Farhan Ahmad Nafis

B.Sc. in Electrical and Electronic Engineering

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https://orcid.org/0009-0007-4273-9849 Research Gate (Farhan Ahmad Nafis)

Education

B.Sc. in Electrical and Electronic Engineering *Brac University* Transcript 2020-2024

Relevant Courses: Artificial Intelligence, Neural Networks, Image Processing, Embedded Systems, Signals and Systems, Machine Learning, Statistics

CGPA: 3.64/4.00 (Approximately 3.80 in last four semesters)

Higher Secondary Certificate (HSC) *St. Joseph Higher Secondary School* Certificate 2017-2019

Secondary School Certificate (SSC) *St. Joseph Higher Secondary School* Certificate 2010-2017

Areas of Expertise

Embedded Systems • Signal and Image Processing • 3D Modeling and Prototyping • PCB Design • Data Analysis • Scientific Documentation

Research Interests

Autonomous systems (UGVs, UAVs) • Autonomous driving vehicles • Computer Vision in autonomous systems • Brain and human-computer-based control systems • Edge, FOG, IoT-based computing • Human-Robot/Machine interaction

Work Experience

Research Assistant, (*Department of EEE, BRACU*) *04/2025 - current*

- Prepared proposal for a project titled "Secure and Scalable Federated Learning leveraging TinyML and incorporating multi-mode communication protocols"
- Started to research and survey for a study that focuses on AI in Engineering Education

Teaching Assistant, (*Department of EEE, BRACU*) *01/2025 - 05/2025*

- Prepared course materials and took tutorial sessions for students
- Gave regular consultation to students to improve their understanding
- Assigned courses: 1) Electromagnetic waves and fields 2) Electrical Circuits I (DC Circuits)

Research Assistant, (*Control and Research Application Center, CARC*) *09/2024 - 03/2025*

- Developed obstacle detection system for a project titled 'Brain-Controlled Wheel Chair'
- Worked with EEG headband and acquired brain-signal
- Used filters to remove noise e.g. 50Hz powerline noise, high-frequency noise, low-frequency rumble and ECG, EMG frequencies using FFT
- Processed the filtered signal to generate patterns
- Created a control algorithm to control a two-motor (24V, 250W) wheelchair using brain signal and compared P300 and motor imagery (MI) mechanisms
- Created manual control system (Remote) using NoduMCU's communication protocol to drive the wheelchair
- Got familiar with MCU-MCU communication, UART, I2C, BLE, ESPNOW, Parallel computing using ESP (Dual-core) and deployed them into the system

Student Tutor, (*EEE Dept. Brac University*)   *01/2023 - 04/2024*

- Prepared materials and instructed the students on three different assigned courses (up to junior/third year engineering level) across four semesters.
- Assigned courses: 1) Electromagnetic Waves and Fields 2) Microprocessors/Embedded Systems Design 3) Machine Learning 4) Electrical Circuits II
- Worked closely with the course faculty to improve the quality of instructions for the students.
- Provided regular tutorials and consultations to assist the students in addition to the class lectures.

Chairperson, (*IEEE Brac University Student Branch*)   *01/2023 - 12/2023*

- Led five IEEE Chapters (IEEE PES, CS, RAS, AESS, and ComSoc) under the *IEEE BracU SB* during a one-year tenure.
- Organized seminars, webinars, and workshops for the members of IEEE, Department of EEE, and Department of CSE of Brac University.
- Organized membership drives for the student branch and hosted events with Industry and Academic professionals.

Project Technical Lead, (*BracU Starbound Rocketry*)   *04/2022 - 11/2022*

- Project was under Laboratory of Space System Engineering and Technology, *LaSSET* and IEEE Aerospace and Electronic Systems Society BracU SBC, *AESS*
- Developed strategic plans for building and launching a water rocket with bare-metal components.
- Designed, simulated, and 3D printed different types of model rockets' body and fins for maximum aerodynamic leverage.
- Designed the electronics payload bay and coded the embedded systems that went onboard the designed rockets for data acquisition and payload testing.
- Created the necessary documentations and managed codebases for communication and representation purposes.

Editor, (*IEEE Brac University Student Branch*)   *01/2022 - 12/2022*

- Prepared event writeups for four chapters (PES, CS, RAS, and AESS) and the main body of IEEE BracU SB.
- Prepared materials to increase student engagement.
- Prepared Newsletter(s) for the student branch and the chapters.

Major Courses & Certifications

- EEE 472: Artificial Intelligence

  - Informed, uninformed and local and adversarial search algorithms and strategies, constraint satisfaction problems, deterministic and stochastic environments, game algorithms was studied

- EEE 474: Neural Networks

  - Multilayer Perceptron (MLP) upon nonlinear classification context problems and build and train neural networks for practical purposes

- EEE 476: lmage Processing

  - Image enhancement, 2D- fourier transform and sampling, high dimensional spectral analysis, filtering, edge detection, de-noising, digital image compression techniques and morphology
  - Convolution, histogram analysis, TensorFlow, Keras, PyTorch frameworks for image classification

- Certifications - Coursera

Tools (Software and Hardware)

- **Platform and Tools:** Proteus, LTspice, MATLAB, VS Code, Jupyter, ROS 2(Learning), CoppeliaSim(Learning), Lab Instrumentaion

- **Data Visualization:** Python, Excel, Google Sheets

- **3D Design and Prototyping:** Solidworks, Autodesk Fusion360, Creality Slicer

- **PCB Design:** EasyEDA, Altium Designer, KiCAD, Saturn PCB Toolkit, Autodesk Eagle, Fritzing

- **Programming:** Python, Embedded C, C++ (Learning), Git, Github, LaTex

- **ML/AI Frameworks:** TensorFlow, Keras, PyTorch (Learning)

- **Hardware:** Sensors, Actuators, Hardware prototyping, Microcontrollers (Arduino, NodeMCU), Raspberry Pi, Analog and Digital ICs, Soldering

Awards and Recognition

- Dean's List (second semester) - Brac University

- Winner - Idea Compettition (Robotics Club of Brac University)

- Completion - Electronic System and PCB Design

Projects

- [*Embedded Systems*] Title: ATmega-32 based IoT integrated ATM machine system with real-time monitoring and intrusion detection system

- [*Digital Logic Design*] Title: Digital electronics-based voting system suitable for four candidates

- [*Machine Learning*] Shopping cart product identification system using YOLO algorithm and hardware implementation on NodeMCU platform. Used YOLOv5 and YOLOv8(s and n)-based object detection model and manual annotation.

- [*Artificial Intelligence*] Title: Heart failure prediction using Decision Tree, SVM, and KNN algorithms. Used EDA and CSV-based numerical data for supervised learning.

- [*Artificial Intelligence*] Title: Image Segmentation using MobileNetV2

- [*Neural Networks*] Title: A Bangla language-based medical Chatbot was developed using TensorFlow, Hugging Face, Tokenizers

- [*Image Processing*] Built several popular CNN architectures from scratch CNN blocks in using Keras like AlexNet, VGG16, VGG19, and InceptionV2 to classify four classes of images

Thesis/Final Year Design Project

IoT-based Mobile Healthcare System with Integrated Real-Time ECG Monitoring -Thesis/FYDP
My thesis project focused on low-cost health data acquisition system. My thesis group and I used TinyML so that we can predict any anomaly using the data from the wearable sensors.

Publications

- [*DOI*] Title: CNN and Transfer Learning-based Deep Learning Architectures for Alzheimer's Disease Detection from MRI Scan: A Comparative Analysis

- [*DOI*] Title: An Efficient IoT-based Fire Detection System using Quantized Deep Learning model on Resource-Constrained Devices

- [*DOI*] Title: Voting and Stacking-based Ensemble methods to detect Bengali Spam SMS with proposal for comprehensive dataset

- [*DOI*] Title: A Reliable Robotic Solution for Hospital Logistics: Implementation of Intelligent Pathfinding and Control Strategy

- [*Under Review, Heliyon*] Title: A Comprehensive Review of Brain-Controlled Wheelchairs: Recent Advancements in EEG, EOG, Hybrid Technologies, and Artifact Removal Techniques for Mobility Control

Presentations

- [*FYDP, 2024*] Title: IoT-based Mobile Healthcare System with Integrated Real-Time ECG Monitoring - Poster

- [*Presented in MIST, 2022*] Title: Heart Disease Detection through ECG Signal Manipulation using Machine Learning and Proprietary Hardware

- [*ICCIT (Conference), 2024*] Title: An Efficient IoT-based Fire Detection System using Quantized Deep Learning model on Resource-Constrained Devices

- [*ECCE (Conference), 2025*] Title: Voting and Stacking-based Ensemble methods to detect Bengali Spam SMS with proposal for comprehensive dataset

- [*ECCE (Conference), 2025*] Title: A Reliable Robotic Solution for Hospital Logistics: Implementation of Intelligent Pathfinding and Control Strategy

Memberships

- [*IEEE*] Membership Number: 96637815

- [*IMechE*] Membership Number: 80744295

- IEEE Computational Intelligence Society (CIS)

- IEEE Vehicular Technology Society (VTS)

Portfolio

- Github Repository - Codebase

- GrabCAD Repository - 3D Models

- IEEE Newsletter - Newsletter

- Final Year Design Project - Presentation

References

- Prof. Dr. AKM Abdul Malek Azad
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  BRAC University
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- Tasfin Mahmud
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  BRAC University
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