Mominul Islam

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Google Scholar ORCiD GitHub LinkedIn

Education

BSc **North South University**, Computer Science and Engineering — Jan. 2019 – Jun. 2023
- CGPA: 3.86/4.00 (≈Top 4%)

Teaching Experience

Lab Instructor — July. 2024 – Present
Dept. of Electrical and Computer Engineering
North South University
– *CSE225L: Data Structures and Algorithms Lab*

Teaching Assistant (GA / UGA) — Feb. 2022 – Jun. 2024
2 years 4 months
Dept. of Electrical and Computer Engineering
North South University
Graduate Assistant (GA) — (Jul. 2023 – Jun. 2024)
Undergraduate Assistant (UGA) — (Feb. 2022 – Jun. 2023)
– *CSE332: Computer Organization and Architecture*
– *CSE325: Concepts of Programming Language*

Work Experience

Intern — Mar. 2024 – Jun. 2024
3 months
Dept. of Business Systems
Beximco Communications Limited
– *ERP Data Verification and Migration Using Python*

Research Interests

– Computer Vision *(Image Quality Assurance, Classification, Segmentation, Pose Estimation, Generative Models)*
– Natural Language Processing *(LLM Context Preservation, Q&A, XAI, Ethical AI)*
– Quantum Machine Learning (*Knowledge Transfer*)

Research in Progress

QML — **Generative Models in Quantum Neural Networks for Alzheimer's Disease Detection**
Computer Vision — **Frame Distillation Algorithm for Reducing Manual Annotation in Video Datasets**
NLP — **Context-Aware Semantic Chunking Algorithm**

Publications

CosSIF: Cosine similarity-based image filtering to overcome low inter-class variation in synthetic medical image datasets, *Mominul Islam, Hasib Zunair, Nabeel Mohammed — Mar. 2024

Computers in Biology and Medicine (Impact Factor: 7.7 — Q1)

Paper: doi.org/10.1016/j.compbiomed.2024.108317 — Code: GitHub

Abstract: Crafting effective deep learning models for medical image analysis is a complex task, particularly in cases where the medical image dataset lacks significant inter-class variation. This challenge is further aggravated when employing such datasets to generate synthetic images using generative adversarial networks (GANs), as the output of GANs heavily relies on the input data. In this research, we propose a novel filtering algorithm called Cosine Similarity-based Image Filtering (CosSIF). We leverage CosSIF to develop two distinct filtering methods: Filtering Before GAN Training (FBGT) and Filtering After GAN Training (FAGT). FBGT involves the removal of real images that exhibit similarities to images of other classes before utilizing them as the training dataset for a GAN. On the other hand, FAGT focuses on eliminating synthetic images with less discriminative features compared to real images used for training the GAN. The experimental results reveal that the utilization of either the FAGT or FBGT method reduces low inter-class variation in clinical image classification datasets and enables GANs to generate synthetic images with greater discriminative features. Moreover, modern transformer and convolutional-based models, trained with datasets that utilize these filtering methods, lead to less bias toward the majority class, more accurate predictions of samples in the minority class, and overall better generalization capabilities. Code and implementation details are available at: https://github.com/mominul-ssv/cossif.

Projects

Deep Learning — Computer Vision

Cattle Pose Estimation Using a Semi-Annotated High-Resolution Image Dataset — Jun. 2024

- Code: Kaggle
- *Model: HRNet-32*

Skin Lesion Classification Using Cross-Stage CNNs and Transformers — Sep. 2022

- Ref. Code: GitHub — *BSc Thesis (Part 2/2)*
- *Models: ConvNeXt, Swin-Transformer, ViT*

Image-to-Image Translation with GAN to Address Class Imbalance — Aug. 2022

- Ref. Code: GitHub — *BSc Thesis (Part-1/2)*
- *Model: StyleGAN2-ADA*

Deep Learning — NLP

Context-to-Question Generation Using Transformer Models — Jan. 2024

- Code: Kaggle
- *Models: BERT, T5 — Hugging Face*

Bengali Text Summarization Using a Multilingual Encoder-Decoder Model — Jun. 2023

- Code: GitHub
- *Model: mT5*

Machine Learning

Heart Disease Detection Using Machine Learning Jul. 2022

- Code: GitHub
- *Algorithms: Logistic Regression, Random Forest, Decision Tree, KNN, Naive Bayes*

Honors and Awards

Bachelor's Degree Honors:

– Summa Cum Laude (Highest Distinction)

Merit Scholarships During Bachelor's Studies:

– 50% Tuition Waiver (Summer 2022 - Fall 2022)

– 25% Tuition Waiver (Spring 2020 - Spring 2022)

Skills

Programming Languages: C/C++, Python, Java
ML Frameworks: PyTorch, TensorFlow, OpenMMLab
Web: HTML, CSS, JavaScript, SQL
Simulation Software: Logisim, Proteus
Typesetting: LaTeX
OS: Linux, Windows

Courses

Quantum Machine learning
Platform: Mahdy Research Academy
Status: Completed (80%+)

Academic Archive

Computer Science

CSE173 Discrete Mathematics — Notes

CSE231 Digital Logic Design — Notes

CSE332 Computer Organization and Architecture — Notes

CSE465 Pattern Recognition and Neural Network — Notes

Mathematics

MAT116 Pre-Calculus — Notes — I — II

MAT125 Introduction to Linear Algebra — Notes — I — II

MAT120 Calculus and Analytical Geometry I — Notes — I — II — III
MAT130 Calculus and Analytical Geometry II — Notes — I — II — III

MAT250 Calculus and Analytical Geometry IV — Notes — I — II

MAT350 Engineering Mathematics — Notes — I — II — III

MAT361 Probability and Statistics — Notes

Languages

Bengali: Native
English: Proficient
IELTS, Overall: 7.0 Oct, 2023

Speaking: 7.5	**Reading:** 7.5	**Writing:** 7	**Listening:** 6.5

References

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