Qi Shutong

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EDUCATION BACKGROUND

University of Toronto (UofT)   **Toronto, Canada**
Ph.D. Student, Electrical and Computer Engineering   *Sep. 2020 - Present*
Research topic: Physics-Informed Machine Learning for Electromagnetic and Multiphysics Modeling

Beihang University (BUAA)   **Beijing, China**
B.Eng., Electronic and Information Engineering   *Sep. 2016 - Jun. 2020*
Excellent Graduate

RESEARCH EXPERIENCE

University of Toronto, Department of Electrical and Computer Engineering   **Toronto, Canada**
Research Assistant, Advised by Professor <u>Costas D. Sarris</u>   *Sep. 2020 - Now*

- Established a hybrid Physics-Informed Neural Network (PINN) with a finite difference method for time-domain electromagnetic modeling with unconditionally stable time-stepping.
- Integrated radial basis functions into PINNs to enable efficient unsupervised electromagnetic modeling in complex scenarios.
- Pioneered a novel approach by combining Finite-Difference Time-Domain (FDTD) method and PINN for multiphysics simulation.
- Developed a deep neural network to compensate for numerical errors in the FDTD method for planar microwave circuit modeling.

Beihang University, School of Electronic and Information Engineering   **Beijing, China**
Research Assistant, Advised by Associate Professor <u>Qiang Ren</u>   *Sep. 2018 - Jun. 2020*

- Utilized the Finite-Difference Frequency-Domain (FD-FD) method for generating an electromagnetic scattering database.
- Developed a deep neural network (U-net) to accelerate the simulation of 2-D and 3-D electromagnetic scattering problems using the FD-FD approach.

WORK EXPERIENCE

Ansys Lumerical   **Vancouver, Canada**
Intern, Mentored by Dr. Jens Niegenmann   *Aug. 2024 - Dec. 2024*

- Working on fast algorithms for metalens modeling.

SKILLS

- Programming language: Proficient in Python and Matlab. Familiar with C and C++.
- Technologies & Frameworks: Extensive experience with Python libraries and frameworks, including PyTorch, GPyTorch, NumPy, pandas, Scikit-learn, and Keras.
- Outstanding in electromagnetics theories, especially FDTD and FEM. Experienced in ANSYS HFSS, Lumerical, COMSOL Multiphysics, and FlexCompute Tidy3D.
- TOEFL: 105

SELECTED PUBLICATIONS

- **Shutong Qi** and Costas Sarris, "Hybrid Physics-Informed Neural Network for the Wave Equation with Unconditionally Stable Time-Stepping," in *IEEE Antennas and Wireless Propagation Letters*, doi: 10.1109/LAWP.2024.3355896.

- **Shutong Qi** and Costas Sarris, "Electromagnetic-Thermal Analysis With FDTD and Physics-Informed Neural Networks," in *IEEE Journal on Multiscale and Multiphysics Computational Techniques*, vol. 8, pp. 49-59, 2023, doi: 10.1109/JMMCT.2023.3236946.

- **Shutong Qi** and Costas Sarris, "Deep Neural Networks for Rapid Simulation of Planar Microwave Circuits Based on their Layouts," in *IEEE Transactions on Microwave Theory and Techniques*, 2022, doi: 10.1109/TMTT.2022.3210229.

- **Shutong Qi**, Yinpeng Wang, Yongzhong Li, Xuan Wu, Qiang Ren and Yi Ren, "2D Electromagnetic Solver Based on Deep Learning Technique," in *IEEE Journal of Multiscale and Multiphysics Computational Technique*, 2020, 5: 83-88.

- **Shutong Qi** and Costas Sarris, "Physics-Informed Neural Networks for Multiphysics Simulations: Application to Coupled Electromagnetic-Thermal Modeling," in *2023 IEEE/MTT-S International Microwave Symposium*, San Diego, CA, USA, 2023, pp. 166-169, doi: 10.1109/IMS37964.2023.10188015.

- **Shutong Qi** and Costas Sarris, "Benchmarking Physics-Informed Neural Networks for Time-Domain Electromagnetic Simulations," in *2023 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (USNC-URSI)*, Portland, OR, USA, 2023, pp. 1619-1620, doi: 10.1109/USNC-URSI52151.2023.10237914.

- **Shutong Qi** and Costas Sarris, "Numerical Dispersion Compensation for FDTD via Deep Learnings," in *2022 IEEE International Symposium on Antennas and Propagation and USNC/URSI Radio Science Meeting*, Denver, CO, USA, 2022, pp. 671-672, doi: 10.1109/AP-S/USNC-URSI47032.2022.9886317.

- Yipeng Wang, Yongzhong Li, **Shutong Qi** and Qiang Ren, "Predicting Scattering From Complex Nano-Structures via Deep Learning," in *IEEE Access*, vol. 8, pp. 139983-139993, 2020, doi: 10.1109/ACCESS.2020.3012132.

- Qiang Ren, Yinpeng Wang, Youngzhong Li and **Shutong Qi**, "Sophisticated Electromagnetic Forward Scattering Solver via Deep Learning," in *Springer Singapore Pte.* Limited, 2021.

AWARDS & ACHIEVEMENTS

- IEEE Microwave Theory and Technology Society Graduate Fellowship — *Feb. 2024*
- Excellent Graduate, Beihang University — *Jun. 2020*
- Excellent Student Leader, Beihang University — *three times*
- Excellent Academic Scholarship, Beihang University — *twice*
- Outstanding Social Work Scholarship, Beihang University — *twice*