Madhurima Chakraborty

M.S. and **Ph.D.** (graduating June 2025) 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

- **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

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   *Bhubaneshwar, OD, India*

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

RESEARCH GRANTS

- Received $1000 API credits from Cohere as part of the Expedition Aya program. Investigating the effectiveness of multilingual LLMs in code summarization across programming and natural languages (e.g., Python/Java, Spanish/Hindi). Aims to improve accessibility and comprehension of codebases for global developer communities.

SELECTED PUBLICATIONS

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).

EDUCATION

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

M.S. in Computer Science, **University of California, Riverside**   09/2019-02/2023

ACCOLADES/INVOLVEMENTS_____

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_____

- **Programming & Scripting**: Developed software using Python, C/C++, JavaScript, TypeScript, and Bash across systems programming, backend services, and automation tasks.
- **Machine Learning & AI**: Worked with PyTorch for ML model development. Applied Prompt Engineering techniques for natural language processing tasks, including zero/few-shot learning.
- **Static Analysis & Security**: Applied tools like CodeQL, WALA, and Jelly to identify vulnerabilities, analyze codebases, and enhance software security posture.
- **Cloud & DevOps**: Built and deployed applications on GCP using Docker containers, automated workflows with GitHub Actions, and maintained CI/CD pipelines for seamless delivery.

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