Haoran Wan

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RESEARCH INTEREST

My current research interests are mobile and ubiquitous computing, including designing and implementing ubiquitous and wireless sensing systems for Internet-of-Things applications (localization, smart homes/buildings, vital sign monitoring/healthcare, and 3D human-mobile interaction). Besides, I have a broad interest in wireless network as well. Currently, most of my projects are based on acoustic signals on commercial off the shelf mobile devices.

EDUCATION

- **Nanjing University** — Nanjing, China
  M.S. in Computer Science and Technology; Average Scores: 88.7/100 — Sep. 2019 - Current
  Advisor: Wei Wang

- **University of Electronic Science and Technology of China** — Chengdu, China
  B.Eng - Networking Engineering; GPA: 3.83/4.0 — Sep. 2015 - Jul. 2019
  Elite Class: Liren Leadership Class

- **National Chiao Tung University** — Taiwan, China
  Exchange Student - Electrical and Computer Engineering; GPA: 4.15/4.3 — Feb. 2017 - Jul. 2017

PUBLICATIONS AND RESEARCH

- RespTracker: Multi-user Room-scale Respiration Tracking with Commercial Acoustic Devices
  Haoran Wan, Shuyu Shi, Wenyu Cao, Wei Wang and Guihai Chen
  IEEE INFOCOM 2021, Apr. 2021.

- VECTOR: Velocity Based Temperature-field Monitoring with Distributed Acoustic Devices
  Haoran Wan, Lei Wang, Ting Zhao, Ke Sun, Shuyu Shi, Haipeng Dai, Guihai Chen, Haodong Liu and Wei Wang
  ACM IMWUT 2022, Revised Version Submitted in May 2022.

- Multi-user Room-scale Respiration Tracking using COTS Acoustic Devices
  Haoran Wan, Shuyu Shi, Wenyu Cao, Wei Wang and Guihai Chen
  ACM TOSN 2022, Under 1st Round of Major Revision.
  Extended version of INFOCOM 2021 paper

- SCALAR: Self-Calibrated Acoustic Ranging for Distributed Mobile Devices
  Lei Wang, **Haoran Wan**, Ting Zhao, Ke Sun, Shuyu Shi, Haipeng Dai, Guihai Chen, Haodong Liu and Wei Wang
  IEEE TMC 2022, Under Review.

- HeadTracker: Fine-grained Head Orientation Tracking System Based on Headphones
  Jinpeng Song, Haipeng Dai, Shuyu Shi, Lei Wang, **Haoran Wan**, Zhizheng Yang, Fu Xiao, and Guihai Chen
  Springer WASA 2022, Under Review.

- ALT: Boost AI Inference Performance by Breaking the Wall between Data Layouts and Loops
  Zhiying Xu, Shuyu Shi, Jiafan Xu, Hongding Peng, Wei Wang, Xiaoliang Wang, **Haoran Wan**, Haipeng Dai, Kun Wang, and Guihai Chen
  ACM ASPLOS 2023, Submitted in Jul. 2022.

PROJECTS

- **Generating Points Cloud with Distributed Acoustic Devices**: (Work in progress) Try to leverage ubiquitous COTS acoustic transceivers, including laptops, mobile phones, and voice assistants in domestic environments to form a distributed sensing scheme and generate precise points cloud features (range, angle, velocity, reflection strength and .etc).

- **Air Temperature Field Reconstruction with COTF Acoustic Devices**: We proposed to use distributed COTS acoustic devices to measure the air temperature on the LOS path of the acoustic signal and reconstruct the air temperature field with multipaths. This system (VECTOR) can estimate the air temperature with average errors $0.25°C$ and reconstruct the temperature field at a decimeter-level spatial resolution. This work was submitted to IMWUT in Nov. 2021 and the revised version was submitted in May. 2022. (Nov. 2021)

- **High Accuracy Localization System between Distributed Devices**: We modeled the sampling frequency offset between distributed acoustic devices and implemented a high accuracy absolute localization system between distributed devices using acoustic signal. This system (SCALAR) returns the absolute localization result ($0.6\ mm$ 1D errors up to $3\ m$) without requiring users to calibrate and can run in long term without performance drop (up to 8 hours). This work was submitted to TMC 2022. (Mar. 2021)

- **Multi-user Room-scale Respiration Tracking using COTF Acoustic Devices**: Solved the problem of limited coverage of acoustic signal, separating multiple users in one room with Zadoff Chu sequence and tracking users before and after movements. With these problems solved, this system can simultaneously monitor at least 4 subjects' respiration signals and can cover a range of 3 meters. This work ended up being accepted by INFOCOM 2021. (Jul. 2020)

- **In-air Continuous Hand Gesture Recognition with Acoustic Signal**: Developed a continuous hand gesture recognition system on mobile cooperating with Huawei. To solve the practical problem of ambiguous gestures like up scroll and reset process of down scroll in continuous using scenario and return the number of each operation. Designed and deployed signal processing framework and deep learning model on mobile phone running in real-time. (Dec. 2019)

Honors and Awards

- Outstanding graduate students of Nanjing University - Dec. 2021
- Huawei Graduate Scholarship - Nov. 2021
- Principal Special Scholarship for PhD Students - Nov. 2019
- Second Class People's Scholarship - Nov. 2016, 2018
- Undergraduate China National Scholarship, Nov. 2017

Skills Summary

- **Languages**: Python, MATLAB, Java, C/C++, SQL, Bash, Verilog
- **Tools**: Scikit, Pytorch/TorchLightning, TensorFlow, Keras
- **Platforms**: Linux, Raspberry, Android, FPGA, Microcontroller
- **Domain Knowledge**: (Array) Signal Processing, Machine Learning, Wireless Network

Experience

Digital Logic Design and Computer Organization Teaching Assistant	Nanjing, China Sep. 2021 - Jan. 2022
Digital Circuit and Digital System Experiment Teaching Assistant	Nanjing, China Sep. 2020 - Jan. 2021
ChinaSoft International Student Developer (Intern)	Chengdu, China Jul. 2017 - Aug. 2017
Chengdu Modern Hospital Volunteer for Elderly Caring	Chengdu, China Jul. 2016