Aranya Saha

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Education

MSc **Bangladesh University of Engineering and Technology (BUET)** *Ongoing*
Department: Electrical and Electronic Engineering (EEE)
Major: Communication and Signal Processing (CSP)
- **Relevant Coursework:** Deep Learning, Digital Speech Processing, Biomedical Signal Processing.

BSc **Bangladesh University of Engineering and Technology (BUET)** *March 2025*
Department: Electrical and Electronic Engineering (EEE)
Major: Communication and Signal Processing (CSP)
- **CGPA: 3.87/4.00**
- **Relevant Coursework:** Artificial Intelligence and Machine Learning, Digital Image Processing, Random Signals and Processes, Microprocessor and Embedded Systems, Wireless Communications, Digital Signal Processing, Digital Electronics, Continuous Signals and Linear Systems, Linear Algebra, Probability and Statistics, Computer Programming, etc.

Research Interests

AI & Machine Learning | Computer Vision | Vision Language Models | Medical Image Processing | Natural Language Processing

Research Experience

Development of a Multimodal Medical Assistance Chatbot for Domain-Specific Applications *Dhaka, Bangladesh*
Undergraduate Thesis *Nov 2023 – Mar 2025*
Presentation Slides
- Developed an efficient dermatology-focused vision-language model by fine-tuning LLaVA with structured reasoning via GRPO and disease-aware prompting.
- Integrated Knowledge Graph-enhanced RAG (KG-RAG) with Direct Preference Optimization (DPO) to reduce hallucinations and ensure accurate medical information retrieval.
- Applied model compression techniques, achieving 30% parameter reduction while maintaining performance.
- *Research Supervisor:* Dr. Mohammad Ariful Haque, Professor, EEE, BUET

Publications

1. Shadman Sobhan, **Aranya Saha**, Tanvir Ahmed Khan, Abduz Zami, *"Skin Cancer Classification Using Pre-trained CNNs: A Transfer Learning Approach Addressing Imbalanced Data Challenges,"* **Accepted** at the 2nd International Conference on Next-Generation Computing, IoT and Machine Learning (NCIM 2025), Bangladesh, June 2025. *[Paper Draft]*

2. Shadman Sobhan, Abduz Zami, Mohiuddin Ahmed, Tanvir Mahtab Zihan, Tanvir Ahmed Khan, **Aranya Saha**, *"A Multi-Stage Deep Learning Approach to Tuberculosis Detection with Explainable Insights,"* **Accepted** at the 2nd International Conference on Next-Generation Computing, IoT and Machine Learning (NCIM 2025), Bangladesh, June 2025. *[Paper Draft]*

Professional Experience

Advanced Chemical Industries Ltd. [Website] *Dhaka, Bangladesh*
Machine Learning Engineer *Apr 2025 – Present*
Currently contributing to multiple AI projects, including:
- *Medical LLM Development:* Building a generalized large language model focused on the medical domain.
- *ACI SpeechHub:* Working on this transcription system leveraging ASR and NLP technologies.

Projects

EchoLens: Multimodal Conversational AI Engine GitHub

- Integrated smolVLM for vision-language, Whisper for speech-to-text, enabling multimodal input fusion.
- Designed persistent conversational memory using JSON storage to maintain context over sessions.

Structural Pruning of Multimodal Large Language Models GitHub

- Applied layer-wise structured pruning to LLaVA model, preserving capabilities while reducing parameters.
- Achieved 40% model size reduction with under 2% accuracy loss on medical downstream tasks.

Simple MedQA-GPT: GPT Tailored for Medical Q&A GitHub

- Fine-tuned GPT-2 with supervised learning on curated clinical Q&A datasets using Hugging Face Trainer.
- Deployed scalable FastAPI REST service with Docker, enabling low-latency medical inference.

IoT-Based Patient Health Monitoring System GitHub Report

- Developed a comprehensive IoT sensor network for real-time patient parameter monitoring.
- Implemented real-time data visualization dashboard with alert systems.

MATLAB-Based Fingerprint Recognition System GitHub Report

- Implemented advanced fingerprint recognition using signal processing techniques.
- Focused on feature extraction algorithms and pattern matching optimization.

Leadership Experience

Association for Computing Machinery (ACM) [Website] *Remote*
Student Executive, ACM SIGCOMM *Apr 2024 – Feb 2025*

- *Appointment:* First-ever Student Executive of ACM SIGCOMM, leading initiatives for thousands of networking professionals alongside Chair Dr. Matthew Caesar, Professor, CS, UIUC.
- *Technical Contributions:* Developed official SIGCOMM website under direct mentorship of the Chair.
- *Community Building:* Co-established official paper reading group; presented a research paper.

Workshop

Robotics Bootcamp 2025 [Website] *Dhaka, Bangladesh*
Institute of Robotics and Automation, BUET *June 2025*

- Delivered a lecture on *PID Control for Robotics*, introducing feedback control fundamentals, PID components, and tuning methods with practical analogies.
- Included interactive simulations and discussed common real-world issues like steady-state error, oscillation, and sensor noise.

Technical Skills

- **Hardware:** Microcontrollers, IoT Devices, Sensors.
- **Programming:** Python, MATLAB, C/C++, Pandas, NumPy.
- **ML/DL/NLP:** PyTorch, TensorFlow, Hugging Face Transformers, CNNs.
- **DevOps & Tools:** Docker, FastAPI, Git, LaTeX, Microsoft Office.

Honors and Awards

- **University Merit Scholarship** (4 semesters) — BUET, for outstanding academic performance
- **Dean's List Award** (Years 1-2) — BUET, for high cumulative GPA achievement
- **29th Rank out of 10,000+** candidates in BUET Undergraduate Admission Test (2019)
- **31st Rank (Male Category) out of 300,000+** in Dhaka Board HSC; **Talent Pool Scholarship** recipient with 96.83% in Physics, Chemistry, Mathematics and 91.15% overall
- **Perfect Attendance Certificate** — Notre Dame College, for flawless attendance during Classes 11-12