Ziqi Wang

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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

Samsung Research America Mountain View, CA
Research Intern for Knox – AI / Mobile / Privacy 2022.6–2022.9

- Designed a time-synchronized multi-sensor data collection platform for non-contact vital signal sensing
- Created a multi-person dataset of UWB radar-measured human respiration and heartbeat along with ground truth
- Investigating an approach combining signal processing and deep learning to compensate for handheld radar motion

Projects

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

Publications

[1] W. Chen, **Z. Wang**, P. Quan, Z. Peng, S. Lin, M. Srivastava, and J. Stankovic, "Making vibration-based on-body interaction robust", in *Proceedings of the 13th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS, co-located with CPS-IoT Week 2022)*, May 2022.

[2] S. Fang, A. Sarker, **Z. Wang**, M. Srivastava, B. Marlin, and D. Ganesan, "Design and deployment of a multi-modal multi-node sensor data collection platform", *Accepted by the Fifth International SenSys+BuildSys Workshop on Data: Acquisition To Analysis (DATA)*, Nov. 2022.

[3] Z. Gu, T. He, **Z. Wang**, and Y. Xu, "Device-free human activity recognition based on dual-channel transformer using wifi signals", *Wireless Communications and Mobile Computing*, vol. 2022, Jun. 2022.

[4] S. S. Saha, S. Sandha, S. Pei, V. Jain, **Z. Wang**, Y. Li, A. Sarker, and M. Srivastava, "Auritus: An open-source optimization toolkit for training and development of human movement models and filters using earables", *Proceedings of the ACM on Interactive Mobile Wearable and Ubiquitous Technologies*, vol. 6, p. 34, Jun. 2022.

[5] **Z. Wang**, A. Sarker, J. Wu, D. Hua, G. Dong, A. D. Singh, and M. Srivastava, "Capricorn: Towards real-time rich scene analysis using rf-vision sensor fusion", *Accepted by the 20th ACM Conference on Embedded Networked Sensor Systems (SenSys)*, Nov. 2022.

[6] **Z. Wang**, A. Sarker, J. Wu, D. Hua, G. Dong, A. D. Singh, and M. Srivastava, "Demo abstract: Towards real-time rich scene analysis using vision-guided wireless vibrometry", *Accepted by the 20th ACM Conference on Embedded Networked Sensor Systems (SenSys)*, Nov. 2022.

[7] **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 (IPSN, co-located with CPS-IoT Week 2021)*, 2021, pp. 386–387.

[8] **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 (SenSys)*, ACM, 2020, pp. 1–14.

[9] M. Alzantot, **Z. Wang**, and M. B. Srivastava, "Deep Residual Neural Networks for Audio Spoofing Detection", in *Proceedings of the 20th Annual Conference of the International Speech Communication Association (INTERSPEECH)*, 2019, pp. 1078–1082.

[10] 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 (BuildSys)*, ACM, 2019, pp. 101–110.

[11] **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 (Ubicomp)*, ACM, 2018, pp. 287–290.

Skills

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

Tools: Git, PyTorch, TensorFlow, ROS

Scholarships and Awards

- Best Poster Honorable Mention Award, UCLA ECE Annual Research Review 2019
- Outstanding Graduates in Shanghai (Top 5% in the EE Department) 2018
- First-class scholarship for outstanding students in Fudan University 2016, 2017, 2018
- The Second Prize in National Undergraduate Electronic Design Contest, Shanghai Area 2017