Radhika Garg

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Summary

My research interests lie in Applied cryptography, focusing on generic secure multi-party computation (MPC). I am especially interested in making multi-party computation(MPC) scalable for real-world systems and accessible with minimum developer effort. I have designed and implemented a generic MPC framework based on homomorphic encryption scalable to more than 100 parties. Recently, I have been working on introducing MPC compilation directly into the LLVM architecture for robust and performant optimization of MPC source code and improved usability of secure computation techniques.

Education

Northwestern Univeristy   *September 2022 - Present*
Ph.D. Computer Science, Advisor: Dr. Xiao Wang   GPA: 3.967/4

Indian Institute of Technology, Roorkee   *July 2018 - May 2022*
B.Tech. Computer Science and Engineering   GPA : 9.371/10

Publications

Radhika, Kang Yang, Jonathan Katz, Xiao Wang. Scalable Mixed-Mode MPC. ***IEEE Symposium on Security & Privacy 2024***.

Research Projects

Distributed Noise Sampling for Differential Privacy   *February 2024 - Present*
– This project focuses on designing and implementing a novel and efficient method for sampling noise for distributed differential privacy in secure machine learning algorithms.

Modular Augmentation of LLVM for MPC   *October 2023 - Present*
– This project aims to build a compiler that allows portability and interoperability between plaintext computation and secure computation.
– It enables users to write programs without needing to understand oblivious algorithms or secure computation libraries, while still achieving performance comparable to code written in specialized languages for secure computation.

Scalable Mixed-Mode MPC   *September 2022 - October 2023*
– This project presents highly efficient protocols for conversion between the input representations used in MPC, resulting in up to 1000 times less communication.
– We designed a multiparty lookup table protocol based on threshold homomorphic encryption. Using this, we developed efficient conversion protocols and implemented a mixed-mode MPC framework based on the lookup table protocol, which is scalable to more than 100 parties.

Work Experience

Teaching Assistant | Northwestern University   *January 2024 - March 2024*
Data Management and Information Processing

Teaching Assistant | Northwestern University *September 2023 - December 2023*
Data Management and Information Processing

Research Intern | Northwestern University *February 2022 - May 2022*
Advisor: Dr. Xiao Wang

Software Engineering Intern | AI4SG, Google Research *June 2021 - August 2021*
Advisor: Dr. Aparna Taneja

Software Engineering Intern | Google Maps, Bangalore *May 2020 - June 2020*
Mentor: Murugappan Sekar and Priyank Sharma

ACHIEVEMENTS

Cabell first year fellowship	Selected among the 10 recipients of all applicants in the McCormick School of Engineering and Applied Sciences.
Best BTP Award	Awarded the best B.Tech. thesis project in the Computer Science Dept. 2022
Code Jam to I/O for Women 2020	Secured 21st rank worldwide and a ticket to Google I/O 2020.
Joint Entrance Examination 2018 (Advanced)	Ranked in top 0.4 percentile with a rank of 669 among 150,000 candidates.

SKILLS

Languages	C, C++, Python, Scala, Javascript, Bash.
Software Packages	Emp-toolkit, Openfhe, LLVM, Git, GDB, Django, ReactJS, NextJS.
Platforms/Architectures	Linux, Windows, WSL, Docker.

OUTREACH AND PROFESSIONAL DEVELOPMENT

Team Member | GWiC, Northwestern University *November 2022 - Present*
Part of the organizing team of the Graduate Women in Computing (GWiC) events.

Chief Coordinator | IMG IIT Roorkee *May 2021 - May 2022*
Led the team of 40 students in development and maintainence of official software and services ecosystem of IIT Roorkee. Coordinated between the IIT Roorkee administration and the student team for deployment and maintainence of various softwares and services.

Mentor | Student Mentorship Program, IIT Roorkee *August 2020 - May 2021*
Mentored five freshman students in Computer Science, IIT Roorkee.

Mentor | Technovation Girls *January 2020 - May 2020*
Mentored group of girls to build a mobile app to address real-world problems.