Christopher Kitras

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Provo, UT, USA

Research Interests

- My research focuses on the resilience of network-enabled embedded systems. I design robust sensor networks that adapt to their environment and repurpose existing technologies to extract actionable information. My systems are intended for deployment on commodity off-the-shelf hardware or pre-existing infrastructure. I am particularly interested in exploring how these approaches can be leveraged to monitor and improve the environment.

Education

- Ph.D. in Electrical and Computer Engineering | December 2026 Brigham Young University, Provo, UT
    - GPA 3.97/4.0
- B.Sc. in Computer Engineering | December 2021 Brigham Young University, Provo, UT
    - GPA 3.6/4.0
    - BYU Half Tuition Scholarship Spring 2019
    - Dean's List Winter 2021

Graduate Classes

- High Performance Computing
- Wireless Networking
- Exploring SDRs
- Robotic Vision
- Advanced Digital Systems (FPGA Design)
- Privacy in Computing Systems
- Cybersecurity & Pen Testing
- Cyber-Physical Systems
- Scientific Computing (HPC on Supercomputers)
- Computational Creativity
- Advanced Computer Networks
- Professional Writing

Publications

- **C. Kitras,** J. D. Beard, J. D. Johnston, P. Lundrigan. Sustainable Radon Mitigation through Optimized HVAC Scheduling. IEEE/ACM Conference on Connected Health: Applications, Systems, and Engineering Technologies (CHASE), 2025
- A. Palacios, D. Harman, **C. Kitras,** E. Kelsey, M. Burnett, W. Harrison, P. Lundrigan. Hidden in Plain Sight: Communicating using Interference. IEEE

International Symposium on Dynamic Spectrum Access Networks (DySPAN), 2025
- C. E. Flowerday, P. Lundrigan, **C. Kitras,** T. Nguyen, J. C. Hansen. Utilizing Low-Cost Sensors to Monitor Indoor Air Quality in Mongolian Gers. Sensors. Vol 23, Iss 18, 2023
- **C. Kitras,** C. Pollan, K. Meyers, P. Lundrigan. Location Verification of Crowd-Sourced Sensors. IEEE International Conference on Computer Communications and Networks (ICCCN), 2023

Posters/Demos

- **C. Kitras,** C. Pollan, J. Linford, P. Lundrigan. TCAM: Traffic Camera Air quality Monitoring. Air Quality: Science for Solutions (S4S), 2025.
- **C. Kitras,** C. Pollan, J. D. Beard, J. D. Johnston, P. Lundrigan. Radon Mitigation through Optimized HVAC Scheduling. Air Quality: Science for Solutions (S4S), 2024. **Best Poster Award.**
- **C. Kitras,** A. Palacios, P. Lundrigan. SSS: Building a Seven Segment Sign. PyCon, 2023.
- **C. Kitras,** C. Pollan, K. Meyers, P. Lundrigan. Location Monitoring Framework for Citizen Science Sensors. Air Quality: Science for Solutions (S4S), 2023. **Best Poster Award.**

Experience

- Research Assistant | April 2020—Present | Network Enhanced Technologies Lab at Brigham Young University
    - Localization of Low-Cost Air Quality Sensors
        - Devised a software-based solution for precise device location using traceroute data
        - Streamlined location determination with minimal firmware changes avoiding hardware alterations
        - Created a secure registration process to associate location info with sessions
        - Led algorithm creation to monitor routing path changes and detect location shifts
    - Low-Cost Air Quality Sensors in Extreme Environments
        - Developed a cost-effective air quality monitor centered on the Particle microprocessor platform to gauge effectiveness of energy-efficient housing versus traditional housing
        - Managed sensor fleets using cloud tools, including executing over-the-air updates

        - Optimized sensor firmware for modular design, allowing for new peripherals without redesign
        - Refined cloud data transfer efficiency by integrating buffering services such as Google PubSub
    - Ghost Modulation
        - Audited unconventional protocol for vulnerabilities and implemented security measures by identifying attack vectors where an eavesdropper could sniff and replay data
        - Implemented a lean message authentication code (MAC) that ensures data integrity by hashing the message, a shared secret, and a timestamp
        - Collaborated with a joint team to devise a strategic implementation for an optimized solution
    - Radon Mitigation
        - Designed a system to reduce radon levels to healthy limits in a large structure without modifying original architecture
        - Optimized monitor selection, choosing a cost-effective yet high-performance SunRADON device to balance budget and system needs
        - Engineered a Python-based client to interface with an undocumented API lacking official clients
        - Formulated an algorithm to project optimal HVAC scheduling for radon mitigation
    - Traffic Camera Air Quality Monitoring Platform
        - Developed a platform that enables ML researchers to access to large datasets to enable real-time model training
        - Compiled a dataset over 3TB full of traffic camera images and the corresponding weather/air quality conditions accessible by a new Python API
        - Designed and maintained web app using MongoDB and Flask instance to store and deliver data
        - Integrating a pre-existing ResNet50 model that will create a regression between available PM2.5 values and the traffic camera images
    - Latency Shift Keying
        - Successfully communicate with devices across various ranges (from an access point to across the internet) by affecting latent behaviors of a device
        - Developed a suite of encoding and decoding strategies based on the topographies in which the devices desire to communicate

        - Proposed a potential implementation 5G implementation using overshadowing techniques to cause the necessary latency for communication

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Presentations

- Sustainable Radon Mitigation through Optimized HVAC Scheduling, CHASE 2025, Manhattan, NY, USA
- Location Verification of Crowd-Source Sensors, ICCCN 2023, Honolulu, HI, USA

Teaching Experience

Instructor

- **ECEN 225**: Intro to Computer Systems Laboratory. (Winter 2023)

Teaching Assistant

- **ECEN 426**: Computer Networks. (Fall 2022)
- **ECEN 220**: Fundamentals of Digital Systems. (Fall 2019, Winter 2020)

Professional Activities

- Member of ACM
- Member of IEEE

Open Source Projects

- SSS
    - I helped create a Seven Segment Sign as a fun interactive display for our lab space. It uses over 1100 individual seven segments joined in a 48x24 grid to create a screen that is controlled entirely by our custom software that performs non-interactive demo looping while allowing users to interrupt and change the demo/game at any moment from a web app. This display won ***first place*** at the BYU IoT Pi Competition.
    - This project was displayed as a demo and a poster at PyCon 2023.