Jiwei Qian

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School of Electrical & Electronic Engineering, Nanyang Technological University, Singapore

EDUCATION:

Nanyang Technological University, SG *Aug. 2021-Feb. 2026*

- *Ph.D. in Electrical & Electronic Engineering* ***Advisor: Prof. Abdulkadir C. Yucel***
- GPA: **5.0**/5.0 (**A+ for all courses**)

University of Illinois at Urbana-Champaign, USA *Aug. 2017-May. 2019*

- *Ph.D. Candidate in Electrical and Computer Engineering* ***Advisor: Prof. Jianming Jin (IEEE Fellow)***
- Overall GPA: **3.94**/4.00

Peking University, CHN *Sep. 2014-Jul.2017*

- *M. S. in Electromagnetic Field and Microwave Engineering* ***Advisor: Prof. Mingyao Xia***
- Overall GPA: **3.51**/4.00

University of Electronic Science and Technology of China, CHN *Sep. 2010-Jul.2014*

- *B. E. in Radio Wave Propagation and Antenna*
- Overall GPA: **3.89**/4.00 **Top 1**

RESEARCH EXPERIENCE:

Applied deep learning techniques for ground-penetrating radar (GPR) signals analysis and interpretation (Interdisciplinary):

- Transformers and generative models for missing GPR data reconstruction.
- Physics-informed deep learning scheme for imaging of tree defects.
- Generative models for GPR data augmentation to improve AI-based interpretation and analysis.
- CNN-based models for object detection, classification, and radargram denoising.
- Multi-modal data fusion of ultrasonic and electromagnetic sensing data for microwave inversion.

AI-assisted radar prototype for nondestructive sensing of tree's internal defects (Systematic):

- Overall design of radar scheme, considering capability of software, hardware, and the integration in between.
- Robustness of developed AI models is verified with real measurement data, achieving industry-level accuracy for detecting internal defects inside the living trees.
- The designed system has been highlighted in news and showcases, including NTU, National Parks of Singapore, and the Ministry of National Development Singapore.

Non-destructive testings for subsurface tree roots in constrained urban planting spaces (Systematic):

- Develop a coordinated sensing strategy combining ground-penetrating radar (GPR) and sonic/ultrasonic sensors to enable reliable detection and imaging of tree root systems within spatially constrained urban environments..
- Design advanced artificial intelligence methods to suppress clutter and interference caused by confined planting conditions, while enabling accurate reconstruction of the dielectric properties (permittivity) of tree roots.
- Establish a multi-modal data fusion framework that integrates ultrasonic and electromagnetic sensing data to achieve robust and high-fidelity reconstruction of subsurface root structures.

Numerical methods for modelling and optimizing the electromagnetics-based multiphysics phenomenon (Interdisciplinary):

- Finite difference time-domain method (FDTD), finite element method (FEM), method of moments (MOM),

and discontinuous Galerkin time domain methods (DGTD) for numerical modelling of the partial differential equations.

- Dynamic adaptive mesh refinement and multi-rate time integration to improve the efficiency of the model.
- Design coupled electromagnetic-plasma equations in physics to model the Multiphysics phenomenon in high-power microwave devices. (at UIUC)
- Design proper schemes to enhance electromagnetic sensing capabilities for hypersonic objects (at PKU).

JOURNAL PUBLICATIONS:

1. **J. Qian**, Y. H. Lee, K. Cheng, Q. Dai, M. L. M. Yusof, D. Lee, and A. C. Yucel, "A deep learning-augmented stand-off radar scheme for rapidly detecting tree defects," *IEEE Transactions on Geoscience and Remote Sensing* (**TGRS**), vol. 62, pp.1-15, 2024. (**Highlighted on NTU webpage and social media**)
2. **J. Qian**, Y. H. Lee, K. Cheng, Q. Dai, M. L. M. Yusof, J. Wang, and A. C. Yucel. "A migration-assisted deep learning scheme for shape and permittivity reconstruction of the target inside the cylindrical object—A case study for tree trunks." *IEEE Transactions on Geoscience and Remote Sensing* (**TGRS**), vol 64, pp.1-18, 2026.
3. **J. Qian,** Y. H. Lee, K. Cheng, M. L. M. Yusof, J. Wang, and A. C. Yucel, "MSFormer: A multi-sparsity transformer for reconstructing corrupted GPR B-scans via self-supervised learning", *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* **(JSTARS)** (Early Access)
4. **J. Qian**, H. Zhang and M. Y. Xia, "Modeling of electromagnetic scattering by a hypersonic cone-like body in near space," *International Journal of Antennas and Propagation* **(IJAP)**, vol. 2017, Article ID 3049532, 11 pages, 2017.
5. Q. Dai, Y. H. Lee, H. H. Sun, **J. Qian**, M. L. M. Yusof, D. Lee, and A. C. Yucel, "Learning from clutter: An unsupervised learning-based clutter removal scheme for GRP B-scans," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* **(JSTARS)**, vol. 17, pp. 19668-19681, 2024.
6. K. Cheng, Y. H. Lee, **J. Qian**, D. Lee, M. L. M. Yusof, and A. C. Yucel, "A compact dual-polarized Vivaldi antenna with high gain for tree radar applications," *Sensors*, vol. 24, no.13, 4170, 2024
7. Q. Dai, Y. H. Lee, H. H. Sun, **J. Qian**, G. Ow, M. Lokman, and A. C. Yucel, "A deep learning-based GPR forward solver for predicting B-scans of subsurface objects," *IEEE Transactions on Geoscience and Remote Sensing Letters* **(TGRSL)**, vol. 19, 2022.
8. S. Yan, **J. Qian** and J. Jin, "An Advanced EM-Plasma Simulator Based on the DGTD Algorithm With Dynamic Adaptation and Multirate Time Integration Techniques," *in IEEE Journal on Multiscale and Multiphysics Computational Techniques,* vol. 4, pp. 76-87, 2019.
9. K. Cheng, Y. H. Lee, **J. Qian**, M. L. M. Yusof, J. Wang, and A. C. Yucel, "A compact dual-polarized Vivaldi antenna with high gain for tree radar applications," *International Journal of Numerical Modelling: Electronic Networks, Devices and Fields*. 2026 (Invited paper) (In press)
10. K. Cheng, Y. H. Lee, **J. Qian**, Q. Dai, M. L. M. Yusof, J. Wang, and A. C. Yucel, "A CycleGAN-Based data augmentation scheme for GPR applications," submitted to *IEEE Transactions on Geoscience and Remote Sensing* **(TGRS)**

CONFERENCE PUBLICATIONS:

1. **J. Qian**, Y. H. Lee, K. Cheng, M. L. M. Yusof, J. Wang, and A. C. Yucel, "A generative adversarial network for enhancing the resolution of GPR Bscans," in *Proc. Int. Applied Comp. EM Society Symp. (ACES),* Orlando, FL, USA, 18-21 May 2025.
2. **J. Qian**, Y. H. Lee, K. Cheng, D. Lee, M. L. M. Yusof, and A. C. Yucel, "A migration-assisted deep learning scheme for shape and permittivity reconstruction of tree defects," in *Proc IEEE Int. Symp. Antennas*

Propagat., Florence, Italy, 14-19 July 2024.

3. **J. Qian**, Y. H. Lee, D. Lee, M. L. M. Yusof, and A. C. Yucel, "A signal processing framework for rapid detection of tree defects via a standoff tree radar system," in *Proc IEEE Int. Symp. Antennas Propagat*., Portland, OR, 2023.
4. **J. Qian**, Y. H. Lee, Q. Dai, K. Cheng, L. He, D. Lee, and A. C. Yucel, "Rapid health assessment of trees via deep learning-augmented radar," in *Proc CNC-USNC/URSI National Radio Sci. Meet.*, Denver, CO, 2022
5. **J. Qian**, S. Yan and J. Jin, "A DGTD algorithm with dynamic h-adaptation and multirate time integration techniques for EM-plasma interaction simulations," *2019 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting*, Atlanta, USA, 2019. (**Invited Talk)**
6. **J. Qian**, H. L. Zhang and M. Y. Xia, "Backscattering of a Hypersonic Cone with Plasma Sheath at Different Attack Angles," *2016 IEEE International Conference on Computational Electromagnetics (ICCEM)*, pp. 1-3, Guangzhou, Feb 23-25, 2016. (**Invited Talk)**
7. **J. Qian** and M. Y. Xia, "Simulation of Scattering by a Rotating Hypersonic Object with Plasma Sheath," *2015 IEEE International Conference on Computational Electromagnetics (ICCEM)*, pp. 258-260, Hong Kong, Feb 2-5, 2015.
8. N. T. Tin, **J. Qian**, K. Cheng, S. G. Razul, and A. C. Yucel, "Two-stage deep learning algorithm for reconstructing the permittivity maps in through the wall imaging scenarios," *in Proc. Int. Applied Comp. EM Society Symp. (ACES)*, Orlando, FL, USA, 18-21 May 2025.
9. K. Cheng, Y. H. Lee, **J. Qian**, J. Wang, M. L. M. Yusof, and A. C. Yucel, "CycleGAN-based data augmentation for enhanced radar-based tree defect detections," in *Proc. Int. Applied Comp. EM Society Symp. (ACES)*, Orlando, FL, USA, 18-21 May 2025.
10. K. Cheng, Y. H. Lee, **J. Qian**, D. Lee, M. L. M. Yusof, and A. C. Yucel, "A compact Vivaldi phased array antenna for tree radar applications," in *Proc 2024 Asia-Pacific Microwave Conference*, Bali, Indonesia, 17-20 November 2024.
11. K. Cheng, Y. H. Lee, **J. Qian**, B. Q. Huy, D. Lee, M. L. M. Yusof, and A. C. Yucel, "A bistatic measurement scheme for revealing signatures of tree defects in radar B-scans," in *Proc IEEE Int. Symp. Antennas Propagat.*, Florence, Italy, 14-19 July 2024。
12. N. T. Dang, Y. H. Lee, **J. Qian**, K. Cheng, D. Lee, M. L. M. Yusof, and A. C. Yucel, "A deep learning-based framework for estimating tree defect parameters via a stand-off radar," in *Proc IEEE Int. Symp. Antennas Propagat*., Florence, Italy, 14-19 July 2024
13. B. Q. Huy, Y. H. Lee, **J. Qian**, K. Cheng, D. Lee, M. L. M. Yusof, and A. C. Yucel, "A deep learning-based imaging of tree interiors via a standoff radar system," in *Proc IEEE Int. Symp. Antennas Propagat.*, Florence, Italy, 14-19 July 2024.
14. N. T. Tin, Y. H. Lee, **J. Qian**, K. Cheng, D. Lee, M. L. M. Yusof, and A. C. Yucel, "Tree defect reconstruction from radar B-scans via a deep learning algorithm with two-stage training," in *Proc IEEE Int. Symp. Antennas Propagat.*, Florence, Italy, 14-19 July 2024
15. K. Cheng, Y. H. Lee, **J. Qian**, M. Lokman, D. Lee, and A. C. Yucel, "A Vivaldi phased-array antenna for tree radar applications," in *USNC-URSI Radio Science Meeting.,* Portland, USA, 23-28 July 2023.
16. Q. Dai, Y. H. Lee, **J. Qian**, M. Lokman, D. Lee, and A. C. Yucel, "A signal processing algorithms-assisted deep learning scheme for ground-penetrating radar imaging," in *USNC-URSI Radio Science Meeting.,* Portland, USA, 23-28 July 2023.
17. S. Yan, **J. Qian** and J. Jin, "An adaptive discontinuous galerkin time-domain method for multiphysics and multiscale simulations," *2019 International Conference on Electromagnetics in Advanced Applications (ICEAA)*, Granada, Spain, 2019, pp. 0592-0592.

18. X. F. Zeng, **J. Qian** and M. Y. Xia, "Simulation of plasma sheath and scattering property of a hypervelocity reentry object," *2017 International Applied Computational Electromagnetics Society Symposium (ACES)*, Suzhou, 2017, pp. 1-2.
19. H. L. Zhang, **J. Qian**, X. Y. Guo and M. Y. Xia, "Validation of extended Kirchhoff approximation and small slope approximation for electromagnetic scattering from ship wake surfaces," *2016 International Conference on Microwave and Millimeter Wave Technology (ICMMT)*, pp. 36-38, Beijing, June 5-6, 2016.
20. M. Y. Xia, **J. Qian** and H. L. Zhang, "Analysis of electromagnetic scattering by hypersonic objects in near space," *2015 IEEE Asia-Pacific Microwave Conference (APMC)*, Nanjing, Dec 6-9, 2015.

PROJECTS:

- Tree-Root Anchorage and Non- Destructive Tests for Trees in Constrained Urban Planting Spaces — Ministry of National Development Singapore, SG
- A Deep Learning-Augmented Ultra-Wideband Radar for Rapid Detection and Imaging of Tree Defects— Ministry of National Development Singapore, SG
- A Novel Computational Approach for Multiphysics Modeling of High-Frequency Electronic Devices— Zhejiang University-University of Illinois at Urbana-Champaign Research Program, USA
- Theory and methods of quasi-static electromagnetic detection of marine environments and targets— National Science Foundation of China, CHN
- Research on electromagnetic scattering characteristics of ultra-high-speed and rotating complex targets— National Science Foundation of China, CHN

SELECTED HONOR:

- Finalist of Andrew T. Yang Research and Entrepreneurship Award — UIUC
- Lixin Tang Scholarship — PKU
- Outstanding Undergraduate Student of Sichuan Province — UESTC
- Outstanding Student of UESTC (**Top Distinction**) — UESTC

PROFESSIONAL ACTIVITY:

- Reviewer for *IEEE Transactions on Antennas and Propagation,*
- Reviewer for *IEEE Transactions on Microwave Theory and Techniques*
- Reviewer for *International Journal of Numerical Modelling: Electronic Networks, Devices and Fields*
- Reviewer for *IEEE Antennas and Wireless Propagation Letters*
- Reviewer for *IEEE Journal on Multiscale and Multiphysics Computational Techniques*
- Reviewer for *IEEE Transactions on Geoscience and Remote Sensing*
- Reviewer for *IEEE Geoscience and Remote Sensing Letters*
- Reviewer for *NDT and E International*

SKILL:

- Programming language: Matlab, Python, Pytorch.
- Proficient in Software: HFSS, FEKO, ADS, HyperMesh, ICEM-CFD, ESI-Fastran, ParaView, Tecplot