SOPHIA YOO

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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

[1] Sophia Yoo, Henry Birge-Lee, Jennifer Rexford, Maria Apostolaki. **"PraxiGuard: Network-Aware Website Fingerprinting Defenses."** *Under review for publication, 35th USENIX Security Symposium.*

[2] 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).

[3] 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).

[4] 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).

[**5]** Sophia Yoo, Satadal Sengupta, Maria Apostolaki, Jennifer Rexford. "**Sieve: Layered Network Defenses against Large-Scale Attacks."** *Open Networking Foundation 2023 P4 Workshop.* (P4'23).

[6] Sophia Yoo, Xiaoqi Chen. **"Secure Keyed Hashing on Programmable Switches."** ACM SIGCOMM 2021 Workshop on Secure Programmable Network Infrastructure. (SPIN'21).

Patents

[1] 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.

[2] Sophia Yoo, Xiaoqi Chen, Jennifer Rexford. **"Split-layer Defense Against Volumetric Attacks with Programmable Data Planes."** Patent Pending.

Notable Awards & Academic Honors

[1] 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

[2] 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

[3] 2025. **Wallace Memorial Fellowship, Highest Graduate Award in Engineering Research,** Princeton University.

[4] 2023, 2024. **Graduate Student Award for Excellence in Service,** Princeton University, ECE Department.

[5] 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

[6] 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

[7] 2020. **Top Honors Recognition**, Temple University, ECE Department.

[8] 2020. **Diamond Award**, Highest Undergraduate Academic Recognition, Temple University.

[9] 2016-2020. **President's Scholar Full Scholarship Award**, Temple University.

Invited Talks

[1] 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)

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

[3] 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)

[4] 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.

[5] 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.

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

[7] 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
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