

Yuanjian LI, Postdoctoral Research Fellow, PhD, MEng, BEng

 LinkedIn  PersonalPage  GitHub  ResearchGate  GoogleScholar  Kaggle  ORCID
 yuanjian.li@ntu.edu.sg  dr.yuanjian.li@icloud.com  1032662342@qq.com  WeChat: LI1032662342

$\frac{1}{\sqrt{2}}$ |Wireless Communications> + $\frac{1}{2}$ |Machine Learning> + $\frac{1}{2}$ |Quantum Computing>

Brief Introduction: I earned PhD in Telecommunications from the Centre for Telecommunication Research (CTR), King's College London (KCL), supervised by Professor A. Hamid Aghvami, Life Fellow of IEEE, Fellow of IET and Fellow of the Royal Academy of Engineering (RAEng), and Professor Osvaldo Simone, Fellow of IEEE.

Research Expertise: Artificial Intelligence (AI)-Native Sixth-Generation (6G) Wireless Systems, Internet of Intelligent Things (IoT), Edge Intelligence, AI-Enabled Joint Computing and Communication Resource Coordination for Non-Terrestrial Communications (e.g., Drone-Aided Networks), (Scalable/Multi-Agent) Deep Reinforcement Learning (DRL), Compressive Sensing (CS)- and Machine Learning (ML)-Aided Channel Estimation, and (Quantum) Machine Learning.

International Collaborators: Hamid. Aghvami (U.K., IEEE Life Fellow), A S Madhukumar (Singapore, IEEE Senior Member), Mathini Sellathurai (U.K., IEEE Fellow), Daoyi Dong (Australia, IEEE Fellow), Gan Zheng (U.K., IEEE Fellow), Walid Saad (U.S., IEEE Fellow), Pei Xiao (U.K., IEEE Senior Member), Yansha Deng (U.K., IEEE Senior Member), Osvaldo Simeone (U.K., IEEE Fellow), Rui Zhao (China, IEEE Member), Feng Shu (China, IEEE Member), An Liu (China, IEEE Senior Member), Tan Zheng Hui Ernest (Singapore).

Data Science and Machine Learning: I have gained broad knowledge and hands-on experience in using Pandas (data analysis/processing/cleaning/refining), Numpy (vectorized mathematical operations), Scipy (data distribution conversion/signal processing), Tensorflow/PyTorch (machine learning framework), Sklearn (machine learning model and data preprocessing related) and Seaborn (data visualization, similar tools include Matplotlib, Bokeh and Plotly) from online community of data scientists and machine learning practitioners, i.e., Kaggle.

Employment

2023.07–Present **Research Fellow** (Work Visa, Full-Time), *Nanyang Technological University*, Singapore
2023.03–2023.06 **Research Associate** (Work Visa, Full-Time), *Heriot-Watt University*, U.K.
2023.01–2023.03 **Research Assistant** (Student Visa, Part-Time), *University of Warwick*, U.K.

Education

2019.10–2022.12 **Doctor of Philosophy (PhD)** in Telecommunications, *King's College London*, U.K.
2016.09–2019.06 **M.Eng.** in Information and Communications Engineering, *Huaqiao University*, Xiamen, China
2011.09–2015.06 **B.Eng.** in Communications Engineering, *Nanjing Tech University*, China

Graduate Teaching Assistant

- > 7CCEMDCO Digital Communications (22~23 SEM1 000001)
- > 5CCE2MCT Mechatronics (21~22 SEM2 000001)
- > 7CCSMMPC Mobile and Personal Communications (20~21 SEM2 000001)

Participated Research Grants

1. National Research Foundation (NRF) Singapore, Competitive Research Programme, NRF-CRP23-2019-0005, On-chip Terahertz Topological Photonics for 6G Communication (TERACOMM)
2. NRF Singapore & Infocomm Media Development Authority (IMDA), Future Communications Research & Development Programme, FCP-NTU-RG-2022-014, Hybrid TeraHertz/Free Space Optics (THz/FSO) for 6G Communication Networks, 2022-10 to 2025-03, SGD 910,000
3. EPSRC, Programme Grants, EP/T021063/1, COG-MHEAR: Towards cognitively-inspired 5G-IoT enabled, multi-modal Hearing Aids, 2021-03 to 2026-02, GBP 3,259,000
4. EPSRC, Research Grant, EP/X04047X/1, Platform Driving The Ultimate Connectivity, 2023-05 to 2024-03, GBP 2,030,860

Peer Review and Chairing for Journals and Conferences

- > **Reviewer for Journals:** IEEE Journal on Selected Areas in Communications (*JSAC*), IEEE Transactions on Wireless Communications (*TWC*), IEEE Transactions on Neural Networks and Learning Systems (*TNLS*), IEEE Transactions on Mobile Computing (*TMC*), IEEE Transactions on Systems, Man, and Cybernetics: Systems (*TSMC*), IEEE Journal of Biomedical and Health Informatics (*JBHI*), IEEE Wireless Communications Magazine (*WCM*), IEEE Internet of Things Journal (*IoTJ*), IEEE Transactions on Information Forensics and Security (*TIFS*), IEEE Internet of Things Magazine (*IoTMag*), IEEE Transactions on Communications

(TCom), IEEE Transactions on Vehicular Technology (TVT), IEEE Wireless Communications Letters (WCL), IEEE ACCESS, Elsevier Digital Communications and Networks (DCN), International Journal of Computing and Digital Systems (IJCDs), SAGE International Journal of Distributed Sensor Networks (IJDSN).

- > **Reviewer for Conferences:** IEEE Global Communications Conference (GLOBECOM), IEEE International Conference on Communications (ICC), IEEE Vehicular Technology Conference (VTC), IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC).
- > **Chairing for Conference:** Session chair for IEEE ICC'22-SAC-05 Machine Learning for Communications Track-Networks

© Patents

1. Secrecy rate optimization method for energy-limited untrusted relay network, Filled 2019-10-08, Issued 2022-08-30, CN Patent No. ZL201910456910.3
2. Untrusted relay network secure transmission method based on opportunity type wireless energy collection, Filled 2019-10-08, Issued 2022-07-01, CN Patent No. ZL201910456465.0
3. Active eavesdropping method based on wireless energy acquisition and full duplex, Filled 2019-04-19, Issued 2022-05-03, CN Patent No. ZL201811249636.4
4. A method for selecting secure transmission of unidirectional full-duplex MIMO relay antennas, Filled 2019-01-11, Issued 2021-03-23, CN Patent No. ZL201810700060.2
5. Bidirectional and duplex MIMO (Multiple Input Multiple Output) relay antenna selection and safety transmission method, Filled 2018-12-21, Issued 2021-02-02, CN Patent No. ZL201810700066.X
6. Artificial noise precoding secure transmission method for full duplex relay system, Filled 2017-08-22, Issued 2020-11-03, CN Patent No. ZL201710307921.6
7. Full duplex multi-antenna destination node interference transmission method based on optimum antenna selection, Filled 2017-09-29, Issued 2020-06-26, CN Patent No. ZL201710273932.7
8. Full-duplex relay transmission method based on energy state, Filled 2018-04-13, Issued 2019-12-13, CN Patent No. ZL201710-463555.3
9. Full-duplex opportunistic relaying protocol self-adaptation switching security transmission scheme, Filled 2017-06-23, Issued 2019-10-18, CN Patent No. ZL201710016694.1

📖 Paper Publications

Manuscripts Under Peer Review:

1. **Yuanjian Li**, A. S. Madhukumar, Tan Zheng Hui Ernest, Gan Zheng, Walid Saad, and A. Hamid Aghvami, "Energy-Efficient UAV-Driven Multi-Access Edge Computing: A Distributed Many-Agent Perspective," Submitted to *IEEE Transactions on Communications* (TCom)
Multi-agent deep reinforcement learning | UAV | energy efficiency | multi-drone multi-user resource association | multi-access edge computing
2. **Yuanjian Li**, and A. S. Madhukumar, "Mixed Near- and Far-Field THz UM-MIMO Channel Estimation: A Sparsifying Matrix Learning-Aided Bayesian Approach," Major Revision for *IEEE Transactions on Wireless Communications* (TWC).
Channel estimation | THz | ultra-massive MIMO | model-driven deep learning | sparse Bayesian learning | adaptive dictionary learning

Published Journals:

1. **Yuanjian Li** and A. Hamid Aghvami, "Radio Resource Management for Cellular-Connected UAV: A Learning Approach," *IEEE Transactions on Communications* (TCom), vol.71, pp.2784-2800, 2023. DOI: [10.1109/TCOMM.2023.3262826](https://doi.org/10.1109/TCOMM.2023.3262826).
Deep reinforcement learning | drones | resource allocation | beamforming design
2. **Yuanjian Li**, A. Hamid Aghvami, and Daoyi Dong, "Path Planning for Cellular-Connected UAV: A DRL Solution with Quantum-Inspired Experience Replay," *IEEE Transactions on Wireless Communications* (TWC), vol.21, pp.7897-7912, 2022. DOI: [10.1109/TWC.2022.3162749](https://doi.org/10.1109/TWC.2022.3162749).
Deep Reinforcement learning | drones | trajectory design | quantum-inspired experience replay | performance optimization
3. **Yuanjian Li**, A. Hamid Aghvami, and Daoyi Dong, "Intelligent Trajectory Planning in UAV-mounted Wireless Networks: A Quantum-Inspired Reinforcement Learning Perspective," *IEEE Wireless Communications Letters* (WCL), vol.10, pp.1994-1998, 2021. DOI: [10.1109/WCL.2021.3089876](https://doi.org/10.1109/WCL.2021.3089876).
Reinforcement learning | quantum mechanics | drones | trajectory planning | quantum-inspired action selection policy
4. **Yuanjian Li**, Rui Zhao, YanSha Deng, Feng Shu, Zhiqiao Nie, and A. Hamid Aghvami, "Harvest-and-Opportunistically-Relay: Analyses on Transmission Outage and Covertness," *IEEE Transactions on Wireless Communications* (TWC), vol.19, pp.7779-7795, 2020. DOI: [10.1109/TWC.2020.3015816](https://doi.org/10.1109/TWC.2020.3015816).
Covert communications | transmission outage | performance analysis | wireless relaying networks | discrete energy harvesting | Markov chain

5. **Yuanjian Li**, Rui Zhao, Yi Wang, Gaofeng Pan, and Chunguo Li, "Artificial Noise Aided Precoding with Imperfect CSI in Full-Duplex Relaying Secure Communications," *IEEE ACCESS*, vol.6, pp.44107–44119, Aug., 2018.
Maximum ratio combining cooperative relay decode and forward artificial noise imperfect CSI asymptotic performance analysis
6. **Yuanjian Li**, Rui Zhao, Lisheng Fan, and An Liu, "Antenna Mode Switching for Full-Duplex Destination-Based Jamming Secure Transmission," *IEEE ACCESS*, vol.6, pp.9442–9453, Jan., 2018.
Physical layer security antenna mode switching convex optimization KKT conditions destination-based jamming optimal power allocation
7. Ke Yang, Siling Feng, Rongen Dong, Xuehui Wang, Yan Wang, Jiatong Bai, **Yuanjian Li**, and Jiangzhou Wang, "IRS-User Matching and Beamforming Design for Multi-Active-IRS-and-UAV-Aided Secure Directional Modulation Networks," Accepted by *Elsevier Chinese Journal of Aeronautics (CJA)*.
Directional modulation active intelligent reflecting surface secrecy sum-rate intelligent reflecting surface unmanned aerial vehicle
8. Daliang Ouyang, Rui Zhao, **Yuanjian Li**, Rongxin Guo, and Yi Wang, "Antenna Selection in Energy Harvesting Relaying Networks Using Q-Learning Algorithms," *China Communications*, vol.18, pp.64–75, Apr., 2021.
Q-learning optimal power split factor outage probability ergodic capacity antenna selection
9. Rui Zhao, Xing Tan, **Yuanjian Li**, Yucheng He, Chunguo Li, and Zhiqiao Nie, "Asymptotic performance analysis of untrusted relay system with full-duplex jamming destination," *Journal on Communications*, vol.39, pp.20-30, Sep., 2018.
Physical layer security full-duplex destination jamming optimal antenna selection ergodic secrecy rate secrecy outage probability
10. Daliang Ouyang, Rui Zhao, **Yuanjian Li**, "Analysis and Optimization of Wireless Powered Untrusted Relay System with Multiple Destinations," *Physical Communication*, vol.42, pp.101161, Jul., 2020.
Physical layer security antenna mode switching destination selection ergodic secrecy rate non-linear energy harvesting
11. Daliang Ouyang, Rui Zhao, Yi Wang, **Yuanjian Li**, and Yulin Yang, "Analysis of Ergodic Security Performance in Multi-User Diversity and Energy-Constrained Untrusted Relay Systems," *Journal of Signal Processing*, vol.35, Feb., 2019.
Physical layer security energy harvesting ergodic secrecy rate opportunistic scheduling untrusted relay

Published Conferences

1. **Yuanjian Li**, A. S. Madhukumar, Tan Zheng Hui Ernest, Gan Zheng, Walid Saad, and A. Hamid Aghvami, "Energy-Efficient UAV-Aided Computation Offloading on THz Band: A MADRL Solution," Accepted by *IEEE Global Communications Conference (GLOBECOM)*, Cape Town, South Africa, Dec., 2024.
Multi-agent deep reinforcement learning drones energy efficiency THz edge computing multi-dimension optimization
2. **Yuanjian Li**, Mathini Sellathurai, Zheng Chu, Pei Xiao and A. Hamid Aghvami, "DRL-Aided Joint Resource Block and Beamforming Management for Cellular-Connected UAVs," *IEEE Global Communications Conference (GLOBECOM)*, Kuala Lumpur, Malaysia, Dec., 2023.
UAV deep reinforcement learning beamforming cellular networks
3. **Yuanjian Li**, Mathini Sellathurai and A. Hamid Aghvami, "Secrecy Performance Analysis on UAV Down-Link Broadcasting with a Full Duplex Receiver," *IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC)*, Toronto, Canada, Sep., 2023.
Physical layer security UAV full duplex secrecy performance analysis Monte Carlo simulation
4. **Yuanjian Li** and A. Hamid Aghvami, "Covertess-Aware Trajectory Design for UAV: A Multi-Step TD3-PER Solution," *IEEE International Conference on Communications (ICC)*, Seoul, May, 2022. DOI: [10.1109/ICC45855.2022.9839093](https://doi.org/10.1109/ICC45855.2022.9839093)
Covert communications deep reinforcement learning UAV trajectory optimization Gaussian-noised location
5. **Yuanjian Li** and A. Hamid Aghvami, "Intelligent UAV Navigation: A DRL-QiER Solution," *IEEE International Conference on Communications (ICC)*, Seoul, May, 2022. DOI: [10.1109/ICC45855.2022.9838566](https://doi.org/10.1109/ICC45855.2022.9838566)
Deep Reinforcement learning drones trajectory design quantum-inspired experience replay performance optimization
6. **Yuanjian Li**, Rui Zhao, Xing Tan, and Zhiqiao Nie, "Secrecy Performance Analysis of Artificial Noise Aided Precoding in Full-Duplex Relay Systems," *IEEE Global Communications Conference (GLOBECOM)*, Singapore, Dec., 2017. DOI: [10.1109/GLOCOM.2017.8254504](https://doi.org/10.1109/GLOCOM.2017.8254504)
Full-duplex relay Rayleigh fading channel artificial noise aided precoding Gaussian-Laguerre approximation beamforming
7. Xing Tan, Rui Zhao, and **Yuanjian Li**, "Large-Scale Antennas Analysis of Untrusted Relay System with Cooperative Jamming," *IEEE International Conference on Network and Service Management (CNSM)*, Japan, Nov., 2017. DOI: [10.23919/CNSM.2017.8256012](https://doi.org/10.23919/CNSM.2017.8256012)
Destination-based jamming full-duplex antenna selection ergodic achievable secrecy rate power allocation
8. Zhiqiao Nie, Rui Zhao, **Yuanjian Li**, and Xing Tan, "A Full-Duplex SWIPT Relaying Protocol Based on Discrete Energy State," *IEEE International Symposium on Wireless Personal Multimedia Communications (WPMC)*, Indonesia, Dec., 2017. DOI: [10.1109/WPMC.2017.8256012](https://doi.org/10.1109/WPMC.2017.8256012)

1109/WPMC.2017.8301864

Full-duplex energy harvesting Markov chain outage probability

9. Daliang Ouyang, Rui Zhao, **Yuanjian Li**, and Xing Tan, “Wireless Energy Harvesting Relaying Networks Combined with Antenna Selection,” *IEEE International Symposium on Wireless Personal Multimedia Communications (WPMC), Portugal, Dec., 2019*. DOI: [10.1109/WPMC48795.2019.9096212](https://doi.org/10.1109/WPMC48795.2019.9096212)

Antenna selection energy harvesting opportunistic scheduling outage probability

Awards and Honors

- 2020.05 Winner of Provincial Excellent M.Eng. Thesis (Fujian Province in China)
2019.06 Excellent Graduate Student, *Huaqiao University*
2018.12 First Class Scholarship for Postgraduate Student, *Huaqiao University*
2018.11 National Scholarship for Graduate Students, *The Ministry of Education of the People's Republic of China*
2017.08 Academic Scholarship for Master Student, *Huaqiao University*
2016.12 General Scholarship for Master, *Huaqiao University*
2011–2014 Received academic awards many times from Nanjing Tech University

Programming

Languages: **Python, Matlab, ~~TeX~~**, Mathematica, C/C++ and VHDL.

Frameworks: **PyTorch, TensorFlow, Keras**, Scikit-learn.

Quantum Frameworks: **PennyLane, IBM Qiskit, TensorFlow Quantum**, Google Cirq.

Languages

Chinese-Mandarin: Native

English: IELTS (Academic) Overall Band 7.0

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