Sabbir Hossain Ujjal

Email: sabbirhossainujjal.buet@gmail.com **Phone:** (+880) 1878110035 <u>LinkedIn</u> <u>Github</u> <u>Website</u>

Education

- **Bachelor of Science in Electrical and Electronic Engineering (EEE)**   *March 2018-May 2023*
  Major in Communication & Signal Processing (CSP)
  Bangladesh University of Engineering and Technology (BUET)
  - **CGPA - 3.75/4.00**

  Relevant Coursework: Random Signals and Processes | Digital Signal Processing I | Continuous Signals and Linear Systems | Control System | Microprocessors and Embedded System

Research Interest

Natural Language Processing (NLP) | Large Language Model (LLM) | Conversational Agents (CA) | Human Robot Interaction | Deep Learning | Machine Learning | Computer Vision

Work Experience

Machine Learning Engineer   *Oct 2023 - Present*
<u>ACI Limited</u>

- **Virtual Assistant:** Developed a 24/7 virtual assistant using ASR, LLM, and RAG technologies to provide product information and problem-solving support for the company's field force and customers.
  - Trained Whisper based **ASR** model for Bangla and English audio transcription.
  - Implemented Retrieval-Augmented Generation (**RAG**) with **LLMs** and Vector Databases to efficiently answer product-related queries in a business context.
- **ACI SpeechHub:** Developed a Speech to Text and Natural Language Understanding **(NLU)** system for the company.
  - Implemented Whisper based **ASR** model for Bangla and English audio transcription.
  - Summarization and keyword extraction from transcribed audio using **BERT** based models.
- **Voice Based Ordering System:** Developed an end-to-end Automatic Speech Recognition (**ASR**) system to streamline the ordering process for sales representatives. This voice-command solution significantly reduced order-taking time, effectively **halving the workload** for interactions with retailers.
- **Writing Assistant:** Developed an end-to-end audio-based writing assistant powered by Large Language Models (**LLMs**) for generating professional reports and emails. This innovative system ensures adherence to reporting standards and proper articulation, significantly enhancing employee productivity in document creation.

Machine Learning Engineer   *Aug 2023 - Oct 2023*
<u>AIEdgeInside - [AI Startup]</u>

- **Computer Vision:** Experimented and developed system utilizing **computer vision** models for various applications.
- **Generative AI:** Researched and experimented with **vision generative models** for various applications.

Research Experience

Undergraduate Thesis under supervision of <u>Dr. Mohammad Ariful Haque</u>.
Research Topic: Development of a multilingual conversational agent using deep learning and natural language processing.

- In our thesis work, we had developed a multilingual conversational agent (CA) which can understand voice command and generate response to help perform day-to-day tasks both in Bangla and English. We used **RASA** platform for deploying our CA and **ASR** and **NLU** models for understanding user voice command.

Publications

- <u>**mTOVA: A Multilingual Task Oriented Virtual Assistant for Human Computer Communication**</u>
  - **Conference:** 5th IEEE International Conference on Telecommunications and Photonics (ICTP) 2023
  - **Authors:** Sabbir Hossain Ujjal, A F M Mahfuzul Kabir, Mohammad Ariful Haque

Competitions

- **Robi Datathon 3.0** **[Champion]**
  - The biggest data analysis competition in Bangladesh where we have to solve business oriented problem leveraging ML algorithms. My team **'ACI_ServerDown'** has become the **champion**, outshining 1,000 teams formed by 3,500 talented individuals.
- **ভাষা-বিচিত্রা: ASR for Regional Dialects** **[First Runner-up]**
  - The objective of this challenge is to create a robust model which **transcribe Bengali speech** with various regional **dialects** following the orthography set by linguists. My team **'কাকাতুয়া'** became the **first runner up** and our model was the fastest model for competing the task among the solutions.
- **Bengali.AI Speech Recognition** **[Bronze Medalist]**[Leaderboard: **59** internationally, **4th** in Bangladesh]
  - The objective of this challenge is to create a robust model which could recognize Bengali speech from out-of-distribution (**ODD**) audio recordings.
- **2nd AVA Challenge@IEEE MIPR 2024 [Second Runner-up]**
  - The objective of this challenge is to build a robust model for **video analysis** which can predict the risk of an impending car accident to the recording vehicle

Achievements

- **RISE Student Research Grant Award**
  - Research grant for undergraduate thesis by Research and Innovation Centre for Science and Engineering (RISE).
- **Dean's List Award in multiple semesters**
  - Academic honor by BUET for attaining CGPA of 3.75 for two consecutive terms.
- **President's Scout Award**
  - The highest rank of Bangladesh Scouts
- **Scholarship from Secondary Education Board**
  - Scholarship awarded by Ministry of Education, Bangladesh

Technical Skills

- **Programming Languages:** Python, C, C++, MATLAB.
- **Frameworks & Libraries:** PyTorch, TensorFlow, Keras, RASA, Numpy, Pandas, Scikit-learn.
- **Circuit Simulation and Design:** Proteus, PSpice
- **Others Tools/Software:** Git, LaTex, PowerPoint, Excel

Academic Projects

- **AI Generated Text Detection**
  - Developed a robust deep learning model to accurately distinguish between AI-generated and human-written text, enhancing various evaluation processes.
  - Language/Framework/Model: Python, Pytorch, DeBERTa, Feature engineering
  - Link: AI Generated Text Detection

- **Resume Classification and Sorting**
  - Engineered a deep learning-based end-to-end system for automated resume classification and sorting, streamlining and enhancing recruitment processes.
  - Language/Framework/Model: Python, Pytorch, BERT, DeBERTa
  - Link: Resume-Classification

- **Bengali Name Extractor**
  - Developed a robust NLP-based system for accurate person name extraction from text which can be used in any call center and online voice based transaction systems.
  - Language/Framework: Python, Pytorch, BanglaBERT
  - Link: Bengali-Person-Name-Extractor

- **Drowsiness Detection by PPG signal Analysis.**
  - Designed and implemented a wearable device using PPG signals to detect drowsiness, alerting users to prevent potential road accidents.
  - Language/platform: Matlab, C++, Arduino
  - Link: Drowsiness Detection by PPG signal Analysis

- **Real Time Covid Patient Monitoring**
  - Developed an IoT-based COVID-19 patient monitoring system with deep learning analytics, providing real-time emergency notifications to relevant parties.
  - Language/platform: Python, C++, Arduino
  - Link: Cough-Rate-estimation-for-Covid-Patient-monitoring-system-using-Deep-learning

- **Bangla Calendar Clock.**
  - Developed a multilingual, multi-calendar microprocessor-based clock displaying Gregorian, Bengali, and Arabic dates, Our developed clock was later selected and hung on the microprocessor lab of BUET EEE department.
  - Language/platform: C++, Arduino
  - Link: Bangla Calendar Clock.

- **Real Time Object Detection for Blind People.**
  - A computer vision based project to developed and end-to-end system for detecting object from an image and audibly sending these detected object messages to the user.
  - Language/platform: Python, Colab
  - Link: Real-Time-Object-Detection-for-Blind-People

Courseworks

- Deep Learning Specialization - [Course on Coursera offered by DeepLearning.AI]
- Machine Learning - [Course on Coursera offered by Stanford University]
- Python for Everyone - [Course on Coursera offered by University of Michigan]
- Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning -[Course on Coursera offered by DeepLearning.AI]
- Mathematics for Machine Learning Specialization - [Course on Coursera offered by Imperial College London]

Reference

Dr. Mohammad Ariful Haque
Professor
Electrical & Electronic Engineering (EEE), BUET
Email: arifulhoque@eee.buet.ac.bd

Dr. Ahmed Zubair
Associate Professor
Electrical & Electronic Engineering (EEE), BUET
Email: ahmedzubair@eee.buet.ac.bd