

Shraddha Barke

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Research Agenda

Programming is hard and error-prone, and involves tedious tasks. My research aims to create tools for software engineers and scientists that generate correct code efficiently and automate mundane tasks in their workflow. To that end, my current research focuses on developing techniques to make program synthesis technology scalable using guidance from probabilistic models. I also aim to develop strategies and metrics to synthesize readable and generalizable code.

Education

- 2018–Present **Ph.D. Computer Science**, *University of California*, San Diego, CA, USA.
Advisor: Nadia Polikarpova.
- 2018–2020 **M.S. Computer Science**, *University of California*, San Diego, CA, USA.
Advisor: Nadia Polikarpova. Report: Guided Program Synthesis Using Probabilistic Models.
- 2013–2017 **B.E. Electronics and Instrumentation**, *Birla Institute of Technology and Science*, Goa, India.
Thesis Advisor: Ashutosh Gupta. Thesis: Fence Synthesis in Weak Memory Models.

Publications

Refereed Conference/Workshop Papers

- OOPSLA 2020 **Shraddha Barke**, Hila Peleg, Nadia Polikarpova. Just-in-Time Learning for Bottom-Up Enumerative Synthesis. *Object-Oriented Programming, Systems, Languages, and Applications*, 2020.
- OOPSLA 2020 Xiang Gao, **Shraddha Barke**, Arjun Radhakrishna, Gustavo Soares, Sumit Gulwani, Alan Leung, Nachiappan Nagappan, Ashish Tiwari. Feedback-Driven Semi-Supervised Synthesis of Program Transformations. *Object-Oriented Programming, Systems, Languages, and Applications*, 2020.
- EMNLP 2019 **Shraddha Barke**, Rose Kunkel, Eric Meinhardt, Nadia Polikarpova, Eric Bakovic, and Leon Bergen. Constraint-based Learning of Phonological Processes. *Conference on Empirical Methods in Natural Language Processing*, 2019.

Book Chapters

- 2018 Annette Bieniusa, Peter Zeller, and **Shraddha Barke**. Collaborative Work Management with a Highly-Available Kanban Board. *Principled Software Development - Essays Dedicated to Arnd Poetzsch-Heffter on the Occasion of his 60th Birthday*, 2018.

In Submission/ Under Preparation

- 2019 John Sarracino, **Shraddha Barke**, Hila Peleg, Nadia Polikarpova, and Sorin Lerner. Targeted Program Synthesis for Programming with Invariants.

Professional Employment

- 2018-present **Graduate Student Researcher**, *University of California*, San Diego, CA.
Graduate research in programming languages, specifically program synthesis and verification.
- Summer 2019 **Research Intern, Program Synthesis using Examples Group**, *Microsoft Research*, Redmond, WA.
Worked with Alan Leung, Gustavo Soares and Arjun Radhakrishna, on extending an on the fly synthesis system that automatically detects repetitive edits and synthesizes transformations for other locations in the code, based on only one instance of the edit. Resulted in publication of a paper in OOPSLA, and the filing of a patent.
- 2017-2018 **Research Intern**, *Technische Universität Kaiserslautern*, Kaiserslautern, Germany.
Worked with Annette Bieniusa and Peter Zeller on a verification system that guarantees safety of applications built on top of weakly consistent databases. Extended the system to support built-in conflict resolution data types (CRDTs) for managing the state of replicas. Developed a collaborative editing application as a testing prototype for Antidote, a distributed database with replicated data types.

- Summer 2016 **Undergraduate Research Intern**, *Tata Institute of Fundamental Research*, Mumbai, India.
Worked with Ashutosh Gupta on a fence synthesis system for relaxed memory models. Implemented a constraint based synthesis algorithm that enables minimal fence synthesis and extended the tool to consider data and address dependencies. Evaluated the tool on mutual exclusion programs and achieved optimal fence placement.
- Winter 2015 **Software Development Intern**, *Outreachy, Linux Kernel*, Remote.
Worked with Greg Hartman and contributed over 500 patches to kernel code that involved updating API interfaces and fixing bugs using static analysis tools, Coccinelle and Checkpatch. Ranked 6 among the most active developers in terms of patches for 4.4 Linux version by LWN.net.

Talks and Workshops

- 2020 “Just-in-Time Learning for Bottom-Up Enumerative Synthesis,” OOPSLA 2020, Chicago, IL.
2019 “Constraint-based Learning of Phonological Processes,” EMNLP 2019, Hong Kong.
2016 “Linux Kernel Staging Drivers Cleanup”, Outreachy Panel, LinuxCon Europe 2016, Berlin.
2016 “Fence Synthesis in Weak Memory Models,” Indian Institute of Science, Bangalore.
2016 “Diving into Open Source with Linux Kernel” Workshop, Grace Hopper 2016, Bangalore.

Teaching and Mentorship

- Fall 2019, 2020 **Teaching Assistant, CSE 130 Programming Languages**, *UC San Diego*.
Responsible for grading exams and assignments, conducting office hours, discussions, and proctoring exams.
- 2019-2020 **Mentor, Early Research Scholars Program**, *UC San Diego*.
Mentored three undergraduate students in the CSE department on a research project.
- 2019-2020 **Mentor, GradWIC Mentorship Program**, *UC San Diego*.
Mentored junior graduate students in CSE as part of the Graduate Women in Computing mentorship program.

Service and Leadership

- 2021 **Artifact Evaluation Committee Member - CAV 2021**.
Evaluated the software artifact to give authors feedback about how well the artifact supports the paper.
- 2019 **Student Volunteer Committee Member - ASE 2019, PLDI 2019**.
Assisted with recording conference talks, and general assistance to keep the conferences running smoothly.
- 2019-2020 **Graduate Women in Computing**, *UC San Diego*.
Event Coordinator. GradWIC aims to increase awareness of diversity issues and foster an inclusive community.
- 2018-2020 **CSE Diversity Equity and Inclusion (DEI) Committee**, *UC San Diego*.
Grad Liaison. Helped with outreach to the graduate student community, informed graduate student organizations to disseminate information about DEI Committee activities; coordinated at student events.
- 2017-2019 **Outreachy Linux Kernel Coordinator**, *UC San Diego*.
Provided application support for Linux Kernel applicants, reviewed patches, collaborated with mentors for the Linux Kernel projects and facilitated communication between mentors, applicants, interns and the organizers.
- 2018 **PhD Admissions Student Committee**, *UC San Diego*.
Member of student committee for PhD admissions in the Computer Science and Engineering department.

Awards and Scholarships

- 2019 CSE Award for Contributions to Diversity - University of California, San Diego.
For significant contributions to the department via diversity initiatives.
- 2019 PLMW Scholarship for PLDI 2019, Phoenix
For attending the Programming Languages Mentoring Workshop and PLDI 2019.
- 2017 PLMW Scholarship for POPL 2017, Paris
For attending the Programming Languages Mentoring workshop and POPL 2017.
- 2017 VMW Scholarship for CAV 2017, Heidelberg.
For attending the Verification Mentoring Workshop and CAV 2017.
- 2016 Ranked 6th most active developer for Linux 4.4 by LWN.net.
For significant number of patches contributed to Linux version 4.4.

2016 Best presentation Award at IISc CSA Undergraduate Summer School, Bangalore.
For presentation titled *Fence Synthesis In Weak Memory Models*.

Relevant Coursework and Skills

Coursework: Program Synthesis, Programming Languages, Advanced Natural Language Processing, Advanced Compilers, Automated Reasoning, Computer Security, Object-Oriented Programming, Seminar on Human-Centered Programming Tools, Probabilistic Reasoning and Learning.

Languages: C#, Scala, Java, Python, Haskell

IDE: IntelliJ, Eclipse, Visual Studio