


# Yumeng He

+1-801-347-7770 | u1528477@umail.utah.edu |  ymh1003  
Salt Lake City, UT

## EDUCATION

### • University of Utah

PhD in Computer Science

August 2024 - Present

Salt Lake City, UT

- GPA: 4.00/4.00, advised by Pavel Panchekha
- Coursework: Programming Languages, Operating Systems, Computer Architecture, Software Security
- Research on program analysis and numerical software reliability, with applications to compilers/HPC

### • University of Rochester

Bachelor of Science, **Double Major** in Computer Science and Mathematics, Minor in Business

August 2020 - May 2024

Rochester, NY

- Grade: 3.98/4.00, graduated summa cum laude, highest distinction

## PUBLICATIONS

- [1] He, Y., & Panchekha, P. (2025). Accurate Numeric Debugging without Arbitrary Precision. *Under Review*.
- [2] He, Y., Nandi, C., & Pai, S. (2025). Formalizing Linear-Motion G-code for Invariant Checking and Differential Testing of Fabrication Tools. *OOPSLA 2025*. [DOI] [ArXiv] [Talk] [Code]
- [3] He, Y., Kotler-Berkowitz, M., Liuson, H., & Nie, Z. (2024). A Critique of Du's" A Polynomial-Time Algorithm for 3-SAT. arXiv preprint arXiv:2404.04395. [ArXiv]
- [4] Chavrimootoo, M. C., He, Y., Kotler-Berkowitz, M., Liuson, H., & Nie, Z. (2023). Evaluating the Claims of" SAT Requires Exhaustive Search". arXiv preprint arXiv:2312.02071. [ArXiv]

## PROJECTS

### • Efficient Numeric Debugging with Improved Accuracy [1]

August 2024 - Present

Skills: C/C++, dynamic analysis & runtime instrumentation, numerical analysis

- Developed a floating-point debugger that avoids high-precision arithmetic while significantly improving the accuracy of state-of-the-art error-free transformation methods.
- Extended a Wasm interpreter to support shadow execution, enabling per-variable floating-point error tracking.
- Designed a dynamic analysis framework that improves result precision through iterative program re-execution.
- Evaluated the system on 44 large, real-world numerical applications, achieving strictly higher accuracy than baseline number systems on most problematic benchmarks with low re-execution overhead.

### • Differential Testing on G-code for 3D Printing Bug Detection [2]

May 2023 - Present

Skills: Python, static analysis, formal semantics, computational geometry



- Developed a static analysis tool to catch software bugs in the 3D printing pipeline ahead of the final print, using differential testing on low-level G-code instructions (the control language for 3D printers).
- Defined formal semantics for G-code using cuboid set representations and sampled point clouds for scalable geometric operations, further segmenting them to enable error localization during comparison.
- Evaluated on 58 real-world buggy models and identified issues by checking the rotation-invariant property.
- Used the tool to compare and analyze real-world fabrication software, such as slicers and mesh-repair tools.

### • Lease Cache Design

May 2023 - August 2023

Skills: Rust, cache/memory systems, memory locality, probability theory

- Modeled performance degradation resulting from optimal virtual lease assignments in physical cache systems.
- Developed mathematical proofs for key properties of the model.

### • Complexity Theory & Computational Social Choice

August 2023 - May 2024

Skills: computational complexity, voting theory

- Collaboratively developed proofs critiquing two papers that address the P vs. NP question [3] [4].
- Contributed to an ongoing paper exploring the difficulty of manipulative actions under uncertain voting rules.

## HONORS AND AWARDS

### • Undergraduate Research Award

May 2024

Department of Computer Science, University of Rochester

- One of four recipients at the graduation ceremony.

### • Phi Beta Kappa

Elected March 2023

University of Rochester Chapter

## PROFESSIONAL EXPERIENCE

### • TA for Computer Organization, CS Dept., University of Rochester

Spring 2023

### • TA for Operations Research, Math Dept., University of Rochester

Fall 2022

### • Product Management Intern, Trucker Path, Renren Inc.

May 2021 - July 2021