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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.

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## Education

- 2020–2026 **Ph.D., Electrical and Computer Engineering**, *University of Waterloo*, Waterloo, (Exp. May) 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<sup>2</sup>* (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

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## 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

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## 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 - **Associate Researcher (Part-time)**, *Huawei Technologies Canada*, Waterloo, Canada  
Apr 2025
  - 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 - **Associate Researcher (Intern)**, *Huawei Technologies Canada*, Waterloo, Canada  
Aug 2023
  - Applied the FMCAD 2022 tool **SEABMC** to verify memory and other safety properties of C programs
- Sep–Dec 22 **Teaching Assistant**, *University of Waterloo*, Waterloo, Canada  
+ Sep–Dec 21 ECE 351 - Compilers (Undergraduate)
- Jan–May 20 **Recitation Leader and Grader**, *New York University*, New York City, USA  
+May–Aug 19 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<sup>2</sup> - 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