SHOAIB AHMED DIPU

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RESEARCH INTEREST

Computer Vision, Biological Image Analysis, Health-informed AI, Trustworthy Machine Learning, Federated Learning, Active Learning and Human-in-the-Loop Machine Learning, Natural Language Processing

EDUCATION

Master of Science in Computer Science and Engineering
January 2023 - May 2025 (Expected)
Brac University, Dhaka, Bangladesh
CGPA : 4.00 / 4.00. (18 Credits Coursework Completed. 18 Credits Thesis Ongoing)

Bachelor of Science in Computer Science and Engineering
January 2017 - December 2020
Brac University, Dhaka, Bangladesh
CGPA : 3.91 / 4.00

RESEARCH

Undergraduate Thesis

• **An Active-Learning based Training-Schedule for Biomedical Image Segmentation on Deep Neural Networks.** [Link] Spring 2020 - Fall 2020
— Developed an Active Learning-based training schedule, utilizing an entropy-based uncertainty metric to minimize iterations and reduce the computational cost of training neural networks.
— Supervisors: Dr. Mahbubul Alam Majumdar, Sowmitra Das, Shahnewaz Ahmed

Journal Publication

• **CDSImpute: An Ensemble Similarity Imputation method for single-cell RNA sequence dropouts**. (2022) [Link]
— Developed a novel method for imputing dropout events in single-cell RNA-seq data, enhancing cell-type identification and differential gene expression analysis.
— Authors : Riasat Azim, Shulin Wang, **Shoaib Ahmed Dipu**
— Published in **Computers in Biology and Medicine**, **Q1** Journal, IF : **7.0**.

• **A patient-specific functional module and path identification technique from RNA-seq data**. (2023) [Link]
— Developed a patient-specific network construction method from RNA-seq data, integrating differential gene expression and mutations to identify regulatory modules, driver genes, and personalized disease networks for improved therapeutic insights.
— Authors : Riasat Azim, Shulin Wang, **Shoaib Ahmed Dipu**, Nazmin Islam, Munshi Rezwan Ala Muid, Md Fazla Elahe, Mei Li
— Published in **Computers in Biology and Medicine**, **Q1** Journal, IF : **7.0**.

• **A Comprehensive Review on Machine Learning Paradigms: Taxonomy, Models, Purposes, Applications, Comparative Benefits, and Future Research Opportunities**. (2024)
— Proposed a new taxonomy, evaluated ML's transformative impact in healthcare, e-commerce, and education, addressed ethical concerns like bias and privacy, and synthesized recent findings to guide future research, emphasizing its potential while mitigating risks.
— Authors : Mohammed Julfikar Ali Mahbub, **Shoaib Ahmed Dipu**, Rakibul Hasan, Md. Fahim-Ul Islam, Md. Mahadi Hasan, Anika Tahsin, Md. Golam Rabiul Alam, Md Zia Uddin
— Under Review in **AI Open**, **Q1** Journal

• **FetalSIFT-CNN: Fetal Brain Plane Classification Enriched by SIFT and Enlightened Through Grad-CAM-based Explainability**. (2024)
— Proposed a novel fetal brain plane classification architecture that integrates CNN-extracted global features with Dense SIFT local features, classifies them using LightGBM, and enhances interpretability through Grad-CAM for global feature visualization and SIFT key points for local feature representation.
— Authors : A.M. Tayeful Islam, **Shoaib Ahmed Dipu**, Md Abu Ibrahim, Md. Golam Rabiul Alam
— To be submitted to **Neural Computing and Applications**, **Q1** Journal, IF : **4.5**.

Conference Publication

• **A Deep Learning Based Ensemble Approach for Gastrointestinal Disease Detection with XAI.** (2024) [Link]
— Proposed an ensemble deep learning model combining a unique CNN architecture with pre-trained models for gastrointestinal disease classification on the Kvasir dataset and enhancing interpretability using LIME-based Explainable AI.
— Authors : Dewan Ziaul Karim, Tasfia Anika Bushra, **Shoaib Ahmed Dipu**
— Published in IEEE International Conference on Artificial Intelligence in Engineering and Technology (**IICAIET)**.

Manuscript Under Preparation

• **FedRetino : A Federated Learning Approach to Classify Retina Image**. (2024).
— Proposed a federated learning-based approach using different CNN architectures to classify retina images from the MedFMC dataset. Experimentation is ongoing with different strategies such as FedAvg, FedSGD, FedProx, and FedDyn.
• **EnerForecast: Time Series Modeling for Energy Consumption Prediction**. (2024).
— Utilized various forecasting models, including ARIMA, SARIMA, SARIMAX, LSTM, GRU, and Prophet, to predict household active power consumption based on historical usage patterns while accounting for seasonal trends, external factors, and additional complexities. Current experimentation seeks to merge statistical and deep learning methods.

Supervision

• **Exploration and Mitigation of Gender Bias in Word Embeddings from Transformer-based Language Models**. (2023). [Link]
— Investigated gender bias in transformer-based language models like BERT by employing various bias detection methods, introducing a novel metric called MALoR, and mitigating bias through continued pretraining on a gender-balanced dataset created via Counterfactual Data Augmentation.
— Co-supervised Undergraduate Thesis with Dr. Farig Yousuf Sadeque

Appointment

Lecturer June 2022 - Present
Department of Computer Science and Engineering, Brac University *Dhaka, Bangladesh*
- Courses Currently Teaching : Algorithms, Database Systems, Artificial Intelligence, Object Oriented Programming

Lecturer May 2021 - May 2022
Department of Computer Science and Engineering, Northern University Bangladesh *Dhaka, Bangladesh*
- Courses Taught : Object Oriented Programming, Theory of Computation, Compiler Design, Introduction to Computer, Web Programming, Database Programming

Student Tutor (Undergraduate Teaching Assistant) September 2019 - December 2020
Department of Computer Science and Engineering, Brac University *Dhaka, Bangladesh*
- Courses Taught : Structured Programming, Object Oriented Programming

Student Tutor (Undergraduate Teaching Assistant) July 2020 - September 2020
Department of Mathematics and Natural Sciences, Brac University *Dhaka, Bangladesh*
- Course Assisted : Linear Algebra and Fourier Analysis

Student Mentor of First Year Advising Team (FYAT) January 2019 - December 2019
Office of Academic Advising, Brac University *Dhaka, Bangladesh*

Technical Skills

Programming Languages: Java, Python, C/C++, R
Other Languages: MATLAB, Mathematica, LaTeX, x86 Assembly, Bash, Verilog
Web Programming: PHP, MySQL, HTML5, CSS
Library: TensorFlow, Keras, PyTorch, Scikit-learn, Pandas, NumPy, Matplotlib, JOGL
Software & Tool: Git, Altera Quartus, Microwind, PSpice, emu8086

Honor & Award

• **Quality Journal Publication Award, Brac University** (Amount : **50,000 BDT / 415 USD**. Awarded to the Authors who published Q1 Journal Articles in 2023)
• **Conference Fund, Brac University** (Amount : **50,000 BDT / 415 USD**. Awarded for publishing in Conference.)
• Completed Bachelor's with **Highest Distinction** (Awarded to candidates whose CGPA is 3.80 or higher)

• Got placed on **Vice Chancellor's List for 6 times** during Bachelor's (Awarded as recognition of achieving a GPA of 3.90-4.00 on a particular semester)
• Got placed on **Dean's List for 5 times** times during Bachelor's (Awarded as recognition of achieving a GPA of 3.70-3.89 on a particular semester)
• **Special Recognition Award** (Vice Chancellor's Certificate) for Residential Semester (Top **4.4%**. Awarded as recognition of high standard of Discipline and Devotion during Residential Semester)
• Merit Based Scholarship (**70% waiver**) on Tuition Fees in every semester of Undergraduate
• Postgraduate Scholarship (**40% waiver**) and Merit Based Scholarship (**75% waiver**) on Tuition Fees in every semester of Postgraduate)

Undergraduate Academic Project

• Automation on Agriculture Field by Creating Mesh Network using esp8086 (Microprocessors) [Link]
• Employee Management & Performance Tracker System (Database Systems) [Link]
• Automated Restaurant Management System (Software Engineering [Link] & System Analysis & Design [Link])
• Maze Solver & Android based Bluetooth Controlled Robot (Digital System Design) [Link]

Service

• **Lab Course Coordinator** [Summer 2022, Fall 2022, Spring 2023, Summer 2023, Fall 2023, Spring 2024, Summer 2024, Fall 2024], Brac University. (Coordinated with Lab Faculty Members of 10-20 different sections & approximately 400-800 students to conduct the Lab Course of those particular semesters)
• **Pre Thesis II Panel Judge** [Summer 2022, Fall 2022, Spring 2023], Brac University. (Evaluated & provided feedback to the Posters & Presentations of the Undergraduate Thesis groups)
• **Final Thesis Defense Panel Judge** [Summer 2023, Spring 2024, Summer 2024, Fall 2024], Brac University. (Evaluated & provided feedback to the research works of Undergraduate Thesis groups)
• **Final Project & Thesis Defense Panel Judge** [Summer 2021, Fall 2021, Spring 2022], Northern University Bangladesh. (Evaluated & provided feedback to the research works of Undergraduate Project & Thesis groups)
• **Academic Advisor of Probationary Students** [Spring 2023, Summer 2023], Brac University. (Consulted and advised undergraduate students who are on academic probation)
• **Organizing & Hosting Webinars** [2021], Northern University Bangladesh. (Invited guests both from Academia & Industry to share their journey & experience with the Undergraduate students) [Link]

Talks and Presentations

• Paper Presentation at IEEE International Conference on Artificial Intelligence in Engineering and Technology, 2024. [Slides] [Paper]
• Contributed Talk : Short Introduction to Neural Networks & Deep Learning, Brac University. [Link]

Miscellaneous

• Champions of Earth : Season I, North South University. **Top 2.7%**. Participated in an Environmental based Idea Generation Competition. Around 296 teams participated in first round & 8 teams made it to the Grand Finale. [Link]