Yuanjian LI, Research Fellow, PhD, MEng, BEng

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

Brief Introduction : I earned the PhD degree from Centre for Telecommunication Research (CTR), King's College London (KCL), WC2R 2LS, U.K., 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 and IET.

Research Expertise : *Sixth-Generation (6G) Wireless Systems, Terahertz (THz) Communications, Channel Estimation, (Scalable/Multi-Agent) Deep Reinforcement Learning (DRL), (Quantum) Machine Learning (ML), Non-Instructive Load Monitoring (NILM) in Smart Grid, Low Latency Communications, Radio Resource Management, and Wireless Communication Performance Analysis & Optimization.*

Data Science and Machine Learning : I have gained broad knowledge and hands-on experience of 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 Seanborn (data visualization, similar tools include Matplotlib, Bokeh and Plotly) from online community of data scientists and machine learning practitioners, i.e., Kaggle.

Research Projects

1. NRF & 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
2. 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
3. EPSRC, Research Grant, EP/X04047X/1, Platform Driving The Ultimate Connectivity, 2023-05 to 2024-03, GBP 2,030,860

Employment

2023.07–Present	**Research Fellow**, Channel Estimation for THz UM-MIMO, *Nanyang Technological University*, Singapore
2023.03–2023.06	**Research Associate**, Intelligent Systems and Communications, *Heriot-Watt University*, U.K.
2023.01–2023.03	**Research Assistant** (Part-Time), Machine Learning for Smart Grid, *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

Programming

Languages :	**Python**, **Matlab**, LaTeX, Mathematica, C/C++ and VHDL.
Frameworks :	**PyTorch**, **TensorFlow**, **Keras**, Scikit-learn.
Quantum Frameworks :	**PennyLane**, **IBM Qiskit**, **TensorFlow Quantum**, Google Cirq.

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)

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

© 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.* ZL201710463555.3
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

Peer Review and Chairing for Journals and Conferences

- **Reviewer for Journals :** IEEE Journal on Selected Aera in Communications (JSAC), IEEE Transactions on Wireless Communications (TWC), IEEE Transactions on Neural Networks and Learning Systems (TNLS), IEEE Wireless Communications Magazine (WCM), IEEE Internet of Things Journal (IoTJ), IEEE Transactions on Information Forensics & Security (TIFS), IEEE Transactions on Systems, Man, and Cybernetics : Systems (TSMC), IEEE Internet of Things Magazine (IoTMag), IEEE Transactions on Communications (TCom), IEEE Transactions on Vehicular Technology (TVT), IEEE Wireless Communications Letters (WCL), Elsevier Digital Communications and Networks (DCN), 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

Paper Publications

Manuscripts Under Peer Review :

1. **Yuanjian Li**, A. S. Madhukumar, Tan Zheng Hui Ernest, Gan Zheng, Walid Saad, and A. Hamid Aghvami, "DSPAC-MN : MADRL-Enabled Energy Efficiency Optimization for UAV-Aided THz Offloading," Submitted to *IEEE Transactions on Communications*
   Multi-agent deep Reinforcement learning | drones | energy efficiency | THz | edge computing | multi-dimension optimization
2. **Yuanjian Li**, and A. S. Madhukumar, Mixed Near- and Far-Field THz UM-MIMO Channel Estimation : A Sparsifying Matrix Learning-Aided Bayesian Approach," Submitted to *IEEE Transactions on Wireless Communications*.
   Channel estimation | THz | ultra-massive MIMO | model-driven deep learning | sparse Bayesian learning | adaptive dictionary learning
3. **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," Submitted to *IEEE Global Communications Conference*
   Multi-agent deep Reinforcement learning | drones | energy efficiency | THz | edge computing | multi-dimension optimization

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`.
   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`
   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/LWC.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`
   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. 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
8. 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

Published Conferences

1. **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
2. **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 | secery performance analysis | Monte Carlo simulation
3. **Yuanjian Li** and A. Hamid Aghvami, " Covertness-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`
   Covert communications | deep reinforcement learning | UAV | trajectory optimization | Gaussian-noised location
4. **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`
   Deep Reinforcement learning | drones | trajectory design | quantum-inspired experience replay | performance optimization
5. **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`
   Full-duplex relay | Rayleigh fading channel | artificial noise aided precoding | Gaussian-Laguerre approximation | beamforming
6. 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`
   Destination-based jamming | full-duplex | antenna selection | ergodic achievable secrecy rate | power allocation
7. 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.2017.8301864`
   Full-duplex | energy harvesting | Markov chain | outage probability
8. 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`
   Antenna selection | energy harvesting | opportunistic scheduling | outage probability

Languages

Chinese-Mandarin : Native **English :** IELTS (Academic) Overall Band 7.0