Md Sultan Mahmud

PhD Student, Dept. of CSE, Penn State

✉ mqm7099@psu.edu | 🏠 hiiamsultan.github.io/sultan.github.io/ | 💻 HiIamSultan | in mdsultanmahmudmahadi | R⁶ Md-Sultan-Mahmud-4

Education

The Pennsylvania State University (PSU)   *University Park, PA, USA*
DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE AND ENGINEERING (CSE)   *Spring'24 - Fall'29*

- **CGPA: 3.89** out of 4.00 (till now)
- **Courses:** Wireless and Mobile Sensing in the age of IoT (Taking), Fundamentals of Computer Architecture (Taking; Core Course), Algorithms and Data Structures in Bioinformatics (Completed; Core Course Substitution)

Bangladesh University of Engineering and Technology (BUET)   *Dhaka, Bangladesh*
BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC ENGINEERING (EEE)   *Feb'17 - May'22*

- **CGPA: 3.84** out of 4.00, **Class Rank:** 30 out of 195 (**Top 15%**)
- **Major:** Communication and Signal Processing, **Minor:** Electronics
- **Key Courses:** Digital Signal Processing (2 courses), Engineering Electromagnetics, Wireless Communication, Radar and Satellite Communications, Communication Systems (2 courses), Random Signals and Processes, Digital Image Processing, Control Systems, VLSI Circuit and Design, Digital Electronics, Electrical Properties of Material, Solid State Devices, Microprocessor and Embedded System.
- **Thesis:** A Study on the Automated Emotion Recognition Task Utilizing Multi-Channel EEG Signal
  - **Area:** Signal Processing and Deep Learning
  - **Supervisor:** Professor Dr. Shaikh Anowarul Fattah

Coursera
Convolutional Neural Networks, Applied Machine Learning in Python, Improving Deep Neural Networks, Structuring Machine Learning Projects, Machine Learning, Mathematics for Machine Learning: Linear Algebra, Mathematics for Machine Learning: Multivariate Calculus, Python Data Structures.

Professional Experience

Teaching Assistant   *Aug'24 - Present*
DEPT. OF CSE, THE PENNSYLVANIA STATE UNIVERSITY   *University Park, PA, USA*
Course: Programming for Engineers with MATLAB (*Role:* Recitation Leader)

Research Assistant   *Jan'24 - Jul'24*
DEPT. OF CSE, THE PENNSYLVANIA STATE UNIVERSITY   *University Park, PA, USA*
Responsibilities: Exploring security vulnerabilities in the 3GPP cellular systems, particularly focusing on lower layers of the cellular radio stack, such as the PHY and MAC.

Lecturer   *Sep'22 - Dec'23*
DEPT. OF EEE, EAST DELTA UNIVERSITY   *Chattogram, Bangladesh*
Instructed Courses: Digital Signal Processing, Signal and Systems, Digital Logic Design, Digital Electronics and Pulse Techniques, Electronics I, Introduction to Electrical Engineering.

Publications

JOURNALS

1. **M. S. Mahmud**, S. A. Fattah, M. Saquib, O. Saha, "CEF2D: CWT Domain 2D Entropy Feature of EEG Signal for Emotion Recognition Using a CNN Model with Reduced Channels and Scales" – In *Biomedical Physics & Engineering Express*

2. O. Saha, **M. S. Mahmud**, S. A. Fattah, M. Saquib, "Automatic Emotion Recognition from Multi-Band EEG Data Based on a Deep Learning Scheme with Effective Channel Attention" – In *IEEE Access*

CONFERENCES

3. **M. S. Mahmud**, M. M. R. Nayan, S. Hasan, M. N. A. Taj, "A Deep Ensemble Model with an Efficient Feature for Multi-class Arrhythmia Classification Utilizing 12-Lead ECG Signal" – In 12th *International*

Conference on Electrical and Computer Engineering (ICECE 2022)

4. **M. S. Mahmud**, O. Saha, S. A. Fattah, "An Efficient Bidirectional LSTM-Based Deep Neural Network for Automatic Emotion Recognition Using EEG Signal" – In *12th International Conference on Electrical and Computer Engineering (ICECE 2022)*

5. O. Saha*, **M. S. Mahmud***, S. A. Fattah, "DEEPSATTNET: An Efficient Deep Neural Network with Self-Attention Mechanism for Emotion Recognition Utilizing EEG Signal" – In *8th IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (IEEE WIECON-ECE 2022)* - **Best Technical Presentation Award**; *These authors contributed equally to this work.**

6. O. Saha, **M. S. Mahmud**, S. A. Fattah, "Automatic Emotion Recognition from EEG Signal Utilizing Wavelet Packet Node Reconstruction and a CNN Classifier" – In *26th International Conference on Computer and Information Technology (ICCIT 2023)*

UNDER REVIEW

7. Y. Dong, T. Yang, A. Al Ishtiaq, S. Rashid, A. Ranjbar, K. Tu, T. Wu, **M. S. Mahmud**, S. Hussain, "CoreCrisis: Threat-Guided Context-Aware Black-Box Testing Framework for 5G Core Network Implementations" – In *USENIX Security'25*

Notable Undergrad Projects

- **Deep Learning-based Multi-class Arrhythmia Classification using 12-Lead ECG Signal**
  - Designed an **Ensemble Deep Learning**-based neural network using TensorFlow Keras to classify different types of **arrhythmia**; Explored efficient **feature** in the **time-frequency** domain and various types of advanced Deep Learning-based models for the classification task
- **Configurable Logic Block (CLB) using CMOS Logic Family**
  - Designed a CLB with parallel loading of **8-bit SRAM** using both **combinatorial** and **sequential** modes of operation in **45nm CMOS technology**
- **Linear Controller-based Ventilator Design for Respiratory System**
  - Designed a linear **PID controller**-based ventilator for the respiratory system; Implemented a **robust** design for the **controller** to follow the exact pressure curve for any values of lung capacitance, lung resistance, leakage resistance, hose resistance and airway pressure
- **Nonlinear Power Factor Correction**
  - Designed a **power system** that can reduce **harmonic distortion** at resistive load to any extent and a certain level in case of inductive or capacitive load
- **Speech to Braille Converter with STM32**
  - Designed and implemented a **real-time speech to braille** converter utilizing google's API, assembly as well as C programming language and STM32 board
- **Hex-Password based Door Lock Security System**
  - Designed a knowledge factor-based password door lock system in Proteus and also analyzed different scenarios in the **timing diagram** of Quartus by means of Verilog coding
- **AM Radio Receiver and Transmitter Circuit Design and Build**
  - Designed and implemented a **modulator** circuit, an **asynchronous demodulator** circuit, an **amplifier** circuit and an **active band-pass filter**, including **PCB** design, for an AM radio
- **Automated Traffic Control System using Fuzzy Logic**
  - Designed an automated traffic control system from real-time CCTV video footage where the **Computer Vision** application was performed by using **video processing** and **object detection**

Awards and Honours

University Merit Scholarship – BUET

Dean's List Award – BUET

Dr. Saifuddin Ahmed Chowdhury Memorial Scholarship – BUET

University Technical Scholarship – BUET

University Stipend Scholarship – BUET

Bronze Award – HRH The Duke of Edinburgh KG KT Founder

Technical Skills

- **Programming Language:** Python, C/C++, Verilog, Assembly
- **Tool/Framework:** srsRAN, Tensorflow, Scikit-Learn
- **Software:** Matlab, Simulink, VS Code, Cadence Virtuoso, Proteus, Emu8086, CodeBlocks, Arduino IDE, LaTeX, MS Office
- **Hardware:** USRP, Microcontroller, Arduino, FPGA
- **Soft Skill:** Presentation, Report Writing

Extracurricular Activities

Vice-Chairperson – IEEE Signal Processing Society BUET Student Branch
Assistant Treasurer – IEEE BUET Student Branch
Vice-President – Badhan BUET Zone Suhrawardy Hall Unit