Haoran Wan

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Education

- **Princeton University** — Princeton, NJ, USA
  Ph.D. in Computer Science — Jul. 2023 - Jun. 2028 (Expected)
  Advisor: Kyle Jamieson
- **Nanjing University** — Nanjing, Jiangsu, China
  M.S. in Computer Science — Sep. 2019 - Jun. 2023
  Advisor: Wei Wang
- **University of Electronic Science and Technology of China** — Chengdu, Sichuan, China
  B.Eng - Networking Engineering — Sep. 2015 - Jul. 2019
- **National Chiao Tung University** — Hsinchu, Taiwan
  Exchange Student - Electrical and Computer Engineering — Feb. 2017 - Jul. 2017

Publications and Research

- L4Span: Spanning Congestion Signaling over NextG Networks for Interactive Applications
  Haoran Wan, and Kyle Jamieson
  In Submission to CoNEXT 2025, June 2025.
- Automated, Cross-Layer Root Cause Analysis of 5G Video-Conferencing Quality Degradation
  Fan Yi, **Haoran Wan**, Kyle Jamieson, Oliver Michel
  In Submission to IMC 2025, May 2025.
- NR-Scope: A Practical 5G Standalone Telemetry Tool
  Haoran Wan, Xuyang Cao, Alexander Marder, and Kyle Jamieson
  ACM CoNEXT, Dec. 2024. [PDF], [Code]
- USee: Ultrasound-based Device-free Eye Movement Sensing
  Wen Cheng, Mingzhi Pang, **Haoran Wan**, Shichen Dong, Dongxu Liu, and Wei Wang
  IEEE SECON (Best Paper Award), Dec. 2024. [PDF]
- Athena: Seeing and Mitigating Wireless Impact on Video Conferencing and Beyond
  Fan Yi, **Haoran Wan**, Kyle Jamieson, Jennifer Rexford, Yaxiong Xie, and Oliver Michel
  ACM HotNet, Nov. 2024. [PDF]
- Telesa: Evolving Mobile Cloud Gaming with 5G Standalone Network Telemetry
  Haoran Wan, Kyle Jamieson
  Arxiv, Feb 2024. [PDF]
- Multi-user Room-scale Respiration Tracking using COTS Acoustic Devices
  Haoran Wan, Shuyu Shi, Wenyu Cao, Wei Wang, and Guihai Chen
  ACM TOSN, May 2023. [PDF]
  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 2023, Feb. 2023. [PDF], [Demo]
- ALT: Boosting Deep Learning Performance by Breaking the Wall between Graph and Operator Level Optimizations
  Zhiying Xu, Jiafan Xu, Hongding Peng, Wei Wang, Xiaoliang Wang, **Haoran Wan**, Haipeng Dai,
  Yixu Xu, Hao Cheng, Kun Wang, and Guihai Chen
  ACM EuroSys 2023, May 2023. [PDF]
- mSilent: Towards General Corpus Silent Speech Recognition using COTS mmWave Radar
  Shang Zeng, **Haoran Wan**, Shuyu Shi and Wei Wang
  ACM Ubicomp/IMWUT 2023, Oct. 2023. [PDF]
- 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 Ubicomp/IMWUT 2022 (Distinguished Paper Award), Sep. 2022. [PDF]
- 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 (Best Paper Award), Nov. 2022. [PDF]

- 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. [PDF]

Demos and Posters

- Demo: Decoding Control Information Passively from Standalone 5G Network
  Haoran Wan, Xuyang Cao, Alexander Marder, and Kyle Jamieson
  ACM Mobicom, Nov. 2024. [PDF]
- Understanding the Impact of Cellular RAN-induced Delay on Video Conferencing
  Fan Yi, Oliver Michel, **Haoran Wan**, and Kyle Jamieson
  ACM Mobicom, Nov. 2024. [PDF]

Selected Projects

- **AI for Network Simulation** June 2025 - Current
  - The goal is to reconstruct the behavior of the volatile wireless networks with AI/ML models, providing a realistic trace-driven simulation model for network algorithm design.
  - Ongoing.
- **Enhancing Interactive Applications in the 5G Network** Aug. 2024 - June 2025
  - Integrated the explicit congestion notification (ECN) marking mechanism into the 5G network to achieve ultra-low latency and good throughput utilization.
  - In submission to CoNEXT 2025.
- **Enhancing Mobile Cloud Gaming through 5G NR-Scope Telemetry** May 2023 - Oct. 2024
  - Developed a tool called NR-Scope to analyze 5G base station's signal with a USRP, which can decode the downlink control information for every user in every transmission time interval (0.5 ms) in the RAN, revealing both uplink and downlink resource allocated to every user in the 5G physical layer.
  - Enhanced the real-time video streaming of an open-source mobile cloud gaming platform (sunshine and moonlight) with the fine-grained RAN resource information.
  - The tool was accepted by CoNEXT 2024, open-sourced at https://github.com/PrincetonUniversity/NR-Scope.
- **Transformer based General Corpus Silent Speech Recognition with mmWave** Dec. 2021 - Nov. 2022
  - Proposed a transformer-based neural network backend with user-adaptive design to recognize the speech sentences, achieving a word error rate of 9.5%, which is comparable with video-based SOTA.
  - Developed a data collection platform concurrently collecting the video, speech, and mmWave radar data. The corpus is formed with 1000+ daily conversation sentences, and we collected $21K+$ samples as our dataset.
  - Designed a signal processing pipeline for localizing users' head and filtering out unrelated motions.
  - This work was accepted by Ubicomp/IMWUT 2023.

Honors and Awards

- IEEE SECON Best Paper Award - Dec. 2024
- ACM IMWUT Distinguished Paper Award - Sept. 2022
- Outstanding graduate students of Nanjing University - Dec. 2021
- Huawei Graduate Scholarship - Nov. 2021
- Principal Special Scholarship for Graduate Students - Nov. 2019
- Second Class People's Scholarship - Nov. 2016, 2018
- Undergraduate China National Scholarship, Nov. 2017

Skills Summary

- **Languages:** C/C++, Python, MATLAB, Java, SQL, Bash, Verilog
- **Tools:** Scikit, Pytorch/TorchLightning, TensorFlow, Keras
- **Platforms:** Linux, Raspberry, Android, FPGA, Microcontroller

Teaching Experience

- Digital Logic Design and Computer Organization — Nanjing, China
  Teaching Assistant — Sep. 2021 - Jan. 2022
- Digital Circuit and Digital System Experiment — Nanjing, China
  Teaching Assistant — Sep. 2020 - Jan. 2021