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# BRYAN PEARSON

## PERSONAL INFORMATION

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**University:** University of Central Florida  
**College Unit:** College of Engineering and Computer Science (CECS)  
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## BIOGRAPHY

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Bryan Pearson is a Ph.D candidate at the University of Central Florida. His advisors are Dr. Xinwen Fu and Dr. Cliff Zou. He is pursuing his degree in Computer Science, with a focus on Internet of Things (IoT) system and security. He received his B.S. in Computer Science from Stetson University (2014), with minors in Physics and Mathematics.

Bryan's research interests include security and forensics of wireless sensor networks (WSN) and IoT systems, especially software and hardware security. He also has interests in networking quality of service (QoS), data mining, and web design. He has been publishing in several conferences and journals including ICC, ICPADS, IFIP, INFOCOM, ICNC, and MDPI Sensors.

## EDUCATION

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<b>University of Central Florida</b> Ph.D in Computer Science Focus: Internet of Things (IoT) security Advisors: Dr. Cliff Zou & Dr. Xinwen Fu	<i>August 2018 - Present</i>
<b>Stetson University</b> B.S. in Computer Science Minors in Math and Physics Advisor: Dr. Daniel Plante	<i>May 2018 GPA: 3.507 / 4.000</i>

## RESEARCH INTERESTS

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- IoT security and forensics
- Applications and solutions of WSN and IoT
- Networking and computer systems QoS
- Light cryptography implementation and optimizations

## WORK EXPERIENCE

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<b>Graduate Assistant</b> Florida IT Pathways to Success (Flit-Path)	<i>August 2018 - Present</i>
<b>Graduate Research Assistant</b> University of Central Florida, Department of Computer Science	<i>August 2018 - August 2019</i>
<b>Instructor</b> ID Tech Camps	<i>June 2017 - July 2018</i>
<b>Clerical Assistant</b> Stetson University, Departments of English/Computer Science	<i>May 2017 - June 2018</i>

## SCHOLARSHIPS AND GRANTS

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**University of Central Florida**

Graduate Presentation Fellowship  
IEEE ICC NSF Student Travel Grant  
Graduate Presentation Fellowship  
Graduate ORC Doctoral Fellowship  
Flit-Path NSF Grant

*Spring 2020*  
*April 2019*  
*February 2019*  
*August 2018*  
*August 2018*

**Stetson University**

Presidential Scholarship  
Federal Pell Grant  
Bright Futures FASA

*August 2014 - May 2018*  
*August 2014 - May 2018*  
*August 2014 - May 2018*

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**ACADEMIC ACTIVITIES**

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**Committee Membership**

1. Program Committee, *Consortium for Computing Sciences in Colleges (CCSC SE)* 2020
2. Web Chair (Organizing Committee), *SecureComm* 2019

**Refereed Journal Papers**

1. *IEEE Internet of Things Journal (IoT-J)* 2021
2. *IEEE Internet of Things Journal (IoT-J)* 2020
3. *IEEE Internet of Things Journal (IoT-J)* 2019

**Refereed Conference Papers**

1. *IEEE International Conference on Distributed Computing Systems (ICDCS)* 2021
2. *IEEE International Conference on Parallel and Distributed Systems (ICPADS)* 2020
3. *Consortium for Computing Sciences in Colleges (CCSC SE)* 2020

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**NOTABLE PROJECTS**

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**MosquitoByte: Fuzzing MQTT Message Brokers**

- This project tries to find vulnerabilities in MQTT brokers using a mutation-based fuzzer. The fuzzer starts with a corpus of valid MQTT packets and applies various fuzzing strategies until the broker crashes.
- Implements a "pseudo-genetic" fuzzing algorithm which tweaks its parameters based on anomalous output and network responses from the broker.
- Written in Python 3.
- So far the fuzzer has discovered vulnerabilities in two popular MQTT brokers, including Mosquitto (CVE TBD).
- Source code: <https://github.com/PBearson/MosquitoByte>
- This project is still in development as part of a course at UCF for the term Spring 2021.

**SIC<sup>2</sup>: Securing MCU Based IoT Devices with Low-cost Crypto Coprocessors**

- We demonstrate how the popular ESP32 platform is vulnerable to format string attacks, and how these attacks can be used to compromise private data which is used in the application
- As a general defense, we propose a framework which pairs MCU based IoT devices with the cryptographic coprocessors, which offer secure key storage and secure execution environment
- Proof-of-concept: ESP-WROOM-32 with ATECC608A
- More information: [https://bpearson.net/papers/ICPADS\\_2020\\_Camera\\_Ready.pdf](https://bpearson.net/papers/ICPADS_2020_Camera_Ready.pdf)

**STAIR: Smart Air Network**

- This project plots ambient particulate matter, CO<sub>2</sub>, air pressure, temperature, and humidity data from sensors onto a map. Our current deployment of devices are built using the SAML11 microcontroller.

- My contributions to this project include integration with Amazon Web Services such as IoT Core (communication from/to sensors), Lambda (payload decoding), DynamoDB (data storage), EC2 (web server), and CodePipeline (CI/CD).
- Publication is forthcoming. The website is available here: <http://3.85.149.13/>.
- Source code available upon request.

### IoT Security Hands-on Laboratory

- We develop a low-cost platform with an industrial grade MCU ESP32 equipped with a crypto co-processor ATECC608A and create teaching materials including labs and case studies for IoT security education.
- Labs include: JTAG hacking, JTAG defense, UART hacking, UART defense, flash ethical hacking, secure key storage, secure booting, network attack, network defense, and secure over-the-air update.
- More information: [https://link.springer.com/chapter/10.1007/978-3-030-43605-6\\_17](https://link.springer.com/chapter/10.1007/978-3-030-43605-6_17)
- Sample lab: [http://cyberforensic.net/labs/iot\\_secure\\_key\\_storage/secure\\_key\\_storage.html](http://cyberforensic.net/labs/iot_secure_key_storage/secure_key_storage.html)

### PUBLICATIONS

1. M. Cash, S. Wang, B. Pearson, Q. Zhou, X. Fu. On Automating BACnet Device Discovery and Property Identification. *In proceedings of IEEE International Conference on Communications (ICC)*, Montreal. June 2021.
2. Z. Ling, R. Liu, Y. Zhang, K. Jia, B. Pearson, X. Fu, L. Junzhou. Prison Break of Android Reflection Restriction and Defense. *In proceedings of IEEE International Conference on Computer Communications (INFOCOM) 2021*. Virtual conference. May 2021.
3. B. Pearson, C. Zou, Y. Zhang, Z. Ling, X. Fu. *SIC<sup>2</sup>*: Securing Microcontroller Based IoT Devices with Low-cost Crypto Coprocessors. *In proceedings of IEEE International Conference on Parallel and Distributed Systems (ICPADS) 2020*. Hong Kong. Dec. 2020.
4. B. Pearson, D. Plante. Secure Deployment of Containerized IoT Systems. *In proceedings of IEEE SoutheastCon 2020*. Raleigh, North Carolina. Mar. 2020.
5. Y. Zhang, J. Weng, Z. Ling, B. Pearson, X. Fu. BLESS: A BLE Application Security Scanning Framework. *In proceedings of IEEE INFOCOM 2020 - IEEE Conference on Computer Communications (INFOCOM)*. Beijing, China. Apr. 2020.
6. B. Pearson, L. Luo, C. Zou, J. Brian, Y. Jin, X. Fu. Building a Low-cost and State-of-the-art IoT Security Hands-on Laboratory. *2nd IFIP International Internet of Things (IoT) Conference*. Oct. 31-Nov. 1, 2019. (Invited Paper.)
7. C. Gao, L. Luo, Y. Zhang, B. Pearson, X. Fu. Microcontroller Based IoT System Firmware Security: Case Studies. *In proceedings of IEEE International Conference on Industrial Internet (ICII)*, Orlando, FL, Nov. 2019. (**Best Paper Award.**)
8. B. Pearson, L. Luo, Y. Zhang, R. Dey, Z. Ling, M. Bassiouni, and X. Fu. On Misconception of Hardware and Cost in IoT Security and Privacy. *In proceedings of IEEE International Conference on Communications (ICC)*, Shanghai, China, May 2019.
9. L. Luo, Y. Zhang, B. Pearson, Z. Ling, H. Yu, and X. Fu. On the Security and Data Integrity of Low-Cost Sensor Networks for Air Quality Monitoring. *Sensors (Basel)*. Dec. 2018.
10. N. Domingo, B. Pearson, and Y. Jin. Exploitations of Wireless Interfaces Via Network Scanning. *In proceedings of IEEE International Conference on Computing, Networking and Communications (ICNC)*, Santa Clara, CA, 2017.

### TECHNICAL SKILLS

**Languages:** C, Python, Java, R, PHP, JavaScript, MatLab

**Software:** Arduino IDE, ESP-IDF, MatLab, Splunk, Wireshark, Mongoose OS, AWS, Google Cloud, Microsoft Azure, Node.js, Apache, Nginx, Spark, Docker, Kubernetes

### REFERENCES

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**Dr. Xinwen Fu** (Primary Advisor)  
Associate Professor of Computer Science  
Email: xinwenfu@ucf.edu

*University of Central Florida*

**Dr. Cliff Zou** (Co-advisor)  
Associate Professor of Computer Science  
Email: changchun.zou@ucf.edu

*University of Central Florida*