Jiale Zhang

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RESEARCH INTEREST

My research interest focuses on building novel multimodal sensing systems (Vision, Audio, Vibration, RFID) with skills of machine/deep learning models and embedded systems to enhance the experiences of human-computer interaction.

EDUCATION

University of Michigan, Ann Arbor, Department of Electrical and Computer Engineering
Ph.D. in Electrical and Computer Engineering, **Major GPA: 3.9/4.0** *Jan 2023 – Present*
M.S. in Electrical and Computer Engineering, **Major GPA: 3.9/4.0** *Sep 2020 – Dec 2022*
ShanghaiTech University (SHTU), School of Information Science and Technology (SIST)
B.E. in Electronic Information Engineering, **Major GPA: 3.9/4.0** *Aug 2016 – Jul 2020*

Honors and Awards:

- Qualcomm Innovation Fellowship 2023-2024
- Rackham International Student Fellowship 2021-2022
- First Prize in the Second Shanghai Maker Contest (**1 out of 300**)

Teaching:

- Graduate Student Instructor of *EECS215: Introduction to Circuit Basics* in FALL 2024
- Graduate Student Instructor of *EECS507: Introduction to Embedded Systems Research* in FALL 2022

SELECTED PUBLICATIONS

- ***(Best Poster)*** Gersey, Julia, Jatin Aggarwal, **Jiale Zhang**, Jesse Codling, and Pei Zhang. "Sniffing Out the City-Vehicular Multimodal Sensing for Environmental and Infrastructure Analysis." In Proceedings of the 23rd ACM Conference on Embedded Networked Sensor Systems, pp. 632-633. 2025.
- ***(Best Paper Runner-Up)*** Codling, J. R., Shulkin, J. D., Chang, Y. C., **Zhang, J.**, Latapie, H., Noh, H. Y., & Dong, Y. (2024, October). FloHR: Ubiquitous Heart Rate Measurement using Indirect Floor Vibration Sensing. In *Proceedings of the 11th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation* (pp. 44-54).
- **Zhang, Jiale**, et al. "Vibration-Based Object Classification with Structural Response of Ambient Music." *Proceedings of the 22nd International Conference on Information Processing in Sensor Networks*. 2023.
- **J. Zhang**, C. Li, W. Jiang, Z. Wang, L. Zhang and X. Wang, "Deep-learning-enabled Microwave-induced Thermoacoustic Tomography based on Sparse Data for Breast Cancer Detection," in *IEEE Transactions on Antennas and Propagation*.
- **Jiale Zhang**, "Directly Controlling the Perceived Difficulty of a Shooting Game by the Addition of Fake Enemy Bullets", CHI EA '21: Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems
- Zhang, Dajun, Zhansong Lin, Ji Liu, **Jiale Zhang**, Zhengping Zhang, Zhang-Cheng Hao, and Xiong Wang. "Broadband high-efficiency multiple vortex beams generated by an interleaved geometric-phase multifunctional metasurface." Optical Materials Express 10, no. 7 (2020): 1531-1544.

RESEARCH EXPERIENCE

Weight Change Estimation Through Audio-Induced Shelf Vibrations in Autonomous Stores Ann Arbor, MI
Advisor: Prof. Pei Zhang, University of Michigan *Feb 2023 – Present*

- Proposed the first system that utilizes audio-induced vibrations from a speaker to detect weight changes on the shelf during shopping using one vibration sensor at best.
- Modeled a structure-dynamics-informed relationship between the shelf vibration response and item weight across multiple locations on the shelf, improving the data efficiency.
- Validated our system in multiple real-world shopping layouts with the best mean absolute percentage error at 0.26%.

Privacy-Aware Activity Localization and Recognition Using Ultrasound Microphone Array Ann Arbor, MI
Advisor: Prof. Alanson Sample, University of Michigan *Feb 2021 – Feb 2025*

- Developed a sound/ultrasound tracking system based on self-designed 49-mic array on FPGA board with configurable sampling frequencies up to 192kHz.
- Prototyped a sound/ultrasound tracking system that can track at most 5 sources simultaneously.
- 45% average improvement is achieved on multi-acoustic event recognition by fusing the location in the system.

Deep-learning-Enabled Thermoacoustic Tomography based on Sparse Data Shanghai
Advisor: Prof. Xiong Wang, ShanghaiTech University *Feb 2021 – Jun 2021*

- Proposed a new DL-based microwave-induced thermoacoustic tomography modality to address the sparse data reconstruction and applies it in breast cancer detection.
- By combining the FPNet and UNet, we successfully reconstructed the breast tumor by only using 25% transducers covering 30 degrees.

WORK EXPERIENCE

Intrinsic and Extrinsic Feedback Design for Vocal Training System on Glasses | PhD Research Intern San Francisco, CA
Advisor: Mark Thomas, Dolby Laboratories *May 2025 – Present*

- Modeled a novel vocal training framework combining intrinsic feedback (real-time voice monitoring with artificial reverberation) and extrinsic feedback (suggestions from an Audio Language Model).
- Prototyped a smart glasses system incorporating speakers, microphones, and head-tracking sensors to support vocal training in a wearable form factor.
- Evaluated the intrinsic feedback system design and gained over 70% preference on the system through the user study.
- Modeled the 1st Audio Language Model as the vocal coach agent trained with reinforcement learnings.

Item-Customer Association Through Camera-RFID Fusion in Autonomous Stores | AI Engineer Ann Arbor, MI
Advisor: Andrew Merrow, Aifi Inc. *May 2024 – Aug 2024*

- Developed the item-customer association system by correlating their motions characterized by RFID and camera.
- Proceeded feature engineering on RFID data and modeled the motion classifier of items attached with RFID with up to 95.8% accuracy among four different classes.
- Extracted coherent vision features indicating the customer motion and modeled a binary classifier for association based on the fusion of features from RFID and vision.

SKILLS

Programming Language: Python, C/C++, C#, Verilog/System Verilog/VHDL, MATLAB
Development Kit: PyTorch, Quartus, Vitis, ESP32, STM32, Labview, Fusion360

COURSE

Core Computer Science & Machine Learning:

- **Computation Data Science and Machine Learning**
- **Machine Learning**
- **Probability and Random Processing**
- **Foundation of Computer Vision**
- **Estimation, Filtering, and Detect**
- **Introduction to Programming**

AR/VR & Human-Computer Interaction

- **AR/VR Intro**
- **Engineering Interactive Systems**
- **Biomedical Instrumentation Design**
- **Infrastructure Sensing**

Mathematics & Theoretical Foundations

- **Linear Algebra**
- **Mathematical Analysis**
- **Probability and Random Processing**
- **Signals and Systems**

Professional Development & Special Topics

- **Academic Writing**
- **FAB Academy X**

Embedded Systems & Hardware Design

- **Introduction to Embedded System Research**
- **FPGA-based Hardware System Design**
- **Analog Integrated Circuit**
- **Digital Integrated Circuit**
- **Electric Circuits**
- **Signals and Systems**
- **Reconfigurable Computing**

Medical & Bio-related Courses

- **Medical Imaging System**
- **Biomedical Instrumentation Design**
- **Introduction to Life Science**

Physics & Engineering Fundamentals

- **General Physics**
- **Electromagnetics**
- **Introduction to Control**