Zhibin Zou

zzou2@albany.edu | www.zhibinzou.com | zhibin-zou-8665851a4 | Guilderland, 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) — Aug. 2019 - Present

- Advised by Prof. Weifu Wang in Robotics from Aug. 2019 - Jun. 2021
- Advised by Prof. Aveek Dutta in Wireless Communication from Jun. 2021 - Present.

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, modulation and machine learning for next-generation wireless communications.

Conferences

[C9] **Z Zou**, X Wei, X Tian, G Chen, A Dutta, K Pham, E Blasch. "Joint Interference Cancellation with Imperfect CSI," *in Proc. IEEE Military Communications Conference (MILCOM) 2024*

[C8] I Amarasekara, **Z Zou**, A Dutta. "Adaptive Neural Network for Deconstructing Multi-dimensional Channel Kernels," *in Proc. IEEE Vehicular Technology Conference (VTC), 2024*

[C7] **Z Zou**, I Amarasekara, A Dutta. "Learning to Decompose Asymmetric Channel Kernels for Generalized Eigenwave Multiplexing," *in Proc. IEEE International Conference on Computer Communications (INFOCOM) 2024* (Acceptance rate $\approx 19.5\%$)

[C6] **Z Zou**, A Dutta. "Multidimensional Eigenwave Multiplexing Modulation for Non-stationary Channels," *in Proc. IEEE Global Communications Conference (GLOBECOM), 2023*

[C5] **Z Zou**, A Dutta. "Capacity Achieving by Diagonal Permutation for MU-MIMO channels," *in Proc. IEEE Global Communications Conference (GLOBECOM), 2023*

[C4] **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*

[C3] **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**] (Award rate $\approx 0.64\%$)

[C2] 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*

[C1] **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*

Journals

[J7] **Z Zou**, I Amarasekara A Dutta. "Explainable Neural Network for Joint Orthogonal Bases of LTV Channels, "*IEEE Transactions on Wireless Communications (TWC)* (Under Review)

[J6] **Z Zou**, A Dutta. "Multi-dimensional Eigenwave Multiplexing (MEM): A General Modulation Beyond OTFS, "*IEEE Transactions on Wireless Communications (TWC)* (Under Review)

[J5] **Z Zou**, A Dutta. "Waveforms for xG Non-Stationary Channels, " arXiv:2301.00454

[J4] **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

[J3] **Z Zou**. "Optimizing towards the best insertion-based error-tolerating joints," arXiv:2209.15147

[J2] **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

[J1] 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

Patents

[P3] 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

[P2] L Song, H Cent, Y Pan, P Yang, **Z Zou**, et al. "A evaluation for the multple group and extended target ellipse shape estimation," *CN Patent*, Application Number 201811640647.5, Patent Number CN109683150B

[P1] 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)

Experience

xAI

AI Tutor - STEM Specialist — 2024. Dec - Present

Refine annotation tools and tackle complex problems in advanced STEM fields using my expertise. Leverage domain knowledge to input data effectively, driving substantial improvements in model performance.

Intelligent Fusion Technology

Research Intern — 2024. May - 2024. Aug

1) Develop algorithms for interference cancellation for time-varying MIMO channels. 2) Develop the simulator for satellite communications and GPS localization.

Publications: [C9]

University at Albany, SUNY

Research Assistant — 2021-Present

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

Publications: [J3], [J4], [J5], [J6], [J7], [C3], [C4], [C5], [C6], [C7], [C8]

Liping Song's Lab, Xidian University

Research Assistant — 2016-2019

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

Publications: [J1], [J2], [C1], [C2], [P1], [P2], [P3]

Awards and Honors

Oct. 2024	**IEEE MILCOM Travel Grant**
Aug. 2023	**National Interest Waiver**: "NIW has been approved, and I do not need employer sponsorship"
Jun. 2022	**Young Gladiator**: "Funded by Institute for the Wireless Internet of Things at Northeastern University"
May. 2022	**Best Paper Award, IEEE ICC**: "IEEE ICC is the flagship conference of IEEE ComSoc"
Sep. 2020	**Granted Chinese Patents**: "Patents CN 108981707B and CN109683150B are granted"
Nov. 2018	**National Scholarship, China**: "Highest level scholarship for students in China"
Dec. 2017	**Excellent Graduate Student, Xidian University**
Nov. 2017	**National Scholarship, China**: "Highest level scholarship for students in China"

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 a low error rate in all types of wireless channels, but especially outperform the state of the art in future xG channels. My contributions to this work are summarized as: — March. 2022 - 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
- Proposed a robust waveform design method based on neural network with imperfect CSI

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 to this work are summarized as: — June. 2021 - Nov 2022

- 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: — Jan. 2022 - Aug. 2022

- 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

Apr. 2019 - Dec. 2020

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:

- 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

Sep. 2016 - May. 2019

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:

- 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

Service and Activities

- 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 IEEE Transactions on Cognitive Communications and Networking, IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Aerospace and Electronic Systems, Computational Intelligence and Neuroscience, Wireless Communications and Mobile Computing, Frontiers in Energy Research, Frontiers in Neurorobotics, IEEE ICC, IEEE GLOBECOM, and IEEE IROS
- Student Member of IEEE, IEEE ComSoc, ACM

Skills

Expertise	5G/6G, MIMO, OFDM, Deep Learning [Certificate], Channel Decomposition, Interference Cancellation, Precoding, Signal Processing, Equalization, Satellite Communication, GPS Localization, Target Tracking
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.
Instrument Skills	Raspberry Pi, Software Defined Radios (SDR), Blender
Programming	Matlab, Python , Julia, C++
Languages	English, Chinese (Native)

References

- Prof. Aveek Dutta
  Associate Professor, University at Albany SUNY, Albany, NY, USA
  +1(518)442-5083 adutta@albany.edu
- Genshe Chen
  CTO, Intelligent Fusion Technology, Inc., Germantown, MD, USA
  +1(240)481-5397 gchen@intfusiontech.com
- Xue Wei
  Ph.D. candidate, University at Albany SUNY, Albany, NY, USA
  +1(518)334-7713 xwei4@albany.edu