Anika Tasnim Ritu

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EDUCATION

Master of Science in Electrical & Electronic Engineering April 2023 – Jan 2026
Rajshahi University of Engineering & Technology (RUET), Rajshahi-6204, Bangladesh.
CGPA: **4.00/4.00**, Relevant courses: Biomedical Electronics; Antenna Array Signal Processing; Digital Circuit Design.

Bachelor of Science in Electrical & Electronic Engineering Feb 2017 – Nov 2022
Rajshahi University of Engineering & Technology (RUET), Rajshahi-6204, Bangladesh.
CGPA: **3.90/4.00**, Class rank: 3/123, Relevant courses: Signals and Linear Systems; Computational Methods in Electrical Engineering; Digital Signal Processing; Embedded System Design.

RESEARCH INTERESTS

Trustworthy and Interpretable AI for Healthcare; Physiological Signal Processing; Wearable Health Sensing; Self-Supervised and Multimodal Learning; Medical Image Analysis.

RESEARCH EXPERIENCE

Remote Research Assistant, Health Informatics Research Laboratory (HIRL) Apr 2025 – Present
Daffodil International University, Dhaka, Bangladesh (Lab Website).

- **Interpretable NMD classification (first-author IEEE TAI):** Developed an interpretable framework for multiclass neuromuscular disorder (NMD) classification by integrating domain-guided EMG feature engineering, a hybrid CNN–LSTM architecture, and explainable AI (SHAP, PDP, PFI, and LIME); evaluated on the Mendeley iEMG dataset and validated through cross-population (EMGLAB) and cross-modality (private sEMG) cohorts, achieving up to 95.83% accuracy, 98.61% AUC, and a 59.56 ms inference time per sample.
- **Residual-manifold EMG classification (collaborative):** Contributed to a residual-manifold learning framework combining Isomap feature embeddings with GWO-optimized XGBoost for cross-dataset and cross-modality NMD classification.
- **Retinal and ocular disease screening (collaborative):** Contributed to the development of CNN–Swin domain adaptation framework with CycleGAN and DANN (13.42% cross-domain improvement) and EDNet-20 for eight-disease fundus classification (94.26% public; 91.80% private accuracy).

Undergraduate and Postgraduate Researcher, Department of EEE, RUET 2021–2022; 2023–2026

- **Cardiovascular signal analysis (B.Sc. and M.Sc. thesis research):** Investigated relationships among ECG-derived features, physiological parameters, and lifestyle factors using statistical analysis, supervised prediction, and unsupervised clustering to characterize cardiovascular phenotypes.

SELECTED PUBLICATIONS

Journal Articles

1. **A. T. Ritu**, S. Hossain, M. Z. Hasan, S. Bosak, A. Hanip, and T. Bhuiyan, "Interpretable CNN–LSTM Framework for Multiclass Neuromuscular Disorder Classification Using Clinically Relevant EMG Features," ***IEEE Transactions on Artificial Intelligence***, vol. 7, no. 6, pp. 3383–3398, 2026. [Link]
2. S. Bosak, M. R. Islam, M. R. I. Sheikh, **A. T. Ritu**, M. B. Hossain, and M. J. Hossain, "Robust Control of Renewable-Hydrogen Electrolyzer-Buck Converter Systems Using Modified Double Integral Sliding Mode Controller for Grid Ancillary Services," *Journal of Power Sources*, vol. 677, p. 239953, 2026. [Link]

Journal Manuscripts Under Review

1. M. Z. Hasan, S. Hossain, S. M. D. Alam, S. K. Shehjad, A. Dey, M. Tazakkaruzzaman, **A. T. Ritu**, M. Hasan, and A. Moustafa, "Domain-Adaptive Deep Learning for Robust Multi-Class Retinal Disease Screening Across Clinical Environments," submitted to *Discover Artificial Intelligence*.
2. S. Hossain, M. M. Sayeb, T. A. Patwary, M. Mehenaj, **A. T. Ritu**, M. M. Rahman, M. Z. Hasan, J. Mumin, S. Ahmmed, and O. Jaman, "EDNet-20: Enhancing Multi-Label Ocular Disease Detection through Deep Learning Optimization," submitted to *Discover Artificial Intelligence*. [Preprint]
3. M. Z. Hasan, R. Ibrahim, A. Fariha, N. Sakib, S. T. Jahan, M. Momtaj, M. A. Rahman, **A. T. Ritu**, S. Hossain, and A. Moustafa, "GWO-RMF: A Meta-Heuristic Residual Manifold Framework for Interpretable Neuromuscular Disorder Classification Using Clinically Relevant EMG Features," submitted to *Applied Computational Intelligence and Soft Computing* (Wiley).

Conference Papers

1. **A. T. Ritu**, A. K. Sarkar, and S. Bosak, "Statistical Analysis of Physical Activity's Impact on Cardiovascular Health using ECG and Lifestyle Metrics," in *2025 4th International Conference on Electrical, Computer and Communication Engineering (ECCE)*, pp. 1–6, 2025. [Link]
2. **A. T. Ritu**, A. K. Sarkar, and S. Bosak, "Assessing the Relationship between Bodily Biological Parameters and Cardiac States of Different Subjects," in *2024 3rd International Conference on Advancement in Electrical and Electronic Engineering (ICAEEE)*, pp. 1–6, 2024. [Link]
3. H. U. Rahman, **A. T. Ritu**, H. J. Rasha, and M. S. Anower, "Comparative Analysis of Microcontrollers in Wearable Devices for Real-Time Arrhythmia Classification: An Embedded Machine Learning Approach," in *2024 6th International Conference on Electrical Engineering and Information & Communication Technology (ICEEICT)*, pp. 1327–1331, 2024. [Link]
4. M. S. Sorkar, M. M. Rahman, and **A. T. Ritu**, "Detection of Neuromuscular Disorders from EMG Signals: A Machine Learning Approach," in *2026 IEEE 2nd International Conference on Quantum Photonics, Artificial Intelligence & Networking (QPAIN)*, Chittagong, Bangladesh, pp. 1–6, 2026. [Link]
5. M. T. Nabi, M. N. Hasan, **A. T. Ritu**, J. Jumana, and I. Z. Netto, "Touchless IoT-Based Health Monitoring System for Elderly and Maternal Healthcare Applications with Real-Time Cloud Integration," in *International Conference on Power, Electronics, Communications, Computing, and Intelligent Infrastructure*, 2026. **(Accepted)**

Conference Manuscripts Under Review

1. **A. T. Ritu** and A. K. Sarkar, "Interpretable Lifestyle-Based Prediction of ECG-Derived Cardiovascular Phenotypes," submitted to the *IEEE International Conference on Signal Processing, Information, Communication and Systems (SPICSCON)*, 2026.
2. **A. T. Ritu** and A. K. Sarkar, "Unsupervised ECG-Lifestyle Clustering for Early Cardiovascular Phenotyping in Young Adults," submitted to the *IEEE International Conference on Signal Processing, Information, Communication and Systems (SPICSCON)*, 2026.

TEACHING EXPERIENCE

Lecturer, Department of Electrical and Electronic Engineering — Jul 2023 – Present
Bangladesh Army University of Engineering & Technology, Natore, Bangladesh.

Lecturer (Contractual), Department of Electrical and Electronic Engineering — Mar 2023 – May 2023
Bangladesh Army University of Engineering & Technology, Natore, Bangladesh.

TECHNICAL SKILLS

Programming: Python, MATLAB, C/C++.
ML/DL: PyTorch, TensorFlow, Keras, Scikit-learn, NumPy, Pandas, Explainable AI (XAI).
Simulation: MATLAB/Simulink, Proteus, Multisim.
Hardware: Arduino, STM32, IoT devices and sensors.
Research Tools: LaTeX, Microsoft Office, Git, GitHub, Microsoft Visio, Draw.io, EndNote.

HONORS & AWARDS

Government Merit-Based Scholarships (4), Ministry of Education, Bangladesh
Awarded four national merit scholarships for performance in national public examinations, with scholarship support spanning 2009–2022: **PSC Talent Pool Scholarship** (18th), **JSC General Scholarship**, **SSC Talent Pool Scholarship** (13th), and **HSC Talent Pool Scholarship** (7th) in the Dinajpur Education Board.

PROFESSIONAL ACTIVITIES

Publication Committee Member, IEEE International Conference on Signal Processing, Information, Communication and Systems (SPICSCON), 2026.
Student Member, IEEE.

REFERENCES

Dr. Ajay Krishno Sarkar
Professor, Dept. of EEE, RUET
Email: aksarkar@eee.ruet.ac.bd

Dr. Md. Rafiqul Islam Sheikh
Professor, Dept. of EEE, RUET
Email: mri.sheikh@eee.ruet.ac.bd