

Weijia He

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RESEARCH INTERESTS

IoT Security & Privacy; Ubiquitous Computing; Computer Security; Privacy; Human-Computer Interaction (HCI)

EDUCATION

University of Chicago, Chicago, IL

Sep. 2017 - Present

Ph.D in Computer Science (expected August 2022)

Advisor: Blase Ur

Shanghai Jiao Tong University, Shanghai, China

Sep. 2013 - Jul. 2017

Bachelor of Science in Information Security

HONORS & AWARDS

- 2022 Siebel Scholar (\$35,000)
- Finalist for the 2020 NortonLifeLock Graduate Fellowship
- Student Travel Grant for the 2019 IEEE Symposium on Security and Privacy (\$1,250)
- USENIX Security 2018 Student Grant (\$745)
- SOUPS 2018 Student Grant (\$770)

CONFERENCE PUBLICATIONS

Can Allowlists Capture the Variability of Home IoT Device Network Behavior?

Weijia He, Danny Yuxing Huang, Nick Feamster, Blase Ur

In submission.

SoK: Context Sensing for Access Control in the Adversarial Home IoT [\[pdf\]](#)

Weijia He, Valerie Zhao, Olivia Morkved, Sabeeka Siddiqui, Earlence Fernandes, Josiah Hester, Blase Ur

In *Proceedings of the 6th IEEE European Symposium on Security and Privacy (EuroS&P)*. Online, September 2021.

Trace2TAP: Synthesizing Trigger-Action Programs From Traces of Behavior [\[pdf\]](#)

Lefan Zhang, Weijia He, Olivia Morkved, Valerie Zhao, Michael L. Littman, Shan Lu, Blase Ur.

In *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 4, 3, Article 104 (IMWUT / UbiComp)*. Online, September 2020.

AutoTap: Synthesizing and Repairing Trigger-Action Programs Using LTL Properties [\[pdf\]](#)

Lefan Zhang, Weijia He, Jesse Martinez, Noah Brackenburg, Shan Lu, Blase Ur.

In *Proceedings of the 41st International Conference on Software Engineering (ICSE)*. Montreal, QC, Canada, 2019.

How Users Interpret Bugs in Trigger-Action Programming [\[pdf\]](#)

Will Brackenburg, Abhimanyu Deora, Jillian Ritchey, Jason Vallee, Weijia He, Guan Wang, Michael L. Littman, Blase Ur

In *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI)*. Glasgow, UK, 2019.

Rethinking Authentication and Access Control for the Home Internet of Things (IoT) [\[pdf\]](#)

Weijia He, Maximilian Golla, Roshni Padhi, Jordan Ofek, Markus Dürmuth, Earlence Fernandes, Blase Ur

In *Proceedings of the 27th USENIX Security Symposium (USENIX Security)*, Baltimore, MD, 2018.

WORKSHOP PUBLICATIONS

When Smart Devices Are Stupid: Negative Experiences Using Home Smart Devices [\[pdf\]](#)

Weijia He, Jesse Martinez, Roshni Padhi, Lefan Zhang, Blase Ur.

In *Proceedings of the IEEE Workshop on the Internet of Safe Things*. San Francisco, CA, 2019.

Clap On, Clap Off: Usability of Authentication Methods in the Smart Home [\[pdf\]](#)

Weijia He, Juliette Hainline, Roshni Padhi, Blase Ur

Proceedings of the Interactive Workshop on the Human Aspect of Smarthome Security and Privacy (WSSP). Baltimore, MD, 2018.

RESEARCH EXPERIENCE

Generating Firewall Rules from Smart Devices' Network Traffic Data Jan. 2020 – Apr. 2022

Keywords: *Network Security, IoT, Traffic Analysis*

Advisors: Nick Feamster (University of Chicago), Blase Ur (University of Chicago)

- Analyzed 10GB of traffic data from the IoT Inspector dataset (with IRB approval).
- Proposed methods for automatically generating allowlists based on the given dataset.
- Explored the possibility of transferring allowlists across different products and regions.
- Developed a proof-of-concept allowlist enforcement system on real-world smart home devices. Analyzed the traffic generated from the device and understood the minimum set of traffic allowed that maintains device functionality.

Multi-User Authentication and Access Control in the Internet of Things Jul. 2017 – Sep. 2021

Keywords: *Security, Privacy, Sensing, HCI, Smart Homes, Access Control, Conceptual Framework*

Advisors: Blase Ur (University of Chicago), Earlene Fernandes (University of Wisconsin), Josiah Hester (Northwestern University)

- Proposed a new way to think about access-control specification for the multi-user home IoT based on relationships, capabilities, and contexts.
- Discovered that access-control policies are frequently context-dependent from a 425-participant online user study.
- Identified 11 contextual factors that future interfaces should support.
- Mapped desired contexts to sensing mechanisms.
- Evaluated existing sensing technologies in terms of security, privacy, and usability. Explored the possibility of physical attacks on sensors by non-technical users.

Trigger-Action Programming in the Home Internet of Things Jan. 2018 – Aug. 2020

Keywords: *HCI, Smart Homes, End-User Programming, User Interface Design, Formal Methods*

Advisors: Blase Ur (University of Chicago), Shan Lu (University of Chicago), Michael L. Littman (Brown University)

- Designed and implemented a custom web-based user interface for creating trigger-action rules for home automation.
- Implemented an accompanying back-end infrastructure that interfaces with the Samsung SmartThings API so that these rules control actual devices for prototype deployments.
- Designed an accompanying survey to understand how end-users creates rules for a given scenario of specifying trigger-action rules or safety properties.
- Designed and conducted a field study in an office environment of synthesizing trigger-action rules based on traces of users' own activities.

A Security Study of Authenticators in Single-Sign-On

Jan. 2016 - Mar. 2016

Keywords: SSO, Authentication, Online Social Networks

Advisor: Yuanyuan Zhang (Shanghai Jiao Tong University)

- Conducted a fuzzing test on the SSO (Single-Sign-On) implementations in the 65 most popular Android apps in the Chinese app market using the Burp Suite.
- Discovered that some apps used insecure authenticators. Many apps, when serving as the relying party, couldn't defend against MITM attacks. This included some of the most popular apps in China, such as Sina Weibo, a Twitter-like app with over 550 million downloads.

SERVICE

- **PC Member**, The 23rd Privacy Enhancing Technologies Symposium (PETS), 2023
- **Publication Chair**, The 22nd Privacy Enhancing Technologies Symposium (PETS), 2023 and 2022
- **Poster Jury**, Symposium on Usable Privacy and Security (SOUPS), 2022 and 2021
- **Artifact Evaluation Committee Member**, USENIX Security Symposium, 2022 and 2021
- **Shadow PC member**, The 41st IEEE Symposium on Security and Privacy, 2020
- **PC Member**, The European Workshop on Usable Security, 2020, 2019
- **PC Member**, CSCW 2019 Workshop on Ubiquitous Privacy: Research and Design for Mobile and IoT Platforms

TEACHING EXPERIENCE

Introduction to Computer Science (CMSC 15100)

Summer 2021

Instructor, University of Chicago

- Duties as the lead instructor for this undergraduate course included giving all lectures for the course; leading labs; holding office hours; and designing labs, homework, and exams. This course is the first programming course in the sequence for prospective computer science majors, and I was the instructor of record for the summer offering.

Introduction to Computer Security (CMSC 23200 / CMSC 33200)

Winter 2022, 2021

Teaching Assistant, University of Chicago

- Duties for this primarily undergraduate course included giving one guest lecture per year, grading assignments, and holding office hours.

Ethics, Fairness, Responsibility, and Privacy in Data Science (CMSC 25910/25900)

Spring 2022, 2020

Teaching Assistant, University of Chicago

- Duties for this undergraduate course included designing problem sets, grading assignments, and holding office hours.

Machine Learning for Cybersecurity

Spring 2021

Teaching Assistant, University of Chicago Graham School for Continuing Liberal and Professional Studies

- Duties for this four-meeting continuing education class for working professionals included preparing homework assignments, holding office hours, and taking notes.

superpowHer: compileHer Tech Capstone 2019

April 2019

Instructor, University of Chicago

- Duties for this outreach activity to middle school girls included giving workshops.

Usable Security and Privacy (CMSC 23210 / CMSC 33210)

Spring 2019, 2018

Teaching Assistant, University of Chicago

- Duties for this undergraduate course included giving one guest lecture per year and grading assignments.

Computer Science with Applications 1 (CMSC 12100)

Fall 2017

Teaching Assistant, University of Chicago

- Duties for this undergraduate course, intended for students not planning to major in computer science, included leading lab sessions, grading problem sets, and holding office hours.

SKILLS

Programming Languages: Python, JavaScript, Java, C++, C#, R, Shell Scripting, LaTeX

Hardware: Raspberry Pi, Jetson Nano

Languages: Mandarin Chinese (native), English (fluent)