

# Ruichen Wang

---

## EDUCATION

**Ph.D., Electrical Engineering, GPA 3.8/4.0**

Expected May 2024

University of Maryland, College Park, MD

**M.S., Electrical Engineering, GPA 3.8/4.0**

May 2017

New York University, New York, NY

**B.S., Astrophysics, GPA 3.0/4.0**

Jun 2015

Peking University, Beijing, China

## PROGRAMMING SKILLS

**Working knowledge:** C++/MATLAB

**Basic knowledge:** Python/R/JAVA

## EXPERIENCE

**University of Maryland, Maryland**

Sep 2020-May 2023

*Research & Teaching Assistant*

- Built a GAN-based ML approach to enhance the accuracy and efficiency of simulating wireless communication within 3D indoor environments, achieving lower MSEs and 5X speedup.
- Developed the EM ray-tracing tool, DCEM, in C++, focusing on acceleration algorithms such as efficient bounding volume hierarchy updates, and caching of propagation paths, and discrete signal processing to address phase distortion and multipath effects in complex environments. Achieved a 30% computation time reduction compared to conventional simulators.
- Extended DCEM for large dynamic urban environments, modeling channel correlation and spatial consistency. Verified results against conventional simulators, showcasing scalability and accuracy.
- Enhanced predictive models in DCEM with UTD smooth surface diffraction, leading to better shadow region predictions, validated by both analytical and simulated results.
- Took classes in Probability and Stochastic Process, Convex Optimization, Learning and Statistical Signal Processing, Time Series Analysis, and Linear Statistical Models.

**OriginWirelessAI, Maryland**

Sep 2019-Jul 2020

*Research Assistant*

- Developed acoustic distance sensing in C++. Transferred and polished the walk detection algorithm from MATLAB to C++ with less calculation time and prediction error. Deployed the walk detection algorithm for field tests and navigation on the physical device.
- Trained a classifier by K-means unsupervised learning to label and classify signals collected by TI mmWave chip of different sugar levels and types of solutions.
- Estimated the relationship between breathing and oxygenation during sleep based on medical and mathematical approximations, and further evaluated by measurement data.
- Enhanced sleep data processing with phase boosting techniques, and implemented an unsupervised clustering method for sleep stage classification, which improved 10% of the overall efficiency of the algorithm. Evaluated results by collecting and processing several weeks' sleep data for 1-person and 2-person sleep monitoring with commercial WiFi devices.

**Intelligent Fusion Technology, Maryland**  
**Researcher**

May 2017-Apr 2018

- Developed a novel algorithm with machine learning for fast path classification and advanced propagation models from Master Thesis, for link analysis in mmWave ray tracing simulations.
- Analyzed and modeled the 5G UAV-assisted communications in urban environments as a convex optimization problem with constraints, proposed solutions with optimized UAV deployment, and dynamic management plan. Verified by solving with PSO in MATLAB on a 2D map.

**NYU Wireless Center, New York**  
**Research & Teaching Assistant**

Sep 2016-May 2017

- Proposed a new propagation model in UHF accounting for street openings in urban street canyons based on data from industries, which showed a significant improvement (about 15%) in prediction accuracy compared to the benchmark model.
- Analyzed mmWave signal behaviors regarding power delay profiles, and collected mmWave data in urban areas in New York City and rural areas in Virginia for public use.
- Took classes in Discrete Signal Processing, Information Theory, and Wireless Communication.

**National Astronomical Observatories of China (NAOC), Beijing**  
**Research Assistant**

Sep 2014-May 2015

- Wrote undergraduate dissertation on pulsar star observations. Modeled and extended the original low-frequency corrugated horn antenna for EM telescopes, which was selected as a candidate feed antenna model for the Five-hundred-meter Aperture Spherical Radio Telescope (FAST).

**PUBLICATIONS**

- (1) **R. Wang** and D. Manocha, "Enhancing EM Ray Tracing Through Machine Learning: Received Power Generator for 3D Indoor Scenes" (*To be submitted soon*)
- (2) **Wang, Ruichen**, Samuel Audia, and Dinesh Manocha. "Indoor Wireless Signal Modeling with Smooth Surface Diffraction Effects." EuCAP2024, Glasgow, Scotland, 2024.
- (3) **R. Wang** and D. Manocha, "Dynamic EM Ray Tracing for Large Urban Scenes with Multiple Receivers," 2023 International Wireless Communications and Mobile Computing (IWCMC), Marrakesh, Morocco, 2023, pp. 1268-1274, doi: 10.1109/IWCMC58020.2023.10182695.
- (4) **R. Wang** and D. Manocha, "Dynamic Coherence-Based EM Ray Tracing Simulations in Vehicular Environments," 2022 IEEE 95th Vehicular Technology Conference: (VTC2022-Spring), Helsinki, Finland, 2022, pp. 1-7, doi: 10.1109/VTC2022-Spring54318.2022.9860362
- (5) **Wang R**, Lu J, Xu Y, et al. Intelligent path loss prediction engine design using machine learning in the urban outdoor environment[C]//Sensors and Systems for Space Applications XI. International Society for Optics and Photonics, 2018, 10641: 106410J.
- (6) **Wang R**, Xiong W, Xu Y, et al. Comprehensive radio frequency link analysis of ground-to-air/air-to-air communication in urban and rural scenarios[C]//2018 IEEE Aerospace Conference. IEEE, 2018.
- (7) **Ruichen Wang**, I-Tai Lu, M.S. Thesis, A New Line-Of-Sight Propagation Model Accounting For Street Openings In Urban Street Canyons, 2017.
- (8) C. N. Macwan, J. S. Lu, I-Tai Lu, **Ruichen Wang**, Ya Hui Wu and J. A. Blaha, "Extension of the ITU-R P.1411-8 urban path loss models to high antennas," 2017 IEEE Long Island Systems, Applications and Technology Conference (LISAT), Farmingdale, NY, USA, 2017, pp. 1-5.
- (9) MacCartney Jr, G. R., Sun, S., Rappaport, T. S., Xing, Y., Yan, H., Koka, J., **Wang, R.**, & Yu, D. (2016, October). Millimeter wave wireless communications: New results for rural connectivity. In Proceedings of the 5th Workshop on All Things Cellular: Operations, Applications and Challenges (pp. 31-36).

**EXTRACURRICULAR ACTIVITIES**

- Chinese Chess Union Master Since 2008
- Chess Coach at Chengdu Dark Blue Chess Club 2011-2015
- Student Musician in Chinese Music Institute at PKU 2011-2015