

# Madhurima Chakraborty

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M.S. and Ph.D. (to be) in Computer Science | [LinkedIn](#) | [Google Scholar](#) | [GitHub](#) | [Email](#)

Ph.D. candidate in Computer Science specializing in static analysis, program security, and backend development. Experienced in building developer tools, code vulnerability detection using LLMs, and optimizing large-scale program analysis systems. Passionate about creating AI-driven tools that improve code security and developer productivity. Seeking backend engineering roles where security, performance, and usability intersect.

## ACHIEVEMENTS

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- **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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*Computing Scholar* 06/2024 - 09/2024

**Lawrence Livermore National Lab** *Livermore, CA, USA*

- *Formal Specification Support for Compiler*: Developed program analysis capabilities in the ROSE compiler, leveraging prompt engineering techniques to guide LLMs in generating formal specifications (pre/post-conditions) for C++ code from Dafny.

*Research Intern* 06/2022 - 09/2022

**Microsoft Research** *Seattle, WA, USA*

- *Code Defect Detection using LLMs*: Investigated the application of machine learning to detect source-sink vulnerabilities in code using static analysis techniques and large language models. Developed a neural modeling framework to identify sanitized and unsanitized data flows for various Common Weakness Enumeration (CWE) vulnerabilities.

*Graduate Researcher* 09/2019 - Present

**University of California, Riverside** *Riverside, CA, USA*

- *Data-driven Call Graph Optimizer*: Trained a neural model to identify specific call types generated by dynamic call-graphs that are otherwise difficult for static call graph generators to capture, subsequently enhancing the static call graph with these relations to improve recall rates.
- *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 impressive speed-up results 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.

*Product Specialist* 01/2018 - 05/2019

**Cognizant Technology Solutions** *Kolkata, WB, India*

- Migrated legacy mainframe-based applications to Java APIs, leveraging Java and H-Base, enhancing system efficiency and performance. This involved handling large codebases and integrating old systems into modern environments.

*Senior Systems Engineer* 08/2015 - 12/2017

**Infosys Limited** *Bhubaneswar, OD, India*

- Led the development and maintenance of high-performance Mainframe applications.
- Implemented new features and performance improvements using COBOL, JCL, and DB2.

## SELECTED PUBLICATIONS

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1. **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)*.
2. **Chakraborty, Madhurima**, Aakash Gnanakumar, Manu Sridharan, and Anders Møller. "[Indirection-Bounded Call Graph Analysis](#)." In *38th European Conference on Object-Oriented Programming (ECOOP 2024)*.
3. **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)*.
4. **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**]
5. **Chakraborty, Madhurima**. "[SPLASH: G: A Study of Call Graph Effectiveness for Framework-Based Web Applications](#)." [**ACM Student Research Competition Grand Finals: Third Place, Graduate Category**]

## EDUCATION

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*Ph.D. in Computer Science, University of California, Riverside* 09/2019-present

Thesis: Enhancing JavaScript Static Analysis: Accurate Call Graphs, Performance Optimization, and Promise Bug Detection

## ACCOLADES/INVOLVEMENTS

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### Academic Achievements

- 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: ECML PKDD'22, MSR'25, TechDebt'25, TOSEM, TNNLS
- 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

Static Analysis & Security Tools: CodeQL, WALA, Jelly

Cloud & Infrastructure: Google Cloud Platform (GCP), Docker, GitHub Actions, CI/CD pipelines

Machine Learning Libraries: PyTorch

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