

# Madhurima Chakraborty

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Research Scientist @ Axiarete AI | Ph.D. in CS | [LinkedIn](#) | [Google Scholar](#) | [GitHub](#) | [Email](#)

Researcher with a Ph.D. in Computer Science and research-to-production experience in generative AI, agentic LLM systems, and program analysis. Experienced in building and deploying LLM-powered reasoning agents for large-scale systems, leveraging domain-informed context engineering to enhance reliability and interpretability. Passionate about developing robust, transparent, and scalable AI systems with real-world impact.

## ACHIEVEMENTS

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- **Most Innovative Project Award**, Cohere Expedition Aya, 2025
- **ACM Student Research Competition Grand Finals, 2022 - Third Place, Graduate Category.**
- **SPLASH Student Research Competition, 2021 - Winner, Graduate Category.**
- **Dean's Distinguished Fellowship** from the University of California, Riverside, 2019

## EXPERIENCE

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Research Scientist 01/2026 - Present  
**Axiarete.ai** Newark, CA, USA

Leading development of a code-driven resilience and governance analysis framework to assess disaster recovery readiness, observability integrity, and software composition risk directly from source code. Enables automated, evidence-backed operational readiness assessment at enterprise scale.

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Machine Learning Researcher 07/2025 - 01/2026  
**Cisco ThousandEyes** San Francisco, CA, USA

Agentic LLMs for Network Observability: Contributed to an AI-powered network observability platform that transforms massive volumes of real-time telemetry into actionable insights for diagnosing anomalous network conditions. Built agentic LLM reasoning modules that analyze data across network, application, and BGP layers to deliver plain-language fault domain explanations directly within ThousandEyes Views. This capability improved Mean Time to Identify (MTTI) from over 10 minutes to just seconds. Designed large-scale evaluation workflows to trace agent behavior, generate live datasets, and continuously enhance system reliability.

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Computing Scholar 06/2024 – 09/2024  
**Lawrence Livermore National Lab** Livermore, CA

Formal Specification and Documentation Support using LLMs: Developed LLM-powered formal specification capabilities in the ROSE compiler to automatically infer pre/post-conditions for C++ and Ada code, enabling automated code repair and richer documentation generation. Built a novel dataset of C++ formal specifications using prompt engineering to bridge raw code and structured semantics.

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Graduate Researcher 09/2019 - 06/2025  
**University of California, Riverside** Riverside, CA, USA

Data-driven Call Graph Optimizer: Enhanced JavaScript call graphs by reducing precision and better capture dynamic behaviors. This work addresses fundamental challenges in static analysis, providing a stronger foundation for downstream tasks such as vulnerability detection by increasing the accuracy of program analysis outputs.  
Call Graph Performance Optimization: Developed and implemented a novel technique for improving static call graph analysis in JavaScript, addressing performance challenges for real-world programs. Achieved up to 2X speed-up in experimental evaluations on large Node.js-based programs and medium-sized web and mobile benchmarks, with minimal impact on recall and precision.  
Call Graph Evaluation: Developed an automated technique to assess the significance of root causes in call graph unsoundness for JavaScript applications. Evaluated the performance of state-of-the-art call graph construction methods on web applications, identifying areas for improvement and offering valuable insights for analysis design.

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Research Intern 06/2022 – 09/2022  
**Microsoft Research** Seattle, WA, USA

Vulnerability Analysis of LLM-Generated Code: Leveraged CodeBERT and static analysis techniques to study and detect source-sink vulnerabilities in partial code snippets generated by AI code assistants like Copilot. Our neural framework enabled automated detection of unsafe data handling and improved vulnerability detection coverage across diverse CWEs.

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## SELECTED PUBLICATIONS

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1. **Chakraborty, Madhurima, Dristi Sharma, Eman Nissar, and Maryam Sikander.** "CodeClarity: A Framework and Benchmark for Evaluating Multilingual Code Summarization." In Fifteenth Biennial Language Resources and Evaluation Conference (LREC 2026).
2. **Chakraborty, Madhurima, Peter Pirkelbauer, and Qing Yi.** "FormalSpecCpp: A Dataset of C++ Formal Specifications Created Using LLMs" In 22nd International Conference on Mining Software Repositories (MSR 2025).
3. **Chakraborty, Madhurima, Aakash Gnanakumar, Manu Sridharan, and Anders Møller.** "Indirection-Bounded Call Graph Analysis." In 38th European Conference on Object-Oriented Programming (ECOOP 2024).
4. **Chakraborty, Madhurima, Renzo Olivares, Manu Sridharan, and Behnaz Hassanshahi.** "Automatic root cause quantification for missing edges in javascript call graphs." In 36th European Conference on Object-Oriented Programming (ECOOP 2022).
5. **Chakraborty, Madhurima.** "A study of call graph effectiveness for framework-based web applications." In Companion Proceedings of the 2021 ACM SIGPLAN International Conference on Systems, Programming, Languages, and Applications: Software for Humanity, pp. 13-15. 2021. [SPLASH Student Research Competition: Winner, Graduate Category]

## EDUCATION

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Ph.D. in Computer Science, **University of California, Riverside** 06/2025  
Thesis: Enhancing JavaScript Static Analysis: Accurate Call Graphs, Performance Optimization, and Promise Bug Detection

## ACCOLADES/INVOLVEMENTS

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### Academic Achievements

- 2025: Most Innovative Project Award in Expedition Aya, a global research competition organized by Cohere Labs for exploring the capabilities of multilingual LLMs for code summarization and understanding across both programming and natural languages.
- 2023: Selected to attend the Twelfth Summer School on Formal Techniques at SRI.
- 2021: Selected to attend the Programming Language Implementation Summer School.
- 2020: Recognized a bug during DeepCode's Bug Bounty program at DeepCode.ai.
- 2018: Awarded the Google Nanodegree Scholarship for Front End Web Developer by Google India & Udacity.
- 2018: Shortlisted for the International Women's Hackathon by Hackerearth.

### Professional Recognitions

- 2018: Received the 1 Star Award at Cognizant Technology Solutions for exceptional performance.
- 2017: Earned the Insta Award at Infosys Limited for the successful implementation of a high-visibility project.
- 2017: Recognized with the Insta Award at Infosys Limited for excellent analytical skills.
- 2016: Acknowledged as a High Performer Trainee at Infosys Limited, awarded to the top 10% of employees.

### Extracurricular and Leadership

- 2017: Achieved the Division-level Public Speaking Champion title at Toastmasters International.
- 2017: Earned the Triple Crown Award at Toastmasters International.

### Synergistic Activities

- Program Committee: SAS'22 (AEC), PLDI'24 (AEC), SPLASH'24 (SV Co-Chair)
- Reviewer: MSR'25, TechDebt'26, TOSEM, TNNLS, TACO, Neurips'25, ICSE'25
- Panelist: PLMW (SPLASH'25)
- Mentor: Open Source Day Summer 21.
- Student Volunteer: PLDI'20, SPLASH'20, ESEC/FSE'23.

## KEY SKILLS

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**Programming:** Python, C/C++, JavaScript, TypeScript, Bash

**Machine Learning & AI:** PyTorch, Prompt Engineering

**LLM & GenAI:** Prompt Engineering, OpenAI APIs, Semantic Kernel, Tool Use, Function Calling

**LLM Evaluation & MLOps:** Opik, LangSmith

**Cloud & DevOps:** AWS (SageMaker, S3, EC2), Docker, Kubernetes, GitHub Actions, Teleport

**Software & APIs:** REST, gRPC, Jupyter, VS Code, Git

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