SOURAV BASAK SHUVO

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Research Interests

Deep Learning, Machine Learning, Medical Image Processing, Biomedical Signal Processing, Generative AI, Large Language Models (LLMs), Domain Adaptation, Disease Detection, Health Informatics, Neuroengineering.

Education

Khulna University of Engineering and Technology Khulna, Bangladesh
Bachelor of Science in Biomedical Engineering *November 11, 2018 – February 27, 2024*

- **CGPA: 3.77/4.00** (80.60%) [Junior/Senior GPA: 3.80] (Ranked 4th in overall merit position)
- Evaluated by **Educational Credential Evaluators (ECE)** on December 30, 2024
  U.S. Equivalence: Bachelor Degree; Major Area of Study: Biomedical Engineering, **Grade Average: 3.91/4.00**
- **UG Thesis:** "Gallbladder Cancer Classification using Parallel Transfer Learning with Multi-model Feature Fusion and LSTM"
  Summary: Developed a hybrid framework combining parallel transfer learning, multi-model feature fusion, and LSTM for gallbladder cancer classification, achieving 99.37% accuracy.

Research Experience

Researcher June 2025 – Current
Bio-Neural Intelligence and Research Advancement Lab, KUET *Khulna, Bangladesh*

- Designed NeuroSwin, a hybrid deep learning model (Swin Transformer-GRU), to classify Parkinson's Disease and identify its source regions in the brain from EEG signals.

Research Assistant Intern October 2024 – Current
Ulster University *Londonderry, Northern Ireland, UK*

- Developed ***TransfusionNet***, a hybrid architecture augmented with a specialized preprocessing pipeline and an early-layer feature fusion paradigm for cervical cancer detection. This work has been published in the **Q1** journal ***Results in Engineering*** (Elsevier, Impact Factor: 7.9).
- Created a benchmark to evaluate the performance of large language models (LLMs) in identifying disease classes, comparing results against our proposed architecture MobileCoAtNet for stomach infection classification.
- Investigated the adaptability of foundational AI models for multi-cancer classification, implementing Model-Agnostic Meta-Learning (MAML) for domain adaptation to enhance generalizability.
- Actively researching the feasibility of large language models (LLMs) for disease diagnosis, reasoning, and treatment follow-up in medical applications.

Undergraduate Research Assistant February 2023 – September 2024
Department of Biomedical Engineering, KUET *Khulna, Bangladesh*

- Designed a hybrid model for gallbladder cancer classification using parallel transfer learning, feature fusion, and LSTM, achieving 99.37% accuracy; part of this work was published at ICEEICT 2024
- Gained experience in academic writing, literature review, and presenting research findings.

Publications (Google Scholar)

Peer-Reviewed Journal Articles

Published:

- M. N. Hasan, **S. B. Shuvo**, M. M. H. Ankon, S. M. T. U. Raju, and N. Siddique, "**TransfusionNet: Framework for cervical cancer detection using deep learning with multi-level fusion**", *Results in Engineering*, vol. 28, p. 107174, 2025, doi: 10.1016/j.rineng.2025.107174.

Under Review/In Preparation:

- M. N. Hasan, I. Ahmad, **S. B. Shuvo**, M. M. H. Ankon, S. Das, N. Siddique, and H. Wang, "**DL^{3}M: A Vision-to-Language Framework for Expert-Level Medical Reasoning through Deep Learning and Large Language Models**," arXiv preprint arXiv:2512.13742, 2025. Under review in *Medical Image Analysis, Elsevier*.
- **S. B. Shuvo**, S. A. Redhila, S. Hossain, and A. D. Roy, "**NeuroSwin: A Swin Transformer-GRU Model for Parkinson's Disease Classification and Brain Region Localization from EEG Signals**," Manuscript in preparation for *Biomedical Signal Processing and Control, Elsevier*.

- **S. B. Shuvo**, M. M. H. Ankon, M. A. Sayed, M. N. Hasan, and M. Z. Chowdhury, "**CholeNet: A Recurrent-Convolutional Hybrid Ensemble Framework with Quad-Fold Parallel Transfer Learning and Spatio-Sequential Feature Fusion for Gallbladder Cancer Classification**," Manuscript in preparation for *Expert Systems with Applications, Elsevier*.
- M. M. H. Ankon, **S. B. Shuvo**, M. N. Hasan, and M. M. H. Manik, "**VRX-UNet: Automated Volumetric Characterization of Intra-tumoral Structures in Gliomas using 3D Segmentation**," Manuscript in preparation for *Computers in Biology and Medicine, Elsevier*.
- M. A. Sayed, M. A. Rahman, **S. B. Shuvo**, M. J. Hossain, M. S. Alam, K. N. Hasan, and M. A. Kadir, "**Advanced image analysis for liver tumor detection and visualization in CT images using automated segmentation**," Manuscript in preparation for *Nature - Scientific Reports*.
- M. N. Hasan, M. M. H. Ankon, **S. B. Shuvo**, I. Ahmad, M. M. H. Manik, and N. Siddique, "**Zero-to-Multi-Shot Benchmarking of Model-Agnostic Meta-Learning (MAML)-Based Domain Adaptation for Multi-Cancer Classification: Comparative Evaluation of LLMs, State-of-the-Art Deep Learning Models, and a Proposed Hybrid Approach**," Ongoing Research.
- Md. N. Hasan, W. M. Shan, T. Joty, Md. M. H. Ankon, **S. B. Shuvo**, and N. Siddique, "Unveiling Overfitting Patterns: Explainable AI-Driven Benchmarking of LLMs, Deep Learning Models, and a Hybrid Framework for Medical Image Classification," Ongoing Research.

Peer-Reviewed Conference Proceedings

Published:

- **S. B. Shuvo** and M. Z. Chowdhury, "**Classification of Gallbladder Cancer Using Average Ensemble Learning**," *2024 6th International Conference on Electrical Engineering and Information & Communication Technology (ICEEICT)*, Dhaka, Bangladesh, 2024, pp. 1450-1455, doi: 10.1109/ICEEICT62016.2024.10534480. [PDF].
- **S. B. Shuvo**, S. Hossain, S. A. Redhila, and U. Bose, "**Exploring Common Molecular Interactions across Multiple Cancers to Identify Potential Therapeutic Targets and Drug Candidates**," *2025 7th International Conference on Electrical Information and Communication Technology (EICT)*, Dhaka, Bangladesh, 2025, pp. 1-6, doi: 10.1109/EICT68394.2025.11355627. [PDF]

Under Review:

- Md. A. Sayed, A. Rahman, **S. B. Shuvo**, M. A. Kadir, Md. I. A. Imran, Md. S. I. Wadud, and Md. N. Hossain, "**Automated PET to Fused PET-CT Mapping Using PatchGAN for Lung Cancer Diagnosis**," Submitted in *2026 IEEE 2nd International Conference on Quantum Photonics, Artificial Intelligence & Networking*, Chattogram, Bangladesh.

PROJECTS

IoT Based Pilot Health Monitoring System | *ESP8266 NodeMCU, Arduino, Blynk IoT* May 2018 – May 2020

- Developed an IoT-Based Pilot Health Monitoring System using ESP8266 NodeMCU, programmed with Arduino IDE, and sensors like MAX30100, DS18B20, and BMP180, integrated with the Blynk IoT platform to monitor pilot health and aircraft state, enhancing flight safety.

MediConnect – A Video Conferencing App for Telemedicine and Healthcare | *Java, Firebase* 2023

- Developed a secure video conferencing app for telemedicine as part of the Telemedicine & Health Care Laboratory individual project, utilizing Java, Firebase, and ZEGOCLOUD for effective remote healthcare communication.
- Implemented features like sharing medical images, prescriptions, and real-time chat to support comprehensive virtual medical consultations.

VitaSync: A Smart Band for Telemedicine Applications | *Sensors, Mobile App Development* 2023

- Remodeled a wearable device for the Telemedicine & Health Care Laboratory group project, integrating sensors to track vital metrics such as heart rate, body temperature, and blood oxygen levels.
- Developed a real-time data transmission system with a mobile app and an alert mechanism to notify users and contacts of health irregularities via email.

Telechroma: A Smart Colorimetric Analyzer for Telemedicine Applications | *Arduino, MIT App* 2022

- Developed Telechroma, a portable and affordable colorimetric analyzer for telemedicine applications, enabling remote diagnostics of glucose concentrations in urine samples.
- Integrated hardware (Arduino Nano, TCS3200) with a mobile app for real-time data transmission and analysis.

Sanitary Napkin Vending Machine | *RFID, Arduino Mega, Stepper Motors* 2022

- Designed and built an automated Sanitary Napkin Vending Machine using RFID, Arduino Mega, stepper motors, and springs to promote menstrual hygiene through accessible and affordable technology.

TECHNICAL SKILLS

Programming Languages: MATLAB, Python (PyTorch, TensorFlow, Keras), R, C/C++
Simulation and Design Tools: NI Multisim, Arduino, Simulink, SOLIDWORKS, AutoCAD, COMSOL Multiphysics
Others: LaTeX, MS PowerPoint, MS Word, MS Excel, MS Visio, Adobe Photoshop, Adobe Illustrator, Adobe Premiere Pro

Standardized Test Scores

International English Language Testing System (IELTS) 16 November, 2024
Overall: 7.5 (Listening- 8.5, Reading- 7.0, Writing- 7.5, Speaking- 6.5)
Graduate Record Examination 1 October, 2024
Score: 313 (Quantitative 165, Verbal 148), AWA 3.5

Training

Full day Technical Workshop on Biomaterials Based Wet Lab Aug 2022
Bangladesh University of Engineering and Technology *Dhaka, Bangladesh*

- Explored the work from the paper "Preparation of Different Polymorphs of Cellulose from Different Acid Hydrolysis Medium" (International Journal of Biological Macromolecules, 2019) and gained hands-on experience in preparing cellulose nanocrystals (CNC) using acid hydrolysis under expert guidance.
- Learned to operate lab equipment such as magnetic stir plates, centrifuges, ovens, autoclaves, FTIR, X-ray diffractometers, and thermogravimetric analyzers used for analyzing the morphology and properties of CNCs.

Leadership/Extracurricular

Advanced Bioengineering Club of KUET (ABC–KUET) Khulna, Bangladesh
President *March 2022 – Present*

- Participated in multiple project-showcasing competitions and fostered innovation and collaboration among club members.
- Organized technical workshops, classes, and seminars, including "NeuroInquire: Exploring EEG and Research Foundations" and "ABC of Research with Hands-on Training on LaTeX."

Fabrication Lab KUET Khulna, Bangladesh
Student Operator *March 2022 – April 2024*

- Assisted in organizing workshops such as 'Hands-on Training Using Fabrication Tools' and 'IQAC's Hands-on-Training Program' at FabLab KUET, covering 3D printing, laser cutting, and CNC milling.
- Helped over 50 students fabricate project and thesis models, guiding them in transforming innovative ideas into real products.

Spectrum – Professional Skill Development Club of KUET Khulna, Bangladesh
Head of Human Resources *March 2020 – March 2024*

- Managed team operations, organized skill development events, and facilitated member engagement.
- Organized the Inter-University Case Study Competition, engaging 240 teams from 45 universities, securing sponsors like Bank Asia PLC, Abul Khair Group, Coca-Cola, and 10 Minute School, and distributing a prize pool of over BDT 100,000 while driving 300,000+ audience interactions.

Awards and Achievements

Honors in Bachelor of Science (B.Sc. Eng.) February 2024
Dean's Award (3 times) Session: 2018-19, 2020-21, 2021-22
Technical Scholarship (4 consecutive times) 2019-2023
IEEE YESIST12 2023 – Finalist 2023
BME Indoor 2022 - Champion in Chess 2022
Intra-University Innovative Idea & Project Competition arranged by FabLab KUET - 2nd Runner-up 2022
National STEM Competition 2021 – Finalist 2021
National High School Programming Contest 2017 (Regional) - Position: 11th (Mymensingh Region) 2017
General Grade Scholarship in JSC Exam given by Board of Intermediate & Secondary Education, Dhaka 2013
Talent Pool Grade Scholarship in PSC Exam given by Board of Intermediate & Secondary Education, Dhaka 2010

Certifications

Neuroscience and Neuroimaging Specialization by Johns Hopkins University on Coursera Ongoing
AI for Medicine Specialization by DeepLearning.AI on Coursera Ongoing
Deep Learning Specialization by DeepLearning.Ai on Coursera Ongoing
Mathematics for Machine Learning Specialization by Imperial College London on Coursera 2025
Python 3 Programming Specialization by University of Michigan on Coursera 2025
Python for Everybody Specialization by University of Michigan on Coursera 2020
Introduction to Programming with MATLAB by Vanderbilt University on Coursera 2020
C for Everyone: Programming Fundamentals by UC Santa Cruz on Coursera 2020
Building Arduino robots and devices by Moscow Institute of Physics and Technology on Coursera 2020