Rafid Umayer Murshed

307 E Clark St., Champaign, IL-61820
(+1) 469-493-6618
✉ rafid.buet.eee16@gmail.com
GoogleScholar 🇬
ResearchGate 🇷
Github 🇴

Education

2025–	**University of Illinois Urbana-Champaign**, *PhD in Computer Science.*
2023– 2025	**The University of Texas at Dallas**, *M.Sc. (Thesis) in Electrical Engineering*, **(GPA-4.00/4.00)**.
2017–2022	**Bangladesh University of Engineering and Technology**, *B.Sc. in Electrical and Electronic Engineering*, (GPA – 3.56/4.00, Final 60 credits' GPA: 3.75/4.00).

Standardized Test Scores

June 2022	**Test of English as a Foreign Language (TOEFL iBT): Total Score – 114/120**, *Reading: 30/30, Listening: 30/30, Speaking: 28/30, Writing: 26/30.*
December 2021	**Graduate Record Examinations (GRE): Total Score – 332/340**, *Verbal: 163/170 (92%), Quantitative: 169/170 (94%), Analytical Writing: 4.5/6 (80%).*

Research Interests

Physics-Informed AI for Next-Generation Wireless Systems: Developing trustworthy digital twins for 6G networks through deep learning of complex wave propagation phenomena, with applications in beamforming optimization, sensing, and communication-sensing integration.

Journal Publications (*All as the first author*)

March 2025	R. U. Murshed, M.S.A. Rafi, S. Reza, M. Saquib and I. Mahbub, **"MetaFAP: Meta-Learning for Frequency Agnostic Prediction of Metasurface Properties"**, *Submitted to IEEE Transactions on Machine Learning in Communications and Networking*. ○ Novel framework built on the meta-learning paradigm for predicting metasurface properties ○ Achieves MSE lower than 0.01 and 80% correlation on datasets of varying difficulty
July 2024	R. U. Murshed, M. S. Ullah, M. Saquib and M. F. Uddin, **"Beyond Traditional Beamforming: Singular Vector Projection Techniques for MU-MIMO"**, *IEEE Commun. Lett. (IF: 4.2), DOI: 10.1109/LCOMM.2024.3522939*. ○ Novel low-complexity high-performance beamforming algorithm for MU-MIMO ○ Theoretical breakthrough: First rigorous mathematical derivation of interference upper bounds for MU-MIMO, enabling provably optimal performance guarantees
March 2024	R. U. Murshed *et al.*, **"Real-time Seismic Intensity Prediction using Self-supervised Contrastive GNN for Earthquake Early Warning"**, *IEEE Trans. Geosci. Remote Sens. vol. 62, pp. 1-19, 2024, Art no. 5909119, doi: 10.1109/TGRS.2024.3373643*. ○ Physics-aware graph neural network learning wave propagation dynamics through self-supervised contrastive learning with minimal labeled seismic data ○ State-of-the-art performance: 234% improvement over existing methods, enabling life-saving earthquake warnings with at least 10-second lead time
December 2023	R. U. Murshed *et al.*, **A CNN-based Multifaceted Signal Processing Framework for Heart Rate Proctoring Using Millimeter Wave Radar Ballistocardiography**, *Array, Volume 20, 2023, 100327, ISSN 2590-0056, DOI: 10.1016/j.array.2023.100327*. ○ Noninvasive radar sensing breakthrough: Achieving medical grade accuracy (98.73% correlation) for cardiovascular monitoring using mmWave technology ○ Multi-physics signal processing: Novel CNN architecture extracting heartbeat signatures from complex radar backscatter, advancing contactless health monitoring

April 2023   R. U. Murshed *et al.*, **"A CNN-LSTM-based Fusion Separation Deep Neural Network for 6G Ultra-Massive MIMO Hybrid Beamforming"**, *in IEEE Access, vol. 11, pp. 38614-38630, 2023, doi: 10.1109/ACCESS.2023.3266355.*

- Domain-knowledge integrated neural architecture combining spatial CNN and temporal LSTM for real-time beamforming
- $100\times$ speedup over iterative algorithms (PE-Alt-Min) while maintaining optimal performance, enabling practical ultra-massive MIMO deployment

Selected Conference Proceedings (*All as the first author*)

June 2024   R. U. Murshed, M. S. Ullah, M. Saquib and M. Z. Win**, "Self-supervised Contrastive Learning for 6G UM-MIMO THz Communications: Improving Robustness Under Imperfect CSI"**, *2024 IEEE International Conference on Communications Workshops (ICC Workshops), Denver, CO, USA, 2024, pp. 220-226, doi: 10.1109/ICCWorkshops59551.2024.10615313.*

- Significantly outperforms existing approaches in terms of achievable rate and error rates

March 2024   R. U. Murshed, M. S. Ullah and M. Saquib, **"A Fast Effective Greedy Approach for MU-MIMO Beam Selection in mm-Wave and THz Communications"**, *2024 58th Annual Conference on Information Sciences and Systems (CISS), Princeton, NJ, USA, 2024, pp. 1-6, doi: 10.1109/CISS59072.2024.10480178.*

- Low-complexity greedy algorithm for MU-MIMO beam- selection and its theoretical, computational advantages

August 2023   R. U. Murshed *et al.*, **"Analysis of Frequency Content and Statistical Relationship among Earthquake Parameters of Seismic Data in Bangladesh"**, *2023 12th International Structural Engineering and Construction Conference, Chicago, IL, USA, 2023, DOI: 10.14455/ISEC.2023.10(1).RAD-08.*

- Multi-resolution signal analysis combining Fourier and wavelet transforms to extract hidden patterns in seismic wave propagation
- Novel statistical frameworks for parameter correlation analysis in complex physical systems

December 2022   R. U. Murshed, S. K. Dhruba, M. T. I. Bhuian and M. R. Akter, **"Automated Level Crossing System: A Computer Vision-Based Approach with Raspberry Pi Microcontroller"**, *2022 12th International Conference on Electrical and Computer Engineering (ICECE), Dhaka, Bangladesh, 2022, pp. 180-183, doi: 10.1109/ICECE57408.2022.10089007.*

- Real-time computer vision deployment on resource-constrained Raspberry Pi hardware, demonstrating edge AI capabilities for safety-critical applications
- System integration innovation: End-to-end pipeline from object detection to hardware control, pioneering edge computing for transportation infrastructure (Patent Application Filed)

December 2021   R. U. Murshed, A. H. Hridhon and M. F. Hossain, **"Deep Learning Based Power Allocation in 6G URLLC for Jointly Optimizing Latency and Reliability"**, *2021 5th International Conference on Electrical Information and Communication Technology (EICT), Khulna, Bangladesh, 2021, pp. 1-6, doi: 10.1109/EICT54103.2021.9733558.*

- Deep learning acceleration of weighted minimum mean square error (WMMSE) optimization, achieving $3000\times$ computational speedup for ultra-reliable communications

Professional Experience

2023-2025   **Graduate Research Assistant**, *Department of ECE, The University of Texas at Dallas, USA.*

- Performing research on physics-informed AI for 6G wireless systems and signal processing under Dr. Saquib
- Research leadership: Co-authored 7 papers (5 first-author) in top-tier venues, establishing new theoretical foundations for AI-native wireless networks and THz communications
- Grant development expertise: Contributed to research proposals to NSF, NIH, FAA, and DARPA, developing technical sections on machine learning for wireless sensing and 6G infrastructure

2022-2023	**Research Assistant**, *Japan Institute of Disaster Prevention and Urban Safety (JIDPUS), BUET.*

- Large-scale data collection and curation: Led comprehensive seismic data acquisition campaign using Bangladesh Meteorological Department's advanced sensor network, collecting and processing data from 48 major and minor earthquakes across Bangladesh and surrounding regions
- Novel dataset creation: Established first comprehensive seismic wave propagation database for Bangladesh's unique geological terrain, enabling breakthrough discoveries in regional earthquake characteristics and wave attenuation patterns
- Physics discovery through data science: Conducted thorough analysis revealing previously unknown seismic wave propagation characteristics specific to Bengal Basin geology, establishing a new understanding of subsurface wave interaction mechanisms
- Real-time AI system deployment: Architected and deployed a graph neural network framework for earthquake early warning systems, achieving life-saving 10-second prediction lead time
- Physics-aware machine learning: Developed novel self-supervised contrastive learning algorithms that learn wave propagation physics with minimal labeled data, establishing new paradigms for scientific AI
- Research leadership: First-authored 3 papers in top-tier venues, leading an interdisciplinary team of electrical, computer, and civil engineers

Major Academic Recognitions and Honors

2025	Siebel School of Computing and Data Science Graduate Fellowship, UIUC, Illinois
2025	Summer Research Fellowship, Harvard University
2025	Marie Skłodowska-Curie Doctoral Fellowship, European Union
2024	Invited Speaker in the show and tell session at MERIF24 in Kansas City, Missouri
2024	NSF Travel Grant Award for attending ARAFest24 in Ames, IOWA
2023-2024	Graduate Research Assistantship awarded by UT Dallas
2017-2022	University Technical Scholarship (Bangladesh University of Engineering and Technology)

Skills

Programming	Python, C, C++, Matlab, Verilog, Embedded C, Bash, Assembly
Frameworks	TensorFlow2, RL Glue, Keras, Pytorch, Sionna, Pandas, OpenCV, SciPy
Platforms	Linux, Git, Docker, Kubernetes, OpenStack, AWS, NVIDIA Sionna, Simulink, Agile
Simulators	Quartus, Proteus, PSpice
OS	Windows, Linux, Android, MAC
Softwares	MS Word, Latex, MS PowerPoint, MS Excel
Languages	English, Bengali, Arabic (reading and writing only), Hindi (speaking only)

References

Dr. Mohammad Saquib,
Professor,
ECE, UT-Dallas,
saquib@utdallas.edu.

Dr. Elahe Soltanaghai,
Assistant Professor,
CS, UIUC,
elahe@illinois.edu.