Usama Ibna Alam

Graduate, Electrical and Electronic Engineering, BUET, Bangladesh

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Research Interest

Large Language Models(LLMs), Signal Processing, Robotics and Automation

Education

Year	Degree	Institute	CGPA
2019-2024	B.Sc. in EEE	Bangladesh University of Engineering and Technology	**3.88**

Relevant Courses

Communication System	Machine Learning and Pattern Recognition
Wireless Communication	Digital Signal Processing
Broadband Wireless Communication	Random Signal Processing
Satellite and Radar Communication	Computer Networks
Optical Communication	Robotics and Automation
Engineering Electromagnetics	Microprocessors and Embedded Systems
	Digital Electronics

Publications

- **Usama Ibna Alam**, Sudipto Pramanik, Mohammad Ariful Haque, "Enhanced Generative Question Answering for Language Learning Using Finetuned LLMs and Reinforcement Learning," submitted to ***International Journal of Artificial Intelligence in Education***.
- "Face Recognition Based Automated Approval For Secure Entry System," submitted to ***International Conference on Electrical and Computer Engineering (ICECE)***.

Research Experience

Research Group: LLM Research Group, Department of EEE, BUET
Supervisor: Dr. Mohammad Ariful Haque

- **Undergraduate Thesis:** (May'23 - May'24)
  - Enhanced Generative Question Answering Using Large Language Models and Reinforcement Learning from Human Feedback
- **Current Research:** (Sept'24 - Present)
  - LLM-Based RLC Circuit Recognition and Simulation
  - LLM-Based Disease Recognition System: A system that processes medical images, detects anomalies using a variational encoder and one-class SVM, and identifies specific diseases with additional medical tools

Industrial Experience

- **Intern** at **Walton Digi-Tech Industries Ltd**, Gazipur, Bangladesh. (Nov'23 - Dec'23)

Awards and Achievements

- EEE Faculty **Dean's List Award**, **University Merit Scholarship** from BUET.
- Positions in undergraduate admission test: **78^{th}/12000** selected candidates in BUET, **706^{th}/90000** students in **Dhaka University**, and secured **Barishal Medical College** in Medical admission test without any preparation.
- **27^{th}/2000** students in **Notre Dame College**, Dhaka.
- Secured **1^{st} position** in "Srijonshil Medha Onneshon" in **Best Science Project** category in Khagrachari District.
- **Board scholarships** e.g., HSC, SSC, JSC, PECE.

Technical Skills

- **Simulation Software:** Cisco Packet Tracer, Matlab, ModelSim, PSpice, Proteus, AutoCAD, PSAF
- **Programming Languages:** Python, C/C++, MATLAB, System Verilog
- **ML Frameworks and Libraries:** Transformers, TRL, Deep Neural Networks (using TensorFlow and Keras), Image Processing (using OpenCV)
- **Hardware Skills:** Arduino, ATMEGA32, FPGA
- **Document Preparation:** Overleaf (LaTeX), Microsoft Office, Microsoft Excel

Language Skill

- **IELTS (Overall Band: 7)**
  - Reading: 8, Writing: 7, Listening: 6.5, Speaking: 7

Notable Projects

- **Voice-Controlled Robotic Floor Cleaner (Control System Lab)** *2022*
  - Developed a robotic floor cleaner that operates via Bengali voice commands like "Shamne" for forward and "Thamo" for stop, with features such as obstacle avoidance, speed adjustment, CNN-based command processing, and a Bluetooth-enabled GUI for additional manual control using Matlab.
- **Face Recognition Based Automated Approval for Secure Entry System (Robotics and Automation Lab)** *2023*
  - Designed a secure entry system using Raspberry Pi and AI-driven face recognition, with anti-spoofing measures to block unauthorized access, Telegram-based access requests for unknown visitors, and OTP generation for secure entry.
- **Smart Home: Remote Controlling Electrical Appliances (Microprocessor and Embedded System Lab)** *2023*
  - Built a home automation system with ESP32 and GSM modules, allowing remote control of appliances via the Blynk app and manual switches, real-time power usage monitoring, and GSM backup for reliable operation during internet outages.
- **Detecting Textual Information From Image and Converting to Audio (Numerical Technique Lab)** *2021*
  - Created a system that detects and extracts text from images or PDFs, then converts it to audio using OCR and MSER, with a GUI that supports file uploads, audio configuration, and saving outputs for improved accessibility.
- **Harmonics Elimination in Power System Using Shunt Active Power Filter (Power System Lab)** *2023*
  - Implemented a Shunt Active Power Filter in an IEEE 9-bus simulation to mitigate harmonics from nonlinear loads, reducing Total Harmonic Distortion (THD) by 50.51% and thereby enhancing overall power quality.
- **IoT-Enabled Fire Detection System with Wireless Communication and Real-Time Alerts (Communication System Lab)** *2023*
  - Developed a fire detection system using NodeMCU ESP8266, integrated with gas, smoke, and IR flame sensors, that sends mobile notifications via Blynk and enables remote monitoring with data storage on ThingSpeak.

Volunteer Works

- **Membership Development Coordinator**, IEEE Engineering in Medicine and Biology Society **(EMBS)**. (2023 - 2024)