

# Zhibin Zou

☎ +1(518)334-0810 | ✉ zzou2@albany.edu | 🏠 www.zhibinzou.com | in zhibin-zou-8665851a4 | 📍 Albany, NY, USA

## Education

### University at Albany, State University at New York

Albany, NY, USA

Ph.D. in Electrical and Computer Engineering (GPA 4.0/4.0)

Sep. 2019 - Present

- Advised by Weifu Wang in Robotics from Sep. 2019 - June. 2021
- Advised by Aveek Dutta in Wireless Communication from June. 2021 - Present
- Selected Courses: Advanced Digital Communication, Modern Wireless Network, Machine Learning and Information Theory, Probability and Random Process, Digital Signal Processing, Statistical Signal Processing, Engineering Optimization, Parameter Estimation and Signal Detection Theory, Discrete Mathematics with Applications, Cyber-Physical Systems, Linear Control Theory, Robotics.

### Xidian University

Xi'an, China

Master of Signal and Information Processing (GPA: 3.75/4.0)

Sep. 2016 - Jun. 2019

### Xidian University

Xi'an, China

Bachelor of Electrical and Computer Engineering (GPA: 3.35/4.0)

Sep. 2012 - Jun. 2016

## Publications

My research focuses on waveform design, precoding and modulation for next-generation wireless communications. I have strong knowledge of MIMO, OFDM, OTFS, channel decomposition, interference cancellation, delay-Doppler domain analysis and machine learning techniques.

### Journals

- [1] **Z Zou**, A Dutta. "Waveforms for xG Non-Stationary Channels," arXiv:2301.00454
- [2] **Z Zou**, M Careem, A Dutta, N Thawdar. "Joint Spatio-Temporal Precoding for Practical Non-Stationary Wireless Channels," *IEEE Transactions on Communications (TCOM)*, vol. 71, no. 4, pp. 2396 - 2409, 2023
- [3] **Z Zou**, L Song, X Cheng. "Labeled box-particle CPHD filter for multiple extended targets tracking," *Journal of Systems Engineering and Electronics*, vol. 30, no.1, pp. 57-67, 2019
- [4] X Cheng, L Song, H Ji, **Z Zou**. "Group target tracking algorithm based on labeled box particle probability hypothesis density," *Systems Engineering and Electronics*, vol. 41, no.8, pp. 1677-1685. 2019

### Conferences

- [1] **Z Zou**, I Amarasekara, A Dutta. "Learning to Decompose Asymmetric Channel Kernels for Generalized Eigenwave Multiplexing," (Submitted to IEEE INFOCOM 2024)
- [2] **Z Zou**. "Optimizing towards the best insertion-based error-tolerating joints," (Submitted to IEEE ICRA 2024)
- [3] **Z Zou**, A Dutta. "Multidimensional Eigenwave Multiplexing Modulation for Non-stationary Channels," in *Proc. IEEE Global Communications Conference (GLOBECOM)*, to appear, 2023
- [4] **Z Zou**, A Dutta. "Capacity Achieving by Diagonal Permutation for MU-MIMO channels," in *Proc. IEEE Global Communications Conference (GLOBECOM)*, to appear, 2023
- [5] **Z Zou**, X Wei, D Saha, A Dutta, G Hellbourg. "SCISRS: Signal Cancellation using Intelligent Surfaces for Radio Astronomy Services," in *Proc. IEEE Global Communications Conference (GLOBECOM)*, 2022
- [6] **Z Zou**, M Careem, A Dutta, N Thawdar. "Unified Characterization and Precoding for Non-Stationary Channels," in *Proc. IEEE International Conference on Communications (ICC)*, 2022 [**Best Paper Award**]
- [7] X Cheng, L Song, **Z Zou**. "Multiple group target tracking with evolving networks and labeled box particle PHD filter," in *Proc. 30th Chinese Control And Decision Conference (CCDC)*, 2018
- [8] **Z Zou**, L Song, X Cheng. "Labeled box-particle PHD filter for multi-target tracking," in *Proc. IEEE International Conference on Computer and Communications (ICCC)*, 2017

### Patents

- [1] L Song, Y Pan, **Z Zou**, et al. "Passive Box-particle PHD multi-target tracking based on TDOA," *CN Patent*, Application Number 201810825869.8, Patent Number CN108981707B (Granted)
- [2] L Song, H Cent, Y Pan, P Yang, **Z Zou**, et al. "A evaluation for the multiple group and extended target ellipse shape estimation," *CN Patent*, Application Number 201811640647.5, Patent Number CN109683150B (Granted)
- [3] L Song, P Yang, H Ceng, Y Pan, **Z Zou**, et al. "Front vehicles distance measuring based on deep learning," *CN Patent*, Application Number 201811322870.5, Patent Number CN109509223A (Filed)

## Research Projects

### NSF CAREER: “Generalizing Deep Learning for Wireless Communication”

MESA Lab, SUNY Albany

This project aims to generalize the architecture of a Deep Learning (DL) based wireless transceiver that will consistently operate with low error rate in all types of wireless channels, but especially outperform the state of the art in future xG channels. My contributions of this work is summarized as:

June. 2021 - Present

- Proposed a multidimensional eigenwave multiplexing (MEM) modulation which designs carriers at the eigen domain to achieve joint orthogonality across space, time-frequency, and delay-Doppler domain
- Proposed an explainable Neural Network to decompose the high-dimensional channel kernel into eigenwaves and implement MEM
- Ongoing work on the channel coding, waveform design and NN architecture optimization

### AFRL Visiting Faculty Research Program: “Channel prediction and precoding for non-stationary wireless channels”

MESA Lab, SUNY Albany

This project aims to predict the real-time CSI at the transmitter by outdated CSI and do precoding to cancel interference for non-stationary channels. My contributions of this work is summarized as:

June. 2020 - Nov 2021

- Derived a High-order Generalized Mercer’s Theorem (HOGMT) for rapidly time-varying multi-dimensional channels decomposition
- Proposed a unified characterization method for non-stationary channels
- Proposed a HOGMT based spatio-temporal precoding to cancel spatial, temporal and jointly spatio-temporal interference

### NSF SWIFT: “SCISRS: Signal Cancellation using Intelligent Surfaces for Radio Astronomy Services”

MESA Lab, SUNY Albany

The objectives of this project are to accurately estimate the RFI incident at the telescope and to configure the RIS so the reflected signal arriving at the telescope receiver precisely cancels the incident RFI. My contributions are:

Apr. 2022 - Present

- Assisted in preparing the NSF SWIFT project proposal
- Proposed the phase and energy solution for RIS elements to cancel RFI
- Proposed an error bound for SCISRS based on the location error

### NSF Collaborative Research: RI: Medium: “ Robust Assembly of Compliant Modular Robots”

Wang’s Lab, SUNY Albany

This project explores how flexible robots can be designed to move and join together to form larger structures, such as temporary antennas, tent supports, bridges, or tunnel reinforcements. My contributions are:

Apr. 2019 - Dec. 2020

- Defined the point-edge contact model for peg-in-hole problem
- Proposed an optimization for error-tolerating peg and socket joints with respect to insertion and stability

### Random Finite Sets based Multi-target Tracking

Li’s Lab Xidian University

The objective of this project is to design Random Finite Sets (RFS) based filters for multi-target tracking, multiple extended targets tracking, and multiple group targets tracking. My contributions summarized as:

Sep. 2016 - May. 2019

- Proposed a labeled box-particle Probability Hypothesis Density (PHD) filter for multi-target tracking
- Implement a Cardinalized Probability Hypothesis Density (CPHD) filter for multiple extended/group target tracking

## Awards and Honors

Jun. 2022	<b>Young Gladiator:</b> “Funded by Institute for the Wireless Internet of Things at Northeastern University”
May. 2022	<b>Best Paper Award, IEEE ICC:</b> “IEEE ICC is the flagship conference of IEEE ComSoc”
Sep. 2020	<b>Granted Chinese Patents:</b> “Patents CN 108981707B and CN109683150B are granted”
Nov. 2018	<b>National Scholarship, China:</b> “Highest level scholarship for students in China”
Dec. 2017	<b>Excellent Graduate Student, Xidian University</b>
Nov. 2017	<b>National Scholarship, China:</b> “Highest level scholarship for students in China”

## Experience

### Research Assistant

MESA Lab, University at Albany, SUNY

2021-Present

Research focuses on MIMO/OFDM/OTFS, Precoding, Modulation, Channel Decomposition, Interference Cancellation, RIS, Machine Learning

### Research Assistant

Weifu Wang’s Lab, University at Albany, SUNY

2019-2021

Research focuses on Robotics, Block Optimization

### Research Assistant

Liping Song’s Lab, Xidian University

2016-2019

Research focuses on Target Tracking, Random Finite Sets Theory, Box-Particle Filter

## Service and Activities

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- Invited to present my work at the [Special Technical Session](#) in IEEE ICC 2022
- Assisted in preparing the funded project NSF SWIFT [#2229496](#) (\$634,799.00)
- Reviewer of IEEE Transactions on Neural Networks and Learning Systems, Computational Intelligence and Neuroscience, Wireless Communications and Mobile Computing, Frontiers in Energy Research, Frontiers in Neurorobotics, IEEE International Conference on Communications, IEEE Globecom, and IEEE/RSJ International Conference on Intelligent Robots and Systems
- Student Member of IEEE, IEEE ComSoc, ACM

## Skills

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<b>Expertise</b>	MIMO, OFDM, Precoding, Signal Processing, Spectrum Analysis, Machine Learning, Target Tracking, Bayesian Filter
<b>Instrument Skills</b>	Raspberry Pi, Software Defined Radios (SDR), Blender
<b>Programming</b>	Matlab, Julia, Python
<b>Languages</b>	English, Chinese (Native)

## References

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- Prof. Aveek Dutta  
Assistant Professor, University at Albany SUNY, Albany, NY, USA  
☎ +1(518)442-5083    ✉ [adutta@albany.edu](mailto:adutta@albany.edu)
- Prof. Dola Saha  
Assistant Professor, University at Albany SUNY, Albany, NY, USA  
☎ +1(303)638-3752    ✉ [dsaha@albany.edu](mailto:dsaha@albany.edu)