

Jie Lu

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Highlights: IEEE INFOCOM 2026; IEEE ICC 2023; IEEE Transactions Journals

Research Interests: O-RAN, 5G NR, Reinforcement Learning for Wireless Networks, and Explainable AI

Education

Ph.D. , Computer Science and Engineering, Michigan State University, USA (Advisor: Prof. Huacheng Zeng)	08/2024 - Present
M.Eng. , Communication Engineering, Chongqing University, China	09/2021 - 06/2024
B.Eng. , Electronic Information Engineering, South-Central Minzu University, China	09/2017 - 06/2021

Technical Skills

Programming Languages: C++, Python (PyTorch), MATLAB, Linux/Bash

Skills: 5G NR (MAC Layer), O-RAN (xApp Development), Near-real-time Radio Resource Management, Deep Reinforcement Learning (PPO, SAC), Explainable AI, End-to-end O-RAN testbed implementation with USRP/commercial radio unit and 10+ smartphones

Research Experience

Deep Reinforcement Learning for 6G Open AI-RAN: A Comprehensive Survey	05/2026–08/2026
- Led and first-authored a comprehensive survey of DRL for 6G Open AI-RAN, connecting learning methodologies with O-RAN architecture, control loops, and deployment requirements. - Developed an O-RAN-aware taxonomy of DRL methods and applications spanning resource management, mobility management, interference control, traffic steering, energy efficiency, network slicing, ISAC, security, and massive MIMO. - Synthesized emerging directions in trustworthy and deployable DRL, including agentic AI, sim-to-real transfer, continual adaptation, benchmarks, standards, and RL operations. (Outcomes: P1).	
DeRAN: Neuro-Symbolic Framework for Interpretable O-RAN Automation – NTIA	12/2025–04/2026
- Developed a neuro-symbolic framework that distills black-box DRL policies into human-readable symbolic representations, enabling trustworthy and auditable automation in carrier-grade 5G O-RAN. - Designed a concept-driven abstraction layer that maps high-dimensional network telemetry into compact, semantically meaningful features, and synthesized interpretable policies via deep symbolic regression (DSR) for continuous control and neurally guided differentiable logic (NUDGE) for discrete decision-making. - Implemented and evaluated the framework on a live 5G O-RAN testbed across two use cases (network slicing and handover), retaining 78% and 87% of DRL's cumulative rewards while providing interpretability by design. (Outcomes: P2).	
EExAPP: Energy-Aware Resource Slicing in Open Radio Access Network (O-RAN) – NTIA	01/2025–07/2025
- Developed an online-learning xApp using a Dual-Actor-Dual-Critic Proximal Policy Optimization (PPO) framework to jointly optimize sleep scheduling and resource slicing for 5G O-RAN in near-real-time. - Implemented a Transformer-based encoder and Graph Attention Network (GAT) to enable scalable resource management for dynamic user populations. - Validated performance on a real-world O-RAN testbed with commercial RU and live traffic, achieving 62% reward improvement while maintaining QoS. (Outcomes: P3).	
xSlice: Graph-Learning Enhanced Resource Slicing – NTIA	10/2024–01/2025
- Designed an online-learning xApp that adaptively adjusts MAC-layer resource allocation based on time-varying channel conditions and traffic fluctuations in near-real-time. - Integrated Graph Convolutional Networks (GCN) with PPO to minimize performance regret by 67% in heterogeneous traffic scenarios. - Conducted over-the-air experiments with USRP and commercial smartphones to evaluate near-real-time QoS optimization and spectrum efficiency. (Outcomes: P4).	
Interference Management in UAV-Assisted Heterogeneous Network – NSFC	01/2022–08/2023
- Proposed a UAV-assisted Heterogeneous Cloud Radio Access Network (H-CRAN) architecture using multiple UAVs as flying radio remote heads (RRHs) to offload traffic and provide seamless coverage. - Developed a comprehensive Interference Management scheme (SIC-STIA-IS) to mitigate cross-tier and co-channel interference in H-CRAN. - Performed extensive simulations to optimize beamforming and sector division, achieving a 45% increase in the sum rate. (Outcomes: P5 & P7).	

Selected Publications

- [P1] J. Lu, P. Yan, Q. Wang, et al., "Deep Reinforcement Learning for 6G AI-RAN: A Comprehensive Survey," *arXiv preprint arXiv:2608.14877*, 2026.
- [P2] J. Lu, P. Yan, P. TAN, et al., "Demystifying Deep Reinforcement Learning: A Neuro-Symbolic Framework for Interpretable Open RAN Automation.", *arXiv preprint arXiv:2605.10648*, 2026.
- [P3] J. Lu, P. Yan, and H. Zeng, "EEExApp: GNN-Based Reinforcement Learning for Radio Unit Energy Optimization in 5G O-RAN", *IEEE International Conference on Computer Communications (INFOCOM)*, 2026. [**Acceptance rate: 18.9%**]
- [P4] P. Yan, J. Lu, H. Zeng., and Y.T. Hou, "Near-Real-Time Resource Slicing for QoS Optimization in 5G O-RAN using Deep Reinforcement Learning", *IEEE/ACM Transactions on Networking*, 2025.
- [P5] J. Lu, J. Li, F.R. Yu, et al., "UAV-Assisted Heterogeneous Cloud Radio Access Network With Comprehensive Interference Management", *IEEE Transactions on Vehicular Technology*, 2024.
- [P6] J. Lu, W. Feng, D. Pu, "Resource Allocation and Offloading Decisions of D2D Collaborative UAV-Assisted MEC Systems", *KSII Transactions on Internet & Information Systems*, 2024.
- [P7] J. Lu, J. Nie, J. Li, et al., "SIC-STIA-IS: An Interference Management Scheme for the UAV-assisted Heterogeneous Network", *ICC 2023-IEEE International Conference on Communications*, 2023.
- [P8] J. Lu, W. Feng, Y. Li, et al., "VMD and self-attention mechanism-based Bi-LSTM model for fault detection of optical fiber composite submarine cables", *EURASIP Journal on Advances in Signal Processing*, 2023.
- [P9] J. Lu, J. Li, W. Feng et al., "Timing shift-based bi-residual network model for the detection of electricity stealing", *EURASIP Journal on Advances in Signal Processing*, 2022.

Honors & Awards

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| • SIGCOMM 2026 N2Women Travel Grant | 2026 |
| • National Scholarship for Graduate Students (Top 1% , highest honor for graduate students in China) | 2023 |
| • Outstanding Graduate Award | 2023 |
| • First-Class Graduate Scholarship | 2022 |
| • National Scholarship for Undergraduate Students (Top 1% , highest honor for undergraduate students in China) | 2018, 2019, 2020 |

Teaching Experience

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| • Teaching Assistant: MSU CSE 422 - Computer Networks | Spring 2026 |
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Professional Services

- Journal Reviewer
- IEEE Transactions on Wireless Communications
 - IEEE Transactions on Vehicular Technology