

EDUCATION

- University of California, Los Angeles (UCLA)** Los Angeles, US
Ph.D. in Electrical and Computer Engineering, Advisor: Mani B. Srivastava 2020–2023
M.S. in Electrical and Computer Engineering, Signal and System Area, GPA: 3.90/4.00 2018–2020
- Thesis: “Towards Robust and Secure Audio Sensing Using Wireless Vibrometry and Deep Learning”
 - Courses: Deep Learning and Neural Network, Large Scale Data Mining, Wireless Communication System, Web and Mobile System, Digital Speech Processing
- Fudan University** Shanghai, China
B.Eng. in Electronics and Information Science and Technology 2014–2018
- Thesis: “Signal AoA Estimation and Human Fall Detection Using Wi-Fi Channel State Information”
 - Courses: Signal and Communication System, Digital Signal Processing, Analog and Digital Circuits, Programmable Logic Device and Hardware Description Language, Computer Architecture
- Minor in Data Science 2016–2018
- Courses: Database Systems, Machine Learning, Data Structure and Algorithms, Distributed Systems

EXPERIENCE

Towards Real-time Rich Semantic Labeling Using Multimodal Sensor Information Fusion

- Tech Stack: C/C++, Python, MATLAB, ROS, Scikit-learn
- Implemented a multimodal sensing system combining LiDAR, camera, and UWB radar
- Designed a pipeline to label the type, location, and vibration states of the objects in the environment
- Organized device drivers, processing algorithms, and information flow into ROS nodes and topics
- Reduced UWB radar processing algorithm complexity significantly using information from the sensors

On-hand Tapping Recognition for Smartwatch Interactions

- Tech Stack: Python, PyTorch, Deep Learning Domain Adaptation
- Implemented a system using smartwatch IMU data to recognize the user’s tapping on hand knuckles as an extended smartwatch interaction interface
- Designed a backbone convolutional neural network for accurate tapping recognition
- Improved the robustness of the model with domain adversarial training to battle user diversities

Audio Vibration Sensing from Multiple Targets Using Impulse-Radio Ultra-Wideband Radar

- Tech Stack: C/C++, MATLAB, PCB Design
- Implemented an IR-UWB radar system that can isolate target sounds from a noisy background
- Derived a theoretical analysis on performing audio sensing using impulse-based wireless signals
- Modified the driver code to re-purpose a XeThru X4M05 radar to sense audio-related vibrations
- Built a statistical signal processing pipeline to locate sound events and separate multiple sound sources

Audio Spoofing Detection Using Deep Neural Networks

- Tech Stack: Python, MATLAB, PyTorch, Speech Processing
- Assembled three deep residual neural network classifier models to protect speech recognition systems from computer-generated fake audios
- Crafted three spectrogram and cepstral coefficients-based features to capture the speech dynamics
- Achieved 25%–75% performance improvement compared to the baseline algorithms

Human Activity Recognition and Fall Detection Using Wi-Fi Channel State Information

- Tech Stack: Python, MATLAB, LibSVM, TensorFlow, Linux 802.11n CSI Tool
- Integrated a robust activity recognition system using the CSI of a commercial Wi-Fi network interface
- Visualized the amplitude of Channel State Information and extracted features using Gabor filters
- Trained a machine learning backend to classify multiple activities and label fall-related samples

Indoor Positioning and Communication System Using Visible Light

- Tech Stack: C, Circuit Design, Visible Light Communication
- Created a visible light communication system consisting of 3 LEDs and a photodiode sensor
- Designed LED driver circuits to transmit three separate audio signals using amplitude modulation of the light intensity, and sensor signal processing circuits enabling frequency-division multiplexing
- Deployed an RSS-based localization algorithm on a Renesas RX23T MCU to achieve decimeter level localization in a $1\text{m} \times 1\text{m} \times 1\text{m}$ box

PUBLICATIONS

- [1] **Z. Wang**, B. Wang, and M. Srivastava, “Protecting user data privacy with adversarial perturbations”, in *Proceedings of the 20th International Conference on Information Processing in Sensor Networks (co-located with CPS-IoT Week 2021)*, 2021, pp. 386–387.
- [2] **Z. Wang**, Z. Chen, A. D. Singh, L. Garcia, J. Luo, and M. Srivastava, “UWHear: Through-wall Extraction and Separation of Audio Vibrations Using Wireless Signals”, in *Proceedings of the 18th ACM Conference on Embedded Networked Sensor Systems*, ACM, 2020, pp. 1–14.
- [3] M. Alzantot, **Z. Wang**, and M. B. Srivastava, “Deep Residual Neural Networks for Audio Spoofing Detection”, in *Proc. Interspeech 2019*, 2019, pp. 1078–1082.
- [4] R. Liu, **Z. Wang**, L. Garcia, and M. Srivastava, “Remediot: Remedial actions for internet-of-things conflicts”, in *Proceedings of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, ACM, 2019, pp. 101–110.
- [5] **Z. Wang**, Z. Gu, J. Yin, Z. Chen, and Y. Xu, “Syncope detection in toilet environments using wi-fi channel state information”, in *Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers*, ACM, 2018, pp. 287–290.

SKILLS

Programming Languages: Python, MATLAB, C/C++, Assembly, VHDL

Tools: Git, PyTorch, TensorFlow, ROS