# Aly Sabri Abdalla

Ph.D. Candidate
Department of Electrical and Computer Engineering
Mississippi State University
Mississippi State, MS, 39762

Phone: (662) 694-9696
Email: asa298@msstate.edu

## Education

- Ph.D. Candidate, Electrical and Computer Engineering, Mississippi State University, from Aug 2019 - present. Expected graduation: Spring 2023. Advisor: Dr. Vuk Marojevic.
- M.S., Electronics and Communications Engineering, College of Engineering and Technology, Arab Academy for Science Technology and Maritime Transport, Egypt, Jan 2019.
- B.S., Electronics and Communications Engineering, College of Engineering and Technology, Arab Academy for Science Technology and Maritime Transport, Egypt, June 2014.

## Research Interests

- Unmanned Aerial Vehicle (UAV) Communications and networking, wireless radio access networks, Reconfigurable intelligent surfaces (RIS), wireless security, machine learning for physical layer security, spectrum sharing, scheduling and congestion control.

- Worked/working on the following research projects:
  1. NSF PAWR Platform AERPAW: Aerial Experimentation and Research Platform for Advanced Wireless, NSF- CNS - 1939334, PI: Dr. Ismail Guvenc (NCSU) and Vuk Marojevic (MSU), et al., 2019-Present.
     - Responsibilities and contributions: I am part of a team that is responsible for performing indoor and outdoor experiments for establishing stable and reliable wireless communications links between ground base station and aerial mobile terminal mounted on the flying drone. Also, study and test open source-software libraries for 4G/5G wireless communication such as srsRAN and OpenAirInterface (OAI) on different software-defined radios for example B205 mini, B210, and X310 [J2, J3, J4, J5, C3, C4, C6, C7, C8, R4, R5].
  2. NSF SWIFT: LARGE: AI-Enabled Spectrum Coexistence between Active Communications and Passive Radio Services: Fundamentals, Testbed and Data, NSF-ECCS- 2030291, PI: Dr. Vuk Marojevic, 2020-Present.
     - Responsibilities and contributions**:** Currently, I am studying the 3GPP standards for the cellular-connected UAVs as a preparation for defining the possible solution for the co-existence between the earth satellite communication and cellular communications enabled via UAV [R1].
  3. NSF CCRI: Planning: Collaborative Proposal: Tools and Research Priority Analyses for Development of Open-Source AI-Enabled Control and Testing Framework for 6G Cellular Research, NSF- CNS- 2016724, PI: Dr. Vuk Marojevic, 2020-2021.
     - Responsibilities and contributions: For planning purposes, I helped the PIs with the background information and led the community survey where I proposed set of questions to gather the interest of researchers, industry, government and other stakeholder in the industry-driven open radio access network (O-RAN) and the development of a 6G research infrastructure with an AI-enabled control and testing framework. Also, I created the survey infographics to summarize and visualize the survey results (https://sites.google.com/msstate.edu/oaic/surveyresults) [J1].

4. NSF CCRI: Collaborative Research: CCRI: New: Open AI Cellular (OAIC): Prototyping Artificial Intelligence-Enabled Control and Testing Systems for Cellular Communications Research
   - Responsibilities and contributions: I am working with the team for designing a software libraries to facilitate research and development on data-driven intelligent solutions for cellular radio networks. Also, I am developing set of protocols and algorithms for enabling testing, efficient control loops, and extension of open interfaces [R2, R3].
5. The Office of Naval Research: Software-defined 5G security testbed, PI: Vuk Marojevic, 2020-Present.
   - Responsibilities and contributions: I helped the project team with defining the appropriate software and hardware components for building a software-defined 5G testbed with various capabilities to serve multiple scenarios [J2, C4].

- Contributions to Research Proposals
  1. NSF CCRI: Planning: Collaborative Proposal: Tools and Research Priority Analyses for Development of Open-Source AI-Enabled Control and Testing Framework for 6G Cellular Research, NSF- CNS- 2016724, Awarded, 2020, Budget $50k.
  2. NSF SWIFT: LARGE: AI-Enabled Spectrum Coexistence between Active Communications and Passive Radio Services: Fundamentals, Testbed and Data, NSF- ECCS- 2030291, Awarded, 2020, Budget $500k.
  3. NSF CCRI: Open AI Cellular (OAIC): Prototyping Artificial Intelligence-Enabled Control and Testing Systems for Cellular Communications Research, NSF- CNS- 2120411, Awarded, 2021, Budget $850k (MSU budget); total project budget: $1.84M.
  4. NSF RINGS: Secure and Resilient Integrated Access and Backhaul-Enabled Aerial-Ground Networks: Fundamentals, Technology, Applications, and Experiments, Declined, 2021, Budget $400k (MSU budget); total project budget: $1M.
  5. NSF SWIFT: 3D Vehicular Communication Network Design for Spectrum Coexistence and Passive User Protection, Declined, 2022, Budget $500k.
  6. NSF CPS: Frontier: Extending Advanced Air Mobility to Rural and Tribal Regions with Applications to Farming and Emergency Medical Service, under review, 2022, Budget $450K (MSU budget); total project budget: $7M.

## Work Experience

- Mississippi State University, ECE Department, MS, USA 01/2022-present
  **Teaching Assistant, Responsibility:**
  Provide laboratory instructions and supervise grade students for the Embedded Systems class.
- Mississippi State University, Advanced Wireless Lab, MS, USA
  **Research Assistant, Responsibility:** 08/2019- present
  Modeled complex problems in UAV communication and networking, spectrum sharing, and wireless network security. Software-defined radio (SDR) design and development via Gnu Radio.
  Used C++, Matlab and Python to develop simulations and software tools for research.
  Used open-source packages, such as srsRAN, Open5GS and OAI to enable networking and communications research experiments.
- AASTMT, ECE Department, Alexandria, Egypt 08/2014- 06/2019
  **Teaching Assistant, Responsibility:**
  Provide theory and laboratory instructions in the following principal areas: Advanced Communication systems, Communication Networks, Microelectronics Circuits and Mobile Communications.

## Research Experience

- Mississippi State University, Advanced Wireless Lab, MS, USA, Sept. 2019 - present.
  Research Assistant, Research topics:

- Unmanned aerial vehicle (UAV)-assisted communication and networking | Research on optimizing the deployment of UAV as a base station or aerial relay and resource allocation to improve the performance of terrestrial wireless communication and aerial users [J2, J3, J4, J5, C3, C4, C6, C7, R4, R5].
- Reconfigurable intelligent surfaces (RIS)-assisted communication | Research on optimizing the active and passive beamforming for ground and aerial RIS nodes and power control to enhance the energy and spectral efficiency of terrestrial wireless communication and aerial users [C1, C2].
- Arial Experimentation and Research Platform for Advanced Wireless | Prototyping and conducting real-time aerial experiments to enable scalable research and testing of advanced wireless communications using programmable radios, software-defined radios, on ground and on UAVs [J2, C4, C8].
- Toward next generation open radio access networks (O-RAN) development | Research on optimizing the performance of current O-RAN architecture including design of data-driven intelligent solutions, and efficient control loops for different O-RAN deployments [J1, R2, R3].

## Peer-Reviewed Articles

### Journal Articles:

J1. A. S. Abdalla, Pratheek S. Upadhyaya, Vijay K. Shah, Vuk Marojevic, "Toward Next Generation Open Radio Access Network--What O-RAN Can and Cannot Do!," in IEEE Network Magazine, doi: 10.1109/MNET.108.2100659.
J2. A. S. Abdalla, A. Yingst, K. Powell, A. Gelonch-Bosch and V. Marojevic, "Open Source Software Radio Platform for Research on Cellular Networked UAVs: It Works!," in IEEE Communications Magazine, vol. 60, no. 2, pp. 60-66, February 2022.
J3. A. S. Abdalla and V. Marojevic, "Securing Mobile Multiuser Transmissions With UAVs in the Presence of Multiple Eavesdroppers," in IEEE Transactions on Vehicular Technology, vol. 70, no. 10, pp. 11011-11016, Oct. 2021.
J4. A. S. Abdalla and V. Marojevic, "Communications Standards for Unmanned Aircraft Systems: The 3GPP Perspective and Research Drivers," in IEEE Communications Standards Magazine, vol. 5, no. 1, pp. 70-77, March 2021.
J5. A. S. Abdalla, K. Powell, V. Marojevic and G. Geraci, "UAV-Assisted Attack Prevention, Detection, and Recovery of 5G Networks," in IEEE Wireless Communications, vol. 27, no. 4, pp. 40-47, August 2020.
J6. B. Shang, V. Marojevic, Y. Yi, A. S. Abdalla and L. Liu, "Spectrum Sharing for UAV Communications: Spatial Spectrum Sensing and Open Issues," in IEEE Vehicular Technology Magazine, vol. 15, no. 2, pp. 104-112, June 2020.

### Conference Proceedings:

C1. A. S. Abdalla and V. Marojevic, "Aerial RIS for MU-MISO: Joint Base Station Beamforming and RIS Phase Shifter Optimization," Accepted for publication in IEEE Conf. International Conference on Sensing, Communication, and Networking (SECON) 2022.
C2. A. S. Abdalla and V. Marojevic, "Optimization-Driven DDPG for Transmit Beamforming and Phase Shifting in Aerial RIS-Assisted MU-MISO Communications," Accepted for publication in IEEE Conf. Personal Indoor and Mobile Radio Communications (PIMRC) 2022.
C3. A. S. Abdalla, A. Behfarnia and V. Marojevic, "Aerial Base Station Positioning and Power Control for Securing Communications: A Deep Q-Network Approach," 2022 IEEE Wireless Communications and Networking Conference (WCNC), 2022, pp. 2470-2475.
C4. A. S. Abdalla, A. Yingst, K. Powell and V. Marojevic, "Open-Source Software Radio Performance for Cellular Communications Research with UAV Users," 2021 IEEE 94th Vehicular Technology Conference (VTC2021-Fall), 2021, pp. 1-6.

C5. A. S. Abdalla and V. Marojevic, "Machine Learning-Assisted UAV Operations with the UTM: Requirements, Challenges, and Solutions," 2020 IEEE 92nd Vehicular Technology Conference (VTC2020-Fall), Victoria, BC, Canada, pp. 1-5, 2020.
C6. A. S. Abdalla, B. Shang, V. Marojevic and L. Liu, "Performance Evaluation of Aerial Relaying Systems for Improving Secrecy in Cellular Networks," 2020 IEEE 92nd Vehicular Technology Conference (VTC2020-Fall), Victoria, BC, Canada, pp. 1-5, 2020.
C7. A. S. Abdalla, B. Shang, V. Marojevic and L. Liu, "Securing Mobile IoT with Unmanned Aerial Systems," 2020 IEEE 6th World Forum on Internet of Things (WF-IoT), New Orleans, LA, USA, pp. 1-6, 2020.
C8. K. Powell, A. S. Abdalla, D. Brennan, V. Marojevic, R. M. Barts, A. Panicker, O. Ozdemir, I. Guvenc, "Software Radios for Unmanned Aerial Systems," 1st International Workshop on Open Software Defined Wireless Networks, 1-6, 2020.

Articles Under Review:

R1. W. Alqwider, A. S. Abdalla and V. Marojevic, "5G Advanced: Wireless Channel Virtualization and Resource Mapping for Real Time Spectrum Sharing," under review in IEEE Communications Standards Magazine.
R2. A. S. Abdalla and V. Marojevic, "End-to-End O-RAN Security Architecture, Threat Surface, Coverage, and the Case of the Open Fronthaul," under review in IEEE Communications Standards Magazine.
R3. P. S. Upadhyaya, A. S. Abdalla, V. Marojevic, J. H. Reed, and V. K. Shah, "Prototyping Next-Generation O-RAN Research Testbeds with SDRs," under review in IEEE Vehicular Technology Magazine.
R4. A. S. Abdalla and V. Marojevic, "Security Threats and Cellular Network Procedures for Unmanned Aircraft Systems," in IEEE Communications Standards Magazine. “Major revision submitted”.
R5. A. S. Abdalla, Ali Behfarnia, and V. Marojevic, " UAV Trajectory and Multi-User Beamforming Optimization for Clustered Users Against Passive Eavesdropping Attacks With Unknown CSI," under review in IEEE Transactions on Vehicular Technology, pp. 1-13.

## Awards

- 2021 Mississippi State University’s Department of Electrical and Computer Engineering (ECE) Best Graduate Researcher Award.

## Professional Activities

- Participant in the Working Group for IEEE P1954™, Standard for Self-Organizing Spectrum-Agile Unmanned Aerial Vehicles Communications.
- Reviewer for IEEE Transactions on Cloud Computing, IEEE Journal on Selected Areas in Communications, IEEE Transactions on Communications, IEEE Transactions on Intelligent Transportation Systems, IEEE Internet of Things Journal, IEEE Communications Letter, IEEE Wireless Communications Letter, Journal of Computing and Information Technology, IEEE System Journal, IEEE Access, and many conferences paper reviews.
- Student Member, IEEE Communication Society, 2018-Present

## Research Collaborators/Professional References

- Dr. Vijay K. Shah Assistant Professor at George Mason University
- Dr. Giovanni Geraci Assistant Professor at Universitat Pompeu Fabra
- Dr. Antoni Gelonch-Bosch Associate professor at Barcelona Tech
- Dr. Ali Behfarnia Assistant Professor at University of Tennessee at Martin
- Dr. Bo Tang Assistant Professor at Mississippi State University