Madhurima Chakraborty

Ph.D. in Computer Science & Engineering

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My Webpage
Github *Linkedin*

Research Interest

I am interested in the applied and fundamental aspects of programming languages and software engineering, with a particular focus on integrating machine learning and large language models (LLMs) to enhance developer productivity. I am also passionate about automated software testing/debugging techniques and structured program analysis..

Education

09/2019–now **Ph.D. in Computer Science & Engineering**, *University of California*, Riverside, CA, USA.
CGPA: **3.86**/4 Advisor: Manu Sridharan

Relevant Courses: Compiler Construction, Advanced Software Testing And Analysis, Software Verification, Advanced Program Analysis

07/2011–05/2015 **Bachelor of Technology in Information Technology**, *RCC IIT*, Kolkata, WB, India.
CGPA: **8.6**/10 Class Rank: **3**/103

Experience

Internship

6/2022 – 9/2022 **Research Intern**, *Microsoft Research*, Redmond, WA, USA.
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.

6/2024 – 9/2024 **Computing Scholar**, *Lawrence Livermore National Lab*, Livermore, CA, USA.
Developed program analysis capabilities in the ROSE compiler to automatically summarize pre and post-conditions of functions for C++ and Ada code.

Research

9/2019 – present **Graduate Student Researcher**, *University of California*, Riverside, CA.
Proposed and implemented a method to automatically quantify the relative importance of different root causes of call graph unsoundness. This led to insights for analysis designers and improvements in state-of-the-art call graph construction techniques. Introduced indirection-bounded analysis to enhance the performance of call graph generation for JavaScript programs, achieving significant speed-ups with minimal reduction in recall and precision.

Teaching

Fall 2020/21 **CS180**, *Introduction to Software Engineering*, CS, *UC Riverside*.

Spring 2021 **CS206**, *Advanced Software Testing and Analysis*, CS, *UC Riverside*.

Work

1/2018 – 5/2019 **Product Specialist**, *Cognizant*, WB, India.
Migrated mainframe-based applications to Java APIs, leveraging Java and H-Base, resulting in enhanced system efficiency and performance.

8/2015 – 12/2017 **Senior Systems Engineer**, *Infosys*, Orissa, India.
Led the development and maintenance of high-performance Mainframe applications, implementing new features and performance improvements using COBOL, JCL, and DB2.

Publications

2024 Madhurima Chakraborty, Aakash Gnanakumar, Manu Sridharan, and Anders Moller. Indirection-Bounded Call Graph Analysis. In *38th European Conference on Object-Oriented Programming (ECOOP)*, 2024.

2022 Madhurima Chakraborty, 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.

2021 M Chakraborty. 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*, SPLASH Companion 2021, page 13–15, 2021. (**Winner of SPLASH 2021 Student Research Competition, ACM Student Research Competition Grand Finals: Third Place, Graduate Category**).

Accolades & Honors

Academic

2023 **Twelfth Summer School on Formal Techniques**, *SRI*.
2022 **ACM Student Research Competition Grand Finals: Third Place, Graduate Category**, *ACM*.
2021 **SPLASH 2021 Student Research Competition: Winner, Graduate Category**, *Splash*.
2020 **WiML ICLR 2020 Travel Grant**, *Women in Machine Learning*.
2020 **Bug recognized at DeepCode's Bug Bounty program**, *DeepCode.ai*.
2019 **Dean's Distinguished Fellowship**, *UC Riverside*.
2018 **Google Nanodegree Scholarship to Front End Web Developer**, *Google India & Udacity*.
2018 **Shortlisted for International Women's Hackathon**, *Hackerearth*.

Professional

2018 **1 Star Award**, *Cognizant Technology Solutions*.
For exceptional performance over the quarter

2017 **Insta Award**, *Infosys Limited*.
For successful implementation of a critical high visibility project

2017 **Insta Award**, *Infosys Limited*.
For excellent analytical skills

2016 **High Performer Trainee**, *Infosys Limited*.
Awarded to top 10% employees

Extracurricular

2017 **Division-level Public Speaking Champion**, *Toastmasters International*.
2017 **Triple Crown Award**, *Toastmasters International*.

Technical Skills

Programming Languages: JavaScript, Python, Java, C/C++, SQL, Bash, Cobol
Libraries and Frameworks: numpy, pandas, scikit-learn, PyTorch
Developer Tools: Git, Docker

Synergistic Activities

Program Committee: SAS'22 (AEC), PLDI'24 (AEC), SPLASH'24 Student Volunteer Co-Chair.
External Reviewer: ECML PKDD'22.
Mentor: Open Source Day Summer'21.
Student Volunteer: PLDI'20, SPLASH'20, ESEC/FSE'23.