Long Duong

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Robotic perception need not be limited to human vision. My research combines complementary sensing modalities with physics-informed learning to reveal physical, chemical, and biological properties that conventional RGB cameras cannot readily observe.

Education

University at Buffalo — Buffalo, NY
Ph.D. in Computer Science and Engineering — 08/24 – 05/28 (Expected)
Advisors: Karthik Dantu and Roshan Ayyalasomayajula — **Award:** Graduate Presidential Fellowship

Texas Tech University (*summa cum laude*) — Lubbock, TX
B.S. in Electrical Engineering | Minor in Mathematics — 08/20 – 12/22

Research Experience

Graduate Research Assistant, University at Buffalo, Buffalo, NY — 08/24 – Present
- Develop multimodal sensing systems and physics-based signal-processing methods for robotic perception, automated material sorting, and Arctic over-the-horizon radar.

Research Assistant, Texas Tech University, Lubbock, TX — 12/21 – 06/24
- Built sensing and data-processing pipelines for acoustic localization, computer vision, and cotton phenotyping.

Selected Research Projects

TIPS: Active Thermal Imaging for Plastic Sorting | Project
Accepted and selected for an *ACM MobiSys 2026* **Featured/Spotlight Presentation**. **Best Paper Nominee.**
- Built a thermal sensing system to distinguish the **six most common plastic types** by how they heat and cool.
- Pretrained a PyTorch encoder on heat-transfer simulations with a **physics-informed loss** to learn a **more robust, data-efficient** thermal representation. With limited real-world data, the loss raised cross-day accuracy by **6.4%** on black plastics (94.0% to 100%) and **30.3%** on white plastics (72.7% to 94.7%) over the same model trained without it.
- Ran inference in **4 s/sample** on NVIDIA Jetson Orin, about **1/75 of the time** reported for TSF parameter recovery (5 min on an RTX 3060, Dashpute et al., CVPR 2023).

Acoustic Localization for Wildlife Monitoring | Project
Published in *Ecological Informatics* (2024).
- Built an automated acoustic localization tool now used to study northern bobwhite quail populations and their habitat in the Rolling Plains of Texas. It detects covey calls with a **biology-informed** model of vocal behavior and locates the birds with a **physics-guided** model of sound propagation.
- Reduced localization error by **7.7%** versus SoundFinder and **16.9%** versus Accumulated Correlation.

ASAP: Affordable, Scalable, Adaptable Plastic sorting — Published in *ACM MobiSys Companion 2026*
- Built a **working infrared sensing prototype** that applies **chemistry and physics principles** to plastic classification by combining spectral measurements with transient thermal responses.
- Targeting a compact, versatile system costing approximately **$1,000** to replace bulky **$250,000** hyperspectral equipment without compromising classification performance.

DARPA FROSTY: Arctic Over-the-Horizon Radar
- Developing **physics-based** channel compensation, target detection, and tracking algorithms to enable reliable radar operation under turbulent Arctic ionospheric conditions.

Selected Publications

Long Duong et al., "TIPS: Thermal Image based Plastics Sorting," *ACM MobiSys*, 2026. **Best Paper Nominee. Featured/Spotlight Presentation.**

Long Duong et al., "Toward robust, fast, scalable autonomous plastics sorting," *ACM MobiSys Companion*, 2026.

Long Duong et al., "A Complete Framework for Hyperbolic Acoustic Localization with Application to Northern Bobwhite Covey Calls," *Ecological Informatics*, 2024.

Technical Skills

- **Systems & Tools:** FPGA, Embedded Systems, Manipulators, Actuators, Power, Circuits, 3D Printing
- **Sensing & Signal Processing:** Computer Vision, Thermal Imaging, Infrared Sensing, Hyperspectral Imaging, mmWave Radar, Acoustic Sensing, Digital Signal Processing
- **Programming:** Python, C++, C, MATLAB, Verilog, Linux, Git, Docker, OpenCV, Codex
- **Machine Learning:** PyTorch, TensorFlow, Physics-Informed Neural Networks, CNNs, Transformers