

Guannan Wei

Department of Computer Science, Purdue University – West Lafayette, IN 47906, USA

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RESEARCH INTERESTS

Programming languages, compilers, software engineering, and their applications.

EDUCATION

Purdue University

Ph.D. in Computer Science

Dissertation: Metaprogramming Program Analyzers

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

West Lafayette, IN, USA

2017 – 2023

University of Utah

M.S. in Computer Science

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

Salt Lake City, UT, USA

2015 – 2017

China University of Geosciences

B.S. in Management Information Systems (studied Law 2010-2012)

Beijing, China

2010 – 2015

Summer Schools

Summer School on Neurosymbolic Programming

Pasadena, CA, USA, 2022

Oregon Programming Languages Summer School

Eugene, OR, USA, 2016, 2017

Racket School of Semantics and Languages

Salt Lake City, UT, USA, 2017

The Seventh Summer School on Formal Techniques

Menlo Park, CA, USA, 2017

ACADEMIC APPOINTMENT

Purdue University, Department of Computer Science

Postdoctoral Researcher

Graduate Research Assistant

West Lafayette, IN, USA

Aug 2023 – present

Aug 2017 – May 2023

University of Utah, School of Computing

Graduate Research Assistant

Salt Lake City, UT, USA

Aug 2015 – May 2017

PUBLICATIONS

Conference

- [1] **Guannan Wei**, Danning Xie, Wuqi Zhang, Yongwei Yuan, and Zhuo Zhang. Consolidating Smart Contracts with Behavioral Contracts. *Proceedings of the ACM on Programming Languages*, 8 (PLDI), 2024.
- [2] Mingwei Zheng, Qingkai Shi, Xuwei Liu, Xiangzhe Xu, Le Yu, Congyu Liu, **Guannan Wei**, and Xiangyu Zhang. ParDiff: Practical Static Differential Analysis of Network Protocol Parsers. *Proceedings of the ACM on Programming Languages*, 8 (OOPSLA), 2024.
- [3] **Guannan Wei**, Oliver Bracevac, Songlin Jia, Yuyan Bao, and Tiark Rompf. Polymorphic Reachability Types:

Tracking Freshness, Aliasing, and Separation in Higher-Order Generic Programs. *Proceedings of the ACM on Programming Languages*, 8 (POPL), 2024.

- [4] Oliver Bračevac, **Guannan Wei**, Songlin Jia, Supun Abeysinghe, Yuxuan Jiang, Yuyan Bao, and Tiark Rompf. Graph IRs for Impure Higher-Order Languages – Making Aggressive Optimizations Affordable with Precise Effect Dependencies. *Proceedings of the ACM on Programming Languages*, 7 (OOPSLA), November 2023.
- [5] **Guannan Wei**, Songlin Jia, Ruiqi Gao, Haotian Deng, Shangyin Tan, Oliver Bračevac, and Tiark Rompf. Compiling Parallel Symbolic Execution with Continuations. *Proceedings of the 45th International Conference on Software Engineering (ICSE)*, 2023.
- [6] 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.
- [7] **Guannan Wei**, Shangyin Tan, Oliver Bračevac, and Tiark Rompf. LLSC: A Parallel Symbolic Execution Compiler for LLVM IR (Tool Demonstration). *Proceedings of the 29th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)*, 2021.
- [8] Yuyan Bao, **Guannan Wei**, Oliver Bračevac, Yuxuan Jiang, Qiyang He, and Tiark Rompf. Reachability Types: Tracking Aliasing and Separation in Higher-Order Functional Programs. *Proceedings of the ACM on Programming Languages*, 5 (OOPSLA), November 2021.
- [9] **Guannan Wei**, Oliver Bračevac, Shangyin Tan, and Tiark Rompf. Compiling Symbolic Execution with Staging and Algebraic Effects. *Proceedings of the ACM on Programming Languages*, 4 (OOPSLA), November 2020.
- [10] **Guannan Wei**, Yuxuan Chen, and Tiark Rompf. Staged Abstract Interpreter: Fast and Modular Whole-Program Analysis via Meta-Programming. *Proceedings of the ACM on Programming Languages*, 3 (OOPSLA), October 2019.
- [11] Gregory Essertel, **Guannan Wei**, and Tiark Rompf. Precise Reasoning with Structured Heaps and Collective Operations. *Proceedings of the ACM on Programming Languages*, 3 (OOPSLA), October 2019.
- [12] Zhuo Zhang, Wei You, Guan hong 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**). *Proceedings of the ACM on Programming Languages*, 3 (OOPSLA), October 2019.
- [13] **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). *Proceedings of the ACM Programming Languages*, 2 (ICFP), July 2018.

Workshop

- [14] 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.
- [15] Joe Hendrix, **Guannan Wei**, and Simon Winwood. Towards Verified Binary Raising. *Workshop on Instruction Set Architecture Specification (SpISA)*, co-located with ITP, 2019.
- [16] 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

[17] 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.

AWARDS

- Maurice H. Halstead Memorial Award in Software Engineering, Purdue University 2022
- ACM SIGPLAN Distinguished Paper Award OOPSLA 2019
- 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, Sinovation Ventures 2013
- The 1st Place, Web development competition, China University of Geosciences Beijing 2012

PROFESSIONAL ACTIVITIES

Program Committee Member

- International Conference on Code Quality (ICCCQ) 2023, 2024
- 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, 2024
- ACM SIGPLAN Conf. on Programming Language Design and Implementation (PLDI) 2021, 2022, 2023
- ACM SIGPLAN International Conference on Functional Programming (ICFP) 2019, 2020, 2021, 2023, 2024
- ACM SIGPLAN Conf. on Object-Oriented Prog., Systems, Lang., and Applications (OOPSLA) 2020, 2024
- ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA) 2021, 2024
- 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

Professional Associations

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

INDUSTRIAL EMPLOYMENT

SambaNova Systems, Inc.

Compiler Engineer Intern

Remote
May 2020 – Aug 2020

Galois, Inc.

Research Intern. Mentor: Joe Hendrix and Ledah Casburn

Portland, OR, USA
May 2018 – Aug 2018

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

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 sectors.

UNDERGRADUATE MENTORING

○ Mikail Khan *Sept 2022 -*
Project: compilation-based concolic execution for WebAssembly.

○ Shangyin Tan *Jun 2020 - Dec 2021*
Published at ICSE 2023 [5], PEPM 2022 [14], ESEC/FSE 2021 [7], OOPSLA 2020 [9].
CRA Outstanding Undergraduate Researcher 2022 (Honorable Mention).
Now PhD student at UC Berkeley.

○ Yuxuan Chen *Sept 2018 - Dec 2018*
Published at OOPSLA 2019 [10].
Now Senior Software Engineer at Meta's Programming Languages and Runtime Team.

INVITED TALKS AND PRESENTATIONS

○ Types and Metaprogramming for Correct, Safe, and Performant Software Systems *May 2024*
Languages, Systems, and Data Seminar, UC Santa Cruz, CA
Principles of Programming and Verification Seminar, Boston University, MA
The University of Texas at Arlington, TX
The University of Texas at Dallas, TX
Rutgers University, New Brunswick, NJ
Drexel University, Philadelphia, PA
Georgia Institute of Technology, Atlanta, GA
New Jersey Institute of Technology, Newark, NJ
Utah State University, Logan, UT
Binghamton University (SUNY), Binghamton, NY
DePaul University, Chicago, IL
Tufts University, Boston, MA
University of California, Merced, CA (remote)
Concordia University, Montreal, Canada (remote)
National University of Singapore, Singapore (remote)
University of Iowa, Iowa City, IA
University at Buffalo (SUNY), Amherst, NY
College of William & Mary, Williamsburg, VA (remote) *May 2024*
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- Rensselaer Polytechnic Institute, Troy, NY* *Feb 2024*
- Louisiana State University, Baton Rouge, LA* *Jan 2024*
- Shanghai Jiaotong University, Shanghai, China (remote)* *Jan 2024*
- **Polymorphic Reachability Types** *Jan 2024*
POPL 2024. London, UK
- Midwest Programming Languages Summit (MWPLS '23). University of Michigan, Ann Arbor, MI* *Oct 2023*
- **Compiling and Controlling Symbolic Execution** *Dec 2023*
Programming Languages Seminar. Northeastern University, Boston, MA
- Midwest Programming Languages Summit (MWPLS '23). University of Michigan, Ann Arbor, MI* *Oct 2023*
- **Compiling Parallel Symbolic Execution with Continuations** *May 2023*
ICSE 2023. Melbourne, Australia
- **Reachability Types: Tracking Aliasing and Separation in Higher-Order Functional Programs** *Oct 2021*
SPLASH/OOPSLA 2021. Chicago, IL
- **LLSC: A Parallel Symbolic Execution Compiler for LLVM IR** *Aug 2021*
ESEC/FSE 2021. Online
- **Compiling Symbolic Execution with Staging and Algebraic Effects** *Nov 2020*
SPLASH/OOPSLA 2020. Online
- **Metaprogramming for Program Analyzers** *Aug 2020*
The Purdue PL Center (PurPL) Retreat. Online
- **Staged Abstract Interpreters** *Oct 2019*
SPLASH/OOPSLA 2019. Athens, Greece
- **Refunctionalization of Abstract Abstract Machines** *Sept 2018*
ICFP 2018. St. Louis, MO
- Purdue Programming Languages Seminar. West Lafayette, IN, USA* *Sept 2018*
- **Precise Reasoning with Structured Heaps and Collective Operations à la Map/Reduce** *Jan 2018*
Purdue Programming Languages Seminar. West Lafayette, IN, USA
- Midwest Programming Languages Summit (MWPLS '17). Indiana University, Bloomington* *Dec 2017*

SOFTWARE

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

- **Diamond: A language with polymorphic reachability types and effects**
<https://github.com/Kraks/diamond-lang>
- **GenSym: A compiler for parallel symbolic execution of LLVM IR**
<https://github.com/Generative-Program-Analysis/GenSym>
- **Lightweight Modular Staging (LMS)**
<https://github.com/TiarkRompf/lms-clean>
- **JAAM: An abstract interpreter for JVM bytecode**
<http://github.com/Ucombinator/jaam>
- **Chinese Translation Project of Textbook “Software Foundations”**
<https://coq-zh.github.io/SF-zh>