

AHMED MAKSUD

ahmed.maksud@email.ucr.edu | [Google Scholar](#) | [ahmedmaksud.github.io](https://github.com/ahmedmaksud) | U.S. Permanent Resident

SUMMARY

Wireless systems engineer (Ph.D. EE, UC Riverside, 2024) spanning the full stack of modern wireless systems; **protocol** (MAC design, IEEE 802.11), **signal** (OFDM/MIMO DSP, channel modeling, PHY-layer security), and **intelligence** (ML/RL-driven scheduling and control). Expertise in **protocol-compliant algorithm design and evaluation** across **802.11** and **5G O-RAN**. Hands-on experience with **system-level simulation** (ns-3, MATLAB/Simulink), **C++/Python** development, **ML/RL frameworks**, **RF lab instrumentation**, and reproducible open-source workflows.

EDUCATION

University of California, Riverside

Ph.D. in Electrical Engineering | GPA: 4.00/4.00

Riverside, CA, USA

Fall 2018 – Summer 2024

- **Advisor:** Yingbo Hua (Fellow IEEE). **Thesis:** *Novel Methods for Wireless Network Security*

Bangladesh University of Engineering and Technology

Bachelor of Science in Electrical and Electronic Engineering | GPA: 3.72/4.00

Dhaka, Bangladesh

Feb 2013 – Sept 2017

TECHNICAL SKILLS

Programming: Python (NumPy / SciPy, PyTorch), C / C++, MATLAB, Bash, L^AT_EX

Simulators & Tools: ns-3 (ns3-ai, Wi-Fi stack, custom modules), MATLAB toolboxes (Communications, SatComm, 5G, DSP, Deep Learning), Simulink, Cadence Virtuoso / SpectreRF

Machine Learning & RL: PPO / DQN (Stable-Baselines3, Gymnasium), MLP / LSTM policy networks, reward shaping & observation-space design, autoencoders

Wireless Standards & MAC: IEEE 802.11ax (TWT, BSR, OFDMA, action frames), CSMA/CA, channel access, QoS, MAC protocol design

PHY-Layer / DSP & Analysis: OFDM, MIMO beamforming, signal estimation/detection, channel coding, S-parameters, RF impairment / calibration, multipath fading, random matrix theory, information theory

Lab Equipment: **O-RAN Labkit (Firecell)**, Network Analyzer (Keysight E5063A), Signal Generator (Agilent N5182A), PowerCast P21XXCSR-EVB Band-6 RF rectenna

Dev Workflow: Git / GitHub, Linux, Docker / Containers, CMake, Claude Code, MCP servers, local LLMs

EXPERIENCE

Texas State University

Postdoctoral Research Fellow | PI: [Marcelo M. Carvalho](#)

San Marcos, TX, USA

Sept 2024 – present

- **ML-driven, energy-aware wireless research:** developed protocol-compliant end-to-end ns-3 simulation pipelines for RL-based **Target Wake Time** scheduling and **RF energy harvesting** on **IEEE 802.11** networks with open-source **ns-3** modules. Secured **\$70K Comcast Innovation Fund** (April 2026). Hands-on **5G O-RAN xApp** experience on the Firecell O-RAN Labkit.

University of California, Riverside

Graduate Student Researcher | Advisor: [Yingbo Hua](#)

Riverside, CA, USA

July 2019 – Aug 2024

- **PHY-layer security via continuous encryption function (CEF):** designed and validated **SVD-based CEF** primitives for (1) secure **UAV-to-Ground** links via PHY-layer encryption and (2) reliable **secret-key generation** via encryption-before-quantization; establishing a new family of cryptographic primitives for **noisy wireless secrets**, robust against **ML-based and known-ciphertext attacks**.
- **MIMO secret-key capacity analysis:** derived and Monte-Carlo-validated closed-form SKC bounds for arbitrary MIMO channels; showing positive key rates persist even when the eavesdropper has **more antennas and better SNR**, where classic **wiretap-channel analysis predicts zero secrecy**.

North-West Power Generation Company Limited

Assistant Engineer | Operations and maintenance of 225 MW thermal power plant

Sirajganj, Bangladesh

Feb 2018 – Aug 2018

RL-driven TWT Scheduling for IEEE 802.11ax Networks[\[IEEE ICCCN'26\]](#)

- Formulated **IEEE 802.11ax TWT** scheduling as a deep-RL problem with a protocol-compliant **208-d observation space** (BSR queues, airtime, FCS errors, duty cycle across 16 STAs), a factored **MultiDiscrete action space** (380 schedule configurations from a combinatorially intractable raw space), and a **multi-objective reward** offering throughput, energy, and queue presets. Trained **MLP-PPO** and **LSTM-PPO** agents (Stable-Baselines3) in ns-3 via ns3-ai, then benchmarked them against an analytical M/D/1 baseline over seed-disjoint episodes, achieving **-44% energy**, **+18% throughput**, and **-73% drops** on the energy preset, and **+15% reward with -77% drops** from LSTM-PPO on the queue preset.
- **Tools & methods:** C++ (ns-3, ns3-ai), Python (Stable-Baselines3), PPO, M/D/1 queueing analysis.

RF Energy Harvesting & MAC Simulation for IEEE 802.11[{GitHub repo}](#)

- Developed two **ns-3** modules enabling realistic RF energy-harvesting research on IEEE 802.11 networks, covering (1) a **PowerCast P21XXCSR-EVB** Band-6 rectenna model with **datasheet fidelity**, extended with energy accounting and deep-discharge / overcharge protection; and (2) **IEEE 802.11 Category-127** vendor-specific action frames letting the AP **announce upcoming RF power delivery**, which stations parse autonomously to **gate harvesting**. Paired the harvester with **TWT scheduling** through **power-delivery windows** that keep stations energy-sustainable, validated in full simulation (**paper under review**).
- **Tools & methods:** C++ (ns-3), Python, PCAP/Wireshark analysis, datasheet-driven hardware modeling.

OFDM Optimization for Secure Communication[{GitHub repo}](#)

- Extended **STEEP**, which is a two-phase **probe-and-echo protocol** that secures wireless links **without any pre-shared key** even over non-reciprocal channels, from single-carrier to **multi-carrier OFDM**. Proved **optimal carrier pairing** between the probe and echo phases and designed **power-allocation policies** for both phases to maximize secrecy rate, achieving **28% higher peak secrecy rate**, matching it at **4 dB lower probing power**, and sustaining **up to 83% of secret-key capacity** where classic wiretap-channel secrecy is near zero.
- **Tools & methods:** Python (NumPy/SciPy), joint resource optimization, Monte-Carlo simulation.

SVD-CEF and Its Applications for PHY-Layer Security[\[IEEE SPL'22, ICC'22, SPAWC'20, Elsevier SP'23\]](#)

- Developed the **SVD-CEF**, a new family of **physical-layer cryptographic primitives** that realizes a nonlinear **continuous encryption function (CEF)** through the **singular value decomposition (SVD)**. Benchmarked it against prior candidates (DRP, IoM hashing, RP, HOP) and proved each fails at least one of the **five formal criteria** for a good CEF, all of which SVD-CEF meets.
- Designed and validated **PHY-layer DSP algorithms** applying the CEF to (1) secure **UAV-to-Ground links** through **symbol and constellation hiding**, sustaining **SER below 1%** under varying SNR with provable security; and (2) reliable **secret-key generation** through **encryption before quantization**, achieving **20 dB BER improvement** and passing **NIST randomness tests**.
- **Tools & methods:** MATLAB, Python, channel models, NIST test, SVD/random-matrix/estimation theory.

Secret-Key Capacity (SKC) of MIMO Channels[\[IEEE WCL'24, MILCOM'23, CISS'23\]](#)

- Derived closed-form upper and lower bounds on the **SKC** of arbitrary MIMO channels using **Maurer's framework** and **random-matrix theory**. Characterized the bounds through their first-order term growing with the log of SNR and their **SNR-invariant second-order term**, showing the achievable key rate **grows with additional channel usage**, regardless of the eavesdropper's antenna count and SNR, with analytical and Monte-Carlo results matching across all studied regimes.
- **Tools & methods:** Python, random-matrix theory, Maurer's bounds, Armijo backtracking, Monte-Carlo simulation.

4th-Order 2.4 GHz Bandpass Filter Design & S-Parameter Analysis[\[Report\]](#)

- Designed and verified a **4th-order 2.4 GHz bandpass filter** with $Q = 50$ components and $50\ \Omega$ port matching; achieved $S_{11} < -10\ \text{dB}$ across passband and $Q\text{-factor} = 24$, validated against 1st / 2nd-order baselines.
- **Tools & methods:** Cadence Virtuoso, SpectreRF, MATLAB.

AWARDS & SERVICE

- **\$70K Comcast Innovation Fund (2026)** for *Agentic TWT Scheduler for Future Home Wi-Fi*.
- **Dean's Distinguished Fellowship**, UCR Department of Electrical and Computer Engineering (2018).
- **Second Runner-up** in [IEEE Video and Image Processing \(VIP\) Cup](#), 2017.
- **Honorable Mention** in International Physics Olympiad (2012).
- **Technical Reviewer** for IEEE ISIT, ICC, WCNC, ICMLCN, Globecom, WiOpt, IROS (2023–present); **TPC Member** for [IEEE Cloud Summit 2026](#).