

Naorin Hossain

Computer Science PhD Candidate * Princeton University
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Education

Ph.D. Candidate, Department of Computer Science, Princeton University, Princeton, New Jersey

- Thesis topic: Formal and applied methods for security and correctness verification in computer hardware
- Advisor: Professor Margaret Martonosi
- Expected graduation date: June 2023

Rutgers University, School of Engineering, New Brunswick, New Jersey

- B.S. Electrical and Computer Engineering, Computer Science
- Honors: *summa cum laude* (GPA: 3.97)
- Graduation date: May 2018

Honors & Awards

Rutgers University

- Matthew Leydt Society – Top 2% of academic achievers 2018
- John B. Smith Award – Graduated from ECE department with a GPA >3.95 2018
- ECE Departmental Service Award 2018
- Honor's Academy 2014-2018
- Presidential Scholar 2014-2018
- Dean's List 2014-2018
- Rutgers Academic Excellence Award 2016
- Eta Kappa Nu (HKN) membership 2016

Academic Research Experience

Princeton University

September 2018 – Present

Advisor: **Professor Margaret Martonosi**

- Develop a framework for formally specifying transistency models and using the models to synthesize suites of enhanced litmus tests
- Defined a transistency model for x86 processors and synthesized enhanced litmus tests that can be used for empirical testing on x86 processors to validate and verify the model
- Apply CheckMate tool to an Intel Sandy Bridge-like microarchitectural specification written in Alloy to synthesize TLB exploits

Rutgers University

September 2017 – May 2018

Advisor: **Professor Ulrich Kremer**

- Investigated swarming strategies and potential tradeoffs for autonomous, battery-operated underwater gliders to cooperatively navigate and achieve desired goals
- Built and tested a simulation environment for a leader-follower strategy using optical communication technologies – specifically LED color detection using a camera and OpenCV

Publications

- **Naorin Hossain**, Caroline Trippel, and Margaret Martonosi, “TransForm: Formally Specifying Transistency Models and Synthesizing Enhanced Litmus Tests”, *47th International Symposium on Computer Architecture (ISCA)*, May-June 2020.

Selected Talks and Presentations

- “TransForm: Formally Specifying Transistency Models and Synthesizing Enhanced Litmus Tests”, *5th IBM Workshop on the Future of Computing Architectures (FOCA)*, October 2020.
- “Security Verification of Virtual Memory Implementations with CheckMate”, *Intel Side Channel Academic Program Workshop 2020*, September-October 2020
- “CheckMate: Automated Synthesis of Hardware Exploits and Security Litmus Tests”, *Intel Side Channel Academic Program Workshop 2019*, June 2019

Relevant Work Experience

Research Intern, Microsoft, Redmond, WA

June 2020 – August 2020

- CHERI + memory versioning: explored novel design for efficient temporal safety on CHERI systems
 - CHERI: replaces integer pointers with capabilities equipped with permission and bounds information, inherently offering spatial memory safety
 - Memory versioning for temporal safety: reduces frequency of full memory sweeps required for capability revocation when freeing memory by $2^n \times$, where n is the number of version bits
 - Formal security analysis: Proposed a formal hardware-software contract for secure speculation on CHERI + memory versioning systems and presented a mathematical model of the system

Applications Engineer I Intern, Hamamatsu Photonics, Bridgewater Township, NJ

June 2018 – August 2018

- Vein imaging demo software: developed MFC application with capability to display image(s) from board level scientific camera, view histogram data of 12-bit grayscale pixel values, adjust contrast of image, and print image
- Wireless oscilloscope: high level design for wireless oscilloscope – analog input from Multi-Pixel Photon Counter (MPPC) module to digital output on Android application

Software Developer Intern, IBM, San Jose, CA

June 2017 – August 2017

- Information Management System (IMS) API Developer (Java):
 - Developed models, controllers, and handlers for a new wizard that is used to add/edit fields in transaction messages for updated version of existing application, IMS Explorer for Development (E4D)
 - Developed refresh functionality for catalog connection and navigation tool for upcoming version of IMS E4D

IT Intern, Verizon, Warren, NJ

June 2016 – August 2016

- Mobile Content Solutions QA Developer: enhanced user interface, added several features, and fixed security vulnerabilities for existing in-house testing automation web application; developed an algorithm for automating input parameter generation
- Intern Hackathon: developed a suite of Alexa skills for the Amazon Echo involving various health assessments using Javascript

IT Intern, NYC School Construction Authority, Long Island City, NY *June 2015 – August 2015*

- Business Analyst: documented user stories and translated them into use cases that could be developed against
- Front End UI Developer: developed one of the user stories using standard web programming languages (Javascript/Angular.JS)

Teaching Experience

Assistantship in Instruction, Princeton University

February 2019 – May 2019

- Designed and graded assignments, projects, and exams in COS 375 Computer Architecture & Organization course with Professor Margaret Martonosi

Assistantship in Instruction, Princeton University

September 2018 – January 2019

- Taught precepts, graded assignments and exams, and assisted students in COS 126 Computer Science: An Interdisciplinary Approach course with Professor Robert Sedgewick

Computer Science Grader, Rutgers University

September 2016 – December 2016

- Assisted with facilitating and reviewing course projects as well as grading exams for CS 431 Software Engineering course with Professor Alex Borgida

Mathematics Grader, Rutgers University

January 2016 – May 2018

- Reviewed MATLAB-based assignments for Math 250: Introduction to Linear Algebra with Professor Lasantha Goonetilleke

Leadership Experience

Eta Kappa Nu (HKN) – Electrical and Computer Engineering Honor Society

- Former President of Rutgers University (Gamma Epsilon) chapter: Led weekly E-Board meetings and monthly general body meetings; collaborated with other organizations such as IEEE to organize joint events; organized and participated in mentorship and middle school outreach programs; communicated with industry professionals to organize professional events for students; several events to assist ECE students such as Tutoring Night

Skills

Computer Skills

- **Programming Languages:** Alloy, Bash, C, C#, C++, Coq, CSS, HTML, Java, Javascript (Angular.JS, jQuery), JSP, MATLAB, MIPS, MySQL, Python, Racket, SystemVerilog, Verilog
- **General Software:** Alloy Analyzer, Microsoft Visual Studio, Canopy, Eclipse, GTKWave, PSpice, QtSpim, Quartus II/ModelSim, MATLAB, Audacity, Cubase
- **Operating Systems:** Windows, Linux-based OS (Ubuntu, Fedora, Kali), z/OS

Languages

- English (*fluent*), Bengali (*intermediate*), French (*novice*)