Tamim Hasan Bhuiyan

Dhaka, Bangladesh

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Research Interest

Brain-Computer Interface(**BCI**), Brain Machine Interface, EEG, Robotics, Reinforcement Learning, Signal Processing, Neuroscience, Medical Imaging, Control, Optimization, AI, ML, Video and Image Processing.

Education

Bangladesh University of Engineering Technology (BUET) *Feb 2020 – Present*
BS in Electrical and Electronic Engineering
Major in Communication and Signal Processing (**CSP**)

- CGPA: 3.76/4.0 (as of the 7th semester out of 8 semesters) (**Grade Sheets**)
- **Expected Date of Graduation**: February, 2025
- **Coursework:** Artificial Intelligence and Machine Learning, Random Signals and Processes, Control Systems , Introduction to Digital Image Processing, Digital Signal Processing, Communication Systems I, Wireless Communications, Radar and Satellite Communication, Computer Programming, Continuous Signals and Linear Systems, Linear Algebra and Numerical Technique, Probability and Statistics.

Experience

Research and Development Engineer Intern *Dhaka, Bangladesh*
Spectrum Engineering Consortium Ltd. *November 2023 – Present*

- Designed and developed custom PCB boards to support the control systems and sensor integration for a 6-DOF robotic arm in a Remotely Operated Vehicle (ROV), utilized by the **Bangladesh Army** in UN peacekeeping missions.
- Developed a relay-based system to automatically lift the toll bar, triggered by real-time license plate recognition and database-driven billing verification, ensuring smooth vehicle passage which is actively working on **Kalna Bridge, Bangladesh**.
- Designed a custom PCB with integrated ammonia and sulfide sensors for real-time quality assessment of bully sticks on a conveyor belt, incorporating color detection modules for automated classification into different categories.

Publications

V-Shopper:A Virtual Automatic Shopping System Based on 5-DOF Robotic Arm with Real-Time Visualization and Billing (**Demo Video**) Oct 2024

Tamim, Md. Asif Kabir, Shaikh Anowarul Fattah (**Draft Paper**)

The system bridges the gap between digital and physical shopping by enabling customers to inspect and approve products from the website via a live video feed streamed from an ESP32 CAM module, while a 5-DOF robotic arm picks products autonomously. Key innovations include a closed-loop feedback system for precise gripping, cost-effective open-source software and robust performance across diverse conditions sets a benchmark for fully automated, immersive online retail solutions.

Final Year Thesis

Cross Attention Based Motor Imagery Classification Oct 2023 - Present
Tamim, Sajid, Shaikh Anowarul Fattah (**Thesis Draft**)
Designed an innovative continuous wavelet-based cross-attention mechanism, achieving benchmark accuracy in motor imagery classification on two famous BCI datasets with fewer parameters than existing models. Ongoing research focuses on integrating signals like MEG and fMRI, as well as techniques such as DFT, STFT, and DWT, to push the boundaries of brain-computer interface performance.

Projects

MedSeg Transformer: Medical Image Segmentation with Swin U-NetR *github repo*

- Explored the performance of Swin U-NetR for semantic segmentation of 3D medical images, focusing on brain tumor (BraTS 2021 and MSD datasets) and spleen segmentation (MSD Task 09). Implemented preprocessing, transfer learning, and fine-tuning to enhance competitive DICE scores and accuracy.

VitalLink: IoT-Based Patient Health Monitor *github repo*

- Developed a cost-effective Arduino-based system to monitor body temperature, heart rate, and blood oxygen levels in real time. Displays data on an LCD and supports continuous health monitoring .
- Tools Used: Arduino Uno, Temperature Sensor, Pulse Oximeter Censor

PowerSync Pro: Harmonic-Free Industrial Power Control *github repo*

- Designed a microcontroller-based system using integral cycle switching to regulate AC power with minimal harmonics, ensuring efficiency and precision for industrial applications.
- Tools Used: Arduino Uno, Proteus, TRIAC, and zero-crossing detection circuits.

SignAI: Traffic Sign Classifier *github repo*

- Developed a model for classifying 48 traffic sign types for advanced driver-assistance systems (ADAS).
- Tools Used: Python, Deep Learning Techniques.

FaultVision: Fault Detection in Power Transmission System(PGCB) *github repo*

- Developed a deep learning system to classify power transmission line faults (LL, LG, LLG, LLL) in the **Northern region of Bangladesh**. The project utilized Simulink for fault simulation and CNN-based models for fault classification using time-series voltage and current data.

FreqRecon: Binary Signal Modulation and Recovery *github repo*

- Implemented FSK modulation and demodulation for binary data transmission and reconstruction.
- Tools Used: Proteus, PCB, Oscilloscope.

SmartGuard: Automatic Overcurrent Protection System *github repo*

- Developed an electronic fuse circuit using Op-Amps, BJTs, relays, and a step-down transformer to provide overcurrent protection by rerouting the current during overvoltage situations.
- Tools Used: PCB, Proteus

Voltage-Aqua Sentinel: A Cost-Effective Battery Monitoring Circuit *github repo*

- Implemented a low-cost battery voltage indicator to efficiently monitor and display voltage levels .
- Developed a real-time water monitoring system with a 7-segment display and buzzer alert to prevent overflows, ensuring efficient water management for domestic and industrial use.
- Tools Used: PCB, Proteus, Multisim, Real time Display, Microcontroller

Technical Skills

Simulation Software: Cadence, MultiSim, Proteus, AutoCad, PSAF, PSpice
Programming Language and Frameworks: C, C++, Python,EAGLE, STM32CUBEMX, Keil, ESP32, ML and Deep learning, Arduino, MATLAB
Hardware: Arduino , FPGA, Atmel32, ESP 32, Servo Motor, DC Motor, Induction Motor, PCB
Documentation: Overleaf(LaTex), Microsoft Excel, Microsoft Office, Adobe Illustrator,Adobe Premiere

Achievements

- Dean's List Award (1^{st}, 2^{nd} year)
- University Merit Scholarship (1^{st}, 2^{nd}, 3^{rd} year)
- Divisional Champion on "The Bangabandhu Creative Talent Search Competition"
- **Board Scholarships**, e.g., HSC, SSC, JSC, PSC.