

# XUENING XU

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## SKILLS

- **Programming Languages:** Python, Java, JavaScript/Node.js, C/C++, HTML/CSS, Lua, SQL, Swift
- **Frameworks:** LangChain, TensorFlow, PyTorch, Scikit-learn, Pandas, NumPy, Matplotlib, Flask, Express.js, React.js
- **Tools & Services:** Docker, Postman, Linux CLI Tools, Redis, OpenAI API, Git, Firebase, AWS, GCP, Wireshark, tcpdump

## SELECTED PROJECTS

- Cross-Language Evaluation of IoT Device Drivers for Security Verification Using LangChain** Oct 2023 - Present
- Create a local database using **Redis** to store embeddings of device driver code generated by **OpenAI Embedding model**.
  - Build a **RAG** model on a local **Hugging Face LLM** within **LangChain** framework to retrieve code with structured prompts.
  - Build an **LLM-based Agent** equipped with tools to discover discrepancies in the implementation of device driver code.
- Computer Vision based IoT Device Event Verification** Mar 2023 - Sep 2023
- Collected images of each IoT device from camera video data and created image pairs as the training and testing datasets.
  - Built a **Siemese neural network** using **TensorFlow** to identify variations in the status of same device from image pairs.
  - Evaluated the proposed deep learning model in the real-world testbeds to verify IoT device events.
- Discovering and Exploiting Vulnerability on Zigbee Devices** Nov 2022 - Feb 2023
- Revealed a vulnerability - *Zigbee Hidden Attributes* that exists on most commodity Zigbee devices.
  - Simulated an end-to-end attack by developing a customized Zigbee light switch in **C** using **nRF5 SDK**.
  - Disclosed this vulnerability to device manufacturers and received acknowledgements from Samsung, Amazon, and Connectivity Standards Alliance (CSA). Amazon awarded a **\$2,500 bounty (Ranked 16)** for the valuable findings.
- Customized Local Server for Connecting IoT Devices to Cloud Platforms** Jan 2022 - Jun 2022
- Developed an one-stop-for-all local server using **Node.js** on **Ubuntu** to connect various types of IoT devices.
  - Integrated with two cloud platforms (IFTTT and Samsung SmartThings) using **Node.js** and implemented **OAuth 2.0** for authentication, enabling device management on the cloud platforms for previously unsupported IoT devices.
  - Implemented a database using **SQLite** to manage connected devices and handle tokens received from cloud platforms.
- End-to-End Smart Speaker Protection System** Sep 2020 - Mar 2021
- Developed a **transparent proxy** in **Python** to redirect network traffic of smart speaker for real-time analysis.
  - Created an analysis tool in **Python** to detect voice invocations and trigger **Firebase Cloud Messaging (FCM)** notifications.
  - Developed an **Android app** in **Java** with FCM integrated to measure smart speaker Bluetooth RSSI upon notifications.
  - Implemented an end-to-end system using **Python** to detect and block unauthorized voice commands based on RSSI.

## EDUCATION

- Stevens Institute of Technology** Jan 2022 - Expected Dec 2024  
*Ph.D. in Computer Engineering*
- Temple University** (Continued at Stevens Institute of Technology) Sep 2019 - Dec 2021  
*Ph.D. Program in Computer and Information Sciences*
- Temple University** (Dual Bachelor's Master's Degree program) Sep 2017 - May 2019  
*M.S. in Computer Science*
- University of Science and Technology of China** Sep 2014 - Jun 2018  
*B.S. in Mathematics and Applied Mathematics*

## PUBLICATIONS

- **X. Xu**, C. Fu, and X. Du, "MP-Mediator: Detecting and Handling the New Stealthy Delay Attacks on IoT Events and Commands." RAID 2023, ACM. (Acceptance rate: 23.5%)
- **X. Xu**, C. Fu, X. Du, and E. Ratazzi, "VoiceGuard: An Effective and Practical Approach for Detecting and Blocking Unauthorized Voice Commands to Smart Speakers." DSN 2023, IEEE. (Acceptance rate: 20%)
- **X. Xu**, X. Du, and Q. Zeng, "Attacking Graph-Based Classification without Changing Existing Connections." ACSAC 2020. (Acceptance rate: 23%)
- **X. Xu**, C. Fu, X. Du, and E. Ratazzi, "Effective UAV and Ground Sensor Authentication." GLOBECOM 2019, IEEE.