

Benjamin Andrew Cyr

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RESEARCH VISION

TO BUILD AND INSPIRE LIFE-ENHANCING TECHNOLOGIES THAT WILL REMAIN SECURE AND TRUSTWORTHY EVEN UNDER THREATS THAT MOST WOULD NEVER CONSIDER.

EDUCATION

UNIVERSITY OF MICHIGAN | PH.D. IN COMPUTER SCIENCE

Expected May 2023 | Ann Arbor, MI • Advisor: Dr. Kevin Fu

UNIVERSITY OF MICHIGAN | MSE IN COMPUTER SCIENCE

May 2020 | Ann Arbor, MI • GPA: 4.0 / 4.0

AUBURN UNIVERSITY | BS IN ELECTRICAL ENGINEERING (COMPUTER ENGINEERING OPTION)

Dec 2017 | Auburn, AL • GPA: 3.98 / 4.0

RESEARCH EXPERIENCE

SPQR LAB – UNIVERSITY OF MICHIGAN | CYBER-PHYSICAL SECURITY RESEARCH

June 2018 – Now | Ann Arbor, MI | Advisor: Dr. Kevin Fu

- Investigated light-based signal injection on microphones in voice-controllable systems.
- Defined adversarial capabilities of laser spoofing attacks on LiDAR sensors used in autonomous vehicles.

AUBURN UNIVERSITY | HARDWARE SECURITY RESEARCH

January 2018 – May 2018 | Auburn, AL | Advisor: Dr. Ujjwal Guin

- Proposed a new theoretical defense through software obfuscation to prevent cloning in low-cost embedded systems.
- Reproduced a firmware extraction attack on an STM32 Microcontroller

AUBURN UNIVERSITY | NETWORKING OPTIMIZATION RESEARCH

August 2017 – May 2018 | Auburn, AL | Advisor: Dr. Yin Sun

- Developed MATLAB simulations for optimizing the age of information in real-time networks.
- Researched the effects of information age on control system networks.

HOCHSCHULE MANNHEIM | EMBEDDED SYSTEMS RESEARCH

May 2017 – July 2017 | Mannheim, Germany | Advisor: Prof. Dr. Walter Götzmann

- Developed a system to measure and display data from an electronic bike using an AVR microcontroller.
- Worked on experimental hardware and interfacing with a mobile application.

AUBURN UNIVERSITY | IMAGE PROCESSING RESEARCH

August 2016 – May 2017 | Auburn, AL | Advisor: Dr. Stanley Reeves

- Development of system for real-time image-processing using Xilinx Zynq-7000 SoC.
- Designed user interface to test the image-processing system.

INDUSTRY EXPERIENCE

SANDIA NATIONAL LABS | CYBER SECURITY ENGINEERING

May 2022 – August 2022 | Albuquerque, NM

- Improved the performance of tools designed to automatically perform malware detection and firmware analysis.
- Developed scripts to compile information from Ghidra analysis.

MOTIONAL INC. | CYBER SECURITY ENGINEERING

May 2021 – August 2021 | Pittsburgh, PA

- Performed penetration tests on sensors used in autonomous vehicle prototypes.
- Developed plans for system-level penetration testing of autonomous vehicles.

ADTRAN INC. | NETWORK DRIVER DEVELOPMENT

May 2016 – August 2016 | Huntsville, AL

- Software development of custom network driver on proprietary ADTRAN equipment.
- Interfaced with the Linux Kernel and a custom FPGA networking accelerator.

ADTRAN INC. | DESIGN VERIFICATION TESTING

August 2015 – December 2015 | Huntsville, AL

- Wrote automated tests to check functionality of software releases on ADTRAN Management and Switch Modules.
- Member of an Agile Team.

ADTRAN INC. | SYSTEM DESIGN AND VERIFICATION TESTING

January 2015 – May 2015 | Huntsville, AL

- Performed routine tests of ADTRAN and Cisco devices using custom CLI and proprietary GUIs.
- Gained detailed knowledge of custom networking management and hardware.

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC) | NETWORK ADMINISTRATION

May 2014 – August 2014 | Huntsville, AL

- Maintained devices and accounts on a private network of computers used to simulate and test vehicle software.
- Provided technical support to engineers developing the vehicle software.

OTHER ENGINEERING EXPERIENCE

AUBURN UNIVERSITY SMALL SATELLITE PROGRAM (AUSSP) | ELECTRICAL POWER SYSTEM MEMBER

January 2014 – May 2018 | Auburn, AL

- Member of Electrical Power System Team in student-managed CubeSat program.
- Managed and taught a team of younger students to build and test embedded systems.

PUBLICATIONS

WHY LASERS INJECT PERCEIVED SOUND INTO MEMS MICROPHONES: INDICATIONS AND CONTRAINDICATIONS OF PHOTOACOUSTIC AND PHOTOELECTRIC EFFECTS

IEEE SENSORS 2021 | ACCEPTANCE RATE: 59%

Benjamin Cyr, Takeshi Sugawara, and Kevin Fu

https://spqr.eecs.umich.edu/papers/cyr_why_lasers_inject_sensors2021.pdf

LIGHT COMMANDS: LASER-BASED AUDIO INJECTION ATTACKS ON VOICE-CONTROLLABLE SYSTEMS

USENIX SECURITY 2020 | ACCEPTANCE RATE: 16.1%

Takeshi Sugawara, Benjamin Cyr, Sara Rampazzi, Daniel Genkin, and Kevin Fu

<https://www.usenix.org/conference/usenixsecurity20/presentation/sugawara>

ADVERSARIAL SENSOR ATTACK ON LIDAR-BASED PERCEPTION IN AUTONOMOUS DRIVING

ACM CONFERENCE ON COMPUTER AND COMMUNICATIONS SECURITY (CCS) 2019 | ACCEPTANCE RATE: 16%

Yulong Cao, Chaowei Xiao, Benjamin Cyr, Yimeng Zhou, Won Park, Sara Rampazzi, Qi Alfred Chen, Kevin Fu, Z. Morley Mao

<https://dl.acm.org/doi/10.1145/3319535.3339815>

LOW-COST AND SECURE FIRMWARE OBFUSCATION METHOD FOR PROTECTING ELECTRONIC SYSTEMS FROM CLONING

IEEE INTERNET OF THINGS JOURNAL 2019 VOL. 6 ISSUE 2

Benjamin Cyr, Jubayer Mahmud, Ujjwal Guin

<https://ieeexplore.ieee.org/abstract/document/8598922>

SAMPLING FOR DATA FRESHNESS OPTIMIZATION: NON-LINEAR AGE FUNCTIONS

IEEE JOURNAL OF COMMUNICATIONS AND NETWORKS 2019 VOL. 21 ISSUE 3

Yin Sun and Benjamin Cyr

<https://ieeexplore.ieee.org/document/8764465>

INFORMATION AGING THROUGH QUEUES: A MUTUAL INFORMATION PERSPECTIVE

IEEE SPAWC 2018 | ACCEPTANCE RATE 54%
Yin Sun and Benjamin Cyr
<https://ieeexplore.ieee.org/document/8764465>

PRESENTATIONS

WHY LASERS INJECT PERCEIVED SOUND INTO MEMS MICROPHONES: INDICATIONS AND CONTRAINDICATIONS OF PHOTOACOUSTIC AND PHOTOELECTRIC EFFECTS

PAPER PRESENTATION | IEEE SENSORS | NOVEMBER 2021

<https://2021.ieee-sensorsconference.org/>

BREAKOUT SESSION: AI AND AUTONOMOUS SYSTEMS SECURITY

LIGHTNING TALK | SPQR DEI EMBEDDED SECURITY WORKSHOP | AUGUST 2020

<https://spqr1ab1.github.io/securityworkshop.html>

LIGHT COMMANDS: LASER-BASED AUDIO INJECTION ATTACKS ON VOICE-CONTROLLABLE SYSTEMS

PAPER PRESENTATION | USENIX SECURITY | AUGUST 2020

<https://www.usenix.org/conference/usenixsecurity20/presentation/sugawara>

LIGHT COMMANDS: LASER-BASED AUDIO INJECTION ATTACKS ON VOICE-CONTROLLABLE SYSTEMS

INVITED TALK | INSTITUTE OF DEFENSE ANALYSIS (IDA) | AUGUST 2020

BREAKING INTO A SMART HOME WITH A LASER - SMARTER EVERY DAY 229

INVITED VIDEO COLLABORATION | SMARTER EVERY DAY | DECEMBER 2019

<https://youtu.be/ozIKwGt38LQ>

LOW-COST AND SECURE FIRMWARE OBFUSCATION METHOD FOR PROTECTING ELECTRONIC SYSTEMS FROM CLONING

POSTER PRESENTATION | SEC ACADEMIC CONFERENCE | APRIL 2018

<http://ocm.auburn.edu/sec/index.html>

TEACHING EXPERIENCE

ADVANCED EMBEDDED SYSTEMS | GRADUATE STUDENT INSTRUCTOR

August 2021 – December 2021 | Ann Arbor, MI

- Lab instructor for students learning advanced topics in embedded systems.
- Provided instruction and assistance to students developing senior-level design projects.

INTRODUCTION TO EMBEDDED SYSTEM DESIGN | GRADUATE STUDENT INSTRUCTOR

January 2021 – May 2021 | Ann Arbor, MI

- Met with students as a remote lab instructor to ensure proper understanding of embedded systems concepts.
- Provided remote assistance and preparation for students in projects, homework, and exams.

INTRODUCTION TO EMBEDDED SYSTEM DESIGN | LAB DESIGN

May 2020 – August 2020 | Ann Arbor, MI

- Designed and wrote lab documents for a undergraduate embedded systems course.
- Course had to be converted and improved so that the labs could be completed remotely.

UNDERGRADUATE RESEARCH ADVISEES

TANVI DESHMUKH

May 2020 – August 2020

Investigating the physics of light signal injection into MEMS devices.

<https://tddeshm.github.io/research/>

COMMUNITY INVOLVEMENTS

LUMIERE EDUCATION | RESEARCH MENTOR

May 2021 - August 2021

Mentor to five students interested in getting involved in undergraduate research. The three-month program included selecting a topic in computer science, performing research and analysis, and writing a paper on findings.

<https://www.lumiere-education.com/>

SPQR DEI EMBEDDED SECURITY WORKSHOP | VOLUNTEER ORGANIZER

August 2020

An organizer for the the virtual Embedded Security Workshop. Responsible for managing breakout sessions and handling workshop emails and questions.

<https://spqr1ab1.github.io/securityworkshop.html>

UNIVERSITY OF MICHIGAN CSEG STUDENT ORGANIZATION | SPQR LAB LIAISON

January 2019 - Now

Representative from the SPQR Lab in CSEG-hosted events in welcoming incoming students and ensuring strong student connections in the Computer Science and Engineering Department.

<https://cseg-michigan.github.io/>

AWARDS AND HONORS

2021 BEST PAPER AWARD | JOURNAL OF COMMUNICATIONS AND NETWORKS

For the publication "Sampling for Data Freshness Optimization: Non-linear Age Functions"