Arif Ullah (Khan)

Ph.D. (Electro. and Commun. Engineering), **MPEC**, **MIEEE**
Tel: +82-62-230-6033, Cell: +82-010-7**9-5**6
Email: arifullah@chosun.ac.kr, Gmail: arifkhaan.ciit@gmail..
Office: SNL (10123), College of IT Convergence, Dept. of Computer Engg., Chosun University, Gwangju, ROK.
Google Scholar Profile: https://shorturl.at/lqzH1

Research Interests

- 5G and beyond 5G networks; MIMO systems; Millimeter wave and Terahertz communications
- UAV and RIS assisted communication; Stochastic geometry analysis of cellular networks
- Machine learning and AI enabled wireless communication

Education

- **GIK Institute of Engineering Sciences and Technology Topi, 23640, Pakistan**
  Doctor of Philosophy (PhD) in Electronic Engineering **Sep. 2017 - Jul. 2021**
  - Study Emphasis: Wireless Communication and Networking
  - Dissertation: User-centric Small Cell Aided Cellular Networks: Sub-6GHz and Hybrid mmWave Communications
  - PhD Supervisor: Prof. Dr. Ziaul Haq Abbas
- **COMSATS University Abbotabad, 22060, Pakistan**
  Master of Science (MS) in Electrical Engineering **Mar. 2014 - Jul. 2016**
  - Study Emphasis: Wireless Communication and Signal Processing
  - Dissertation: Precise Estimation of Soft Output in MIMO OFDM Receiver using Modified LAS Algorithm
  - MS Supervisor: Prof. Dr. Shahid Khattak
- **Balochistan University of IT, Engg. & Management Sci. Quetta, Pakistan**
  Bachelor of Science (BS) in Electronic Engineering **Aug. 2007 - Dec. 2011**
  - Study Emphasis: Electronic and Communication Engineering
  - Final Year Project: Real time Tracking, Monitoring, and Controlling of Vehicles through GPS and GSM

Professional Experience

- **Chosun University Gwangju, 61452, Republic of Korea**
  Research Assistant Professor **Sep. 2023 - Aug. 2024**
  - Department of Computer Engineering, College of IT Convergence:
- **Chosun University Gwangju, 61452, Republic of Korea**
  Assistant Professor, Wireless Communication and Networking **Apr. 2022 - Aug. 2023**
  - Department of Computer Engineering, College of IT Convergence:
- **Chosun University Gwangju, 61452, Republic of Korea**
  Postdoctoral Fellow, Smart Networking Research Laboratory (SNL) **Oct. 2021 - Apr. 2022**
  - Advisor: Prof. Dr. Wooyeol Choi
  - Research task: My research at CU focuses on UAVs and machine learning aided wireless networks
- **GIK Institute of Engineering Sciences and Technology Topi, 23640, Pakistan**
  Graduate Teaching/Research Assistant **Sep. 2017 - Jun. 2021**
  - **Duty**: My duty was to assist in lectures and to instruct in Laboratory work at undergraduate and graduate level
  - **Teaching Assistant**: Assisted as a teaching assistant in the undergraduate courses such as Linear Circuit Analysis (EE-211) course (Fall 2017), Digital Control System (EE-444) course (Spring 2021)
  - **Laboratory Instructor**: Assisted as an instructor in the following undergraduate Labs: 1) Electronics Devices and Circuit Lab (EE-231L) (Spring 2018-2019), 2) Signal and System Lab (EE-351L) (Fall 2018-2019), 3) Communication System Lab (EE-361L) (Spring 2020)
- **COMWAVE Institute of Information Sci. and Techno., Abbotabad, Pakistan**
  Visiting Lecturer **Jul. 2016 - Jul. 2017**
- **Egyptian Pakistani Telecommunication Sevices Company Limited Pakistan**
  Trainee Engineer (Operation and Maintenance) **Sep. 2012 - Jun. 2013**

Selected Publication

Peer-reviewed Publications:

- **[J14]**: Iftikhar Ahmad, **Arif Ullah**, and Wooyeol Choi, "WiFi-Based Human Sensing with Deep Learning: Recent Advances, Challenges, and Opportunities", *IEEE Open Journal of the Communication Society*, early access, 2024. 10.1109/OJCOMS.2024.3411529
- **[J13]**: **Arif Ullah**, Wooyeol Choi, Teklu Merhawit Berhane, Yusuf Sambo, and Muhammad Ali Imran, "Soft-Output Deep-LAS Detection for Coded MIMO System: A Learning-Aided LLR Approximation", *IEEE Transactions on Vehicular Technology*, early access, 2024. DOI. 10.1109/TVT.2024.3391614
- **[J12]**: Aamir Nadeem **Arif Ullah**, and Wooyeol Choi, "Social-Aware Peer Selection for Energy Efficient D2D Communications in UAV-Assisted Networks: A Q-Learning Approach", *IEEE Wireless Communications Letter*, vol. 13, no. 5, pp. 1468-1472, 2024. DOI: 10.1109/LWC.2024.3375235
- **[J11]**: Youngwoo Oh, **Arif Ullah**, and Wooyeol Choi, "Multi-Objective Reinforcement Learning for Power Allocation in Massive MIMO Networks: A Solution to Spectral and Energy Trade-Off", *IEEE Access*, vol. 12, pp. 1172 - 1188, Dec. 2023. DOI: 10.1109/ACCESS.2023.3347788
- **[J10]**: **Arif Ullah**, Wooyeol Choi, and Sinem Coleri, "Path Loss Estimation and Jamming Detection in Heterogeneous Vehicular Networks: A Hybrid Machine Learning Framework", *IEEE Sensors Journal*, vol. 23, no. 24, pp. 31325 - 31336, 2023. DOI: 10.1109/JSEN.2023.3329490
- **[J9]**: **Arif Ullah**, Wooyeol Choi, Ziaul Haq Abbass, and Ghulam Abbass, "Aerial-Terrestrial Networks with Multi-antenna Transmissions: How Many UAVs Need to Be Deployed?", *IEEE Transaction on Vehicular Technology*, vol. 73, no. 2, pp. 2212 - 2226, Sep. 2023. DOI: 10.1109/TVT.2023.3316195
- **[J8]**: Fawad, Iftikhar Ahmad, **Arif Ullah**, and Wooyeol Choi, "Machine Learning Framework for Precise Localization of Bleached Corals Using Bag-of-Hybrid-Visual-Feature Classification", *Nature Scientific Report*, vol. 13, pp. 1946, 2023. DOI: 10.1038/s41598-023-46971-7
- **[J7]**: **Arif Ullah**, Ziaul Haq Abbas, Ghulam Abbas, Fazal Muhammad and Jae-Mo Kang, "Hybrid millimeter wave heterogeneous networks with spatially correlated user equipments," *Digital Communications and Networks*, in press, Oct. 2022. DOI: 10.1016/j.dcan.2022.10.022
- **[J6]**: **Arif Ullah**, Ziaul Haq Abbas, Fazal Muhammad, Irfanullah, Alam Zeb, and Shahid Khattak, "Likelihood ascent search augmented sphere decoding receiver for MIMO systems using M-QAM constellations," *IET Communication*, vol. 14, no. 22, pp. 4152-4158, Dec. 2020. DOI: 10.1049/iet-com.2019.1316
- **[J5]**: **Arif Ullah**, Ziaul Haq Abbas, Ghulam Abbas, Fazal Muhammad, and Lei Jiao, "Capacity Driven SBS Deployment in Heterogeneous Cellular Networks: Outage probability and Rate coverage Analysis," *Transaction on Emerging Telecommunications Technologies*, vol. 31, no. 6, p. e3876, 2019. DOI: 10.1002/ett.3876
- **[J4]**: Ziaul Haq Abbas, **Arif Ullah**, Ghulam Abbas, Fazal Muhammad, and Frank Yong Li, "Outage Probability Analysis of User-Centric SBS based HCNets Under Hybrid Rician/Rayleigh Fading," *IEEE Communication Letters.*, vol. 24, no. 2, pp. 297-301, Dec. 2019. DOI: 10.1109/LCOMM.2019.2959578
- **[J3]**: **Arif Ullah**, Ziaul Haq Abbas, Ghulam Abbas, Fazal Muhammad, and Lei Jiao, "Performance Analysis of User-Centric SBS Deployment with Load Balancing in Heterogeneous Cellular Networks: A Thomas Cluster Process Approach," *Computer Networks*, vol. 170, pp. 107120, 2020. DOI: 10.1016/j.comnet.2020.107120
- **[J2]**: **Arif Ullah**, Ziaul Haq Abbas, Fazal Muhammad, Ghulam Abbas, and Sunghwan Kim, "Uplink Performance Analysis of User-centric Small Cell Aided Dense HCNets with Uplink/Downlink Decoupling," *IEEE Access*, vol. 8, pp. 148460-148474, 2020. DOI: 10.1109/ACCESS.2020.3015915
- **[J1]**: Hammad Ahmad, Muhammad Mahmood Ali, **Arif Ullah**, Arbab Abdur Rahim, Husnul Maab, and Mahmood Khan, "An Ultra-Thin Beam Splitter Design Using a-Si:H Based on Phase Gradient Metasurfaces," *Journal of Nanoelectronics and Optoelectronics*, vol. 14, no. 9, pp. 1339-1343, Sep. 2019. DOI: 10.1166/jno.2019.2614

Manuscripts Submitted/in Preparation

- **[S1]**: **Arif Ullah**, Fawad, Amir Nadeem, Muhammad Arif, Muhammad Mehran Bashir, and Wooyeol Choi, "6G Internet-of-Things Assisted Smart Homes and Buildings: Enabling Technologies, Opportunities and Challenges", *Submitted to IEEE Internet of Things Journal*, 2023.

Conference Proceedings

- **[C2]**: Fawad, **Arif Ullah**, Iftikhar, and Wooyeol Choi, "RS-DeepNet: A Machine Learning Aided RSSI Fingerprinting for Precise Indoor Localization," *The 2nd International Conference on Maritime IT Convergence*, Jeju, South Korea, 23-25 Aug. 2023. **(Outstanding paper award)** DOI: 10.36227/techrxiv.171174559.94756982/v1

- [**C1**]: **Arif Ullah**, Ziaul Haq Abbas, Ghulam Abbas, and Fazal Muhammad, "Analysis of Outage Probability and Rate Coverage in Heterogeneous Cellular Networks with joint uniform and clustered users," *20nd IEEE International Multi topic Conference (INMIC)*, Islamabad, Pakistan, 29-30 Nov. 2019. DOI: 10.1109/INMIC48123.2019.9022767

Thesis

- [**T1**]: **Arif Ullah**. (2021). User-centric Small Cell Aided Future Cellular Networks: Sub-6GHz and Hybrid Millimeter Wave Communications [Doctoral dissertation, GIK Institute of Engineering Sciences and Technology]. Available online on HEC portal http://prr.hec.gov.pk/jspui/handle/123456789/18249
- [**T2**]: **Arif Ullah** (2016). Precise Estimation of Soft Output for Sphere Decoding based MIMO OFDM Receiver using Modifed Likelihood Ascent Search Algorithm [MSc. dissertation, COMSATS University]. Institutional Repository at https://....

Academic Projects

- **MAIVNet-6G**: Modeling and Analysis of Intelligent V2E Network for 6G. Unfortunately, this project couldn't secure funding in the Horizon Europe Program 2022, however, it received encouraging remarks, achieving an overall score of **78/100 (Excellence: 4.5/5, Impact: 3/5, Implementation: 3.7/5)** in evaluation.
- **Federated deep reinforcement learning-based resource allocation for flying ad-hoc networks**: This project was funded by the National Research Foundation (NRF), Republic of Korea.
- **User-centric small cells aided multi-tier networks**: This project focuses on the stochastic geometry modeling and performance evaluation of hotspot-aided user-centric small cell deployment in HCNet (2018–2021)
- **Beam splitter design using metasurfaces**: This project focuses on the design of an ultra-thin beam splitter Using a-Si: H based on phase gradient metasurfaces in HFSS (Spring 2018)
- **Precise estimation of soft output for sphere decoder**: In this project we precisely estimated the soft output for sphere decoding (SD) receiver in multi-antenna setup using low complexity modified likelihood ascent search algorithm (LAS) in MIMO OFDM system. (2015–2016)
- **Design of UHF-RFID Tags with Meander-Line Antennas**: This project focuses on the design of different active and passive UHF-RFID tags and simulated small-size meandered line antenna tags using HFSS for transportation applications (2015)

Courses Undertaken

Online Courses:

- **(2021)**, "Introduction to Machine Learning": offered by DUKE University online and Coursera

Graduate Courses:

- **(2014)**: Stochastic Processes (EEE-611), Optimization Techqs. (EEE-712), Microwave Passive Devices & Circuits (ETN-611), EM Field Theory (ETN-610), Radio Engg. (ETN-616), Data Commun. & Nets. (ETN-671)
- **(2015)**: Linear System Theory (ECI-665), Wireless Communication Techniques (ETN-644)
- **(2017)**: Advance Algo. & Computational Techs. (CS-506), Organic Semiconductor & Devices (EE-633)
- **(2018)**: Computational Methods for Engineers (ES-531), Instrumentation & Control Systems (EN-541), Cyber Security & IOT (CS-520), Electromagnetic Meta materials (EE-613)

Skills Summary

- **Programming**: Python (basic), Matlab, LaTeX, C/C++, Assembly language, Mathematica
- **Softwares**: Simulink, Advance Design System (ADS), High Frequency Structured Simulation (HFSS), CST Microwave Studio, Pspice, Electronic Workbench, Inkscape, Linux
- **Languages**: English, Urdu, Pashto

Honors, Awards, & Memberships

- **Postgraduate Fellowship**: Selected for Graduate Assistantship (GA4) during my PhD studies at GIK Institute of Engineering Sciences and Technology Pakistan, **2017 - 2021**
- **MS Scholarship**: Selected for Prime Minister Fee Reimbursement Scheme with full fee scholarship covering the tuition fee expenses during MS studies at COMSATS University, **2014 - 2016**
- **Member IEEE**: Member of Institute of Electrical and Electronics Engineers with Membership #: 95038221
- **Member PEC**: Member of Pakistan Engineering Council with Membership #: ELECTRO/16479

Presentations/Awards/Seminars

- **P2**: Paper Presentation in the 2nd International Conference on Maritime IT Convergence, Jeju, South Korea, 2023
- **P1**: Paper Presentation in the 22nd IEEE International Multi Topic Conference held at National University of Computer and Emerging Sciences, Islamabad, Pakistan, 2019
- **C1**: Attended IEEE International Conference on Communications (ICC), Seoul, South Korea, 2022
- **W1**: Attended the 1st International Pak-Turk Workshop on Emerging Technologies in the Field of Science and Engineering held at GIK Institute of Engineering Sciences and Technology, Pakistan, 2018
- **W2**: Attended a a hands on Workshop on Deep Intelligence, organized by Aerial Robotic Lab at GIK Institute of Engineering Sciences and Technology, Pakistan, 2021
- **S1**: Attended a seminar on "Writing a Good Research Paper" held at GIK Institute of Engineering Sciences and Technology, Pakistan, 2019

Organizations & Community Services

Journals/Conference Reviewer

- IEEE: Wireless Communications Letter, Transactions on Vehicular Technology, Transactions on Intelligent Transportation System, Communications Magazine
- ELSEVIER: Digital Communications and Networks, Computer Networks
- MDPI: Drones, Sensors, Applied Sciences, Information
- RS Open: Journal on Innovative Communication Technologies
- (ICEAAI-2022): International Conference on Engineering Applications of Artificial Intelligence, Abha, KSA
- (ICCIT-2023): 3rd International Conference on Computing and Info. Techno, University of Tabuk, KSA

TPC

- (ICIESTR-2024): 1st International Conference on Innovative Eng. Sci. & Techno. Research, Muscat, Oman
- (INMIC-2023): 2nd International Conference on Maritime IT Convergence, Jeju South Korea
- (ICRAIS-2023): International Conference on Recent Advances in IT for Sustainable Development, Manipal India

References

- **Prof. Dr. Ziaul Haq Abbas** (Ph.D Advisor): Associate Professor, Faculty of Electrical Engineering, GIK Institute of Engineering Sciences and Technology Topi, 23640, Pakistan. Email: ziaul.h.abbas@giki.edu.pk, Phone: +92 (0) 938 281 026 (Ext. 2275)
- **Prof. Dr. Ghulam Abbas** (Ph.D. Co-advisor): Faculty of Computer Science and Engineering, GIK Institute of Engineering Sciences and Technology Topi, 23640, Pakistan. Email: abbasg@giki.edu.pk, Phone: +92 (0) 938 281 026 (Ext. 2739)
- **Prof. Dr. Shahid Khattak** (MS. Advisor): Professor and HOD Department of Electrical Engineering, COMSATS University Abbotabad, Islamabad, Pakistan. Email: skhattak@ciit.net.pk, Phone: +92 (0) 992 383 5915