HAO ZHOU

Postdoctoral Researcher, School of Computer Science, McGill Unversity hao.zhou4@mail.mcgill.ca

EDUCATION AND WORKING

Postdoctoral Researcher, School of Computer Science, McGill University, Canada Oct.2023 – Now
Supervisor: Prof. Xue (Steve) Liu

Ph.D. in Electrical and Computer Engineering, University of Ottawa, Canada Sep.2019 – Aug. 2023
Supervisor: Prof. Melike Erol-Kantarci

M.Eng in Electrical Engineering, Tianjin University, China Sep.2016 – Dec.2018
Supervisor: Prof. Shaoyun Ge. GPA: 4.0 / 4.0

B.Eng. in Electrical Engineering and Automation, Huazhong University of Science and Technology, China
GPA: 4.0 / 4.0 Sep.2012 – Jun.2016

Research interests: **AI-enabled Wireless Networks**: Developing AI/ML techniques, such as **reinforcement learning, transfer learning, large language models, in-context learning**, for **5G/6G networks**: network slicing, network security, Open-radio access networks (O-RAN), Reconfigurable intelligent surfaces (RISs), mmWave networks.

AI for Smart Home and Microgrid: ML-enabled **energy trading** for smart home and microgrid, renewable energy resources integration.

SCHOLARSHIP AND AWARDS

Best Doctoral Thesis Award in Faculty of Engineering, University of Ottawa (*1st position among all PhD graduates of the engineering faculty in 2023*) May. 2024

Best Journal Paper Award, IEEE ComSoc CSIM Technical Committee Nov. 2023

Best Paper Award, COMMUNICATION SOFTWARE & MULTIMEDIA Track, IEEE International Conference on Communications (ICC) (*one of 16 selected papers from 2778 submissions*) May. 2023

Outstanding Self-financed Abroad Chinese Students Award (6000 USD $), China Scholarship Council Jul. 2023

International Doctoral Scholarship, University of Ottawa 2019 – 2023

International Doctoral Admission Scholarship, University of Ottawa 2020 – 2023

Canada NSERC CREATE TOP-SET, Canada NSERC 2019 – 2023

Second Prize Graduate Student Scholarship, Tianjin University Oct.2017 and Oct.2018

Outstanding Graduate Award, Huazhong University of Science and Technology May.2016

Outstanding Student Leader Award, Huazhong University of Science and Technology Oct.2014 and Sep.2015

National Encouragement Scholarship, Huazhong University of Science and Technology Oct.2013 and Sep.2014

PROJECT EXPERIENCE

Large Language Model-driven Efficient and Flexible NextG Cellular Network Management with American Samsung May.2024 – Aug.2025
Contribution: I am a team leader for this project and supervise 3 PhD students. It aims to investigate how state-of-the-art large language model (LLM) techniques can be used for efficient and flexible nextG wireless networks. **As the main proposal writer, this collaboration has been granted the Samsung Global Research Outreach (GRO) program (150,000 USD for 1 year, and only 11 projects are selected worldwide).**

AI-enabled Performance Enhancement for the Reconfigurable Multi-Player RAN- MITACS Accelerate Program with Ericsson Canada May.2020 – Aug.2023

Contribution: I supervised **1 Master and 3 PhD students in this project as the organizer and team leader. This collaboration has produced more than 5 conference papers and 5 patents collaborated with Ericsson.** I proposed a hierarchical deep reinforcement learning scheme for joint sleep and transmission power control of small base stations. We combine the reconfigurable intelligent surface with the sleep control for energy-efficient RAN.

Ontario Centers of Excellence (OCE) 5G ENCQOR with Ciena May.2020-Mar.2022

Contribution: I have **supervised 1 Master student** in this project, contributing to 3 conference papers. We proposed two novel clustering methods that consider the user uncertainties in the beam management of mmWave, and a vision-aided localization method to predict the user locations.

PUBLICATIONS

Journal Papers:

[J16] H. Zhou, C. Hu, D. Yuan, Y. Yuan, D. Wu, X. Chen, H. Tabassum, X. Liu, "Large Language Models (LLMs) for Wireless Networks: An Overview from the Prompt Engineering Perspective," ***IEEE Wireless Communications***, pp.1-10, Jan. 2025.

[J15] H. Zhou, C. Hu, D. Yuan, Y. Yuan, D. Wu, X. Liu, Z. Han, and C. Zhang, "Generative AI as a Service in 6G Edge-Cloud: Generation Task Offloading by In-context Learning," ***IEEE Wireless Communications Letters***, pp.1-5, Dec. 2024.

[J14] M. A. Habib, **H. Zhou**, PE. Iturria-Rivera, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, and M. Erol-Kantarci, "Machine Learning-enabled Traffic Steering in O-RAN: A Case Study on Hierarchical Learning Approach," ***IEEE Communications Magazine***, vol.63, no.1, pp. 100-107, Jan. 2025.

[J13] S. Salhi, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, and M. Erol- Kantarci, "Jamming Attacks and Mitigation in Transfer Learning Enabled 5G RAN Slicing," ***IEEE Trans. on Machine Learning in Communications and Networking***, vol. 2, pp. 1492-1508, Sep. 2024.

[J12] H. Zhou, C. Hu, Y. Yuan, Y. Cui, Y. Jin, C. Chen, H. Wu, D. Yuan, L. Jiang, D. Wu, X. Liu, C. Zhang, X. Wang, and J. Liu, "Large Language Model (LLM) for Telecommunications: A Comprehensive Survey on Principles, Key Techniques, and Opportunities," ***IEEE Communications Survey & Tutorials***, pp.1-52, Sep. 2024.

[J11] H. Zhou, M. Erol-Kantarci, Y. Liu, and H. V. Poor, "A Survey on Model-based, Heuristic, and Machine Learning Optimization Approaches in RIS-aided Wireless Networks," ***IEEE Communications Survey & Tutorials***, vol.26, no.2, pp.781-823, 2nd quarter, 2024.

[J10] H. Zhou, M. Erol-Kantarci, Y. Liu, and H. V. Poor, "Heuristic Algorithms for RIS-assisted Wireless Networks: Exploring Heuristic-aided Machine Learning," ***IEEE Wireless Communications***, vol.3, no.4, pp.1-9, Aug. 2024.

[J09] H. Zhou, M. Elsayed, M. Bavand, R. Gaigalas, S. Furr, and M. Erol-Kantarci, "Cooperative Hierarchical Deep Reinforcement Learning based Joint Sleep, Power, and RIS Control for Energy-Efficient RAN," ***IEEE Trans. on Cognitive Communications and Networking***, pp.1-15, Jul. 2024.

[J08] H. Zhang, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, and M. Erol-Kantarci, "On-Device Intelligence for 5G RAN: Knowledge Transfer and Federated Learning enabled UE-Centric Traffic Steering," ***IEEE Trans. on Cognitive Communications and Networking***, vol.10, no.2, pp. 689-705, Apr. 2023.

[J07] M. Razghandi, **H. Zhou**, M. Erol-Kantarci, and D. Turgut, "Smart Home Energy Management: VAE-GAN synthetic dataset generator and Q-learning," ***IEEE Trans. on Smart Grid***, vo.15, no.2, pp.1562-1573, May 2024.

[J06] H. Zhou, M. Erol-Kantarci, and H. V. Poor, "Knowledge Transfer and Reuse: A Case Study of AI-enabled Resource Management in RAN Slicing," ***IEEE Wireless Communications***, vol.30, no.5, pp.1-10, Oct. 2023.

[J05] H. Zhou, M. Erol-Kantarci, and H. V. Poor, "Learning from Peers: Deep Transfer Reinforcement Learning for Joint Radio and Cache Resource Allocation in 5G Network Slicing," ***IEEE Trans. on Cognitive Communications***

and Networking, vol.8, no.4, pp.1925-1941, Dec.2022. *IEEE ComSoc CSIM TC Best Journal Paper Award*

[J04] H. Zhou, A. Aral, I. Brandic, and M. Erol-Kantarci, "Multi-agent Bayesian Deep Reinforcement Learning for Microgrid Energy Management under Communication Failures," ***IEEE Internet of Things Journal***, vol.9, no.14, pp.11685-11698, Jul. 2022.

[J03] PE. Iturria-Rivera, H. Zhang, **H. Zhou**, S. Mollahasani, and M. Erol-Kantarci, "Multi-Agent Team Learning in Virtualized Open Radio Access Networks (O-RAN)," ***Sensors***, vol.22, no.14, pp.1-13, Jul. 2022.

[J02] S. Ge, **H. Zhou**, H. Liu, et al., "Coordinated Planning of Highway Charging Stations and Rest Area Considering Traffic Accidents," ***Proc. of the CSU-EPSA***, vol.31, no.3, pp.1-8. Mar. 2019.

[J01] J. Huang, **H. Zhou**, J. Han, et al., "Distribution Network Reliability Assessment Considering V2G," ***Electric Construction***, vol.38, no.2, pp.77-83. Mar. 2017.

Under Review Works:

[U06] Z. Yan, **H. Zhou**, H. Tabassum, and X. Liu, "Hybrid LLM-DDQN based Joint Optimization of V2I Communication and Autonomous Driving," pp.1-5, Oct. 2024. (Minor revision, ***IEEE Wireless Communications Letters***)

[U05] H. Zhang, W. Wang, **H. Zhou**, Z. Lu, and Ming. Li, "A Hierarchical DRL Approach for Resource Optimization in Multi-RIS Multi-Operator Networks," pp.1-13, Oct. 2024. (Major revision, ***IEEE Trans. on Wireless Communications***)

[U04] C. Hu, **H. Zhou**, D. Wu, X. Chen, J. Yan, and X. Liu, "Self-Refined Generative Foundation Models for Wireless Traffic Prediction," pp.1-5, Aug. 2024. (Submitted to ***IEEE Trans. on Vehicular Technology***)

[U03] H. Zhou, C. Hu, D. Yuan, Y. Yuan, D. Wu, X. Liu, and C. Zhang, "Large Language Model (LLM)-enabled In-context Learning for Wireless Network Optimization: A Case Study of Power Control," pp.1-5, Aug. 2024. (Submitted to ***IEEE Wireless Communications Letters***)

[U02] H. Zhou, C. Hu, and X. Liu "An Overview of Machine Learning-Enabled Optimization for Reconfigurable Intelligent Surfaces-Aided 6G Networks: From Reinforcement Learning to Large Language Models," pp.1-8, Apr. 2024. (**An invited paper by *2024 IEEE Future Networks World Forum***)

[U01] H. Zhang, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, and M. Erol-Kantarci, "Intelligent Attacks and Defense Methods in Federated Learning-enabled Energy-Efficient Wireless Networks," pp.1-13, Dec. 2023, (Major revision, ***IEEE Trans. on Wireless Communications***).

Conference Papers:

[C24] Z. Yan, **Hao Zhou**, J. Pei, A. Kaushik, H. Tabassum, P. Wang, "CVaR-Based Variational Quantum Optimization for User Association in Handoff-Aware Vehicular Networks," **Accepted by *2024 IEEE ICC***, Jan. 2025, pp. 1-6.

[C23] S. Salhi, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, and M. Erol- Kantarci, "Jamming Attacks and Mitigation in Transfer Learning Enabled 5G RAN Slicing," ***in Proc. 2024 IEEE ICC***, Jun. 2024, pp. 4269-4274.

[C22] H. Zhang, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, and M. Erol-Kantarci, "Distributed Attacks over Federated Reinforcement Learning-enabled Cell Sleep Control," ***in Proc. 2023 IEEE GLOBECOM Workshop***, Dec. 2022, pp.1-6.

[C21] S. Salhi, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, and M. Erol- Kantarci, "Policy Poisoning Attacks on Transfer Learning enabled Resource Allocation for Network Slicing," ***in Proc. 2023 IEEE GLOBECOM***, Dec. 2022, pp.1-6.

[C20] Y. Dantas, PE. Iturria-Rivera, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, and M. Erol- Kantarci, "Split Learning for Sensing-Aided Single and Multi-Level Beam Selection in Multi-Vendor RAN," ***in Proc. 2023 IEEE GLOBECOM***, Dec. 2022, pp.1-6.

[C19] M. A. Habib, **H. Zhou**, PE. Iturria-Rivera, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, and M. Erol-Kantarci, "Hierarchical Reinforcement Learning Based Traffic Steering in Multi-RAT 5G Deployments," ***in Proc.***

2023 IEEE ICC, May. 2022, pp.1-6. *2023 IEEE ICC Best Paper Award.*

[C18] Y. Dantas, PE. Iturria-Rivera, **H. Zhou**, M. Elsayed, M. Bavand, R. Gaigalas, and M. Erol- Kantarci, "Beam Selection for Energy-Efficient mmWave Network Using Advantage Actor Critic Learning," ***in Proc. 2023 IEEE ICC***, May. 2022, pp.1-6.

[C17] M. A. Habib, **H. Zhou**, PE. Iturria-Rivera, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, and M. Erol-Kantarci, "Intent-driven Intelligent Control and Orchestration in O-RAN via Hierarchical Reinforcement Learning," ***in Proc. 2023 IEEE MASS***, Sep. 2023. pp.1-7.

[C16] M. A. Habib, **H. Zhou**, PE. Iturria-Rivera, M. Elsayed, M. Bavand, R. Gaigalas, S. Furr, and M. Erol-Kantarci, "Traffic Steering for 5G Multi-RAT Deployments using Deep Reinforcement Learning," ***in Proc. 2022 IEEE CCNC***, Jan. 2023, pp. 1-6.

[C15] **H. Zhou**, L. Kong, M. Elsayed, M. Bavand, R. Gaigalas, S. Furr, and M. Erol-Kantarci, "Hierarchical Reinforcement Learning for RIS-Assisted Energy-Efficient RAN," ***in Proc. 2022 IEEE GLOBECOM***, Dec. 2022, pp.1-6.

[C14] H. Zhang, **H. Zhou**, and M. Erol-Kantarci, "Federated Deep Reinforcement Learning for Resource Allocation in O-RAN Slicing," ***in Proc. 2022 IEEE GLOBECOM***, Dec. 2022, pp.1-6.

[C13] Y. Yao, **H. Zhou**, M. Erol-Kantarci, "Joint Sensing and Communications using Deep Reinforcement Learning-based Beam Management in 6G Networks," ***in Proc. 2022 IEEE GLOBECOM***, Dec. 2022, pp.1-6.

[C12] Y. Yao, **H. Zhou**, M. Erol-Kantarci, "Deep Reinforcement Learning-Based Radio Resource Allocation and Beam Management Under Location Uncertainty in 5G mmWave Networks," ***in Proc. 2022 IEEE ISCC***, Jul. 2022, pp.1-6.

[C11] H, Zhang, **H. Zhou**, M. Erol-Kantarci, "Team Learning-Based Resource Allocation for Open Radio Access Network (O-RAN)," ***in Proc. 2022 IEEE ICC***, Jan. 2022, pp.1-6.

[C10] M. Razghandi, **H. Zhou**, M. Erol-Kantarci, and D. Turgut, "Variational Autoencoder Generative Adversarial Network for Synthetic Data Generation in Smart Home," ***in Proc. 2022 IEEE ICC***, Jan. 2022, pp.1-6.

[C09] **H. Zhou**, and M. Erol-Kantarci, "Knowledge Transfer based Radio and Computation Resource Allocation for 5G RAN Slicing," ***in Proc. 2022 IEEE CCNC***, Jan. 2022, pp.1-6.

[C08] M. Razghandi, **H. Zhou**, M. Erol-Kantarci, and D. Turgut, "Smart Home Energy Management: Sequence-to-Sequence Load Forecasting and Q-Learning," ***in Proc. 2021 IEEE GLOBECOM***, Dec. 2021, pp.1-6.

[C07] **H. Zhou**, M. Elsayed, and M. Erol-Kantarci, "RAN Resource Slicing in 5G Using Multi-Agent Correlated Q-Learning," ***in Proc. 2021 IEEE PIMRC***, Sep. 2021, pp.1-6.

[C06] M. Razghandi, **H. Zhou**, M. Erol-Kantarci, and D. Turgut, "Short-Term Load Forecasting for Smart Home Appliances With Sequence to Sequence Learning," ***in Proc. 2021 IEEE ICC***, Jun. 2021, pp.1-6.

[C05] **H. Zhou**, and M. Erol-Kantarci, "Decentralized Microgrid Energy Management: A Multi-agent Correlated Q-learning Approach," ***in Proc. 2020 IEEE SmartGridComm***, Nov. 2020, pp.1-7.

[C04] **H. Zhou**, and M. Erol-Kantarci, "Correlated Deep Q-learning based Microgrid Energy Management," ***Proc. IEEE 25th Int. Workshop CAMAD***, Sep. 2020, pp.1-6.

[C03] J. Zhang, **H. Zhou**, C. Liu, et al. "Highway Charging Station Plan Based on Dynamic Traffic Flow Simulation," ***in Proc. 2018 Int. Conf. on Energy, Environment, Bio. Sciences***, Mar. 2018, pp.1-6.

[C02] J. Zhang, **H. Zhou**, et al., "Multi-objective Planning of Charging Stations Considering Vehicle Arrival Hot Map," ***in Proc. 2017 IEEE EI2***, Nov. 2017, pp.1-6.

[C01] S. Ge, J. Li, H. Liu, X. Liu, Y. Wang, and **H. Zhou**, "Domestic Energy Consumption Modeling per Physical Characteristics and Behavioral Factors," ***in Proc. 2018 ICAE***, Aug. 2018, pp.1-6.

PATENTS AND INVENTION DISCLOSURES

[P06] H. Zhang, **H. Zhou**, M. Erol-Kantarci, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, "Attacks and defense in federated reinforcement learning-based wireless networks, US provisional patent filed on 5 May 2023, US patent filed on 05 May 2024.

[P05] Y. Dandas, P. E. Iturria Rivera, **H. Zhou**, M. Erol-Kantarci, M. Bavand, M. Elsayed, R. Gaigalas, Y. Ozcan, "Split Learning for Sensing-Aided Beam Selection", US provisional patent filed on 29 April 2023, US patent filed on 29 April 2024.

[P04] H. Zhang, **H. Zhou**, M. Erol-Kantarci, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, "User Equipment (UE)-centric Traffic Steering for Wireless Communications", US provisional patent filed on 18 April 2023, US patent filed on 17 April 2024.

[P03] A. Habib, **H. Zhou**, P. E. Iturria Rivera, M. Erol-Kantarci, M. Elsayed, M. Bavand, R. Gaigalas, Y. Ozcan, "System and Method for Intelligent Traffic Steering in RAT", US provisional patent filed on 10 November 2022, PCT patent filed on 11 November 2023.

[P02] H. Zhou, Melike Erol-Kantarci, M. Elsayed, M. Bavand, R. Gaigalas, S. Furr, "System and Method for Intelligent Joint Sleep, Power and RIS Control", US provisional patent filed on 11 August 2022, US patent filed on 11 August 2023.

[P01] H. Zhou, L. Kong, Melike Erol-Kantarci, M. Bavand, R. Gaigalas, M. Elsayed, S. Furr, "System and Method for RIS-Assisted Energy-Efficient RAN Using Hierarchical Reinforcement Learning", US provisional patent filed on 07 May 2022, US patent filed on 06 May 2023

TEACHING AND TRAINING EXPERIENCE

Virtual Could RAN Intern, Ericsson, Canada — Jan.2023 – Apr.2023

Research Assistant, NETCORE Lab, University of Ottawa, Canada — Sep.2019-Aug.2023

Teaching Assistant, School of Electrical and Computer engineering, University of Ottawa:
ELG3155: Introduction to Control Systems ELG4139: Electronics
ELG4126: Sustainable Electrical Power Systems ELG4152: Modern Control Systems
ELG4157: Modern Control Engineering ELG3316: Electric Machines and Power Systems — Sep.2020-Dec.2022

Research Assistant, Key Laboratory of Smart Grid of Ministry of Education, Tianjin University — Sep.2016-Dec.2019

PROFESSIONAL SERVICES, INVITED TALKS, AND TUTORIALS

Tutorials on "**Generative Foundation Models (GFMs) For NextG Communication Networks: Fundamentals, Key Techniques, and Future Directions**" — 2025 IEEE International Conference on Communications (ICC)

Invited talks on "**Optimization Techniques for Reconfigurable Intelligent Surfaces**", AI/ML Working Group — IEEE Future Networks Feb. 2024

Invited talks on "**Large Language Models (LLMs) for NextG Wireless Networks**", AI/ML Working Group — IEEE Future Networks Sep. 2024

TPC Member, 2025 IEEE ICC Conference — Oct. 2024

TPC Member, 2024 IEEE ICC Conference — Oct. 2023

Session Chair, 2022 IEEE CCNC Conference — Jan.2022

Session Chair, 2021 IEEE PIMRC Conference. — Sep.2021

Google Scholar link: https://scholar.google.com/citations?user=AVx1JkgAAAAJ&hl=zh-CN