Yusen Su

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Research Interests

My research focuses on designing, implementing, and using static program analysis techniques to automatically verify software and optimize existing toolchains. Currently, I am working on designing new abstract domains for scalable analysis while maintaining practical precision for verification tasks.

Education

2020-2026 (Exp. May) **Ph.D., Electrical and Computer Engineering**, *University of Waterloo*, Waterloo, Faculty of Engineering — Grade - 87.75 / 100.00

Dissertation *Scalable Program Analysis: Abstract Interpretation Techniques and Practical Applications* (Adviser: Prof. Arie Gurfinkel)

2018–2020 **M.Sc., Computer Science**, *New York University*, New York, NY, Courant Institute of Mathematical Sciences — GPA - 3.90 / 4.0

Dissertation *Data Flow Refinement Type Inference Tool:* `DRIFT`^{2} (Adviser: Prof. Thomas Wies)

2015–2016 **B.Sc., Computer Science**, *University of Minnesota - Twin Cities*, Minneapolis, MN, College of Science and Engineering — GPA - 3.66 / 4.0

2012–2014 **B.Sc., Computer Science and Technology (Dual degree)**, *University of Electronic Science and Technology of China*, Chengdu, China, School of Computer Science and Engineering — GPA - 3.77 / 4.0

Publications

Ongoing Y. Su, J. A. Navas, A. Gurfinkel. **Scalable Taint Analysis via Heap-Aware Propagation**.

2025 Y. Su, J. A. Navas, A. Gurfinkel. **Template DBM: A New Weakly Relational Domain for Efficient Memory-Access Validation** *17th International Conference on Verified Software: Theories, Tools, and Experiments* (VSTTE 2025).
Best Tool Paper Award

2025 Y. Su, J. A. Navas, A. Gurfinkel, I. Garcia-Contreras. **Automatic Inference of Relational Object Invariants.** *Verification, Model Checking, and Abstract Interpretation* (VMCAI 2025). DOI: 10.1007/978-3-031-82700-6_10

2022 S. Priya, Y. Su, Y. Bao, X. Zhou, Y. Vizel, A. Gurfinkel. **Bounded Model Checking for LLVM.** *22nd Formal Methods in Computer-Aided Design* (FMCAD 2022). DOI: 10.34727/2022/ISBN.978-3-85448-053-2_28

2021 S. Priya, X. Zhou, Y. Su, Y. Vizel, Y. Bao, A. Gurfinkel. **Verifying Verified Code.** *Automated Technology for Verification and Analysis* (ATVA 2021). DOI: 10.1007/978-3-030-88885-5_13

2021 Z. Pavlinovic, Y. Su, T. Wies. **Data flow refinement type inference.** *Proc. ACM Program. Lang.* (POPL 2021). DOI: 10.1145/3434300

Conference Service

Subreviewer	Tools and Algorithms for the Construction and Analysis of Systems (TACAS) '26, '23, '22; FMCAD '25, '22; International Symposium on Formal Methods (FM) '24, '23; NASA Formal Methods Symposium (NFM) '22
AEC	Computer Aided Verification (CAV) '25; TACAS '26, '25 AEC = Artifact Evaluation Committee
Volunteer	CAV '24

Professional Experience

Sep 2023 - Apr 2025 **Associate Researcher (Part-time)**, *Huawei Technologies Canada*, Waterloo, Canada
- Built a test-case generation tool using the binary analysis symbolic execution tool `angr`
- Integrated into the property-based testing framework `RapidCheck` for coverage-guided testing

May 2023 - Aug 2023 **Associate Researcher (Intern)**, *Huawei Technologies Canada*, Waterloo, Canada
- Applied the FMCAD 2022 tool `SEABMC` to verify memory and other safety properties of C programs

Sep–Dec 22 + Sep–Dec 21 **Teaching Assistant**, *University of Waterloo*, Waterloo, Canada
ECE 351 - Compilers (Undergraduate)

Jan-May 20 +May-Aug 19 **Recitation Leader and Grader**, *New York University*, New York City, USA
CSCI-GA.2110 - Programming Languages (Graduate)

Sep-Nov 2017 **Web Developer Intern**, *Harbin Institute of Technology*, Harbin, China
Ground Station TM/TC System - `Mun`
- Self-designed a TCP-WebSocket proxy client and built the `Tornado` web server
- Designed the web server architecture and completed the integration testing

Selected Projects

2021–Present `Crab` **- A lib for abstract interpretation-based Analysis**, *University of Waterloo*
- Designed and implemented a taint analysis based on existing abstract domains
- Designed and implemented an abstract domain to represent complex relational invariants
- Designed and implemented an abstract domain to verify spatial memory safety in LLVM IR
- Integrated `Crab` as a preprocessor in `SEABMC` pipeline

2020–2021 `DRIFT`^{2} **- Data Flow Refinement Type Inference Tool**, *New York University*
- Implemented a data-flow refinement type inference tool based on abstract interpretation

Technical Skills

PLang.	C/C++, Python, OCaml, Java, Rust, Scala, Scheme, MATLAB, Prolog, SQL
Verif. Tools	`SeaHorn, angr, CBMC, KLEE, Liquid Haskell, SMACK`
Infrastructure	LLVM, Docker, Git, Vagrant, VirtualBox, Linux/Unix systems
Dev. Tools	Visual Studio, Xcode, Android Studio, Eclipse, SQL Server, PyQt, Vim, IntelliJ IDEA
Languages	Mandarin (native), English (fluent), Spanish (beginner)

Honors and Awards

2020–present	Graduate Research Studentship, University of Waterloo
2012–2014	National Endeavor Fellowship, University of Electronic Science and Technology of China

Leadership and Activities

Summer 2013 **Rutgers China Bridge Program in Engineering**, *Rutgers University*,
Direct Leadership Team, UESTC