Amar Shah

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Research Interests

My background is in automated program verification. Specifically, I am interested in tools such as Verus that enable developers to write verified code and SAT and SMT solvers that provide the reasoning support.

Education

Carnegie Mellon University August 2024 - Present
PhD in Computer Science advised by Marijn Heule & Bryan Parno

University of California, Berkeley January 2020 - December 2023
BA Computer Science and Math; Minor in Logic GPA: 3.90
Honors Thesis: *Reasoning about Algebraic Datatypes* advised by Federico Mora & Sanjit A. Seshia

Research Experience

Assisted Software Technologies Group (ETH Zürich) February 2024 - July 2024
- Advised by Prof. Zhendong Su
- Fuzzing Database engines and building SMT solvers

Learn & Verify Group (UC Berkeley) August 2022 - December 2023
- Advised by Prof. Sanjit Seshia and Federico Mora
- Worked on SMT solvers for Algebraic Datatypes and synthesizing invariants for distributed systems

University of Maryland Math REU June 2022 - August 2022
- Worked with Professor Maria Cameron on optimal control in stochastic systems

Refereed Conference & Journal Publications

[1] **Amar Shah**, Federico Mora, and Sanjit A. Seshia. "An Eager Satisfiability Modulo Theories Solver for Algebraic Datatypes". In: *Thirty-Eighth AAAI Conference on Artificial Intelligence*. 2024. URL: `https://doi.org/10.1609/aaai.v38i8.28649`.

[2] Jiaxin Yuan, **Amar Shah**, Channing Bentz, and Maria Cameron. "Optimal control for sampling the transition path process and estimating rates". In: *Communications in Nonlinear Science and Numerical Simulation (CNSNS)* (2024). DOI: `https://doi.org/10.1016/j.cnsns.2023.107701`.

Student Research Posters and Presentations

[1] "An Eager SMT Solver for Algebraic Data Type Queries". Programming Languages Design & Implementation (PLDI). July 2023. **PLDI Undergraduate Student Research Competition Winner. ACM Student Research Competition Grand Finals Runner Up**.

[2] "Results for Optimal Controllers in Transition Path Theory". Joint Mathematical Meetings. Jan. 2023.

[3] "Optimal Control in Transition Path Theory". Gulf Coast Undergrad Research Symposium. Oct. 2022. **Outstanding Presentation Award**.

Other Talks

[1] "Model Theory & o-minimality". Berkeley Math Directed Reading Program. Dec. 2021.

[2] "Quantum Logic Gates". MathIly-Er High School Camp. July 2021.

[3] "Solovay-Kitaev Theorem & Representation Theory". Berkeley Directed Reading Program. May 2021.

Research Software

Algaroba   Primary developer
- An Eager SMT Solver for the theory of Algebraic Datatypes
- **Winner of QF_Datatypes division at SMTCOMP 2024**

UCLID5   Contributor
- An integrated modeling, verification and synthesis tool
- I helped implement support for Algebraic Datatypes

Teaching Experience

Undergraduate Student Instructor

Math 1A: Calculus	Fall 2022
CS 70: Discrete Mathematics & Probability Theory	Summer 2021

Teaching Assistant

Berkeley Math Circle Elementary	Fall 2021, Spring 2022

Course Reader

C 191: Quantum Information Science & Technology	Spring 2023
CS 170: Efficient Algorithms & Intractable Problems	Spring 2023
CS 70: Discrete Mathematics & Probability Theory	Fall 2021, Spring 2022

Awards

Second Place Winner ACM Grand Finals, Undergraduate Student Research Competition	2024
First Place Winner, PLDI Undergraduate Student Research Competition	2023
EECS Evergreen Research Award (UC Berkeley)	2023
Summer Undergraduate Research Fellow (UC Berkeley)	2023
Math Outstanding Graduate Student Instructor (UC Berkeley)	2023
Gulf Coast Undergraduate Research Symposium Outstanding Presentation	2022
Dean's List (UC Berkeley): Fall 2021, Spring 2022, Fall 2023, Spring 2023	2021-2023
EECS Honors Program: Focus in Mathematical Logic (UC Berkeley)	2020-2023
Math Honors Program (UC Berkeley)	2020-2023
Honors to Date (UC Berkeley)	2020-2023
Eagle Scout	2019

Academic Service

Graduate Application Support Program Mentor	Fall 2024
Berkeley Undergraduate Mathementoring Program Mentor	Fall 2021, Fall 2023
Berkeley Math Tournament Problem Writer	2020
Berkeley Science Journal reviewer	Jan. - Dec. 2020

Miscellaneous

Activities:	IEEE Upsilon Pi Epsilon (**CS Honors Society**); Math Directed Reading Program; Student Association of Applied Statistics; Quantum Computing @ Berkeley; Undergrad Theoretical Computer Science; Math Undergrad Student Association
Programming Languages:	Python; C; C++; Rust; OCaml; Java; LaTeX; Assembly (RISC-V)
Tools:	SAGEMath; PyTorch; TensorFlow; NumPy; HTML; CSS; GCP; UNIX; Git
Languages:	English (native), Hindi (fluent), Spanish (basic), German (basic)

Non Academic

Berkeley Student Cooperative (Kitchen, Garden, Social and Waste Reduction Manager)	2020-2023
Community Homestead (Farm and Social Work)	2019