

Hossein Mohammadi

Ph.D. Candidate in Electrical and Electronics Engineering · Graduate Research Assistant

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RESEARCH PROFILE

Wireless-communications and AI/ML researcher working at the intersection of 5G/6G radio access networks, dynamic spectrum sharing, and machine learning. Ph.D. candidate at Mississippi State University with first-author IEEE publications spanning VTC, WCNC, ICC, MILCOM, DySPAN, and CCNC, and contributions to two NSF-funded programs on active-passive spectrum coexistence and secure 5G communications. Experienced in designing deep-learning and reinforcement-learning methods for interference mitigation, spectrum selection, and network resource management, and in validating them through system-level simulation and SDR-based 5G testbeds.

RESEARCH AREAS

- AI/ML-enabled wireless systems and radio transceivers
- O-RAN, 5G/6G, network slicing, and resource management
- Dynamic spectrum sharing and active-passive coexistence
- RF-interference mitigation and passive radiometry
- Secure and resilient 5G communications
- Software-defined radio and 5G COTS testbeds
- MIMO, beamforming, full-duplex, and interference-limited communications

EDUCATION

Ph.D. Candidate, Electrical and Electronics Engineering

May 2021 – Present

Mississippi State University — Minor in Computer Science

Starkville, MS, USA

M.Sc., Electrical Engineering — Communication Systems

Sep 2016 – Sep 2019

University of Tehran

Tehran, Iran

- Thesis: *Self-Interference Management in In-Band Full-Duplex Systems*

RESEARCH EXPERIENCE

Graduate Research Assistant

May 2021 – Present

Mississippi State University, Department of Electrical and Computer Engineering

Starkville, MS, USA

NSF SWIFT-SAT / INTERACT — Learning-Based RFI Mitigation for Active-Passive Spectrum Coexistence

2024 – Present

NSF Award 2332661 — Collaborative Research: SWIFT-SAT: INtegrated Testbed Ensuring Resilient Active/Passive CoexisTence (INTERACT)

- Designed and implemented a deep-reinforcement-learning spectrum-selection framework in which a Double Deep Q-Network (DDQN) agent uses STFT and power-spectral-density observations to identify interference-dominant 5G NR subbands for passive radiometer receivers operating in shared spectrum.
- Developed neural successive-interference-cancellation modules — compact U-Net time–frequency masking and a two-stage multi-layer perceptron trained with Levenberg–Marquardt and Bayesian regularization — to suppress structured 5G OFDM interference while preserving passive radiometric baselines and natural-emission statistics.
- Built end-to-end MATLAB/Python simulation and evaluation workflows: 3GPP-compliant 5G NR waveform generation, Sionna CDL channel modeling, IQ-data processing, model training, and comparison against random, static, and oracle baselines with residual-interference-risk and radiometric-bias diagnostics.
- Supported SDR-based over-the-air experimentation with GNU Radio, USRP B210 radios, and the MATLAB 5G Toolbox for channel-affected 5G waveform capture and analysis.
- First-authored the IEEE DySPAN 2025 paper on AI-assisted successive interference cancellation and two follow-on manuscripts (one submitted letter, one journal article in preparation) extending the framework.

NSF Convergence Accelerator Track G — Combating Vulnerability and Unawareness 2023 – Present **in 5G Network Security**

NSF Grants ITE-2326898 and ITE-2515378 — Track G: Securely Operating Through 5G Infrastructure

Stealth communication over 5G

- Contributed to the design and analysis of an error-pattern steganographic communication framework that conceals covert data within standard 5G traffic while preserving normal protocol behavior.
- Developed the residual-detection validation analysis, characterizing statistical detectability under finite adversarial observations using relative entropy (KL divergence) and detection-probability metrics in a hypothesis-testing framework.
- Supported hardware-in-the-loop validation on a 5G Standalone commercial-off-the-shelf testbed built on srsRAN, Open5GS, USRP B210 radios, and commercial Android devices.

Secure multipath 5G communication

- First-authored the IEEE MILCOM 2024 paper on defending 5G networks against jamming attacks with multipath communications.
- Contributed to a three-path 5G Standalone communication architecture that combines threshold secret sharing with path diversity across independent cellular links for resilience against eavesdropping, jamming, and infrastructure failure.
- Analyzed link- and application-level performance — CQI, MCS, BLER, RSRP, throughput, and latency distributions, with Wireshark packet traces — and evaluated end-to-end message recovery under single-path jamming and gNB-failure scenarios.

O-RAN, Federated Learning, and 6G Network Management (Dissertation Research) 2021 – Present

- Developed SliceFed, a federated constrained multi-agent deep-reinforcement-learning framework (constrained MDP with Lagrangian primal–dual PPO and federated averaging) for dynamic spectrum slicing with URLLC latency guarantees in dense 6G radio access networks (paper submitted to IEEE DySPAN 2026).
- Evaluated reinforcement-learning schemes for trajectory optimization of aerial radio units in non-terrestrial 6G deployments (IEEE ICC 2023).
- Co-authored studies on AI-driven fuzzing for vulnerability assessment of O-RAN traffic-steering algorithms and on auditable geographic fairness for multi-operator LEO spectrum sharing (arXiv preprints,

2026).

- Investigated AI-assisted network slicing, federated learning, and distributed resource management for O-RAN and 6G non-terrestrial networks to improve quality of service.

AI-Enabled Radio Transceivers and Nonlinear Receivers

- Developed AI-driven demodulation approaches for nonlinear receivers operating in shared spectrum with high-power blockers (IEEE WCNC 2022).
- Co-authored a symbol-error-rate characterization of communication receivers under receiver nonlinearity (IEEE VTC-Spring 2020).
- Investigated opportunities and challenges of artificial-neural-network architectures for radio transceivers (IEEE VTC-Fall 2021).
- Studied multi-layer-perceptron-based self-interference and interference management for radio transceivers in interference-limited settings.

Graduate Researcher

Sep 2016 – Sep 2019

University of Tehran, Department of Electrical and Computer Engineering

Tehran, Iran

- Developed self-interference management techniques for in-band full-duplex wireless systems (M.Sc. thesis; arXiv preprint 2202.00764).
- Implemented and compared adaptive beamforming algorithms and simulated space-time block coding and MIMO systems.
- Conducted signal-processing studies on resampling, windowing, and power-spectral-density estimation, and explored neural-network methods for wireless applications.

TECHNICAL EXPERTISE

Programming & Scientific Computing: Python (proficient), MATLAB (proficient), C++ (working knowledge), Bash, Linux

AI & Machine Learning: Deep learning, multi-layer perceptrons, U-Net architectures, deep reinforcement learning (DDQN, PPO), constrained MDPs, federated learning, model training and evaluation, optimization for machine learning

ML Frameworks: TensorFlow/Keras, PyTorch, Sionna

Wireless Communications: 5G NR, O-RAN/Open RAN, network slicing, wireless resource allocation, non-terrestrial networks, spectrum sharing, RF sensing and passive radiometry, interference mitigation, wireless security, MIMO, MU-MIMO, massive MIMO, millimeter-wave communications, adaptive beamforming, full-duplex communications

Signal Processing & Analysis: Digital and statistical signal processing, information theory, STFT and PSD analysis, OFDM waveform analysis, channel modeling (CDL), estimation theory, adaptive filtering, Monte Carlo evaluation

Testbeds & Platforms: srsRAN, GNU Radio, USRP B210, MATLAB 5G Toolbox, Wireshark, POWDER wireless testbed, COTS Android UEs, hardware-in-the-loop 5G experimentation

Research & Documentation: LaTeX, Git/GitHub, Overleaf, IEEE manuscript preparation, technical writing, experimental design, reproducible research, data visualization

PUBLICATIONS

Complete list: [Google Scholar profile](#). Submitted and in-preparation manuscripts are listed separately from peer-reviewed publications.

Peer-Reviewed Conference and Workshop Papers

- [1] S. B. H. Natanzi, **H. Mohammadi**, B. Tang, and V. Marojevic, "Secure mmWave beamforming with proactive-ISAC defense against beam-stealing attacks," in *Proc. IEEE 23rd Consumer Communications & Networking Conference (CCNC)*, 2026.
- [2] **H. Mohammadi**, S. B. H. Natanzi, R. Nassiri, B. Tang, and V. Marojevic, "Adaptive beamforming for interference-limited MU-MIMO using spatio-temporal policy networks," in *Proc. IEEE 23rd Consumer Communications & Networking Conference (CCNC)*, 2026, pp. 1–2.
- [3] **H. Mohammadi**, F. Faisal, and V. Marojevic, "Robust AI-assisted successive interference cancellation for coexistence of RF sensors and 5G signals in shared spectrum," in *Proc. IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, 2025, pp. 1–8, doi: 10.1109/DySPAN64764.2025.11115917.
- [4] **H. Mohammadi**, M. Zhang, A. Jha, V. Marojevic, R. A. Chou, and T. Kim, "Fortifying 5G networks: Defending against jamming attacks with multipath communications," in *Proc. IEEE Military Communications Conference (MILCOM)*, 2024.
- [5] A. Jha, S. Kashani, **H. Mohammadi**, A. Kirchner, M. Zhang, R. A. Chou, S. W. Kim, H. M. Kwon, V. Marojevic, and T. Kim, "Enhancing next-generation wireless security: A lightweight secret sharing scheme with robust integrity check for military communications," in *Proc. IEEE Military Communications Conference (MILCOM)*, 2024.
- [6] **H. Mohammadi**, V. Marojevic, and B. Shang, "Analysis of reinforcement learning schemes for trajectory optimization of an aerial radio unit," in *Proc. IEEE International Conference on Communications (ICC)*, 2023.
- [7] **H. Mohammadi**, W. Alqwider, T. F. Rahman, and V. Marojevic, "AI-driven demodulators for nonlinear receivers in shared spectrum with high-power blockers," in *Proc. IEEE Wireless Communications and Networking Conference (WCNC)*, 2022.
- [8] **H. Mohammadi** and V. Marojevic, "Artificial neuronal networks for empowering radio transceivers: Opportunities and challenges," in *Proc. IEEE 94th Vehicular Technology Conference (VTC-Fall)*, 2021.
- [9] J. Dsouza, **H. Mohammadi**, A. V. Padaki, V. Marojevic, and J. H. Reed, "Symbol error rate with receiver nonlinearity," in *Proc. IEEE 91st Vehicular Technology Conference (VTC-Spring)*, 2020.

Submitted Manuscripts

- [1] **H. Mohammadi**, F. Faisal, and V. Marojevic, "AI-enhanced successive interference cancellation for coexistence of passive sensors and 5G signals," submitted to *IEEE Geoscience and Remote Sensing Letters*, 2026.
- [2] **H. Mohammadi**, S. B. H. Natanzi, R. Nassiri, J. Hassanpour, B. Tang, and V. Marojevic, "SliceFed: Federated constrained multi-agent DRL for dynamic spectrum slicing in 6G," submitted to *IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, 2026.
- [3] M. Zhang, **H. Mohammadi**, Y. Jang, S. Dhakal, P. Shantharama, V. Marojevic, B. A. Jones, D. J. Love, and T. Kim, "From theory to practice: Error-pattern steganographic communication system design over 5G networks," submitted manuscript, 2026.

Preprints

- [1] S. B. H. Natanzi, **H. Mohammadi**, B. Tang, and V. Marojevic, "AI-driven fuzzing for vulnerability assessment of 5G traffic steering algorithms," *arXiv preprint arXiv:2601.18690*, 2026.
- [2] S. B. H. Natanzi, **H. Mohammadi**, V. Marojevic, and B. Tang, "FairShare: Auditable geographic fairness for multi-operator LEO spectrum sharing," *arXiv preprint arXiv:2601.09641*, 2026.
- [3] **H. Mohammadi**, M. Sabbaghian, and V. Marojevic, "Self interference management in in-band full-duplex systems," *arXiv preprint arXiv:2202.00764*, 2022.

Manuscripts in Preparation

- [1] **H. Mohammadi**, F. Faisal, A. M. Alam, K. Al Mahmud, A. C. Gurbuz, M. Kurum, and V. Marojevic, "Deep reinforcement learning-assisted spectrum selection for RFI-resilient passive sensing in shared 5G environments," manuscript in preparation, 2026.
- [2] M. Zhang, **H. Mohammadi**, S. Dhakal, P. Shantharama, V. Marojevic, B. A. Jones, R. Olu-Jordan, V. Rana, and R. A. Chou, "A secure multipath communication system and the implementation on a 5G COTS testbed," manuscript in preparation, 2026.

TEACHING EXPERIENCE

Graduate Teaching Assistant

2016 – 2019

University of Tehran — Random Variables and Stochastic Processes

Tehran, Iran

- Assisted instruction for a graduate course on random variables and stochastic processes, leading weekly instructional sessions.
- Prepared problem sets, worked examples, and review materials, and supported students with probability and random-process concepts.

AWARDS AND PROFESSIONAL DEVELOPMENT

- Second Place, ECE Research Symposium, Department of Electrical and Computer Engineering, Mississippi State University, 2025.
- Third Place, ECE Research Symposium, Department of Electrical and Computer Engineering, Mississippi State University, 2024.
- Selected Participant, CyberPowder Fellows Program, University of Utah (NSF POWDER/PAWR wireless testbed), 2026.
- Selected Participant, COLOSSEUM Open RAN Digital Twin Workshop, Northeastern University, 2023.
- Certificate: Deep Learning and Reinforcement Learning, IBM (Coursera).

SELECTED COURSEWORK

Communications & Signal Processing: Information Theory; Coding Theory; Advanced Communication Theory; Digital and Wireless Communications; Digital Signal Processing; Adaptive Filter Theory; Estimation Theory; Random Signals and Systems; Random Variables and Stochastic Processes

AI & Computer Science: Machine Learning; Optimization for Machine Learning; Digital Image Processing; Theory of Computation; Cloud Computing and Security; Data Communication Networks; Wireless Networks; Internet of Things