Dr. Yufei **Zhao**

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About me

I hold a Ph.D. with extensive experience in advanced RF systems, signal processing, and intelligent sensing technologies. My strong academic background, combined with a proven ability to lead teams in successfully completing complex projects, equips me with a deep understanding of both the theoretical and practical dimensions of cutting-edge research. I am eager to apply my expertise to drive innovation and contribute to pioneering advancements.

Personal

Nationality: Chinese
Birthday: 04-Mar-1990
Status: Married
Children: One
Residence: Singapore

Areas of specialization

Algorithm • Antennas design • Radar sensing • Communications • Prototyping • RF Experiments • Optical experiment • Circuit design • Team leading

Interests

Wireless communication engineering, RF & Microwave systems, Reconfigurable Intelligent Surface (RIS), Quantum Sensors, Artificial Intelligence, Advanced metasurface, Electromagnetic technologies, Orbital Angular Momentum (OAM)

Short Resume

2007–2020 **Education Background**
STUDYING · China
Won first place in competitions in mathematics, physics, chemistry, and biology. Attended the Science Experimental Class at Shandong Experimental High School. Majored in Electronic Information Engineering at Harbin Institute of Technology. Secured a direct entry for a doctoral program in Aerospace Science and Technology at Tsinghua University.

2020–Now **After Graduation**
WORKING · China & Singapore
Joined Huawei's Beijing Research Center as a senior engineer (17th level), focusing on advanced research in wireless communication technologies from 5G to 6G. Then, moved to Nanyang Technological University (NTU) in Singapore to engage in research and teaching activities since 2021.
`https://www.researchgate.net/profile/Yufei-Zhao-4?ev=hdr_xprf`

Degrees

2014 **Bachelor**
ELECTRONIC INFORMATION ENGINEERING · Harbin Institute of Technology (HIT)

2020 **Ph.D.**
AEROSPACE SCIENCE AND TECHNOLOGY · Tsinghua University

Software

MATLAB
LaTeX
CST
HFSS
C/C++
python

Research Experiences

2014–2015 **Virtual Reality (VR) indoor human-computer interaction project for Tencent Company**
LEAD · Tsinghua University
Proposed a non-fuzzy magnetic coupling positioning algorithm based on the iterative optimization algorithm. Positioning rang > 2 m, experimental accuracy < 0.01 m.

2015–2016 **High precision magnetic positioning gesture input device for Samsung Company**
LEAD · Tsinghua University
Proposed high precision gesture recognition algorithm design and the experimental system development. Digital single processing and communication module development.

2016–2017 **Low complexity indoor WiFi measurement for MHI Company**
LEAD · Tsinghua University
Proposed a low-rank matrix recovery algorithm based on compressed sensing to reduce the measurement cost and complexity. Develop the experimental platform in interfering environment.

2017–2020 **Theoretical research and innovation on OAM beams**
LEAD · Tsinghua University
OAM researches on both quantum state photon and microwave beams. Proposed the idea of transform domain, the rotation Doppler mapping algorithm, which lays a foundation for the high-precision mode detection and long-distance transmission of multi-mode OAM beams.

Awards

- Young Scientist Award in both 2022 and 2024 Singapore Workshop on Antenna
- Huawei Innovation Star in 2021 of the Huawei company
- National Scholarship for Chinese Undergraduate Students
- First Class Scholarship for Tsinghua Graduate Students

Fundings

1. Key Project of the National Natural Science Foundation of China, from January 1, 2018, to December 31, 2022, concluded, participated.
2. General Project of the National Natural Science Foundation of China, from July 1, 2024, to June 30, 2027, initiated, participant.
3. Future Communications Programme (FCP) Grant of Singapore, from June 1, 2022, to May 31, 2025, initiated, Lead
4. Temasek Laboratories@NTU Seed Research Project (2023), concluded, lead
5. Temasek Laboratories@NTU Seed Research Project (2024), initiated, lead

Patents

1. **Y. Zhao**, Y. L. Guan, "A Reconfigurable Intelligent Surface System for Wireless Communications," granted patent, No. WO2024196311A1.
2. **Y. Zhao**, Y. L. Guan, Afkar Mohamed Ismail, C. Yuen, "Multi-Spot Beamforming Orbital Angular Momentum (OAM) Reconfigurable Intelligent Surfaces (RIS)," PCT Patent Application, No. 10202400406R.
2. **Y. Zhao**, Y. L. Guan, C. Yuen, Y. Hong, "A covert communication scheme that transmit and receive indexing bits using 3D OAM beam patterns and reconfigurable meta-surface," Patent Application, NTU Ref: 2024-384.
3. Z. Yang, Y. L. Guan, **Y. Zhao**, "A Shape Index Modulation Transmitter for a Multi-Mode Orbital Angular Momentum (OAM) System,", granted patent, No. WO/2024/237853.
4. C. Zhang, **Y. Zhao**, Chinese granted patent, CN110177067A.
5. C. Zhang, **Y. Zhao**, Chinese granted patent, CN110445742A.
6. C. Zhang, **Y. Zhao**, Chinese granted patent, CN108566356B.

Research Experiences

2020–2021 — **Reconfigurable antenna system based on metasurface and characteristic mode analysis technology**

Participate · Huawei Technology Limited Company (Beijing)

In charge of the research project of the smart metamaterial surface (Project approval and periodic report) The performance evaluation of Reconfigurable Intelligent Surface (RIS) in communication systems (Multi-cell scenarios, programming).

2020–2021 — **Ultra-massive MIMO communications, integrated radar and communication system**

Participate · Huawei Technology Limited Company (Beijing)

In charge of the research project of the reconfigurable MIMO-HBF system, and integrated radar and communication researches (Project approval, periodic report, measurement, performance evaluation, participate in academic discussion and so on).

2021–now — **Intelligent vehicle and transportation research based on integrated radar and communication technologies**

Lead · Nanyang Technological University

Develop and design integrated RadCom systems tailored for intelligent vehicles. Create and optimize signal processing algorithms for simultaneous radar and communication operations. Collaborate on the development of experimental prototypes and conduct field trials to validate the performance of integrated radar and communication systems.

2021–now — **Reconfigurable metasurface and innovative antenna design for future communication application scenarios**

Lead · Nanyang Technological University

Design and optimize innovative antenna structures that integrate with reconfigurable metasurfaces to achieve superior performance in future communication systems. Develop prototypes of the reconfigurable metasurfaces and antenna designs. Conduct experimental validation in real-world settings to assess performance, robustness, and adaptability.

2023–now — **Research on Rydberg atomic microwave sensor in communication and radar system**

Participate · Nanyang Technological University

Design theoretical models and simulations to understand the behavior of Rydberg atoms in the presence of microwave fields. Design theoretical models and simulations to understand the behavior of Rydberg atoms in the presence of microwave fields. Investigate methods for integrating Rydberg atomic sensors into existing communication and radar architectures.

Journal Publications Selected

1. **Y. Zhao**, et al., "Free space spot-beamforming for IoT multi-user near-orthogonal overlay communications enhanced by OAM waves and reconfigurable metasurface," *Electromagnetic Science*, 2025.
2. **Y. Zhao**, et al., "Metasurface Router for Near-Field Multi-User Low-Interference Access Driven by Structured Wave," *IEEE Transactions on Vehicular Technology*, under review, 2025, **IF 6.7**.
3. A. M. Ismail, **Y. Zhao**, et al., "Visually steered reconfigurable intelligent surface-assisted mobile communications," *IEEE Antennas and Wireless Propagation Letters*, 2025, **IF 4.8**. **(Corresponding Author)**
4. Y, Li, **Y. Zhao**, et al., "A Novel Design of Varactor-Based RIS: Achieving Low-Profile, Wideband, and Continuous Phase Control," *IEEE Antennas and Wireless Propagation Letters*, 2025, **IF 4.8**. **(Corresponding Author)**
5. X. Ma, **Y. Zhao**, et al., "Joint precoder and reflector design for RIS-assisted multi-user OAM communication systems," *IEEE Transactions on Wireless Communications*, 2025, **IF 10.7**. **(Corresponding Author)**
6. **Y. Zhao**, et al., "2-Bit RIS prototyping enhancing rapid-response space-time wavefront manipulation for wireless communication: Experimental studies," *IEEE Open Journal of the Communications Society*, 2024, **IF 6.3**.
7. **Y. Zhao**, et al., "Near-orthogonal overlay communications in LoS channel enabled by novel OAM beams without central energy voids: An experimental study," *IEEE Internet of Things Journal*, 2024, **IF 8.9**.

Journal Publications Selected

8 **Y. Zhao**, et al., "Exploring RCS diversity with novel OAM beams without energy void: An experimental study," *IEEE Transactions on Vehicular Technology*, 2024, **IF 6.7**.

9 Z. Zhao, X. Feng, **Y. Zhao**, et al., "OFDM-Based Waveform Design for MIMO DFRC Systems with Reduced Range Sidelobes: A Majorization-Minimization Approach," *IEEE Transactions on Vehicular Technology*, 2024, **IF 6.7**, **(Corresponding Author)**.

10 **Y. Zhao**, et al., "Holographic-inspired metasurfaces exploiting vortex beams for low-interference multi-node IoT communications: Theory to prototype," *IEEE Internet of Things Journal*, 2023, **IF 8.9**.

11 **Y. Zhao**, et al., "Multimode OAM beams convergent transmission with co-divergent angle tailored by Airy wavefront," *IEEE Transactions on Antennas and Propagation*, 2023, **IF 5.8**.

12 **Y. Zhao**, et al., "Orbital angular momentum nondegenerate index mapping for long distance transmission," *IEEE Transactions on Wireless Communications*, 2019, **IF 10.7**.

13 **Y. Zhao**, et al., "Distributed antennas scheme for orbital angular momentum long-distance transmission," *IEEE Antennas and Wireless Propagation Letters*, 2020, **IF 4.8**.

14 **Y. Zhao**, et al., "Compound angular lens for radio orbital angular momentum coaxial separation and convergence," *IEEE Antennas and Wireless Propagation Letters*, 2019, **IF 4.8**.

15 **Y. Zhao**, et al., "Orbital angular momentum beamforming for index modulation with partial arc reception," *Electronics Letters*, 2019, **IF 0.8**.

16 Q. Lyu, **Y. Zhao**, et al., "Angular Metasurface Design based on Constitutive Parameters," *Electromagnetic Science*, 2025. **(Corresponding Author)**

17 A. Ding, Y. H. Lee, E. L. Tan, **Y. Zhao**, et al., "Focusing Metasurfaces of (Un)equal Power Allocations for Wireless Power Transfer," *IEEE Antennas and Wireless Propagation Letters*, 2025, **IF 4.8**.

18 Y. Chen, X. Guo, C. Yuen, **Y. Zhao**, et al., "Harnessing Rydberg atomic receivers: From quantum physics to wireless communications," *IEEE Transactions on Wireless Communications*, under review, 2025. **IF 10.7**

19 T. Gong, J. Sun, C. Yuen, G. Hu, **Y. Zhao**, et al., "Rydberg atomic quantum receivers for classical wireless communications and sensing: Their models and performance," *IEEE Transactions on Communications*, under review, 2025. **IF 7.2**

20 H. Shi, **Y. Zhao**, et al., "Stacked intelligent metasurface with polarization controllable steep frequency filtering," *Advanced Functional Materials*, under review, 2025. **IF 18.5**

21 D. Lin, J. Wan, J. Wang, L. Kong, **Y. Zhao**, et al., "A Novel topology-scale-adaptive and energy-efficient clustering scheme for energy sustainable large-scale SWIPT-enabled WSNs," *IEEE Trans. on Mobile Computing*, 2024, **IF 7.7**.

22 H. Luo, J. Wang, D. Lin, L. Kong, **Y. Zhao**, et al., "A novel high-precision and low-latency abandoned object detection method under the hybrid cloud-fog computing architecture," *IEEE Internet of Things Journal*, 2024, **IF 8.2**.

23 H. Luo, J. Wang, D. Lin, L. Kong, **Y. Zhao**, et al., "A novel energy-efficient approach based on clustering using grey prediction in WSNs for IoT infrastructures," *IEEE Internet of Things Journal*, 2024, **IF 8.2**.

24 Z Yang, Y Ge, **Y. Zhao**, et al., "Protograph LDPC code and shaped index modulation design for multi-mode OAM systems," *IEEE Transactions on Communications*, 2024, **IF 8.3**.

25 M. Chen, R. Chen, **Y. Zhao**, et al., "Index-modulation OAM detectors resistant to beam misalignment," *IEEE Transactions on Vehicular Technology*, 2024, **IF 6.7**.

26 C. Zhang, **Y. Zhao**, et al., "Position aided open-loop passive magnetic MIMO transmission," *IET Communications*, 2017, **IF 1.5**.

27 C. Zhang, **Y. Zhao**, et al., "High precision deep sea geomagnetic data sampling and recovery with three-dimensional compressive sensing," *IEICE TRANSACTIONS on Fundamentals of Electronics, Communications and Computer Sciences*, 2017, **IF 0.4**.

28 C. Zhang, **Y. Zhao**, et al., "High Precision electromagnetic momentum positioning with current loop," *Journal of Magnetics*, 2017, **IF 0.6**.

29 C. Zhang, X. Jiang, **Y. Zhao**, "Efficient instantaneous channel propagation modeling for aeronautical communications systems with compressed sensing," *IEEE Transactions on Antennas and Propagation*, 2021. **IF 5.8**

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Conference Publications Selected

1. **Y. Zhao**, et al., "Metamaterial antenna skin enables advanced human machine interactions," *IEEE International Conference on Flexible Printable Sensors and Systems*, 2025.
2. **Y. Zhao**, et al., "IF phase compensation and demultiplexing for distributed OAM radio receiving system," *ICC 2024-IEEE International Conference on Communications*, 2024.
3. **Y. Zhao**, et al., "2-bit intelligent reflection surface enhances urban wireless communications: An experimental study," *2024 IEEE International Workshop on Antenna Technology (iWAT)*, 2024.
4. **Y. Zhao**, et al., "Enhancing urban mobile communications with dynamic 3D beam tracking: A 2-bit phase-quantized adaptive RIS approach," *IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2024)*, 2024.
5. **Y. Zhao**, et al., "Overcoming energy divergence with high-order and directional OAM pencil beams," *2024 IEEE Asia Pacific Microwave Conference (APMC)*, 2024.
6. **Y. Zhao**, et al., "Flexible secondary beamforming using holographic metasurfaces for multi-mode vortex beam transmission in wireless communications," *2024 IEEE Vehicular Technology Conference (VTC2024-Spring)*, 2024.
7. **Y. Zhao**, et al., "Advanced artificial Doppler shift manipulation with rotational vortex beams in space-time digital-coding RIS system: A practical approach," *2024 VTS Asia Pacific Wireless Communications Symposium (APWCS)*, 2024.
8. **Y. Zhao**, et al., "Vortex beams enhance IRS-aided low-rank channel transmission: Principle and prototype," *ICC 2023-IEEE International Conference on Communications*, 2023.
9. **Y. Zhao**, et al., "Orbital angular momentum transmission based on satellite formation relay in space communications," *2022 Asia-Pacific Microwave Conference (APMC)*, 2022.
10. **Y. Zhao**, et al., "OAM-based reconfigurable Doppler shifts enable PAPR reduction for multi-carrier Doppler diversity," *2022 Asia-Pacific Microwave Conference (APMC)*, 2022.
11. **Y. Zhao**, et al., "Flexible self-alignment reception for OAM-based large-capacity wireless backhaul links," *2022 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (AP-S/URSI)*, 2022.
12. **Y. Zhao**, et al., "Orbital angular momentum waves multiplexing transmission experiment based on pseudo-coplanar scheme," *2019 IEEE International Conference on Communications (ICC)*, 2019.

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Experiments Demonstrations Selected

1. Visually Steered Reconfigurable Intelligent Surface Assisted Mobile Communications: `https://youtu.be/jMiD8xICdm4`
2. Artificial Doppler Shift Experiment Comparing with OAM Beams and Plane Waves: `https://youtu.be/IJDO-I-umaI`
3. RIS Prototyping Enhancing Rapid-Response Space-Time Wavefront Manipulation for Wireless Communication: `https://youtu.be/riBH0YZBXtk`
4. Holographic-Inspired Metasurfaces Exploiting Vortex for Low-Interference Multi-Node IoT Communications: `https://youtu.be/EvCkdouuihw`
5. Metamaterial Antenna Skin Enables Advanced Human Machine Interactions: `https://youtu.be/kdKsCEPi6fs`
6. Exploring RCS Diversity with Novel OAM Beams without Energy Void: `https://youtu.be/q9B4OVHIfbM`
7. Rotational OAM-based Target Detection for Advanced Radar Applications: `https://youtu.be/Qw1GKBZsUKA`
8. Multi-User Low-Interference Near-Field Access Enabled by Spatially Converging Multi-Mode Vortex Waves: `https://youtu.be/mE-ztLe0D6g`
9. Intelligent Meta-Surface OAM Router for Scalable High-Capacity Low-Interference Communications: `https://youtu.be/E8e1TrlYKLQ`
10. Near-Orthogonal Overlay Communications in LoS Cchannel En- abled by Novel OAM Beams without Central Energy Voids: `https://youtu.be/cQiwJqzv7m4`