RAHUL GULIA

Highly accomplished technical leader with 10+ years of equivalent experience (Ph.D.) in architecting, simulating, and optimizing **Private 5G/6G and Advanced Wi-Fi (IEEE 802.11)** solutions. Proven ability to lead design and delivery projects, apply **AI for network automation**, and mentor junior engineers, directly addressing the core responsibilities of a Level 4 Engineer. Proven ability to analyze product requirements and convert them into rigorous **system and feature validation** test cases. Deep functional expertise across the **3GPP protocol stack (PHY, MAC, RLC, RRC, PDCP).**

CONTACT

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GitHub: https://github.com/RahulSinghGulia

EDUCATION

- **PhD in Electrical & Computer Engineering** | Sep 2020 – Present
  Rochester Institute of Technology,
  Advisor: Dr. Amlan Ganguly
- **M.S. in Electrical Engineering** | Sep 2018 – Aug 2020,
  Rochester Institute of Technology
- **B.E. in Electronics & Communication Engineering** | Sep 2010 – May 2014
  Visvesvaraya Technological University

SKILLS

- **AI/ML & Data Science: Generative AI** (VAEs), **Reinforcement Learning** (RL), Deep Learning, Cross-Layer Optimization, **Goal-Oriented/Semantic Communication**.
- **Wireless Systems & Standards: 5G/6G Concepts**, 4G LTE, **Massive MIMO, Open RAN**, OFDM, IEEE 802.11, **Digital Twins**.
- **Modeling & Simulation: ns-3** (System-Level Simulation), **MATLAB**, **Python** (NumPy, SciPy), C/C++.
- **Signal Processing:** Core proficiency in filtering, feature extraction, and **AI-aided channel estimation** and equalization.

PUBLICATIONS

- R. Gulia et al., **"Memory-Augmented Generative AI for Real-time Wireless Prediction in Dynamic Industrial Environments,"** *IEEE Transactions on Communications* (Under Review).
- R. Gulia et al., **"AI-Driven Radio Propagation Prediction in Automated Warehouses using Variational Autoencoders,"** *Engineering Applications of Artificial Intelligence, Elsevier* (Under Review).
- R. Gulia et al., "Evaluation of 60 GHz Wireless Connectivity for an Automated Warehouse," *Information, 2023*.
- R. Gulia et al., "Automated Warehouse 5G Infrastructure Modeling Using VAEs," *ISNCC, 2024*.

EXPERIENCE

Research Assistant | RIT Sep 2020 – Present

- **Accelerated network simulations by 108x**, reducing prediction time for large-scale systems from **37.9 hours to 21 minutes**, enabling real-time network performance tuning.
- Pioneered a physics-informed deep learning framework (**WISVA**) for **accurate SINR heatmap prediction and wireless sensing**.
- Developed a dynamic digital twin framework (**Evo-WISVA**) to model and predict spatiotemporal changes in wireless channels, achieving high accuracy (**MAE: 0.329 dB**).

- Led development of a novel, stabilized Symbolic Regression (SR) framework in collaboration with a researcher, for interpretable BLER modeling in V2X systems.
- Provided a transparent, deployable "white-box" alternative to black-box ML, enabling efficient real-time link adaptation and foundational physical insight.

ns3 Wireless Intern | AIRA TECHNOLOGIES, INC. Jun 2023 – Aug 2023

- Conducted in-depth **performance analysis of an Open RAN deployment** using the ns-3 simulator, focusing on system-level performance.
- Collaborated on developing and enhancing **rApp functionalities** to improve network intelligence and scalability.

Teaching Assistant | RIT August 2019 – May 2020

Course: EEEE 484 – Introduction to Communication Systems |

- Assisted Dr. Panos Markopoulos in delivering core concepts of communication systems to ~30 students.
- Provided direct guidance and support on assignments, quizzes, and lab experiments, fostering active learning and problem-solving skills.

PROJECTS

Interpretable, Physics-Informed Classification of Respiratory Patterns via Wi-Fi CSI

- Developed a novel, feature-engineered pipeline utilizing the **Analytic Signal Method via the Hilbert Transform** on filtered CSI data to extract robust, physically meaningful features (e.g., **Mean I:E Ratio**) for non-contact classification.
- **Challenged black-box deep learning paradigms** by creating a transparent, **geometric classification** model that achieved performance **comparable to complex LSTM systems** (> accuracy) while ensuring full model interpretability.

Evo-WISVA: Dynamic Channel Digital Twin for Smart Warehouses

- Developed an AI/ML digital twin framework (**Evo-WISVA**) that predicts wireless channel conditions in dynamic warehouse environments achieving high accuracy (MAE=0.329 dB), securing **industry funding from Toyota Raymond Corporation**; achieved high accuracy and an average prediction speed of **0.000496 seconds per frame**.

Stabilized Symbolic Regression for Interpretable BLER Modeling in V2X Systems (Collaboration with F. Papoola)

- Designed and implemented a physics-informed **Symbolic Regression** framework to discover explicit analytical expressions for V2X BLER, addressing the interpretability gap of black-box ML models.
- Engineered a robust numerically protected operator set and applied a -ln(BLER) target transformation, enabling stable learning over an extreme dynamic range of wireless communication data.
- Utilized an **aggressive Genetic Programming** configuration (20,000 population, 300 generations) to derive a 253-node analytical expression with $\boldsymbol{R^2}$**of 0.86 and MSE of** $\boldsymbol{2.08x10^{-2}}$ on unseen BLER data.

MD-OFDM: Energy-Efficient & Low-PAPR MIMO-OFDM System

- Developed a novel system that achieved up to **5 dB PAPR reduction** and a **60% reduction in RF chain power consumption** in simulations, directly addressing **Layer 1** challenges.

TECHNICAL PRESENTATION

- **Evaluation of wireless connectivity in an automated warehouse at 60Ghz,** 2022 IEEE International Conference on Consumer Electronics (ICCE) 2022, Rochester, NY, 2022
- **Automated Warehouse 5G Infrastructure Modeling Using Variational Autoencoders**, 2024 International Symposium on Networks, Computers and Communications (ISNCC), Washington, DC, 2024

SERVICES

- **Active Technical Committee Member:** IEEE Consumer Technology Society (CTSoc) – Consumer Communications Networks and Connectivity (CCN).
- **Peer Reviewer:** IEEE Internet of Things Journal, IEEE ICCE-Taiwan (2025), and other leading conferences/journals in wireless communications and AI/ML.
- **Research Showcase Leader:** Led team in presenting innovative wireless AI research at Imagine RIT: Creativity and Innovation Festival.

CERTIFICATIONS

- IBM Deep Learning & Reinforcement Learning (Coursera, May 2024)
- Generative Deep Learning with TensorFlow (Coursera, Mar 2024)
- VAEs for Image Compression (Coursera, Jan 2024)
- Neural Networks & Deep Learning (Coursera, Aug 2022)