Bhakti Shah

[shahbhakti21@gmail.com]

EDUCATION

Doctor of Philosophy, Computer Science 2024-Present.
University of St Andrews, St Andrews, UK
Advisor: Dr. Edwin Brady.

Master of Science, Computer Science 2023-2024
University of Chicago, Chicago, USA
Thesis: Proof Visualization for Graphical Languages
GPA: 3.82.

Bachelor of Science *with honors*, Computer Science 2020-2024
University of Chicago, Chicago, USA.
Major GPA: 3.71.

RESEARCH EXPERIENCES

Amazon Web Services, Automated Reasoning Group June 2024 – September 2024
Applied Science Intern Arlington, VA, USA

- Worked with the Cedar team.
- Extended the Lean formalization of the Cedar policy language.

Amazon Web Services, Automated Reasoning Group June 2023 – September 2023
Applied Science Intern Arlington, VA, USA

- Worked with the Cedar team.
- Formalized the Cedar policy language in the interactive theorem prover Lean4.
- Under guidance of Emina Torlak, Senior Principal Scientist, AWS & Associate Professor, University of Washington, and Mike Hicks, Senior Principal Scientist, AWS & Professor Emeritus, University of Maryland, College Park.

University of Chicago, Chicago Quantum Programming Languages Group April 2022 – Present
Research Assistant Chicago, IL, USA

- Added proofs about quantum padding for multi-qubit gates to QuantumLib, a formally verified library for reasoning about quantum programs.
- Developed ZXViz, an abstract graph visualization tool, to support VyZX, a verification of the ZX calculus.
- Developed ViCAR, a framework for reasoning about monoidal categories in Coq.
- Under guidance of Robert Rand, Assistant Professor, University of Chicago.

University of Chicago, Programming Languages Group March 2022 – June 2022
Research Assistant Chicago, IL, USA

- Worked on a structure-aware code editor with direct manipulation interactions, based on Deuce. Added AST-based interactive SVG block overlays, as well as structural editing features.
- Under guidance of Ravi Chugh, Associate Professor, University of Chicago.

University of Chicago, Human-Robot Interaction Lab February 2021 – March 2022
Research Assistant Chicago, IL, USA

- - Explored the impact of the presence of robots in relation to fostering deep conversations between individuals, leading to the eventual publication of a formal study.
- Under guidance of Sarah Sebo, Assistant Professor, University of Chicago.

PUBLICATIONS & ABSTRACTS

- **Imperative Syntax for Dependent Types**, HATRA '25. [pdf] [slides]
  Bhakti Shah, Edwin Brady
- **How We Built Cedar: A Verification-Guided Approach**, FSE '24. [pdf]
  Craig Disselkoen, Aaron Eline, Shaobo He, Kyle Headley, Michael Hicks, Kesha Hietala, John Kastner, Anwar Mamat, Matt McCutchen, Neha Rungta, Bhakti Shah, Emina Torlak, Andrew Wells
- **ViCAR: Visualizing Categories with Automated Rewriting in Coq**, ACT 2024. [pdf]
  Bhakti Shah*, William Spencer*, Laura Zielinski*, Adrian Lehmann*, Ben Caldwell*, Robert Rand
- **VyZX: Formal Verification of a Graphical Quantum Language**, TOPLAS '26. [pdf]
  Adrian Lehmann*, Ben Caldwell*, Bhakti Shah, Robert Rand
- **VyZX: Formal Verification of a Graphical Quantum Language with automated structural rewrites**, QPL 2024. [pdf]
  Adrian Lehmann*, Ben Caldwell*, Bhakti Shah, Robert Rand
- **A Lean Verification of Cedar**, POPL '24, Student Research Competition. [2nd Place, Undergraduate Category] [extended abstract] [poster]
  Bhakti Shah
- **Integrating Dependency Building with Document Checking in Coq**, CoqPL '24. [extended abstract]
  Emilio Jesús Gallego Arias, Bhakti Shah
- **Visualizing Graphical Proofs in Coq**, ICFP '23, Student Research Competition. [2nd Place, Undergraduate Category] [extended abstract] [poster]
  Bhakti Shah

PROFESSIONAL EXPERIENCES AND PROJECTS

Amazon Web Services, Console Experiences June 2022 – September 2022
Software Development Engineer Intern East Palo Alto, CA, USA

- Transitioned the logging system for a backend dependency of the AWS Global Console to a more robust and accessible platform. Made configuration changes that improved latency and ease of use for all service teams across the Console.
- Wrote holistic end to end tests in TypeScript using the Jest framework for the same backend service, allowing a transition from slower, manual deployments to faster, automated deployments for a high priority service.

University of Chicago, Pediatric Cancer Data Commons June 2021 – September 2021
Research Assistant Chicago, IL, USA

- Worked with an expert data analyst to map data dictionary terms, reducing redundancies in extracted medical data.
- Under guidance of Sam Volchenbaum, Associate Professor, University of Chicago Medicine.

Bankuish April 2021 – June 2021
Android Development Intern Chicago, IL, USA

- Built the learning component of the Android application Bankuish in Java.
- Utilized the YouTube API to display content dynamically.

University of Chicago, Computer Science Instructional Laboratory March 2021 – Present
Systems Administrator, Tutor Chicago, IL, USA

- Assisting members of the computer science community at UChicago with their technical needs.
- Head of Inventory and Scheduling, responsible for 5 high-capacity computer labs and 30 staff members.

University of Chicago, Environmental Research Group January 2021 – February 2022
Member Chicago, IL, USA

- Worked in a team on a data analysis project to determine the relationship between air quality, public transit usage, and COVID-19 cases in the city of Chicago.

University of Chicago, ucopendata January 2021 – February 2022
Member Chicago, IL, USA

- Launched a project aimed at exploring the impact of remote learning on student sentiments, via analysis of course evaluations.
- Used web-scraping and data sanitization technologies to collect 20 years' worth of student course evaluation data.

Francis and Rose Yuen Hackathon December 2020
Leader, Winning team Chicago, IL, USA

- Team leader of the winning project at the hackathon.
- Built a service allowing elderly individuals to request services via SMS, in line with the theme of helping the community during COVID-19.

Sameeksha Capital July 2020
Intern Mumbai, MH, India

- Built software that compiled data about company executives' interviews dynamically.
- Scraped web data in Python, utilizing the Selenium webdriver API.
- Stored data using the Pandas library and pickling for efficiency.

Heckyl Technologies June 2019
Java Intern Mumbai, MH, India

- Built software that compiled data from regulatory sites and documents.
- Scraped web data in Java, utilizing the HTMLUnit browser and PDFBox library.
- Stored data in a MySQL cloud database, using SQL commands.

AWARDS

- Travel Award: Programming Languages Mentoring Workshop (PLMW) at Principles of Programming Languages (POPL) 2023.
- Second Place, Student Research Competition: International Conference on Functional Programming (ICFP) 2023.
- Second Place, Student Research Competition: Principles of Programming Languages (POPL) 2024.

SERVICE

Saturdays with CSIL August 2023 – May 2024

- Developed a curriculum for an extra-curricular computer science focused program targeted at local Chicago high school students, aimed at exposing them to specialized topics that they would not otherwise have access to.
- In collaboration with the UChicago Neighborhood Schools Program and Chicago Young Internship Program.
- Conducted two pilot sessions focused on Programming Languages and Neural Networks respectively, along with mentorship sessions for easier access to computer science and college application resources.

Service, SIGPLAN July 2024 – Present

- Member, Artifact Evaluation Committee, POPL 2025, Denver, USA.

Volunteering, SIGPLAN January 2023 – Present

- Student Volunteer, POPL 2023, Boston, USA.
- Student Volunteer & AV Specialist, ICFP 2023, Seattle, USA.
- Video co-chair, SPLASH 2023, Cascais, Portugal.
- Video co-chair, POPL 2024, London, UK.

Senior Digital Literacy Initiative September 2022 – June 2024

- Wrote a proposal for an adult digital literary campaign through CSIL, aimed at bridging the gap between elderly individuals and technology in the Chicago community. Proposal was eventually accepted.
- Designed a curriculum and outline for a session in-person at a senior center, aimed at increasing the attendees' comfort level with their mobile phones and PCs.
- Conducted two pilot sessions at two different senior centers, both of which had an overwhelmingly positive response.

Volunteering, Interstell<her> Hackathon February 2021

Mentored elementary and middle school girls over the course of a two day hackathon.

TEACHING

University of St Andrews, Tutorial Instructor January 2025 – Present

- CS 2006, Advanced Programming Projects. *Candlemas 2025.*

University of St Andrews, Laboratory Demonstrator January 2025 – Present

- Sub-honours labs. *Candlemas 2025.*

University of Chicago, Teaching Assistant January 2022 – June 2024

- CMSC 11111, Creative Coding. *Winter 2022.*
- CMSC 14200, Introduction to Computer Science II. *Winter 2023*
- CMSC 22100, Programming Languages. *Spring 2023.*
- CMSC 22300, Functional Programming. *Fall 2023.*
- CMSC 22100, Programming Languages. *Spring 2024.*

University of Chicago, Grader September 2021 – December 2022

- CMSC 16100, Honors Introduction to Computer Science I. *Fall 2021.*
- CMSC 15200, Introduction to Computer Science II. *Spring 2022.*
- CMSC 27100, Discrete Mathematics. *Fall 2022.*

Coding4Youth June 2021 – September 2021

Tutored students in middle school mathematics & AP Java.

CSIL Minicourses March 2021 – Present

Designed and conducted minicourses on a variety of topics for members of the UChicago CS community, including version control (Git & SVN), LaTeX, Databases, Terminal skills, etc.

Introduction to Programming Course June 2020

Designed and conducted a virtual introduction to programming course for children aged 6-9, over the course of three weeks. Primarily in Scratch.

INTERESTS

Soccer, weightlifting, bugs, art.