (PurPL) Retreat. Online Aug. 2020
- Staged Abstract Interpreters
SPLASH/OOPSLA 2019. Athens, Greece Oct. 2019
- Refunctionalization of Abstract Abstract Machines
ICFP 2018. St. Louis, MO Sept. 2018
Purdue Programming Languages Seminar. West Lafayette, IN Sept. 2018
- Precise Reasoning with Structured Heaps and Collective Operations à la Map/Reduce
Purdue Programming Languages Seminar. West Lafayette, IN Jan. 2018
Midwest Programming Languages Summit (MWPLS '17). Bloomington, IN Dec. 2017

AWARDS

- Maurice H. Halstead Memorial Award in Software Engineering, Purdue University 2022
- ACM SIGPLAN Distinguished Paper Award OOPSLA 2019
- Travel Award, ACM SIGPLAN OOPSLA 2019
- Travel Award, ACM SIGPLAN ICFP 2018
- ACM SIGPLAN PL Mentoring Workshop (PLMW) Scholarship SPLASH 2018
- Oregon Programming Language Summer School Fellowship 2017
- The 3rd Class Scholarship (top 15%), China University of Geosciences Beijing 2013
- The 3rd Prize, Hackathon held by Sinovation Ventures 2013
- The 1st Place, Web development competition, China University of Geosciences Beijing 2012

SKILLS

Functional Programming: Scala, Racket/Scheme, Haskell, OCaml, SML

Theorem Proving: Agda, Coq, SAT/SMT

Logic Programming: miniKanren, Datalog, Prolog

Other PLs: Python, Java, JavaScript, C/C++, SQL **Tools:** PLT Redex, \LaTeX , Git, Vim, Emacs, Linux

Languages: Chinese (native), English (fluent)

PROFESSIONAL ACTIVITIES

Program Committee Member

- The 3rd International Conference on Code Quality (ICCCQ) 2023
- ACM SIGPLAN Workshop on Virtual Machines and Intermediate Languages (VMIL) 2021
- European Conference on Computer Systems (EuroSys) Shadow 2021

Artifact Evaluation Committee Member

- ACM SIGPLAN Symposium on Principles of Programming Languages (POPL) 2023
- ACM SIGPLAN Conf. on Programming Language Design and Implementation (PLDI) 2021, 2022
- ACM SIGPLAN International Conference on Functional Programming (ICFP) 2019, 2020, 2021
- ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA) 2021

- ACM SIGPLAN Conf. on Object-Oriented Prog., Systems, Lang., and Applications (OOPSLA) 2020
- International Conference on Computer Aided Verification (CAV) 2020

Sub-reviewer

- ACM SIGPLAN International Conference on Functional Programming (ICFP) 2022
- ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA) 2021
- International Conference on Learning Representations (ICLR) 2019

Student Volunteer

- ACM SIGPLAN Symposium on Principles of Programming Languages (POPL) 2023
- ACM SIGPLAN International Conference on Functional Programming (ICFP) 2019
- Midwest Programming Languages Summit & PurPL Fest 2019
- Fedora User and Developer Conference 2014

Membership

- ACM and ACM Special Interest Group on Programming Languages (SIGPLAN) 2017 -

SOFTWARE

I lead or contribute to several research software and open-source projects:

- **GenSym: A compiler for parallel symbolic execution of LLVM**
<https://github.com/Generative-Program-Analysis/GenSym>
- **LLSC: The predecessor symbolic-execution compiler of GenSym**
<https://github.com/Kraks/sai>
- **Lightweight Modular Staging (LMS)**
<https://github.com/TiarkRompf/lms-clean>
- **JAAM: An abstract interpreter for JVM bytecode**
<http://github.com/Ucombinator/jaam>
- **The Chinese Translation of “Software Foundations”**
<https://coq-zh.github.io/SF-zh>