

EDUCATION

- **University of Tennessee, Knoxville, TN-37916, USA**
GPA 4.00/4.00
2021–July 2025
PhD in Computer Engineering
- **University of Kentucky, Lexington, KY-40506, USA**
GPA 3.879/4.00
2017–2021
Bachelor of Science in Computer Engineering

ENGINEERING
SKILLS[Level:
Advanced]

- **Programming Languages:** Python, *Embedded C*, *C*, *C++*, *C#*, Rust, Verilog/SystemVerilog, VHDL, Java, Javascript, Matlab, *ARM/x86 Assembly*. **Design Tools:** Virtuoso, Vivado, Innovus, Keil (*AMD*), Quartus. **Hardware:** RTOS, FPGA Design and Synthesis, CUDA, RISC-V. **Machine Learning & Quantum Libraries:** Keras, Pytorch, Tensorflow, IBM Qiskit, OpenQASM, PennyLane. **Security Tools:** NMAP, Metasploit, SQLMap, Netcat. **Operating System:** Windows, Linux.

EXPERIENCE

- Undergraduate Research Assistant, Dept of ECE, University of Kentucky, Lexington (2019-2021)
- Teaching Assistant, Dept of EECS, University of Tennessee, Knoxville (2021-Present)
- **NSF Graduate Research Fellow**, Dept of EECS, University of Tennessee, Knoxville (2022-Present)

DISTINCTIONS
AND
AWARDS

- **2020 - Schneider Electric Fellowship, University of Kentucky:**
Smart-Home Research on ML-based CPS Anomaly Detection in collaboration with SPARK Lab.
- **2021 - Upsilon Pi Epsilon (UPE) Award:**
IEEE Computer Society Award for Academic Success in Computer Engineering.
- **2022–Present - NSF Graduate Research Fellowship Program (GRFP):**
Prestigious fellowship awarded to outstanding students with significant contributions to STEM.
- **2025 - UTK Gonzalez Outstanding Graduate Teaching Assistant Award:**
Award for outstanding commitment, dedication, and notable ambition in EECS academic pursuits.

RELEVANT
PROJECTS

- **Crystals-KYBER-based Post-Quantum Cryptographic 3D Printing Security -**
 - Developed a Crystals-KYBER-based post-quantum cryptographic framework in Embedded C for 3D Printer in collaboration with Southeastern Advanced Machine Tools Network (SEAMTN).
 - Engineered a novel & highly efficient CAN communication tree/graph structure for 3D printers.
 - Built a proof-of-concept 3D printer farm, presented at security conference HOST, with simple API callback structure for plug-and-play.
 - Taught prospective engineers offensive/defensive security for manufacturing networks with Kali.
- **Post-Quantum Cryptographic Vehicular Security Framework -**
 - Developed an embedded CAN framework safe from quantum threats for commercial vehicles while adhering to original ISO 11898 protocol specifications.
 - Built embedded testbench for collecting performance benchmarks of this design.
- **ASHRAE-based Smart Home COMFORT Controller (UKY Best Senior Project 2021) -**
 - Designed Smart HVAC at the UKY Spark Lab to meet ASHRAE "COMFORT" Standards.
 - Developed lightweight, secure communication firmware/API with embedded C, C++, and C# for WLAN-based, smart integration for HVAC devices.
 - Documented various performance and functionality metrics for future use in Spark Lab.
- **GUI Operating System Designed for RISC-V Architecture -**
 - Designed an operating system and SBI in C for a virtual RISC-V with GUI/input support.
 - Implemented supervisor, hypervisor, and user modes for privilege protection.
 - Provides "hardware threading" for a multi-core RISC-V ISA with power saving capabilities.
- **Smart-Home Sensor Anomaly Detection using Keras Deep Learning -**
 - Proposed an ML model to identify sensor anomalies in Honda US Smart Home data.
 - Trained a deep learning autoencoder model in Python in collaboration with Schneider Electric.

- **16-bit Pipelined Processor for 8-bit SIMD Posit Arithmetic in Verilog (Gr8BOnd) -**
 - Implemented a 16-bit pipelined processor capable of performing SIMD Within a Register (SWAR) in a Turing-complete instruction set.
 - Fully developed in Verilog and implemented on the Intel Cyclone V SoC/FPGA.
 - Developed a Monte Carlo-based testing apparatus for validating processor functionality via Icarus.
- **Quantum Anomaly Detection for Industrial Control Systems -**
 - Engineered high-accuracy Quantum ML models in Python for detecting cyberattacks in critical infrastructures with Oak Ridge National Lab (ORNL).
 - Determined metrics for parametrizing the success, or advantage, of a CPS-related QSVM model on detecting real-world industrial cyberattacks.
 - Investigated the effects of modern NISQ noise in quantum machine learning.
 - Designed Python framework for easy integration of IBM Qiskit in Cyberphysical Systems.
- **FPGA-Based Multilayer Perceptron (MLP) as a Neural Network using Verilog -**
 - Designed a MLP neural network accelerator with parametrizable neurons and layers using dedicated DSP hardware on the Intel Cyclone V and Xilinx Artix-7.
 - Implemented wrapper/controller for easy interfacing with SoC RAM and I/O.
 - Evaluated various performance metrics of the FPGA design in terms of power, area, and timing.
- **FPGA Implementation and Side-Channel Analysis of PRESENT & AES Cryptography -**
 - Designed FPGA implementation of the PRESENT & AES cryptographic engines with a state machine-based controller in Verilog.
 - Taught students how to perform validation and investigate power usage, timing, and utilization.
 - Performed side-channel power analysis attacks on HW implementations of PRESENT & AES.

MAJOR ACADEMIC COURSES

- **Systems Programming, Computer Programming, Network/Software/Embedded Security, System on Chip Design, Machine Learning, Compiler Design, Operating System Design, Emerging Computing (Quantum), GPU & Multicore Programming, Data Mining and Analytics, Adv. Embedded Systems, Algorithm Design/Analysis, Digital Logic Design**

PUBLICATIONS

- **Tyler Cultice**, Md. Saif Hassan Onim, Annarita Giani and Himanshu Thapliyal, “Anomaly Detection for Real-World Cyber-Physical Security using Quantum Hybrid Support Vector Machine”, *Proceedings of IEEE Computer Society Annual Symposium on VLSI 2024 (ISVLSI 2024)*, Knoxville, TN, USA, July 1-3, **2024 (Best Paper Award)**
- **Tyler Cultice**, Joseph Clark, Himanshu Thapliyal. ”A Novel Hierarchical Security Solution for Controller-Area-Network-Based 3D Printing in a Post-Quantum World.” *Sensors* 23.24 (**2023**): 9886.
- **Tyler Cultice**, Joseph Clark, and Himanshu Thapliyal. ”Lightweight Hierarchical Root-of-Trust Framework for CAN-Based 3D Printing Security.” *Proceedings of the Great Lakes Symposium on VLSI 2023*. **2023**.
- **Tyler Cultice**, and Himanshu Thapliyal. ”Vulnerabilities and Attacks on CAN-Based 3D Printing/Additive Manufacturing.” *IEEE Consumer Electronics Magazine* 13.1 (**2023**): 54-61.
- Chin, Jun-Cheng, Himanshu Thapliyal, and **Tyler Cultice**. ”CAN Bus: The Future of Additive Manufacturing (3D Printing).” *IEEE Consumer Electronics Magazine* (**2022**).
- **Tyler Cultice**, and Himanshu Thapliyal. ”PUF-based post-quantum CAN-FD framework for vehicular security.” *Information* 13.8 (**2022**): 382.
- **Tyler Cultice**, Dan Ionel, and Himanshu Thapliyal. ”Smart home sensor anomaly detection using convolutional autoencoder neural network.” *2020 IEEE International Symposium on Smart Electronic Systems (iSES)(Formerly iNiS)*. IEEE, **2020**.
- **Tyler Cultice**, Carson Labrado, and Himanshu Thapliyal. ”A puf based can security framework.” *2020 IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*. IEEE, **2020**.