

Wentao Yu

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🔗 <https://wyuaq.github.io/>

Research Interests

My research explores the intersection of **machine learning** and **signal processing** to design advanced transceiver algorithms for **next-generation wireless systems**. I am particularly interested in applying model-driven deep learning and generative models to tackle practical challenges in millimeter-wave and terahertz systems, near-field communications and sensing, and ultra-massive MIMO systems.

Education

The Hong Kong University of Science and Technology

Sept 2021 – Aug 2025

Ph.D. in Electronic and Computer Engineering

- Advisor: Prof. Khaled B. Letaief
- Awarded Hong Kong Ph.D. Fellowship Scheme (HKPFS)

Massachusetts Institute of Technology

Sept 2024 – Aug 2025

Visiting Ph.D. Student in Electronic Engineering and Computer Science

- Advisor: Prof. Lizhong Zheng
- Supported by HKUST Overseas Research Award

Nanjing University

Sept 2017 – Jun 2021

B.Eng. in Electronic Science and Engineering

- Advisor: Prof. Shaowei Wang
- Outstanding Graduate, Ranking: 3/193, Awarded China National Scholarship

Experience

Massachusetts Institute of Technology

Cambridge, MA, USA

Visiting Researcher

Sept 2024 – Aug 2025

- Conducted research on the information-theoretic feature learning framework – “H-score networks”.
- Conducted research on its applications to (i) direction-of-arrival (DoA) estimation using sparse arrays, and (ii) massive MIMO beamforming with implicit channel estimation.

The Hong Kong University of Science and Technology

Hong Kong SAR, China

Graduate Research Assistant

Sept 2021 – Aug 2025

- Designed an adaptive and robust deep learning framework for THz ultra-massive MIMO channel estimation with convergence guarantees and flexible performance-complexity trade-offs.
- Designed a Bayes-optimal unsupervised learning algorithm for channel estimation in near-field holographic MIMO systems and studied its uncertainty quantification.
- Proposed two deep learning frameworks for iterative and non-iterative transceiver algorithms in ultra-massive MIMO systems and investigated their applications in beam-focusing, channel estimation, and CSI feedback.
- Proposed the concept of physical layer foundation models, a unified deep learning model that can be applied across a wide range of tasks in intelligent transceiver design, and studied its practical applications.
- Studied out-of-distribution detection in task-oriented semantic communications with information bottleneck.

- Proposed a multi-label learning algorithm for antenna selection in massive MIMO systems.
- Designed a learning-based branch-and-bound algorithm for quantized precoding in multi-user massive MIMO.

Honors and Awards

- **2024 IEEE Signal Processing Society's Annual Top 25 Downloaded Article Paper** [Paper](#) [🔗](#)
- **2024 HKUST ECE Senior Teaching Assistant Fellowship**
- 2024 HKUST Overseas Research Award
- 2021 HKUST Redbird Ph.D. Scholarship
- **2021 Hong Kong Ph.D. Fellowship Scheme (HKPFS)**
- 2021 Outstanding Graduate of Nanjing University
- 2019 The Interdisciplinary Contest in Modeling (ICM), Outstanding Winner (Top 0.14%)
- 2019 Outstanding Student Leaders of Jiangsu Province (Only 10 awardees among all UGs at NJU)
- 2019 Baosteel Scholarship (Only 6 awardees among all UGs at NJU)
- **2018 China National Scholarship**

Teaching

I am honored to receive the **HKUST ECE Senior Teaching Assistant Fellowship**, which "recognizes *RPg* students who have demonstrated excellent performance and dedication in serving as a teaching assistant."

The Hong Kong University of Science and Technology
Teaching Assistant

Hong Kong SAR, China
Sept 2021 – Aug 2024

- EESM 5536 Digital Communications (2023 Spring, 2022 Fall)
- ELEC 4901 Final Year Undergraduate Thesis (2023 Fall)
- ELEC 3100 Signal Processing and Communications (2022 Spring)
- ELEC 2600 Probability and Random Processes in Engineering (2023 Fall, 2022 Fall)

Nanjing University
Peer Mentorship

Nanjing, China
Sept 2018 – Jun 2021

- Provided support for freshmen both academically and socially
- Coordinated peer mentors in the School of Electronic Science and Engineering

Publications

Journal

[J7] **Wentao Yu**, Xiangxiang Xu, Lizhong Zheng, Khaled B. Letaief, "A neural feature learning framework for direction-of-arrival estimation," *IEEE Transactions on Signal Processing*, in preparation, 2025.

[J6] **Wentao Yu**, Hengtao He, Shenghui Song, Jun Zhang, Lizhong Zheng, Khaled B. Letaief, "Physical layer foundation models for ultra-massive MIMO systems," *IEEE Transactions on Wireless Communications*, in preparation, 2025.

[J5] **Wentao Yu**, Hengtao He, Shenghui Song, Jun Zhang, Linglong Dai, Lizhong Zheng, Khaled B. Letaief, "AI and deep learning for THz ultra-massive MIMO: From model-driven approaches to foundation models," *Engineering*, under review, Dec. 2024. (**Invited paper**)

[J4] **Wentao Yu**, Yifan Ma, Hengtao He, Shenghui Song, Jun Zhang, Khaled B. Letaief, "Deep learning for near-field XL-MIMO transceiver design: Principles and techniques," *IEEE Communications Magazine*, vol. 63, no. 1, pp. 52-58, Jan. 2025. (**Popular article of IEEE ComMag**)

[J3] **Wentao Yu**, Hengtao He, Xianghao Yu, Shenghui Song, Jun Zhang, Ross Murch, Khaled B. Letaief, "Bayes-optimal unsupervised learning for channel estimation in near-field holographic MIMO," *IEEE Journal of Selected Topics in Signal Processing*, vol. 18, no. 4, pp. 714-729, May 2024. (**Popular article of IEEE JSTSP**)

- [J2] **Wentao Yu**, Yifei Shen, Hengtao He, Xianghao Yu, Shenghui Song, Jun Zhang, Khaled B. Letaief, “An adaptive and robust deep learning framework for THz ultra-massive MIMO channel estimation,” *IEEE Journal of Selected Topics in Signal Processing*, vol. 17, no. 4, pp. 761-776, Jul. 2023. (**IEEE Signal Processing Society’s annual top 25 downloaded article from Sept. 2023 to Sept. 2024**)
- [J1] **Wentao Yu**, Tianyu Wang, Shaowei Wang, “Multi-label learning based antenna selection in massive MIMO systems,” *IEEE Transactions on Vehicular Technology*, vol. 70, no. 7, pp. 7255-7260, Jul. 2021.

Conference

- [C7] **Wentao Yu**, Hengtao He, Xianghao Yu, Shenghui Song, Jun Zhang, Ross Murch, Khaled B. Letaief, “Learning Bayes-optimal channel estimation for holographic MIMO in unknown EM environments,” in *Proc. IEEE International Conference on Communications (ICC)*, Denver, CO, USA, Jun. 2024.
- [C6] Yifan Ma, **Wentao Yu**, Xianghao Yu, Jun Zhang, Shenghui Song, Khaled B. Letaief, “Lightweight and flexible Deep equilibrium learning for CSI feedback in FDD massive MIMO,” in *Proc. IEEE International Conference on Machine Learning for Communication and Networking (ICMLCN)*, Stockholm, Sweden, May 2024.
- [C5] Ruoxiao Cao, **Wentao Yu**, Hengtao He, Xianghao Yu, Shenghui Song, Jun Zhang, Yi Gong, Khaled B. Letaief, “Newtonized near-field channel estimation for ultra-massive MIMO systems,” in *Proc. IEEE Wireless Communications and Networking Conference (WCNC)*, Dubai, UAE, Apr. 2024.
- [C4] Hongru Li, **Wentao Yu**, Hengtao He, Jiawei Shao, Shenghui Song, Jun Zhang, Khaled B. Letaief, “Task-oriented communication with out-of-distribution detection: An information bottleneck framework,” in *Proc. IEEE Global Communications Conference (GlobeCom)*, Kuala Lumpur, Malaysia, Dec. 2023.
- [C3] **Wentao Yu**, Hengtao He, Xianghao Yu, Shenghui Song, Jun Zhang, Khaled B. Letaief, “Blind performance prediction for deep learning based ultra-massive MIMO channel estimation,” in *Proc. IEEE International Conference on Communications (ICC)*, Rome, Italy, May-Jun. 2023.
- [C2] **Wentao Yu**, Hengtao He, Xianghao Yu, Shenghui Song, Jun Zhang, Khaled B. Letaief, “Hybrid far- and near-field channel estimation for THz ultra-massive MIMO via fixed point networks,” in *Proc. IEEE Global Communications Conference (GlobeCom)*, Rio de Janeiro, Brazil, Dec. 2022.
- [C1] Tianyu Wang, **Wentao Yu**, Shaowei Wang, “Inter-slice radio resource management via online convex optimization,” in *Proc. IEEE International Conference on Communications (ICC)*, Montreal, Canada, Jun. 2021.

Presentations

- “AI for THz UM-MIMO: From model-driven deep learning to foundation models”
- IEEE Signal Processing Society’s invited webinar, Virtual, Feb. 25, 2025.
- “Blind performance prediction for deep learning based ultra-massive MIMO channel estimation”
- IEEE International Conference on Communications (ICC), Rome, Italy, May 30, 2023.
- “Learning Bayes-optimal channel estimation for holographic MIMO in unknown EM environments”
- Monthly faculty meeting of the Hong Kong 6G area of excellence scheme, Hong Kong, May 23, 2024.
 - IEEE International Conference on Communications (ICC), Denver, CO, USA, Jun. 11, 2024.
- “An adaptive and robust deep learning framework for THz ultra-massive MIMO channel estimation”
- IEEE Global Communications Conference (GlobeCom), Virtual, Dec. 5, 2022.
 - IEEE Hong Kong 6G Wireless Summit, Hong Kong, Sept. 13, 2023.
 - Monthly faculty meeting of the Hong Kong 6G area of excellence scheme, Hong Kong, Nov. 14, 2023.

Academic Services

Journal Reviewer for

- IEEE Journal on Selected Areas in Communications (JSAC)
- IEEE Transactions on Wireless Communications (TWC)
- IEEE Transactions on Communications (TCOMM)
- IEEE Transactions on Machine Learning for Communications and Networking (TMLCN)

- IEEE Transactions on Vehicular Technology (TVT)
- IEEE Transactions on Cognitive Communications and Networking (TCCN)
- IEEE Transactions on Intelligent Transportation Systems (T-ITS)
- IEEE Transactions on Circuits and Systems II – Express Briefs (TCAS-II)
- IEEE Communications Magazine (MCOM)
- IEEE Open Journal of Vehicular Technology (OJVT)
- IEEE Wireless Communications Letters (WCL)
- IEEE Communications Letters (CL)
- Physical Communications

Conference Reviewer for

- IEEE Global Communications Conference (Globecom)
- IEEE Wireless Communications and Networking Conference (WCNC)
- IEEE Vehicular Technology Conference (VTC)
- International Symposium on Wireless Communication Systems (ISWCS)

Conference TPC Member for

- 2024 IEEE WCNC Workshop on Model-Driven Deep Learning for 6G

Miscellaneous

Languages: Chinese (Native), English (Full Professional Proficiency, TOEFL Speaking: 28/30)

Volunteer Work: Served as the leader of the Youth Volunteer Organization of the School of Electronic Science and Engineering, Nanjing University, regularly organizing volunteer projects for the community.

Hobbies: Table Tennis, Photography, Basketball, Erhu (Chinese violin, 10+ years of practice)