Ali Akbar

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OBJECTIVE

An ambitious and passionate person seeking a role as a Research/Teaching Assistant to pursue graduate studies and actively contribute to research in the field of Machine Learning, Deep Learning, Computer Vision.

RESEARCH INTEREST

- Machine Learning
- Deep Learning
- Computer Vision
- Multimodal Learning

ACADEMIC QUALIFICATION

University of Dhaka (Website) **Jan. 2019 - April 2024**
Bachelor of Science (B.Sc.) in Electrical and Electronic Engineering ***CGPA: 3.52(out of 4.00)***

PUBLICATIONS

Kowshik, M. Ashikuzzaman, Yeasin Arafat Pritom, Md Sohanur Rahman, **Ali Akbar**, and Md Atiqur Rahman Ahad. **"Nurse Care Activity Recognition from Accelerometer Sensor Data Using Fourier-and Wavelet-based Features"** *In Adjunct Proceedings of the 2021 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2021 ACM International Symposium on Wearable Computers, pp. 434-439. 2021.*

EXPERIENCES

Data & Design Lab *(from February, 2025)*
full-time *Research Assistant*

- I am currently working on a project aimed at enhancing the quality of power supply to industrial clusters across Dhaka City through statistical analysis, including unsupervised machine learning-based clustering techniques. As part of this project, an interactive chatbot is being developed for consumers, enabling them to inquire about electricity issues. Additionally, another team is preparing a dashboard to visualize the overall behavior of electricity across the country.

RESEARCH EXPERIENCE

- **Nurse Care Activity Recognition from Accelerometer Sensor Data Using Fourier- and Wavelet-based Features.** A series of pre-processing steps were performed, including data cleaning, resampling, windowing, and filtering. Feature extraction was conducted using Fast Fourier Transform (FFT) and Discrete Wavelet Transform (DWT). Subsequently, feature selection techniques such as Variance Threshold, ANOVA, and Chi-square tests were employed. Finally, a range of machine learning algorithms was employed to classify 25 distinct nurse activities. *(May, 2021)*
- **COVID and Community Acquired Pneumonia (CAP) disease diagnosis based on chest CT scan images using Deep Neural Network.** The dataset used in this study was sourced from an open-access online platform. The images were converted into numerical data, followed by resizing and rescaling to prepare them for effective analysis and model training. Various pre-trained deep learning models were applied, with a custom 4-layer fully connected network with dropout added below the pre-trained layers (modified architecture), and their performance was comprehensively compared. Model selection was performed based on various performance metrics, including Accuracy, Precision, Recall, and F1-score. *BSc.Thesis (4^{th} Year, 2^{nd} Semester)*

- **End-to-End micro-bacterial segmentation and detection using ViT-based model** Publicly accessible open-source bacteria image datasets were utilized in this study. we have introduced an Max-ViT based Mask R-CNN (instance segmentation) model that outperformed the existing CNN-based models. *(ongoing research work, a manuscript will be submitted soon)*

- **A Visual Question Answering Framework for Plant Leaf Disease Using SOTA Vision–Language Models.** We collected approximately 600k plant leaf disease images from open-source datasets and, after preprocessing, reduced the dataset to around 300k images. Our objective is to develop a chatbot-like framework for leaf disease analysis, where different questions can be asked based on leaf disease images. To achieve this, our goal is to generate nearly 1M question–answer (QA) pairs from these images and validate them with the assistance of senior biologists. Subsequently, we will apply state-of-the-art vision–language models (VLMs) and compare their performance using various metrics. *(ongoing research work)*

- **Integrating Gut Microbiome Taxonomic Profiles with Supervised Machine Learning for IBS (Irritable Bowel Syndrome) Diagnosis.** We collected 1,093 publicly available DNA sequencing datasets of IBS patients and healthy controls from NCBI, and added 10 IBS and 6 healthy samples sequenced from individuals in Bangladesh. All raw sequences were processed through the CZID pipeline to remove human DNA and ensure data quality. After collecting the dataset, several preprocessing steps were carried out. Hyperparameters were optimized using `Optuna`, which is based on the Bayesian optimization method and 5-fold cross-validation was performed to evaluate the generalization of the models. Subsequently, the dataset was split, and several machine learning models were trained. The models were then evaluated using various metrics, including Accuracy, F1-score, Matthews Correlation Coefficient (MCC), and AUROC. *(This is part of a research project. A manuscript is being prepared and will be submitted to a journal soon.)*

TECHNICAL SKILLS

Software	MATLAB, PSpice, Simulink, Android Studio
Programming Languages	C, Java, Python
Data Analysis Tools	Origin, Python libraries (pandas, numpy, matplotlib, OpenCV), Microsoft Excel
3D modelling/Illustration	Adobe Illustrator, AutoCAD
ML libraries/framework	Scikit-Learn, PyTorch, TensorFlow 2.0

ACHIEVEMENTS AND ACTIVITIES

- *Runner up* at Third Nurse Care Activity Recognition Challenge, 2021, awarded by HASCA workshop, ACM Ubicomp. (**Certificate**)

- *Participated* Kharagpur Data Science Hackathon, 2021.

SYNERGISTIC ACTIVITIES

President **Dec 2022 - Feb 2024**
Luminator, Dr. Muhammad Shahidullah Hall Students' Association.

Joint General Secretary **Apr 2023 - Oct 2024**
Idrakpur Bus Committee, University of Dhaka.

Organizing Secretary **May 2023 - Aug 2024**
Students' Association of Munshiganj-Bikrampur, University of Dhaka.