# Zhaorui WANG

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## Education

08/2015 - 08/2019 **The Chinese University of Hong Kong**, Hong Kong
Ph.D. in Information Engineering
Thesis Title: Signal Detection for Short-Packet Physical-Layer Network Coding with FSK Modulation
Supervisor: Professor Soung Chang LIEW

09/2011 - 06/2015 **University of Electronic Science and Technology of China**, Chengdu, China
B.Sc. in Mathematics and Physics Basic Science
Elite Class, GPA: 3.89/4.00

## Work Experience

08/2022 - Present **Research Assistant Professor**
School of Science and Engineering, The Chinese University of Hong Kong, Shenzhen, China

09/2021 - 03/2022 **Post-Doctoral Researcher**
Department of Information Engineering, The Chinese University of Hong Kong, Hong Kong
Supervisor: Professor Henry CHEN

10/2020 - 08/2021 **Visiting Scholar**
Shenzhen University, Shenzhen, China
Collaborator: Professor Shengli ZHANG
State Key Laboratory of Scientific and Engineering Computing (LSEC), Beijing, China
Collaborator: Professor Ya-Feng LIU

09/2019 - 09/2020 **Post-Doctoral Researcher**
Department of EIE, The Hong Kong Polytechnic University, Hong Kong
Supervisor: Professor Liang LIU

## Awards and Honors

2022 **Pengcheng Peacock Plan (Type C)**, Shenzhen, China
2019 **Research Postgraduate Student Grants for Overseas Academic Activities**, CUHK
2018-2019 **Postgraduate Studentship**, CUHK
2015-2018 **Hong Kong PhD Fellowship**, Research Grants Council (RGC) of Hong Kong
2015 **Best Undergraduate Thesis Award**, UESTC
2012&2014 **People's Scholarship**, UESTC

## Research Grant

- Start-Up Fund of Pengcheng Peacock Plan, PI, RMB 2,400,000, 2024-2027.

## Research Interests

- Low Latency Wireless System
- LLM-Enabled Intelligent Communication System
- Channel Estimation and Signal Detection

## Selected Publications

# denotes corresponding author, * denotes supervised/co-supervised student

[S1] L. You, S. Liu, W. Xie, **Z. Wang**#, Y. Tan, and S. C. Liew, "Improving Cooperative Wi-Fi Broadcast with Fine-Grained Channel Estimation," in Proc. IEEE/ACM International Symposium on Quality of Service (IWQoS), 2024. **[Demo Video]**

[S2] X. Liu*, Y. Sun*, **Z. Wang**#, L. You, H. Pan, F. Wang, and S. Cui, "Receiver-Centric Generative Semantic Communications," submitted to IEEE International Conference on Communications (ICC), 2025. **[Demo Video]**

[S3] **Z. Wang**, L. Liu, and S. Cui, "Channel Estimation for Intelligent Reflecting Surface Assisted Multiuser Communications: Framework, Algorithms, and Analysis," IEEE Transactions on Wireless Communications (TWC), vol. 19, no. 10, pp. 6607-6620, Oct. 2020. **(ESI Hot Paper and ESI Highly Cited Paper, Citation around 800)**

[S4] **Z. Wang**, S. C. Liew, and L. Lu, "Noncoherent Detection for Physical-Layer Network Coding," IEEE Transactions on Wireless Communications (TWC), vol. 17, no. 10, pp. 6901-6916, Oct. 2018.

## Journal Publications

[J1] **Z. Wang**, S. C. Liew, and L. Lu, "Noncoherent Detection for Physical-Layer Network Coding," IEEE Transactions on Wireless Communications (TWC), vol. 17, no. 10, pp. 6901-6916, Oct. 2018.

[J2] **Z. Wang** and S. C. Liew, "Coherent Detection for Short-Packet Physical-Layer Network Coding with FSK Modulation," IEEE Transactions on Wireless Communications (TWC), vol. 19, no. 1, pp. 279-292, Jan. 2020.

[J3] **Z. Wang**, L. Liu, and S. Cui, "Intelligent Reflecting Surface Design for 6G-Assisted Internet of Things," Chinese Journal on Internet of Things, vol. 4, no. 2, pp. 84-95, Jun. 2020. **(Invited Paper)**

[J4] **Z. Wang**, L. Liu, and S. Cui, "Channel Estimation for Intelligent Reflecting Surface Assisted Multiuser Communications: Framework, Algorithms, and Analysis," IEEE Transactions on Wireless Communications (TWC), vol. 19, no. 10, pp. 6607-6620, Oct. 2020. **(ESI Hot Paper and ESI Highly Cited Paper, Citation around 800)**

[J5] **Z. Wang**, Y.-F. Liu, and L. Liu, "Covariance-Based Joint Device Activity and Delay Detection in Asynchronous mMTC," IEEE Signal Processing Letters (SPL), vol. 29, pp. 538 - 542, Jan. 2022.

[J6] **Z. Wang**, L. Liu, S. Zhang, P. Dong, Q. Yang, and T. Wang, "PNC Enabled IIoT: A General Framework for Channel-Coded Asymmetric Physical-Layer Network Coding," IEEE Transactions on Wireless Communications (TWC), vol. 21, no. 12, pp. 10335 - 10350, Dec. 2022.

[J7] **Z. Wang**, L. Liu, and S. Cui, "Massive MIMO Communication with Intelligent Reflecting Surface," IEEE Transactions on Wireless Communications (TWC), vol. 22, no. 4, pp. 2566 - 2582, Apr. 2023.

[J8] **Z. Wang**, L. Liu, and S. Cui, "Channel Estimation in Intelligent Reflecting Surface Assisted Communications," Radio Communications Technology, vol. 50, no. 2, pp. 238 - 244, Feb. 2024. **(Invited Paper)**

[J9] **Z. Wang**, Y.-F. Liu, Z. Wang, L. Liu, H. Pan, and S. Cui, "Device Activity Detection in mMTC with Low-Resolution ADC: A New Protocol," IEEE Transactions on Wireless Communications (TWC), vol. 23, no. 6, pp. 5847 - 5862, Jun. 2024.

[J10] L. You, Z. Tang, P. Wang, **Z. Wang**, H. Dai, and L. F, "Quick and Reliable LoRa Physical-Layer Data Aggregation through Multi-Packet Reception," IEEE/ACM Transactions on Networking (ToN), vol. 32, no. 2, pp. 1616 - 1630, Apr. 2024.

[J11] H. Pan, S. Yang, T. T. Chan, **Z. Wang**, C. M. Leung, and J. Li, "SC-PNC: Semantic Communication-Empowered Physical-layer Network Coding," IEEE Transactions on Cognitive Communications and Networking (TCCN), vol. 10, no. 4, pp. 1160 - 1174, Aug. 2024.

[J12] W. Wang*, M. Zhu*, K. Shen#, **Z. Wang**#, and S. Cui, "Power Allocation for Finite-Blocklength IR-HARQ," IEEE Communications Letters (CL), vol. 28, no. 11, pp. 2673 - 2677, Nov. 2024.

[J13] P. Wu, Q. Liu, Y. Dong, **Z. Wang**, and F. Wang, "LMaaS: Exploring Pricing Strategy of Large Model as a Service for Communication," IEEE Transactions on Mobile Computing (TMC), vol. 23, no. 12, pp. 12748 - 12760, Dec. 2024.

[J14] Z. Wang, Y.-F. Liu, **Z. Wang**, and W. Yu, "Covariance-Based Activity Detection in Cooperative Multi-Cell Massive MIMO: Scaling Law and Efficient Algorithms," IEEE Transactions on Information Theory (TIT), vol. 70, no. 12, pp. 8770 - 8790, Dec. 2024.

[J15] R. Wang*, **Z. Wang**, L. Liu, S. Zhang, and S. Jin, "Reducing Channel Estimation and Feedback Overhead in IRS-Aided Downlink System: A Quantize-then-Estimate Approach," to appear in IEEE Transactions on Wireless Communications (TWC), 2024.

[J16] X. Han, H. Pan, **Z. Wang**, and J. Li, "Successive Interference Cancellation-Enabled Timely Status Update in Linear Multi-hop Wireless Networks," submitted to IEEE Transactions on Mobile Computing (TMC), 2024.

[J17] L. You, Y. Wang, S. Liu, Y. Tan, **Z. Wang**#, and S. C. Liew, "Improving Wi-Fi Cooperative Broadcast with Fine-Grained Channel Estimation," submitted to IEEE Transactions on Mobile Computing (TMC), 2024.

[J18] Z. Wang, Y.-F. Liu, and **Z. Wang**, "Covariance-Based Activity Detection in Cooperative Multi-Cell Massive MIMO," submitted to Mobile Communications, 2024. **(Invited Paper)**

## Conference Publications

[C1] Y. Zhang, **Z. Wang**, S. Wang, Y. Xiao, and L. Dan, "A Low-Complexity Detection Algorithm for Spatial Modulation Systems," in Proc. International Conference on Wireless Communications, Networking and Mobile Computing (WiCOM), 2014.

[C2] **Z. Wang**, S. C. Liew, and L. Lu, "Optimal Noncoherent Detection for Physical-Layer Network Coding," in Proc. IEEE Global Communications Conference (GLOBECOM), 2018.

[C3] **Z. Wang**, L. Liu, and S. Cui, "Channel estimation for intelligent reflecting surface assisted multiuser communications," in Proc. IEEE Wireless Communications and Networking Conference (WCNC), 2020.

[C4] **Z. Wang**, L. Liu, and S. Cui, "Intelligent Reflecting Surface Assisted Massive MIMO Communications," in Proc. IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), 2020. **(Invited Paper)**

[C5] S. Yang, H. Pang, T. T. Chan, and **Z. Wang**, "Semantic Communication-Empowered Physical-layer Network Coding," in Proc. IEEE Wireless Communications and Networking Conference (WCNC), 2023.

[C6] Z. Wang, Y.-F. Liu, **Z. Wang**, and W. Yu, "Scaling Law Analysis for Covariance Based Activity Detection in Multi-Cell Massive MIMO," in Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2023.

[C7] R. Wang*, **Z. Wang**, L. Liu, S. Zhang, and S. Jin, "A Quantize-then-Estimate Protocol for CSI Acquisition in IRS-Aided Downlink Communication," in Proc. IEEE Global Communications Conference (GLOBECOM), 2023.

[C8] W. Xie, E. Zhang, L. You, D. Wang, **Z. Wang**, and L. Fu, "Combating Multi-path Interference to Improve Chirp-based Underwater Acoustic Communication," in Proc. IEEE International Conference on Communications (ICC), 2024.

[C9] L. You, S. Liu, W. Xie, **Z. Wang**#, Y. Tan, and S. C. Liew, "Improving Cooperative Wi-Fi Broadcast with Fine-Grained Channel Estimation," in Proc. IEEE/ACM International Symposium on Quality of Service (IWQoS), 2024. **[Demo Video]**

[C10] E. Zhang, L. Liang, L. You, and **Z. Wang**, "Enabling Concurrent Random Access in Underwater Acoustic Networks," in Proc. ACM/IEEE Information Processing in Sensor Networks (IPSN), 2024.

[C11] Z. Zhao*, **Z. Wang**, S. Zhang, and L. Liu, "Finding Defective Elements in Intelligent Reflecting Surface via Over-the-Air Measurements," in Proc. IEEE Global Communications Conference (GLOBECOM), 2024.

[C12] M. Zhu*, Y. Sun*, L. You, **Z. Wang**#, Y.-F. Liu, and S. Cui, "Rethinking Grant-Free Protocol in mMTC," in Proc. IEEE Global Communications Conference (GLOBECOM), 2024.

[C13] E. Zhang, J. You, L. You, **Z. Wang**, D. Wang, and L. Fu, "Enabling High-Performance Uncoordinated Random Access in Underwater Acoustic Networks," submitted to IEEE International Conference on Computer Communications (INFOCOM), 2024.

[C14] X. Liu*, Y. Sun*, **Z. Wang**#, L. You, H. Pan, F. Wang, and S. Cui, "Receiver-Centric Generative Semantic Communications," submitted to IEEE International Conference on Communications (ICC), 2025. **[Demo Video]**

[C15] Y. Wang, S. Liu, L. You, Y. Tan, **Z. Wang**, and L. Fu, "Efficient Channel Estimation for Cooperative Broadcast in Infrastructure-based Vehicle Networks," submitted to IEEE International Conference on Communications (ICC), 2025.

## Patents

[P1] Chinese Patent CN104333434B, "Reduced-Complexity Detector for Spatial Modulation," November 2014.

[P2] Chinese Patent CN104168049A, "A Signal Detection Method for Generalized Spatial Modulation in MIMO," February 2015.

## Supervised Students

- Bei Shi
  Cosupervised Ph.D. Student at CUHKSZ since Sep. 2024
  Research Topic: System Design on Random Access in Massive IoT
- Yifei Sun
  Supervised Research Assistant at CUHKSZ since Sep. 2024
  Research Topic: LLM-Enabled Semantic Communication System
- Mingrui Ma
  Supervised Master Student at CUHKSZ since Sep. 2023
  Research Topic: System Design on Random Access in Massive IoT

- Xunze Liu
  Supervised Master Student at CUHKSZ since Sep. 2023
  Research Topic: LLM-Enabled Semantic Communication System
- Minhao Zhu
  Supervised Master Student at CUHKSZ from Sep. 2022 to Sep. 2024
  Research Topic: Massive Machine Type Communications
- Ziyi Zhao
  Cosupervised Ph.D. Student at PolyU since Sep. 2023
  Research Topic: Intelligent Reflecting Surface Assisted Communications
- Rui Wang
  Cosupervised Ph.D. Student at PolyU since Sep. 2021
  Research Topic: Intelligent Reflecting Surface Assisted Communications

## Teaching Assistant at CUHK

- ENGG 2420D Complex Analysis and Differential Equations, Fall 2018
  Course Instructor: Prof. Raymond YEUNG, Recipient of 2022 Claude E. Shannon Award
- ENGG 2470 Probability and Statistics for Engineers, Spring 2018

## Technical Program Committee (TPC) Member

- IEEE GLOBECOM 2023
- IEEE GLOBECOM 2023 Workshop - Un-IoT
- IEEE GLOBECOM 2022
- IEEE GLOBECOM 2021
- IEEE VTC 2023 Fall
- IEEE VTC 2023 Spring
- IEEE VTC 2022 Spring
- IEEE VTC 2021 Spring
- IEEE VTC 2021 Fall
- IEEE ICCC 2024
- IEEE ICCC 2023
- IEEE ICCC 2022

## Technical Reviewer

- IEEE Transactions on Mobile Computing (TMC)
- IEEE Transactions on Wireless Communications (TWC)
- IEEE Transactions on Communications (TCOM)
- IEEE Journal on Selected Areas in Communications (JSAC)
- IEEE Transactions on Vehicular Technology (TVT)
- IEEE Transactions on Signal Processing (TSP)
- IEEE Communications Magazine
- IEEE Internet of Things Journal
- IEEE Wireless Communications Letters
- IEEE Signal Processing Letters

- IEEE Global Communications Conference (GLOBECOM)
- IEEE International Conference on Communications (ICC)
- IEEE Wireless Communications and Networking Conference (WCNC)
- IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC)
- IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)
- IEEE Vehicular Technology Conference (VTC)