MAHMUD WASIF NAFEE

Biomedical Engineer | Generative AI & CT Imaging Research

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EXPERIENCE

Graduate Research Assistant

WANG-AXIS Lab, Rensselaer Polytechnic Institute

August 2025 – Present
Troy, NY

- Repurposed and customized state-of-the-art GAN architectures for CT artifact removal by redesigning training objectives and optimization strategies, supported by physics-based simulation pipelines to generate virtual paired datasets.
- Adapted Poisson Flow Generative Models (PFGM) for denoising-oriented reconstruction and implemented projection-to-image pipelines to evaluate performance under realistic CT acquisition settings.

Contractual Research Assistant

Cyber Physics Intelligence Laboratory, IAT, BUET

July 2024 – June 2025
Dhaka, Bangladesh

- Designed convolutional and hybrid CNN–Transformer architectures tailored to the noisy and high-dimensional structure of Wi-Fi CSI data, incorporating dilated convolutions and gated attention mechanisms for robust feature extraction.
- Designed CSI denoising and dimensionality refinement pipelines using discrete wavelet decomposition for high-frequency noise attenuation and clustering-based subcarrier selection to reduce redundancy across 60-channel inputs.

PROJECTS

AI-Powered Chest X-ray Report Writing Assistance for Radiologists

Dept. of Biomedical Engineering, BUET

July 2023 – June 2024
Supervisor: Dr. Taufiq Hasan

- Investigated vision-language models (Florence-2, PaliGemma, Vision Encoder-Decoders) and pretrained CNN backbones for automated radiology report generation.
- Integrated patient metadata and radiologist diagnostic labels into multimodal pipelines and designed structured report templates tailored for small vision-language models.
- Performed comparative analysis against state-of-the-art approaches (CXR-RePaiR, RGRG) and explored multimodal retrieval strategies for improved contextual accuracy.

LLM Editing via In-Context Learning

W&M Data-Driven Decision Intelligence (D^3i) Lab, College of William & Mary

December 2024 – July 2025
Supervisors: Dr. Haipeng Chen, Dr. Yanfu Zhang

- Identified limitations of fixed-size, similarity-based in-context editing methods that fail to account for edit difficulty and long-tail knowledge distributions.
- Developed policy-optimized, utility-driven retrieval strategies for weight-free knowledge editing, enabling black-box LLM API deployment while reducing prompt bloat and computational cost.

EDUCATION

Ph.D. in Biomedical Engineering

Rensselaer Polytechnic Institute (RPI), Troy, NY

August 2025 – Present
Advisor: Prof. Ge Wang, WANG-AXIS Lab

B.Sc. in Biomedical Engineering

Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

April 2019 – July 2024

ACHIEVEMENTS

- **2nd Runner-up, Glioma-MDC 2025 (ISBI Challenge)**
  Integrated classical frequency-domain image processing techniques with ensemble learning models to improve mitotic figure detection and classification in H&E-stained glioma histopathology images.
- **Crystal Sea Award — Rice360 Global Healthcare Competition 2023**
  Awarded for designing BABY BELT, a low-cost wearable system combining textile-based piezoresistive sensing for uterine contraction monitoring with acoustic signal processing for fetal heart rate estimation.

STRENGTHS & SKILLS

GAN-based Artifact Removal
Diffusion Models
Poisson Flow Generative Models (PFGM)
Higher-Order Transformers
Vision-Language Models
Reinforcement Learning
Denoising & Reconstruction Models

PyTorch HuggingFace Transformers
LoRA Fine-Tuning ASTRA Toolbox
pydicom CUDA TensorFlow
ITKSnap

PUBLICATIONS

M.W. Nafee, M. Jiang, H. Chen, Y. Zhang. *Dynamic Retriever for In-Context Knowledge Editing via Policy Optimization*. EMNLP 2025.

M.W. Nafee, A.H. Juicy. *Enhanced Mitotic Figure Detection in Glioma Using Super-Resolution Images and High-Frequency Content Maps*. IEEE ISBI 2025.

M.W. Nafee, T. Rahman, T. Hasan. *RadTextAid: A CNN-Guided Framework Utilizing Lightweight Vision-Language Models for Assistive Radiology Reporting*. GenAI4Health @ AAAI 2025.

M.W. Nafee, M.K. Joarder, M. Rahman, T.F. Sanam. *Descriptor: A Word-Level Wi-Fi CSI-Based Deep Bangladeshi Sign Language Dataset (WiBaSL)*. IEEE Data Descriptions.

M.K. Joarder, **M.W. Nafee**, M. Rahman, T.F. Sanam. *A Robust Signal Processing Framework for CSI-Based Bangla Sign Language Recognition via Doppler-Based Subcarrier Selection, Complex ICA, and Energy-Based Fusion*. IEEE Access.

A.H. Juicy, T. Rahman, **M.W. Nafee**, S.N. Ali. *BabyBelt: A Low-Cost Wearable Uterine Contraction Monitoring Belt Using Velostat Sensors*. IEEE EMBS BSN 2025.

REFERENCES

Prof. Ge Wang

Clark & Crossan Endowed Chair Professor
Director, Biomedical Imaging Center
Editor-in-Chief, IEEE Transactions on Medical Imaging
Rensselaer Polytechnic Institute

- Email: wangg6@rpi.edu
- Website: https://wang-axis.github.io/

Dr. Haipeng Chen

Assistant Professor of Data Science
William & Mary

- Email: hchen23@wm.edu
- Graduate Program Director, Department of Data Science

LANGUAGES

Python
MATLAB

COURSEWORK

Graduate

- Medical Imaging and Machine Intelligence
- Introduction to Deep Learning
- Biostatistics

Undergraduate

- Magnetic Resonance Imaging
- Digital Signal Processing
- Random Signals and Processes
- Comm Protocols for Biomedical Instruments
- Bioinformatics Algorithms
- Linear Algebra and Matrix Theory
- Integral and Differential Calculus
- Complex and Vector Calculus
- Differential Equations

SERVICE & EXTRACURRICULARS

- Reviewer, GenAI4Health Workshop at NeurIPS 2025
- Reviewer, Medical Physics Journal
- Volunteer, EMNLP 2025
- President, BUET Brainiacs (2023–24)
- Volunteer, RPI BME Graduate Council (2025–)