

# Hien Vu

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## RESEARCH INTERESTS

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- ML-driven system design and signal processing for remote sensing
- Low-power wireless sensing
- Thermal management for Li-ion batteries

## KEY SKILLS

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- **Machine Learning & AI:** Point cloud processing, computer vision, sensor data fusion, and real-time ML deployment.
- **Programming:** Python, C/C++, MATLAB, assembly, bash, and Verilog.
- **Algorithms and analysis:** Multimodal signal processing, physical system modeling, and MATLAB simulations.
- **Embedded systems:** Microprocessor design, real-time systems, sensor integration, RISC-V, MIPS, and FPGA.
- **Hardware Design:** PCB Design (Altium), mmWave radar, RF design, high-speed/high-power/low-power systems design, wireless sensing systems, and UART/I2C/SPI.

## EDUCATION

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<b>Purdue University</b> , West Lafayette, Indiana PhD in Electrical and Computer Engineering (candidate)	(expected) Aug 2026 GPA: 3.65/4.00
<b>University of Wisconsin-Madison</b> (UW-Madison), Madison, Wisconsin MSc in Electrical and Computer Engineering	May 2023 GPA: 3.82/4.00
<b>Soongsil University</b> , Seoul, South Korea MSc in Computer Science	2020 GPA: 3.86/4.00
<b>Hanoi University of Science and Technology</b> (HUST), Hanoi, Vietnam BSc in Electronics and Telecommunications Engineering	May 2018 GPA: 3.51/4.00

## PROFESSIONAL EXPERIENCE

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<b>Doctoral Researcher – NEIS Lab, Purdue University</b> – West Lafayette, IN	Aug 2024 – Present
<ul style="list-style-type: none"><li>• Architected a machine learning system that uses mmWave radar to track respiration of moving subjects, achieved pose tracking error &lt; 5 cm for 97% of the time and respiration error &lt; 3 bpm 91% of the time in breathing range 10–45 bpm.</li><li>• Developed two distinct localization systems: a high-precision Ultra-Wideband tracking network and an optimization-based multi-view visual localization system, both achieved centimeter accuracy in real-time tracking.</li><li>• Engineered an end-to-end multimodal ML fusion pipeline (UWB+IMU+RGB) for subject tracking and behavior monitoring.</li><li>• Designed a data ingestion pipeline for 9 sensor modalities, automating temporal synchronization (drift &lt; 10ms) and annotation validation for 213k bounding boxes, published as the MmCows benchmark at NeurIPS 2024.</li></ul>	
<b>Graduate Research Assistant – WISEST Lab, UW-Madison</b> – Madison, WI	Aug 2021 – Jul 2024
<ul style="list-style-type: none"><li>• Developed eTag, an energy-neutral sensing system using backscatter communication, published at MobiCom 2023.</li><li>• Designed a novel shared-coil architecture for simultaneous RFID communication and wireless charging in wearable devices, mitigating mutual coupling problem while reducing footprint by 30% compared to standard dual-coil designs.</li><li>• Developed energy-efficient firmware for RFID scanning using STM32-based LoRa SoC that reduced the energy cost by 15x, and engineered a closed-loop wireless power transfer protocol for autonomous charging of wearable devices.</li><li>• Analyzed 2,000 hours of field data to validate system reliability and real-time heat stress detection in complex operational settings.</li></ul>	
<b>Research Assistant – EC Lab, Soongsil University</b> – Seoul, South Korea	Mar 2019 – Jul 2021
<ul style="list-style-type: none"><li>• Designed a flexible supercapacitor-based conformal wearable battery using cascade multiphase buck converter that delivers 840W in 5-second pulses, optimizing energy density and form factor for rapid and critical military applications.</li></ul>	

- Developed a novel bidirectional buck-boost control policy that enables uninterrupted power delivery and continuous system operation under dynamic load conditions, surpassing system design specs required for technology transfer.
- Developed control strategies for internal heating of Li-ion batteries in cold conditions that balance both cell temperature and SOC without requiring precise cell characterization.
- Designed a high-speed FPGA-based flash storage system with 512GB SLC-NAND using Altium Designer, minimizing propagation delay and ensuring signal integrity across 1,000+ components.
- Implemented Extended Kalman Filter on a RISC-V MCU to process 9-DOF IMU data for precise tracking in AR/VR apps.

#### **System Engineer – Interland Inc.** – Hanoi, Vietnam

Jun 2018 – Feb 2019

- Investigated sensing solutions for measuring dissolved oxygen in water, and integrated with IBM cloud service for large-scale automated shrimp farming.

#### **Undergraduate Research Assistant**, HUST, Hanoi

Jun 2015 – Jul 2018

- Developed a gyroscope-based balancing system and control algorithms for two-wheeled personal vehicles to maintain stability.
- Designed air pollution monitoring devices and managed the deployment of sensor networks on a large scale to track environmental metrics.

### PROJECT LEADERSHIP

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- Led the full-lifecycle development of the conformal wearable battery, delivering a production-grade system that passed rigorous DoD testing and achieved successful technology transfer to DoD contractor.
- Recruited and trained a team of 20+ people to curate the MmCows large-scale multimodal dataset (20k annotated out of 4.8M RGB images) while ensuring data synchronization and annotation accuracy.
- Led a cross-discipline team to design and deploy eTag as a multi-node IoT network on multiple production cattle, analyzing over 2,000 hours of field data to validate system reliability in complex operational settings.

### TEACHING and MENTORING EXPERIENCE

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| FA 2023 | <b>ECE 399 Independent Study</b> , Research Mentor, UW-Madison, WI <ul style="list-style-type: none"> <li>• Project: Analyzing gas compounds for health monitoring of dairy heifers.</li> <li>• Helped an undergrad student develop a wireless sensor suite for measuring gases.</li> </ul>                 |
| SP 2023 | <b>ECE 399 Independent Study</b> , Research Mentor, UW-Madison, WI <ul style="list-style-type: none"> <li>• Project: Characterizing high-precision pressure sensor for monitoring dairy cattle.</li> <li>• Mentored an undergrad student in analyzing air pressure to detect standing behaviors.</li> </ul> |
| FA 2022 | <b>Undergraduate Research Scholars Program</b> , Research Mentor, UW-Madison, WI <ul style="list-style-type: none"> <li>• Project: Monitoring dairy cattle's comfort using integrated ear tags.</li> <li>• Helped an undergrad student to develop a low-power ear tag to measure ear flicks.</li> </ul>     |
| SP 2022 | <b>ECE 315 Introduction to Microprocessor Lab</b> , Teaching Assistant, UW-Madison, WI  |
| FA 2021 | <b>ECE 315 Introduction to Microprocessor Lab</b> , Teaching Assistant, UW-Madison, WI  |
| FA 2021 | <b>ECE 210 Introduction in Electrical Engineering</b> , Teaching Assistant, UW-Madison, WI  |
| SP 2020 | <b>Circuits Laboratory II</b> , Teaching Assistant, Soongsil University, Seoul  |
| FA 2019 | <b>Circuits Laboratory I</b> , Teaching Assistant, Soongsil University, Seoul   |
| FA 2018 | <b>Power Electronics</b> , Teaching Assistant, HUST, Hanoi  |

### PROFESSIONAL SERVICES

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| Jan 2026 | Web co-chair for ISLPED 2026 (IEEE/ACM International Symposium on Low Power Electronics and Design) |
| Jun 2025 | Reviewer for NeurIPS 2025 (The Conference on Neural Information Processing System)                  |

## PUBLICATIONS

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- Unmesh Raskar, Omkar Prabhune, **Hien Vu**, and Younghyun Kim. MooBot: RAG-based Video Querying System for Dairy Cattle Behavior and Health Insights. **CVPR Workshop**, 2025.
- **Hien Vu**, Omkar Prabhune, Unmesh Raskar, Dimuth Panditharatne, Hanwook Chung, Christopher Y. Choi, and Younghyun Kim. MmCows: A Multimodal Dataset for Dairy Cattle Monitoring. **NeurIPS** (the Conference on Neural Information Processing Systems), 2024. Spotlight paper, top 5% ratings, acceptance rate 25.3%.
- Hanwook Chung, **Hien Vu**, Younghyun Kim, and Christopher Y. Choi. Subcutaneous temperature monitoring through ear tag for heat stress detection in dairy cows. **Biosystems Engineering**, 2023.
- **Hien Vu**, Hanwook Chung, Christopher Y. Choi, and Younghyun Kim. eTag: An Energy-Neutral Ear Tag for Real-Time Body Temperature Monitoring of Dairy Cattle. **ACM MobiCom** (International Conference on Mobile Computing and Networking), 2023. Acceptance rate 24%.
- **Hien Vu** and Donghwa Shin. Simultaneous Internal Heating for Balanced Temperature and State-Of-Charge Distribution in Lithium-ion Battery Packs. **Journal of Energy Storage**, 2023.
- Nhat-An Nguyen, **Hien Vu**, Massoud Pedram, and Donghwa Shin. An Attachable Battery-Supercapacitor Hybrid for Large Pulsed Load. **IEEE Design & Test**, 2022.
- **Hien Vu** and Donghwa Shin. Scheduled Pre-heating of Li-ion Battery Packs for Balanced Temperature and State-of-charge Distribution. **MDPI Energies**, 2020.
- **Hien Vu**, Nhan Tran, Loan Pham-Nguyen, and Huy-Dung Han. LQG Regulator for Control Moment Gyroscope based Balancing System. **IEEE ICCE** (International Conference on Communications and Electronics), 2018.

## FELLOWSHIPS and AWARDS

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- 2023 **Young Fellowship and Travel Award**, ACM/IEEE Design Automation Conference
- 2023 **NSF Travel Award**, International Conference on Mobile Computing and Networking
- 2021 **Young Fellowship**, ACM/IEEE Design Automation Conference

## PRESENTATIONS

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- Oct 2025 **Purdue Institute of Chips and AI: Workshop on Chips & AI**
  - Title: Edge AI for Wearable and Wireless Sensing
- May 2025 **Purdue OIGP Spring Reception**, Interdisciplinary Graduate Programs
  - Title: Multimodal Sensing and Learning for Precision Livestock Farming
- Jan 2025 **Purdue AI Fusion**
  - Title: Multimodal Sensing and Learning for Precision Livestock Farming
- Dec 2024 **NeurIPS** (The Conference on Neural Information Processing System)
  - Title: MmCows: A Multimodal Dataset for Dairy Cattle Monitoring
- Oct 2024 **Purdue ECE Grad Student Symposium**
  - Title: MmCows: Multimodal Sensing and Deep Learning Framework for Dairy Cattle Monitoring
- Aug 2024 **ACM/IEEE ISLPED** (International Symposium on Low Power Electronics and Design)
  - Title: eTag: An Energy-Neutral Ear Tag for Real-Time Body Temperature Monitoring of Dairy Cattle
- Mar 2024 **NSF CPS PI Meeting** (Cyber-Physical Systems Principal Investigators' Meeting)
  - Title: Mitigating Heat Stress in Dairy Cattle using a Physiological Sensing-Behavior Analysis-Microclimate Control Loop
- Oct 2023 **UW-Madison Sustainability Symposium**
  - Title: Sustainable Dairy Farming using Wearable Technology for Heat Stress Detection
- Oct 2023 **ACM MobiCom** (International Conference on Mobile Computing and Networking)
  - Title: eTag: An Energy-Neutral Ear Tag for Real-Time Body Temperature Monitoring of Dairy Cattle

- Jul 2023    **ACM/IEEE DAC** (Design Automation Conference), Young Fellow Program
  - Title: WisTag: An Energy-Neutral Wearable Sensor for Real-Time Animal Monitoring
- Dec 2021    **ACM/IEEE DAC** (Design Automation Conference), Young Fellow Program
  - Title: An Optimal Control Scheme for Hybrid Power System with Synchronous Buck Converter

## MEDIA COVERAGE ---

- Nov 2023    Smart system keeps cows cool. Covered by Agri-View ([link](#)).
- Oct 2023    Mooooo's in distress? In the barn of the future, smart system will keep hot cows cool. Covered by UW-Madison News ([link](#)).

## REFERENCES ---

- Dr. Younghyun Kim, Associate Professor, Purdue University (PhD advisor) | [younghyun@purdue.edu](mailto:younghyun@purdue.edu)
- Dr. Christopher Choi, Professor, University of Wisconsin-Madison (PI) | [cchoi22@wisc.edu](mailto:cchoi22@wisc.edu)
- Dr. Donghwa Shin, Associate Professor, Soongsil University (MSc advisor) | [donghwashin@ssu.ac.kr](mailto:donghwashin@ssu.ac.kr)