

# Yuhao Chen

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## Education

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**Master in Electronic Engineering, Tsinghua University** 08/2021-06/2024

*Thesis: Accurate CSI Acquisition for Extremely Large-Scale Antenna Array*

- Advisor: Prof. Linglong Dai (*IEEE Fellow*)

**Bachelor in Electronic Engineering, Tsinghua University** 08/2017-06/2021

*Thesis: Wideband Beamforming for Reconfigurable Intelligent Surface*

- Advisor: Prof. Linglong Dai (*IEEE Fellow*)

## Research Interests

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- Reconfigurable intelligent surface (RIS) assisted 6G wireless communications
- Channel state information (CSI) acquisition for extremely large-scale antenna array (ELAA)
- Signal processing for massive multiple-input-multiple-output (MIMO)

## Research Experiences

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### RIS-assisted wireless communications

*Research Assistant to Professor Linglong Dai*

10/2020-06/2024

- To enable accurate beam training in RIS-assisted wideband communication systems in the presence of the beam split effect, analyzed the power distribution pattern and proposed a novel analytical beam training framework, which directly calculated the direction of the user rather than choosing in traditional schemes.
- To reduce the unacceptable codebook size in near-field RIS-assisted communication systems, designed a dynamic codebook, which exploited the geometric relationship among sub-arrays to represent the near-field channel with a small codebook size dynamically.
- To improve the beam training accuracy in RIS systems, exploit the idea of channel coding in the beam training procedure to enable the error correction so as to acquire accurate location of user.
- Collaborated with students from the Microwave Research Institute at Tsinghua University to develop an AI-based end-to-end communication prototype together with a 2304-element RIS @ 28 GHz.
- Collaborated with students from the Microwave Research Institute at Tsinghua University to develop a prototype based on a 64-element active RIS @ 3.5 GHz.
- Conducted several field tests on the RIS performance, and the results have been included in several white papers and reported at Global 6G Development Conference, 2022.

### CSI acquisition for ELAA

*Research Assistant to Professor Linglong Dai*

06/2022-06/2024

- To enable accurate channel estimation in non-stationary ELAA systems with hybrid precoding architectures, inspired by classical STBC code, proposed a group time block code-based signal extraction scheme, which redesigned traditional configurations at the base station to make the recognition of spatial non-stationary effect possible in future ELAA systems.
- To realize effective beam training in near-field uniform circular array systems, analyzed the frequency-dependent focusing property and proposed an angle-distance beam training framework, which simultaneously explored different distances and angles.
- Conducted the test of the proposed beam training framework in the prototype based on NI mmWave Transceiver System and verified the efficiency of the proposed framework.

## Publications

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### Book Chapter

- Z. Zhang, **Y. Chen**, Q. Yu, and L. Dai, "IRS architecture and hardware design," *Intelligent Surfaces Empowered 6G Wireless Network*, Wiley-IEEE Press, 2023.

## Journal Papers

- **Y. Chen** and L. Dai, "Coded beam training for RIS assisted wireless communications," submitted to *IEEE Transactions on Wireless Communications*.
- **Y. Chen**, M. Jian, and L. Dai, "Channel estimation for RIS assisted wireless communications: Stationary or non-stationary?," *IEEE Transactions on Signal Processing*, 2024.
- **Y. Chen** and L. Dai, "Non-stationary channel estimation for extremely large-scale MIMO," *IEEE Transactions on Wireless Communications*, vol. 23, no. 7, pp. 7683-7697, Jul. 2024.
- **Y. Chen** and L. Dai, "Near-field wideband beam training for ELAA with uniform circular array," *Science China Information Sciences*, vol. 67, no. 6, pp. 162303, May 2024.
- M. Cui, H. Jiang, **Y. Chen**, and L. Dai, "Continuous-time channel prediction based on tensor neural ordinary differential equation," *China Communications*, vol. 21, no. 1, pp. 163-174, Jan. 2024.
- **Y. Chen**, J. Tan, M. Hao, R. MacKenzie, and L. Dai, "Accurate beam training for RIS-assisted wideband Terahertz communication," *IEEE Transactions on Communications*, vol. 71, no. 12, pp. 7425-7440, Dec. 2023.

## Conference Papers

- **Y. Chen**, J. Tan, and L. Dai, "Analytical beam training for RIS-assisted wideband terahertz communication," in *Proceedings of 2023 IEEE Global Communications Conference (IEEE GLOBECOM'23)*, Dec. 2023.
- **Y. Chen**, Z. Zhang, M. Cui, and L. Dai, "Channel estimation for non-stationary extremely large-scale MIMO," in *Proceedings of 2023 IEEE 97th Vehicle Technology Conference (IEEE VTC'23 Spring)*, Jun. 2023.
- M. Cui, Z. Wu, **Y. Chen**, S. Xu, F. Yang, and L. Dai, "Demo: Low-power communications based on RIS and AI for 6G," in *Proceedings of 2022 IEEE International Conference on Communications (IEEE ICC'22) Workshops*, May 2022. (**IEEE ICC 2022 Outstanding Demo Award**)

## Patents

- L. Dai, **Y. Chen**, J. Li, J. Tan, M. Hao, and R. MacKenzie, "Low cost beam training method and codebook design for RIS-assisted wideband wireless communication system," 2022-08-07, PCTCN2022/104529. (Granted)
- L. Dai, **Y. Chen**, "Channel estimation for extremely large-scale MIMO," 2023-08-09, ZL202310680438.8. (Granted)

## Honors and Awards

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- **Excellent Master Dissertation** of Tsinghua, 2024
- **Excellent Graduates** of Beijing, 2024
- **National Scholarship** at Tsinghua University, 2023
- **National First Prize** of the China Graduate Electronic Design Competition, 2022
- **IEEE ICC Outstanding Demo Award**, 2022
- **Gold Medal** of International Exhibition of Inventions of Geneva, 2022
- **Gold Medal** of Invention and Innovation Competition of Beijing, 2022
- **Gold Medal** of National Exhibition of Inventions of China, 2021
- **Grand Prize** of the 11th "Challenge Cup" Technological Innovation Competition of Capital, 2021
- **Comprehensive Excellence Scholarship** of Tsinghua University, 2020
- **"Stars of Electronic" Award** at Tsinghua University, 2020
- **Comprehensive Excellence Scholarship** of Tsinghua University, 2018

## Skills

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- Languages: Native Mandarin Speaker, Advanced English (TOFEL-iBT score of 104)
- Proficiency in simulations using C/C++, MATLAB, Python, and Pytorch for deep learning
- Proficiency in prototype development and field test