Promit Basak

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Research Interest

- Deep Learning
- Biomedical AI
- Multimodal Sensing
- Generative Vision
- Cybersecurity and Privacy

Education

University of Dhaka **Jan 2018 – Dec 2022**

Bachelor of Science in Electrical and Electronic Engineering *CGPA: 3.63/4.00*

- Major: **Computer**, Minor: **Communication**
- **Senior design projects**:
  (i) An Embedded Approach to Fall Detection and Human Activity Recognition using Wi-Fi Channel State Information.
  (ii) A Non-invasive Fetal Heart Monitoring System using 1D-CycleGAN.

Publications

- ***Promit Basak**, Rusab Sarmun, Saidul Kabir, Israa Al-Hashimi, Enamul Hoque Bhuiyan, Anwarul Hasan, Muhammad Salman Khan, Muhammad E. H. Chowdhury*, **Machine-agnostic Automated Lumbar MRI Segmentation using a Cascaded Model Based on Generative Neurons**, In revision.

- *Farhana Ahmed Chowdhury, Md Kamal Hosain, Md Sakib Bin Islam, Md Shafayet Hossain, **Promit Basak**, Sakib Mahmud, M Murugappan, Muhammad EH Chowdhury*, **ECG waveform generation from radar signals: A deep learning perspective**, Computers in Biology and Medicine, Volume 176, 2024, doi.org/10.1016/j.compbiomed.2024.108555. *[Q1, IF: 7.7]*

- ***Promit Basak**, A.H.M Nazmus Sakib, Muhammad E.H. Chowdhury, Nasser Al-Emadi, Huseyin Cagatay Yalcin, Shona Pedersen, Sakib Mahmud, Serkan Kiranyaz, Somaya Al-Maadeed*, **A Novel Deep Learning Technique for Morphology Preserved Fetal ECG extraction from Mother ECG using 1D-CycleGAN**, Expert Systems with Applications, Volume 235, 2024, doi.org/10.1016/j.eswa.2023.121196. *[Q1, IF: 8.5]*

- *A. H. M. Nazmus Sakib, **Promit Basak**, Syed Doha Uddin, Shahamat Mustavi Tasin, and Md Atiqur Rahman Ahad*, **Can Ensemble of Classifiers Provide Better Recognition Results in Packaging Activity?**, In Sensor-and Video-Based Activity and Behavior Computing: Proceedings of 3rd International Conference on Activity and Behavior Computing (ABC 2021), doi.org/10.1007/978-981-19-0361-8_10.

- ***Promit Basak**, Shahamat Mustavi Tasin, A.H.M. Nazmus Sakib, Syed Doha Uddin, and Md Atiqur Rahman Ahad*, **A Windowless Approach to Recognize Various Modes of Locomotion and Transportation**, In Proceedings of UbiComp/ISWC '21 Adjunct, 2021, Association for Computing Machinery, doi.org/10.1145/3460418.3479385.

- ***Promit Basak**, Shahamat Mustavi Tasin, Malisha Islam Tapotee, Md. Mamun Sheikh, A. H. M. Nazmus Sakib, Sriman Bidhan Baray, and Md Atiqur Rahman Ahad*, **Complex Nurse Care Activity Recognition using Statistical Features**, In Proceedings of UbiComp/ISWC '20 Adjunct, 2020, Association for Computing Machinery, doi.org/10.1145/3410530.3414338.

Selected Projects

Cattle Identifier using Muzzle Imprint | Supervisor: *Dr. Farig Yousuf Sadeque* **Currently running**

- This work aims to identify each cow uniquely from images captured using smartphone cameras.
- We proposed image processing techniques to extract muzzle images into muzzle patterns and used a CNN-based similarity learning model for cattle detection.

Pediatric Trauma Recognition from X-ray | Supervisor: *Dr. Muhammad E. H. Chowdhury* **May, 2024**

- This proposed system detects different types of trauma (fractures, periosteal reactions, etc.) from pediatric X-rays.
- We utilized an efficient layer aggregation network for the detection task.

Anatomical segmentation of Lumbar MR Images | Supervisor: *Dr. Muhammad E. H. Chowdhury* **February, 2024**

- We built a machine-agnostic generalized framework to segment individual lumbar vertebrae and intervertebral discs from MR images which is the first of its kind to the best of my knowledge.
- The proposed model based on generative neurons outperformed most of the known approaches in this task.

Speech Recognition for Foreign Language Learning | Supervisor: *Dr. Farig Yousuf Sadeque* **January, 2024**

- The project's objective is to identify and score Bengali pronunciation spoken by non-residents and foreigners.
- A novel pronunciation metric *Phonetic Distance* is proposed that measures the pronunciation accuracy disentangling the issues with character-phone variability and Unicode normalization of indic languages.

Adventitious Lung Sound Estimation | Supervisor: *Dr. Muhammad E. H. Chowdhury* **July, 2023**

- This system can detect different types of normal and abnormal pediatric lung sounds recorded by stethoscopes.
- We proposed a Self-ONN-based classifier model for this purpose.

O-level Question Answer Generation using LLM | Supervisor: *Dr. Farig Yousuf Sadeque* **April, 2023**

- This project generates mathematical and non-mathematical questions with answers for an online exam and preparation platform.
- We used a multi-stage strategy to generate correct answers for mathematical questions including symbolic extraction and calculation.

Non-invasive Fetal ECG Extraction | Supervisors: *Dr. M. Shafiul Alam & Dr. M. E. H. Chowdhury* **January, 2023**

- The developed framework reconstructs the fetal ECG in a non-invasive way from abdominal ECG taken from pregnant mothers for earlier detection of various diseases and abnormalities.
- It can further measure different heart rate variability metrics with great accuracy.

Human Activity Recognition using Wi-Fi CSI | Supervisor: *Dr. Mohammad Shafiul Alam* **May, 2022**

- The project is designed to recognize five activities only using Wi-Fi CSI packets in a semi-controlled environment.
- We created a custom dataset of 15 subjects and more than 800 data samples.

Bento packaging activity recognition | Supervisor: *Dr. Md Atiqur Rahman Ahad* **October, 2021**

- Aimed at detecting different types of errors during bento-box packaging in an industrial setup.
- Used a novel ensemble approach to solve the issue of limited motion capture data.

Transportation mode detection from smartphone's wireless data | *Dr. Md Atiqur Rahman Ahad* **April, 2021**

- Recognized eight transportation modes using GPS, Wi-Fi, and cellular data from smartphones.
- Developed a windowless approach for human activity recognition, improving model generalization.

Intelligent Malware and DDoS attack detection | *Supervisor: Dr. Md Atiqur Rahman Ahad* **September, 2020**

- The malware detection tool is designed to detect different types of malware including viruses, worms, trojans, and backdoors using static and dynamic analysis of a program.
- The DDoS attack detection tool uses Wireshark to analyze inbound and outbound packets to detect DDoS attacks using machine learning.

Vehicle Detection in the Wild **January, 2021**

- The system can recognize 17 types of vehicles from images taken from the busy streets of Dhaka.
- It utilizes the extensive preprocessing and augmentation process accompanied by a state-of-the-art model to generalize its performance over different weather and scene conditions.

Professional Experiences

Qatar University Machine Learning Group **May 2022 – Current**

Research Assistant (Remote) *Doha, Qatar*

- Worked on 6 machine learning and deep learning projects including computer vision and biomedical signal processing.

mPower Social Enterprise Limited **June 2023 – Current**

Machine Learning Engineer (Research & Development) *Dhaka, Bangladesh*

- Built and deployed different pipelines in computer vision and classical machine learning domains.

Creative Crowdfunding Protocol **November 2023 – January 2024**

Software Engineer (Contractual Remote) *New York, US*

- It is a sister concern of Kickstarter. Developed backend services for three teams: protocol, AI, and client development

Heavytask LLC **December 2020 – June 2021**

Junior Software Engineer (Remote) *Dallas, Texas*

- Implemented and developed web services and integrated APIs for a redistributable CRM project.

Technical Skills

Languages: Python, MATLAB, C, C++, Javascript, SQL, LaTeX.
Machine Learning: Numpy, Pandas, OpenCV, Scikit Learn, PyTorch, TensorFlow, MLOps
Web dev: Django, node.js, FastAPI, Docker
Others : Git, Bash, DBMS, Robotics, IoT, Blockchain, AWS, GCP.

Relevant Courseworks

- Intelligent Systems
- Computer Programming
- Differential Equations
- Statistics and Probability
- Computer Organization and Architecture
- Database Systems
- Computer Networks
- Signals and Systems
- Digital Signal Processing
- Telecommunication Network
- Mobile Cellular Communication

Non-academic Courses and MOOCs

- **Object-Oriented Data Structures in C++**: Instructor: Dr. Wade Fagen-Ulmschneider.
- **Beginning C++ Programming - From Beginner to Beyond** Instructor: Dr. Frank Mitropoulos.
- **Algorithms, Part I** Instructors: Dr. Wayne and Dr. Sedgewick.
- **Mathematics For Computer Science** Instructors: Prof. Leighton and Dr. Van Dijk.
- **Machine Learning**: Instructor: Dr. Andrew NG.
- **Deep Learning Specialization**: Instructor: Dr. Andrew NG.

Standardized Tests

- **GRE**: Quant: 168, Verbal: 149, AWA: 4.
- **IELTS**: Listening: 8.5, Reading: 8.5, Writing: 7, Speaking: 6.5, Overall: 7.5.

Achievements

Robi Datathon 3.0 **June, 2024**
Grand Finalist *Robi Axiata Limited, Bangladesh*

Blockchain Olympiad Bangladesh **August, 2022**
Document Authentication Award *IBCOL*

Bento Packaging Activity Recognition Challenge 2021 **October, 2021**
Champion *Sozolab, Japan*

2nd Nurse Care Activity Recognition Challenge 2020 **September, 2020**
Runner Up *Sozolab, Japan*

HCL HACK IITK 2020 - The Cybersecurity Hackathon **August, 2020**
Runner Up *IIT Kanpur, India*

"Esho Robot Banai" - Maze Solving Robot Competition **July, 2019**
Runner Up *Channel I, Bangladesh*

Volunteering Activities

- **General Secretary, Gopalpur Students' Association**: A regional association to help aspiring students.
- **Member, Dhaka University IT Society**: An organization working for IT literacy across the campus.

References

- **Dr. Mohammad Shafiul Alam**, Professor, University of Dhaka, Email: **msalam@du.ac.bd**.
- **Dr. M E H Chowdhury**, Assistant Professor, Qatar University, Email: **mchowdhury@qu.edu.qa**.
- **Dr. M Atiqur Rahman Ahad**: Associate Professor, University of East London, Email: **mahad@uel.ac.uk**.