Hanjie Wu

Tel: +86 188-4510-8570 | **Email:** hanjiewu@link.cuhk.edu.cn

Address: No.2001 Longxiang Avenue, Longgang District, Shenzhen, Guangdong, China 518172

EDUCATION

The Chinese University of Hong Kong, Shenzhen (QS 2026 #32) Jan. 2026 - now

- Doctor of Philosophy | Computer and Information Engineering
- School of Science and Engineering
- Collaborative Degree Program with The Chinese University of Hong Kong, Department of Information Engineering

University of Electronic Science and Technology of China (985 & double first-class) Sept. 2022 - Jun. 2025

- Master of Engineering | Communication Engineering (including Broadband Networks, Mobile Communications, etc.)
- National Key Laboratory of Wireless Communications | **GPA:** 3.79/4 | **Rank:** 10%/182
- Be recommended for admission to a master's degree without an entrance exam

Harbin Engineering University (211 & double first-class) Sept. 2018 - Jun. 2022

- Bachelor of Engineering | Electronic Information Engineering
- School of Information and Communication Engineering | **GPA:** 90.07/100 | **Rank:** 5%/370

PUBLICATIONS

[1] **Wu H**, Cheng X. Multi-RIS-assisted mmWave MIMO systems exploiting statistical CSI: Ergodic capacity analysis and joint beamforming design[J]. ***IEEE Transactions on Wireless Communications***, vol. 24, no. 9, pp. 7747-7760, Sept. 2025. (**SCI, IF 10.7, JCR-Q1**)

[2] **Wu H**, Xiang Y, Cheng X. Ergodic capacity analysis and resolution optimization for uplink MU-MIMO systems with mixed ADCs[J]. ***IEEE Transactions on Green Communications and Networking***, vol. 9, no. 3, pp. 829-843, Sept. 2025. (**SCI, IF 6.7, JCR-Q1**)

[3] Xiang Y, **Wu H**, Cheng X. Ergodic capacity analysis of uplink MU-MIMO systems with low-resolution ADCs[J]. ***IEEE Access***, vol. 11, pp. 132833-132842, 2023. (**SCI, IF 3.6, JCR-Q2**)

RESEARCH EXPERIENCES

Spatial shaping of quantization noise in massive MIMO systems Nov. 2024 - Mar. 2025

Key Participant | Huawei Cooperation Project | University of Electronic Science and Technology of China

- In the early stage as the main student responsible person, I handled system modeling, performance evaluation, and algorithm design.
- **Overview:** Based on spatial sigma-delta and other methods, the spatial degrees of freedom are utilized to effectively mitigate channel distortion noise. This causes the quantization noise to form a "null" in the user's spatial direction while being mapped to other spatial dimensions, thereby relaxing the complexity of digital signal processing while maintaining the performance of the user's air-interface signals.
- **Progress:** According to the technical approaches, the generalized spatial sigma-delta modulator with arbitrary order and quantization levels is primarily employed to process quantization noise. Simultaneously, the Bussgang decomposition signal model is applied to optimize the filter coefficients in the sigma-delta modulator, achieving the system design objective of minimizing the EVM (Error Vector Magnitude) at the receiver side.

Capacity analysis and beamforming design of multi-RIS-assisted mmWave MIMO systems Nov. 2023 - Oct. 2024

Key Researcher | National Natural Science Foundation of China | University of Electronic Science and Technology of China

- Serving as the lead researcher, I was responsible for system modeling, performance analysis, algorithm design and simulation, as well as paper writing.
- **Overview:** For multi-RIS-assisted mmWave MIMO systems, an algorithm has been designed based on instantaneous CSI using the WMMSE method to jointly optimize hybrid beamforming and RIS phase shift matrices, thereby maximizing system performance. Furthermore, using the replica method from statistical physics, closed-form expressions for the ergodic capacity can be derived based on statistical CSI. With the expressions, a corresponding algorithm has been subsequently developed to optimize the hybrid beamforming and RIS phase shift matrices.
- **Progress:** One research paper has been published. The derived analytical expressions for ergodic capacity demonstrate high accuracy, and the proposed optimization algorithm exhibits fast convergence. Through beamforming optimization, the ergodic capacity of the multi-RIS-assisted mmWave communication system has been significantly improved.

Capacity analysis and optimization design of MU-MIMO systems with low resolution ADCs Dec. 2022 - Oct. 2023

Key Researcher | National Natural Science Foundation of China | University of Electronic Science and Technology of China

- Serving as the lead researcher, I was responsible for system modeling, performance analysis, optimization algorithm design, and paper writing.
- **Overview:** For nonlinear quantization models under low-resolution uniform ADCs, the replica method from statistical physics is employed to derive closed-form expressions for the ergodic capacity and conduct performance analysis. Building on this, the ergodic capacity for both linear and nonlinear quantization models in mixed ADC systems can be further derived for resolution optimization design.
- **Progress:** Two research papers have been published. The derived analytical expressions exhibit high accuracy with significantly lower computational time compared to Monte Carlo simulations. Moreover, through appropriate system configuration, the approach can partially compensate for capacity loss due to low-resolution ADCs while substantially reducing system costs.

DOA estimation method based on channel compression and 1-bit quantization Dec. 2021 - Jun. 2022

Key Researcher | Research Project | Harbin Engineering University

- As the principal investigator, I led system modeling, algorithm design, and simulation.
- **Overview:** This project combined 1-bit quantization and compressed sensing techniques to develop channel-compressed 1-bit quantization DOA estimation model for both uniform and sparse arrays. The proposed approach effectively reduces data dimensionality at the receiver, decreases the number of RF front-end channels, lowers system costs, while maintaining the capability for high-rate wideband signal processing.
- **Progress:** The developed DOA estimation model achieves an optimal balance between cost and estimation performance. It preserves estimation degrees of freedom, accuracy, and resolution with significant cost reductions. The sparse array implementation demonstrates substantially higher estimation degrees of freedom compared to conventional uniform arrays.

WORK EXPERIENCE

Shenyang Neusoft Technology Education Group Jul. 10 2021 - Jul. 21 2021

Software Talent Training Center | Training Team Member

- I participated in the design of the "Smart Healthcare" system project.
- Built upon database and display modules, the system incorporates user registration, data transmission, information integration, information processing, and error handling functionalities. Through intelligent terminals serving three parts (hospitals, doctors, and patients), it provides users with specific services such as information queries.

EXTRACURRICULAR ACTIVITIES

- Vice Minister, Practice Department, Graduate Student Union Sept. 2022 - Sept. 2023
- Participant, "Retracing the Long March" Revolutionary Spirit Study Tour Nov. 2022
- Member, Publicity Department, Readers' Association Oct. 2018 - Oct. 2019
- Vice Minister, Education Department, Green Association Oct. 2018 - Oct. 2019
- Vice Minister, Student Life & Rights Department, Student Union Oct. 2018 - Oct. 2019
- Volunteer, Winter Vacation Rural Elderly Assistance Program Feb. 2019
- Volunteer, Youth League Branch River Cleanup Initiative Feb. 2018

HONOURS AND AWARDS

- **Outstanding Master's Thesis Award in 2025** (UESTC) Jun. 2025
- Outstanding Graduate Student (UESTC) Nov. 2023 & Nov. 2024
- Second-Class Academic Scholarship (UESTC) Nov. 2023 & Nov. 2024
- First-Class Academic Scholarship (UESTC) Jun. 2022
- **Outstanding Communist Youth League Member** (HEU) May 2019
- Second-Class Outstanding Student Scholarship (HEU) Dec. 2020 & May 2021
- First-Class Outstanding Student Scholarship (HEU) May 2019 & Dec. 2019 & Dec. 2020

SKILLS

- **Language:** Mandarin Chinese (native), English (IELTS: 6.5)
- **Technology:** MATLAB, C, Python, Java, Microsoft Office, LaTex
- **Hobbies:** History, Handicraft, Music, Sports, Travel