

SOPHIA YOO

sophiayoo@princeton.edu | <https://sophiayoo1.github.io>

Department of Electrical and Computer Engineering: 41 Olden Street, Princeton, NJ 08540

Education

Princeton University, Ph.D. Candidate

May 2022 - May 2026 (Expected)

Electrical and Computer Engineering

Committee: Jennifer Rexford (Advisor), Maria Apostolaki (Advisor), David Hay, Prateek Mittal, Adrian Perrig

Princeton University, M.A.

Aug. 2020 - May 2022

Electrical and Computer Engineering

Committee: Jennifer Rexford (Advisor), Prateek Mittal, Ravi Netravali

Temple University, B.S.

Aug. 2016 - May 2020

Electrical Engineering, Computer Engineering Concentration

Minors in Computer Science, Music

4.0 / 4.0 GPA, *summa cum laude*

Research Interests

Network Security & Privacy, Software-Defined Networking, Programmable Data Planes, Hardware-Software Co-Design

Publications

Sophia Yoo, Xiaoqi Chen, Jennifer Rexford. “**SmartCookie: Blocking Large-Scale SYN Floods with a Split-Proxy Defense on Programmable Data Planes.**” *33rd USENIX Security Symposium*. (SEC’24).

Sophia Yoo*, Jiarong Xing*, Xenofon Foukas, Daehyeok Kim, Michael K. Reiter. “**On the Criticality of Integrity Protection in 5G Fronthaul Networks.**” *33rd USENIX Security Symposium*. (SEC’24).

Henry Birge-Lee, Sophia Yoo, Benjamin Herber, Jennifer Rexford, Maria Apostolaki. “**Tango: Secure Collaborative Route Control across the Public Internet.**” *21st USENIX Symposium on Networked Systems Design and Implementation*. (NSDI’24).

Sophia Yoo, Satadal Sengupta, Maria Apostolaki, Jennifer Rexford. “**Sieve: Layered Network Defenses against Large-Scale Attacks.**” *Open Networking Foundation 2023 P4 Workshop*. (P4’23).

Sophia Yoo, Xiaoqi Chen. “**Secure Keyed Hashing on Programmable Switches.**” *ACM SIGCOMM 2021 Workshop on Secure Programmable Network Infrastructure*. (SPIN’21).

Patents

Sophia Yoo*, Jiarong Xing*, Xenofon Foukas, Daehyeok Kim. “**Security in 5G Fronthaul Networks.**” US Patent Application No. 18/743,792, filed June 2024. Patent Pending.

Sophia Yoo, Xiaoqi Chen, Jennifer Rexford. “**Split-layer Defense Against Volumetric Attacks with Programmable Data Planes.**” Patent Pending.

Notable Awards & Academic Honors

2022-2026. **Graduate Research Fellowships Program Award (DGE-2039656)**, National Science Foundation.

Press Release: <https://ece.princeton.edu/news/nsf-awards-grads-work-computer-vision-security-and-clean-energy-materials>

2025. **Applied Networking Research Prize (ANRP) for Tango [NSDI'2024]**, Internet Research Task Force.

Press Release: <https://ece.princeton.edu/news/princeton-researchers-win-applied-networking-research-prize-improving-internet-performance>
<https://ece.princeton.edu/news/tango-gives-paired-networks-better-performance-when-they-dance-their-own-tune>

2025. **Wallace Memorial Fellowship, Highest Graduate Award in Engineering Research**, Princeton University.

2023, 2024. **Graduate Student Award for Excellence in Service**, Princeton University, ECE Department.

2022. **Pramod Subramanian *17 Early Career Graduate Award**, Princeton University.

Press Release: <https://ece.princeton.edu/news/graduate-commencement-celebrates-critical-contributions-doctoral-and-masters-students>

2022. **Princeton Research Day Innovation & Entrepreneurial Mindset Award**, Princeton University.

Press Release: <https://www.princeton.edu/news/2022/05/10/princeton-research-day-returns-fully-person-first-time-three-years>

2020. **Top Honors Recognition**, Temple University, ECE Department.

2020. **Diamond Award**, Highest Undergraduate Academic Recognition, Temple University.

2016-2020. **President's Scholar Full Scholarship Award**, Temple University.

Invited Talks

April 2025. “*SmartCookie: A Split-Proxy Defense on Programmable Data Planes.*” Department of Computer Science (CSC 564: Research Topics in Computer Networks). Cal Poly State University, San Luis Obispo, CA. (Virtual)

November 2024. “*On the Criticality of Integrity Protection in 5G Fronthaul Networks.*” NextG Student Research Lunch Seminar Series. Princeton University, Princeton, NJ.

October 2024. “*SmartCookie: A Split-Proxy Defense on Programmable Data Planes.*” Messaging, Malware and Mobile Anti-Abuse Working Group (M3AAWG) DDoS Special Interest Group Forum. (Virtual)

July 2024. “*Tango: Secure Collaborative Route Control across the Public Internet.*” Princeton ECE/Intel Research Experience for Undergraduate (REU) Seminar Series. Princeton University, Princeton, NJ.

January 2024. “*Getting Out of My Box: Towards Social and Intellectual Department Cohesion.*” Department of Electrical and Computer Engineering 2024 Faculty Retreat. Princeton University, Princeton, NJ.

June 2022. “*SmartCookie: Distributed In-Network SYN Flooding Mitigation.*” Princeton ECE/Intel Research Experience for Undergraduate (REU) Seminar Series. Princeton University, Princeton, NJ.

July 2021. “*Grad School: What, Why, and How?*” Princeton ECE/Intel Research Experience for Undergraduate (REU) Seminar Series. Princeton University, Princeton, NJ.

Professional Experience

Microsoft Research - Graduate Research Intern (Advisor: Daehyeok Kim) 5.2022 - 5.2023

- Explore vulnerabilities and new attack vectors in emerging next-generation 5G cellular infrastructure
- Discover novel denial-of-service attacks to user devices over the O-RAN fronthaul interface
- Design new countermeasures and leverage programmable data planes to defend against newly discovered attacks

NASA Jet Propulsion Laboratory - Graduate Software Computing Systems Intern 5.2020 - 8.2020

- Programmed in C the gimbal drive electronics unit emulator for the Multi-Angle Imager for Aerosols (MAIA) mission
- Modified command and telemetry dictionaries for MAIA instrument electronics flight software to coordinate with AMMOS Instrument Toolkit (AIT), tested uplink/downlink command and telemetry processing
- Performed black-box system testing with AIT from an east-coast Linux platform to a west-coast flight electronics box

Temple University Engineering Department - Undergraduate Research Assistant 8.2019 - 12.2019

- Conducted independent research on embedded systems under Dr. Dennis Silage of Temple's ECE department
- Executed analysis of PYNQ Linux operating system on Xilinx PYNQ-Z1 board

Honeywell System Sensors - Firmware Engineer Intern 5.2019 - 8.2019

- Modified electric circuit design of fire alarm strobe to use existing integrated microcontroller comparator, removed external comparator component, and reduced production cost of boards by over \$250,000 yearly
- Programmed firmware in C and Assembly for compatibility with product specs in newly designed embedded system

Teaching Experience

Princeton University, Information Security - Assistant Instructor 1.2022 - 5.2022

- Weekly office hours and precept instruction throughout the semester
- Logistical management of hands-on security assignments and grading for 300 students per semester

Temple University, Principles of Electric Circuits - Diamond Peer Teacher 1.2020 - 5.2020

- Independently planned, designed, & led weekly recitations/assessments for two class sections
- Engaged and instructed students in group settings and individually with weekly office hours

Temple University, Intro to Engineering - Undergraduate Teaching Assistant 1.2018 - 5.2019

- Organized and restructured curriculum; reduced grade disputes by 80%
- Designed quizzes for testing and improving understanding of 300 students per semester

Temple University Student Success Center - STEM Tutor 10.2017 - 10.2019

- Tutored peers in Physics, Chemistry, Math, Computer Science, and Engineering courses
- Developed students' problem solving skills, devised learning strategies, individualized progress reports

Joy Music Studio - Music Instructor, Executive Board Advisor 1.2011 - present

- Train children and adults with tailored lesson plans for each student in violin, piano, harp, and music theory

Service & Outreach

- Computer Networks, Journal Review** **June 2024**
- Princeton ECE Graduate Social Committee Co-Founder and Member, Princeton University** **2022 - 2024**
- Proposed and established the inaugural ECE Social Committee on behalf of ECE grad students & postdocs
 - Ran weekly social hangouts and larger events to grow department-wide community, diversity, & inclusion
- Princeton Lakeside Graduate Housing External Relations Delegate, Princeton University** **2022 - 2024**
- Advocated on behalf of ~700 graduate students & families in the Lakeside community to the university
 - Acted as a liaison between students and Graduate School, Facilities, Housing, Transportation, Public Safety, etc.
- Princeton/Intel Research Experience for Undergraduates, Princeton University** **2022**
- Mentored undergraduate students in network security research, programmable switch DDoS defenses
- Princeton Pre-Application Support Program, Princeton University** **2021 - 2023**
- Mentored Ph.D. applicants from underrepresented backgrounds, guided their application process
- Institute of Electrical & Electronics Engineers** **2018 - present**
- Member, supported organization members for continual professional development
- Joyful Sound of Music, Musician and Program Coordinator** **2008 - present**
- Shared music (violin, piano, harp, voice) at local elderly communities, weddings, funerals, parties, banquets
- Society of Women Engineers, Temple University Chapter** **2017 - 2020**
- Engaged in community and youth outreach, served on planning committee, attended national SWE conference

References

Prof. Jennifer Rexford

Department of Computer Science
Princeton University
35 Olden Street, Princeton, NJ 08540
jrex@princeton.edu

Prof. Maria Apostolaki

Department of Electrical & Computer Engineering
Princeton University
41 Olden Street, Princeton, New Jersey 08544
apostolaki@princeton.edu

Prof. Michael K. Reiter

Department of Electrical & Computer Engineering
Duke University
Hudson Hall Engineering Building
100 Science Drive, Suite 130, Durham, NC 27705
michael.reiter@duke.edu

Prof. David Hay

Department of Computer Science & Engineering
Hebrew University
Rothberg Family Buildings
Edmond J. Safra Campus, 9190401 Jerusalem, Israel
dhay@cs.huji.ac.il

Prof. Prateek Mittal

Department of Electrical & Computer Engineering
Princeton University
41 Olden Street, Princeton, New Jersey 08544
pmittal@princeton.edu

Dean Julie Yun

School of Engineering & Applied Science
Princeton University
41 Olden Street, Princeton, New Jersey 08544
julieyun@princeton.edu