BRETT SAIKI

Industrial PhD Student ~ U.W. and Intel

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SUMMARY

Graduate student doing research in programming languages, computer number systems, and term rewriting; obsessed with all things floating-point in both software and hardware.

Languages: C, C++, Racket, Rust, Java, Python

Interests: Programming Languages, Floating-point, Numerics, Verification

EDUCATION

University of Washington | *Paul G. Allen School of Computer Science and Engineering*   Sep. 2024 — Present
PhD Computer Science and Engineering   Seattle, WA

University of Washington | *Paul G. Allen School of Computer Science and Engineering*   Sep. 2023 — Present
M.S. Computer Science and Engineering   Seattle, WA

University of Washington | *Paul G. Allen School of Computer Science and Engineering*   Aug. 2019 — Jun. 2023
B.S. Computer Engineering, B.A. Mathematics   Seattle, WA

EXPERIENCE

Intel Corporation | Seattle, WA (Remote)   Sept 2024 — Present
GPU Logic Design Engineer
- researching computer numerics, programming languages, and rewriting engines (at the University of Washington)
- developing libraries for simulating and formally verifying numerical hardware in GPUs and other accelerators

University of Washington | Seattle, WA   Sep. 2023 — Sep. 2024
Research Assistant
- developed tools and libraries for floating-point accuracy optimization and term rewriting
- collaborated with undergraduate students, graduate students, and professors

Intel Corporation | Folsom, CA   Jun. 2023 — Sep. 2023
Mathematical Hardware Intern   Jun. 2022 — Sep. 2022
- developed compilers for translating numerical specifications, libraries for formally verifying hardware designs, and visualization tools for simulating numerical algorithms
- improved high-level graphics hardware algorithms

University of Washington | Seattle, WA   Sep. 2022 — Jun. 2023
Undergraduate Research Assistant   Dec. 2019 — Jun. 2022
- developed tools and libraries for floating-point accuracy optimization and term rewriting
- collaborated with graduate students, professors, and industrial groups

University Enterprises Inc. | Santa Ana, CA   Jun. 2019 — Aug. 2019
Contracted by State Compensation Insurance Fund (SCIF)
Summer Intern
- learned lifecycle of a worker's compensation insurance claim
- indexed digital documents, digitized physical claims, contacted medical providers for work status updates

PUBLICATIONS

Target-Aware Implementation of Real Expressions
Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2025
Brett Saiki, Jackson Brough, Jonas Regehr, Jesús Ponce, Varun Pradeep, Aditya Akhileshwaran, Zachary Tatlock, Pavel Panchekha

Equality Saturation Theory Exploration à la Carte
Object-Oriented Programming, Systems, Languages and Applications (OOPSLA) 2023
Anjali Pal, Brett Saiki, Ryan Tjoa, Cynthia Richey, Amy Zhu, Oliver Flatt, Max Willsey, Zachary Tatlock, Chandrakana Nandi

Odyssey: An Interactive Workbench for Expert-Driven Floating-Point Expression Rewriting
ACM Symposium on User Interface Software and Technology (UIST) 2023
Edward Misback, Caleb C. Chan, Brett Saiki, Eunice Jun, Zachary Tatlock, Pavel Panchekha

Rewrite Rule Inference Using Equality Saturation | *Distinguished Paper Award*
Object-Oriented Programming, Systems, Languages and Applications (OOPSLA) 2021
Chandrakana Nandi, Max Willsey, Amy Zhu, Brett Saiki, Yisu Wang, Adam Anderson, Adriana Schulz, Dan Grossman, Zachary Tatlock

Combining Precision Tuning and Rewriting
IEEE International Symposium on Computer Arithmetic (ARITH) 2021
Brett Saiki, Oliver Flatt, Chandrakana Nandi, Pavel Panchekha, Zachary Tatlock

TALKS

Target-Aware Implementation of Real Expressions
ASPLOS 2025 (Conference); Rotterdam, Netherlands; April 2025

Combining Precision Tuning and Rewriting
FPTalks 2021 (Workshop); Virtual; July 2021

Combining Precision Tuning and Rewriting
ARITH 2021 (Conference); Virtual; June 2021

PATENTS

Level-Of-Detail Determination Using Major Squared And Efficient Clamping In a Graphics Environment Bill Zorn, Theo Drane, Brett Saiki	US-20240312034-A1 Accepted: Sept 2024
Level-Of-Detail Eigenvector Determination in a Graphics Environment Bill Zorn, Theo Drane, Brett Saiki	US-20240312110-A1 Accepted: Sept 2024
Computation of Correctly Rounded Floating Point Summation Brett Saiki, Bill Zorn, Theo Drane	US-20240160405-A1 Accepted: May 2024
Computation of Exact Floating Point Addition Brett Saiki, Bill Zorn, Theo Drane	US-20240152323-A1 Accepted: May 2024

RESEARCH

FPy	Project	PyPI	Docs Embedded Python DSL for design space exploration of numerical algorithms	
Herbie	Project	GitHub Floating-point accuracy improver	PLDI 2015, ARITH 2021, UIST 2023, ASPLOS 2025
Ruler	Project Rewrite rule synthesis for EqSat	OOPSLA 2021, OOPSLA 2023
FPBench	Project FPCore tools, compilers, benchmarks	NSV 2016

PROJECTS

Minim	Project Scheme interpreter written in C	**mpmfnum**	Project	Docs Number systems library in Rust	**generic-flonum**	Project	Docs Alternate MPFR interface in Racket with subnormalization and exponent bounds