

# Yimeng Liu

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## OBJECTIVE

Ph.D. candidate in Computer Science & Engineering at Michigan State University focused on **computer vision, multi-modal learning, and decision intelligence**. Skilled in **Transformer architectures, efficient fine-tuning (PEFT/LoRA/QLoRA), and reinforcement learning agents** for adaptive behavior in **simulation-to-real transfer**. Published in top-tier venues (MobiCom, INFOCOM, SenSys) and experienced in **scalable AI deployment across edge devices and cloud systems**.

## EDUCATION

**Michigan State University, USA**

*Ph.D. in Computer Science & Engineering*

*Aug. 2023 - Present*

Anticipated Graduation: *May. 2027*

**Virginia Tech, USA**

*B.S. in Mathematics*

*Sep. 2019 - May. 2023*

**GPA: 3.72**

**Dean's List:** *Fall 2019, Spring 2020, Fall 2020, Spring 2021, Fall 2021, Spring 2022*

## PUBLICATION

[10] **Y. Liu**, M. Gan, H. Zeng, L. Li, Y. Dong, and Z. Cao, "Hydra: Accurate multi-modal leaf wetness sensing with mm-wave and camera fusion", In Proceedings of the ACM *MobiCom*, 2024.

[9] **Y. Liu**, M. Gan, G. Li, Y. Dong, and Z. Cao, "Adonis: Neural-enhanced Fine-grained Leaf Wetness Sensing with Efficient mmWave Imaging", In Proceedings of IEEE the *INFOCOM*, 2025.

[8] **Y. Liu**, M. Gan, H. Zeng, Y. Ren, G. Li, J. Lin, Y. Dong, X. Tan and Z. Cao, "Proteus: Enhanced mmWave Leaf Wetness Detection with Cross-Modality Knowledge Transfer", In Proceedings of the ACM *SenSys*, 2025.

[7] Y. Ren, G. Li, **Y. Liu**, Y. Dong, and Z. Cao, "AeroEcho: Towards Agricultural Low-power Wide-area Backscatter with Aerial Excitation Source," In Proceedings of the IEEE *INFOCOM*, 2025.

[6] M. Gan, **Y. Liu**, L. Liu, C. Wu, Y. Dong, H. Zeng, and Z. Cao, "Poster: mmleaf: Versatile leaf wetness detection via mmwave sensing", In Proceedings of the ACM *MobiSys*, 2023.

[5] R. Wang, **Y. Liu**, and R. Müller, "Detection of passageways in natural foliage using biomimetic sonar", *Bioinspiration & Biomimetics* 17.5 (2022): 056009.

[4] **Y. Liu**, M. Gan, Y. Ren, G. Li, J. Lin, Y. Dong, and Z. Cao "Hydra-Bench: A Benchmark for Multi-Modal Leaf Wetness Sensing", In Proceedings of the IEEE International Conference on Image Processing, 2025. (In Submission)

[3] J. Wang, T. Li, B. Xie, J. Xiong, M. Cui, Z. Cao, H. Zeng, R. Liu X. Zhang, and **Y. Liu**, "MetaTap: A Low-Cost Metasurface-Based System for Daily Drinking Water Contamination Detection", In Proceedings of the ACM *SenSys*, 2026. (In Submission)

[2] J. Wang, B. Xie, T. Li, J. Xiong, **Y. Liu**, Z. Cao, H. Zeng, X. Zhang, and K. Sun, "M MetaNutri: A Battery-free Capsule for Soil Moisture and Nitrogen Monitoring", In Proceedings of the ACM *UbiComp*, 2025. (In Submission)

[1] G. Li, C. Ni, H. Zeng, **Y. Liu**, M. Gan, Y. Ren, Z. Cao, and T. Li, "PiezoSE: Enable Reliable and Real-time Earable Speech Enhancement with Tiny Piezoelectric Sensor", In Proceedings of ACM *SenSys*, 2026. (In Submission)

## RESEARCH EXPERIENCE

Edge Intelligence and Networking Lab, Michigan State University

May. 2022 - present

Research Assistant (Advisor: [Dr. Zhichao Cao](#))

### Causal Inference for Driving Risk

Ongoing Project

- Built a **peer-normalization pipeline** to align telematics features by, enabling fair cross-driver comparison and reducing contextual bias in risk estimation.
- Engineered **multiscale time-series features** and integrated anomaly detection outputs into weekly driver profiles.
- Applied **causal inference frameworks** (DoWhy, EconML, DR-Learner, Causal Forest) to estimate heterogeneous treatment effects of driving contexts on near-crash risk.
- Validated causal hypotheses via **Decision Curve Analysis (DCA)** and **off-policy evaluation (OPE)**, providing interpretable “green/amber/red” driver risk recommendations.
- Implemented an **MLOps pipeline** with Hydra, MLflow, and grouped bootstrap resampling for reproducible causal effect estimation and risk report generation.

### LLM + RL: Adaptive Driving Risk Modeling

Ongoing Project

- Architected a **neural-LLM hybrid pipeline** with PEFT adapters and cross-modal embeddings, achieving **45% model size reduction** and **30% faster inference latency**, enabling real-time deployment on in-vehicle edge devices.
- **Fine-tuned domain-specific LLMs** to generate personalized safety reports and micro-coaching feedback; pilot tests showed **25% improvement in driver performance**.
- Integrated **PPO-based RL agents** into CARLA driving simulations, adapting driving strategies based on real-time cognitive state estimation; achieved **22% higher safety scores** vs. baseline policies.
- Developed an **end-to-end reasoning loop** combining LLM interpretation and RL policy adaptation, enabling dynamic adjustment of alerts and interventions.

### Transformer-based mmWave SAR Imaging for Agriculture

- Developed a Transformer-based 3D object detection method combining mmWave SAR and RGB data, achieving **12% accuracy gain** over traditional point-cloud-based methods.
- Designed a contrastive learning model for continuous Leaf Wetness Level regression, improving  $R^2$  score from **0.56 to 0.95** (70% relative gain) over commercial sensors.
- Applied cross-modality knowledge distillation from RGB to SAR, boosting SAR-only classification accuracy by **10%** compared to state-of-the-art baselines.

## SKILLS

- **Machine Learning / LLMs / RL:** PyTorch, TensorFlow, Hugging Face Transformers, PEFT, LoRA, QLoRA, RAG, prompt engineering, Stable Baselines3, RLlib, Ray, PPO, SAC, policy gradient
- **Distributed Training & Optimization:** DeepSpeed, FSDP, TensorRT, ONNX Runtime
- **Simulation & Robotics:** CARLA, Mujoco, OpenAI Gym, ROS
- **MLOps & Tools:** Weights & Biases, MLflow, Git, Docker, TI mmWave Studio
- **Programming:** Python, C/C++, Java, MATLAB, JavaScript, HTML/CSS
- **Data Science:** Jupyter Notebooks, cloud-based ML deployment