Rachel Thomas

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Education

University of Maryland at College Park Aug 2024 – Present
Doctor of Philosophy in Computer Science *College Park, MD*

University of North Carolina at Chapel Hill Jan 2023 – May 2024
Master of Science in Computer Science *Chapel Hill, NC*

University of North Carolina at Chapel Hill Aug 2018 – Dec 2022
Bachelor of Science in Computer Science *Chapel Hill, NC*

- Minor in Mathematics

Publications

CheckOut: User-Controlled Anonymization for Customer Loyalty Programs July 2024
Matthew Gregoire, ***Rachel Thomas****, Saba Eskandarian* *PoPETS 2024*

- Published in the *24th Privacy Enhancing Technologies Symposium (PoPETS)*
- Acceptance Rate: 20%

Projects

Anonymous Group Chat Messaging with Private Reputation Systems Aug 2024 – Present
Department of Computer Science at University of Maryland *College Park, MD*

- Collaborating with Dr. Gabe Kaptchuk and Dr. Ian Miers to develop an innovative group messaging system leveraging Zero-Knowledge Proofs (ZK-proofs) to allow users to send anonymous messages on platforms like Signal while maintaining the option to reveal their identities as needed, without modifying the underlying group messaging protocol.
- Engineered a system that offers users the flexibility to toggle between anonymous and identified messaging, optimizing both privacy and functionality within existing group chat environments.
- Integrated a privacy-preserving reputation system using ZK-Promises to balance anonymity and moderation, empowering moderators to enforce rules without compromising user identities.
- Developed a private reputation scoring framework that ensures accountability, maintains conversation quality, and supports secure, respectful interactions, all while safeguarding user privacy through verifiable yet concealed reputations.

Side-Channel Analysis of Microsoft Edge Password Leak Detection Protocol Aug 2023 – May 2024
Department of Computer Science at UNC Chapel Hill *Chapel Hill, NC*

- Lead a research project under the advisement of Dr. Andrew Kwong, focusing on identifying and analyzing side-channel vulnerabilities in Microsoft Edge's Password Leak Detection Protocol and Microsoft SEAL homomorphic encryption library.
- Participated in a team-oriented setting, conducting comprehensive analyses to pinpoint vulnerabilities within Edge's FHE algorithm and investigate side-channel attacks within Microsoft SEAL.
- Developed attack vectors and threat models to simulate real-world side-channel attacks, demonstrating expertise in both native code environments and browser-based implementations.

CheckOut: User-Controlled Anonymization for Customer Loyalty Programs May 2022 – May 2024
Department of Computer Science at UNC Chapel Hill *Chapel Hill, NC*

- Worked under the advisement of Dr. Saba Eskandarian and mentorship of Matthew Gregiore to design a scalable system for obfuscating loyalty card transactions, which streamlines card-swapping processes, ensuring equitable user benefits from loyalty programs.
- Collaborated with a team to design, develop, and implement an Android application that enhances user privacy while tracking loyalty points, employing advanced cryptographic techniques to secure user data.
- Engineered a robust framework for randomizing loyalty barcodes, preserving user anonymity and protecting shopping habits from tracking systems.

Experience

Graduate Teaching Assistant Aug 2024 – Present

Department of Computer Science at University of Maryland *College Park, MD*

- Assisted in teaching advanced concepts of computer and network security, including cryptography, network protocols, and security vulnerabilities, for UMD's CMSC 414 Computer and Network Security course
- Graded assignments, projects, and exams, ensuring consistent and fair evaluation of student performance.
- Managed course-related administrative tasks, including maintaining grade records, organizing resources, and coordinating communication between students and faculty.
- Conducted office hours and online sessions to address student inquiries and offer additional assistance outside of regular class hours.

Graduate Research Assistant Jan 2023 – May 2024

Department of Computer Science at UNC Chapel Hill *Chapel Hill, NC*

- Worked under the advisement of Dr. Saba Eskandarian and Dr. Andrew Kwong to conduct research in privacy-enhancing technologies, cryptography, and side-channel attacks.
- Conducted in-depth analysis of side-channel attack vectors, identifying potential vulnerabilities in modern cryptographic systems.
- Utilized advanced cryptographic techniques, such as homomorphic encryption and zero-knowledge proofs, to ensure data privacy in sensitive applications.
- Co-authored research papers published in peer-reviewed journals and presented findings at academic conferences.
- Assisted in mentoring undergraduate students and junior researchers, guiding them through complex research methodologies and experimental designs.

Undergraduate Research Assistant Aug 2022 – Dec 2022

Department of Computer Science at UNC Chapel Hill *Chapel Hill, NC*

- Conducted research on privacy-enhancing technologies and cryptography under the advisement of Dr. Saba Eskandarian, focusing on developing advanced solutions to improve data protection and user privacy.
- Contributed to cutting-edge research projects that explored innovative methods to secure digital communications and safeguard sensitive information.
- Awarded the Summer Award for Research-Intensive Courses grant scholarship by the Office for Undergraduate Research at UNC Chapel Hill for dedication to academic research.

Undergraduate Learning Assistant Aug 2021 – Dec 2021

Department of Mathematics at UNC Chapel Hill *Chapel Hill, NC*

- Supported instruction for MATH 233 - Calculus of Functions of Several Variables, assisting the professor with course delivery and student engagement.
- Conducted individual and group tutoring sessions during office hours, addressing student queries and enhancing their understanding of complex calculus concepts.
- Developed and curated supplementary course materials and study guides, contributing to improved student comprehension and performance.

Community & Leadership

Girl Security Mentorship Program Nov 2023 – Sept 2024

Girl Security Winter 2024 Mentee Cohort

- Selected as a mentee for the Winter and Summer 2024 season, demonstrating commitment to personal and professional growth within the national security field.
- Engaged in an intensive mentorship program led by Girl Security, a dedicated organization fostering change in national security through education, workforce development, and mentorship.

Graduate Research Mentor Aug 2023 – May 2024

UNC Chapel Hill Security Lab *Chapel Hill, NC*

- Mentored undergraduate researcher Nermien Elassy, offering strategic guidance on research methodologies, project development, and navigating complex topics in security and privacy.
- Provided personalized support to foster technical skills, critical thinking, and professional growth, preparing students for advanced research opportunities in the field of privacy and security.

Graduate Women in Computer Science (GWiCS) Aug 2023 – May 2024

Department of Computer Science at UNC Chapel Hill *Chapel Hill, NC*

- Member of UNC Chapel Hill's Graduate Women in Computer Science (GWiCS) organization, fostering a nurturing and supportive community for non-binary and female-identifying graduate students within the Department of Computer Science.

Awards

Dean's Fellowship Aug 2024

University of Maryland at College Park *Fellowship*

- Awarded the Dean's Fellowship from the University of Maryland, a distinguished honor recognizing exceptional achievements in computer science and research.
- This fellowship acknowledges outstanding merit and provides support for excellence in academic and research pursuits within the PhD program.

Degree With Distinction Dec 2023

University of North Carolina at Chapel Hill *Honors*

- Graduated with Distinction (or Magna Cum Laude) in Computer Science from the University of North Carolina at Chapel Hill.

Summer Award for Research-Intensive Courses May 2022

Office of Undergraduate Research at UNC Chapel Hill *Fellowship*

- Awarded the Summer Award for Research-Intensive Courses, a tuition and funding grant offered by the Office of Undergraduate Research at the UNC Chapel Hill to undergraduate students dedicated to conducting novel research in their field of study.