Nicholas Heinrich-Barna, Ph.D. Candidate

nick@heinrich-barna.net Nicholas Heinrich-Barna
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Objective

As a SMART Fellow driven by a commitment to serve the United States, my research interests lie in advancing security research in PLCs. My goal is to develop novel verification techniques, like PLC fuzzing, to enhance security assurance for these systems. I also mentor undergraduate students on projects pertinent to DoD interests.

Employment

July 2023 – · · · · **PhD Student, SETH LAB, Texas A&M University**, I work on security assurance of industrial control systems. I primarily utilize fuzzing; however, instead of simulating hardware, I utilize custom-made firmware and drivers to access peripherals directly.

May – Aug 2024 **NREIP Research Intern, Navsea-NUWC, Middletown, RI**, I worked as a research intern. I am primarily focused on hardware security products for use by Navsea-NUWC.

May – Aug 2023 **Vulnerability Research Intern, Raytheon CODEX, Melbourne, FL**, I worked to exploit firmware vulnerabilities on embedded systems. I am primarily focused on reversing firmware binaries to find bugs that can be turned into DOS exploits.

May – Aug 2022 **Vulnerability Research Intern, Raytheon CODEX, Melbourne, FL**, I built a decentralized cloud computing platform to rapidly sort large amounts of data. I used the Elastic stack, alongside TIKA, and other custom-made tools.

Mar – Apr 2022 **CAE-Cy Intern, MISI Dreamport, Virtual**, Worked as a SOC analyst monitoring live networks and participated in rapid incident response scenarios.

Education

2023 – · · · · **Ph.D., Texas A&M University** Computer Engineering.
Advisor: Doctor Jeyavijayan "JV" Rajendran.
Focus: *Hardware Security Assurance Methods in Industrial Control Systems.*

2018 – 2023 **B.Sc. Computer Engineering, Texas A&M University**.
GPA: 3.782
Minors: *Cyber-security.*

B.Sc. Petroleum Engineering, Texas A&M University.
GPA: 3.782

Extracurricular

Academic

Aug 2025 **Selected Attendee**, *Specification and Verification for Secure Cyberspace*, MOD25 Summer School, Marktoberdorf, Germany.

Oct 2023 **Invited Speaker**, *Security Assurance via Programmable Logic Controllers*, INFORMS 2023, Phoenix, Arizona.

2021 – 2023 **Defense Cyber Leader Development Program Graduate**, competitively selected to work in a two year NSA- sponsored cyber-security workforce development program

Extracurricular (continued)

Leadership

2023 – 2024 **Project Mentor**, Provided project guidance to a team of undergraduates for various hardware security projects.

2020 – 2022 **Ross Volunteer Company**, Honor Guard for the governor of Texas.

2019 – 2022 **Academic and Career Mentor**, constructed academic progress reports and provided career assistance to potential at-risk students.

2019 **Eagle Scout**

Security Competitions

2023 **1st in USA CSAW Embedded Security Competition**, led a team of 4 to place first among US teams in NYU's CSAW Embedded Security Competition. The topic was side-channels.

Miscellaneous

Awards and Achievements

2024 - 2029 **SMART Scholar**, Received the merit-based SMART Scholarship, which currently funds my five-year PhD program.

2019, '21, '22, '23 **Undergraduate Deans Honor Roll**, achieved a semester GPA of over 3.50.

2021 – 2022 **Top Academic Mentor in Organization**, voted two years in a row the top academic mentor of Corps of Cadets. Selection pool of around 50 people.

Certifications

2022 **Hollingsworth Ethical Leadership Certificate**.

Projects

2024 **PLC Fuzzing**, ICS Security. Utilized novel fuzzing techniques to secure modern PLCs.

2023 **Custom Rowhammer Attack**, hardware engineering. Induced malicious changes in RAM cells from non-privileged space via an FPGA.

2022 **Custom DOS Scripts**, network engineering. DOS attack done with a TCP reset, packet flooding, and ARP poisoning strategies.

TCP, UDP, and IP Spoofing, network engineering. Custom program to spoof another IP address in order to take over the communication between two devices covertly.

Course Work

2023 **Machine Learning 1**, Introduction to machine Learning. Developed a model to predict in-house mortality of hospital patients at 89% accuracy.

2022 **Computer and Network Security 1**, Introduction to software and network security. Developed custom attack-and-defend scripts to obstruct, or defend systems.

2021 **Security of Embedded Systems 1**, Introduction to hardware security. Utilized modern security techniques to deliver exploits and apply security fixes for embedded systems.

References

Available on Request