Md Tanzim Hossain

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PROFILE

I am a dedicated professional with a strong background in computer science and engineering, with extensive experience in both academia and research. Over the years, I have held various roles such as Lab Instructor, Lab Officer, and Lecturer at North South University and Presidency University, where I have effectively mentored students and led lab sessions. My expertise in deep learning in medical research and in data analysis, particularly in the development of algorithms for mathematical modeling and model order reduction, has been a key driver in solving complex problems. With strong proficiency in Python, MATLAB, Microsoft Excel and data visualization tools like Microsoft Power BI, I am able to derive actionable insights from large datasets, making me an invaluable asset to any data-driven project. My research has been published in high-impact journals, further solidifying my analytical capabilities and commitment to advancing innovative solutions.

PROFESSIONAL EXPERIENCE

Backend & AI/ML Lead, *BigMatrix Research Lab* 01/2025 – Present | Dhaka, Bangladesh

- Led advanced AI research initiatives in healthcare-focused machine learning, defining research objectives and translating clinical problems into deployable AI systems.
- Designed end-to-end system architectures for deep learning and multimodal AI pipelines, covering data ingestion, model training, inference, and evaluation.
- Developed and supervised models for lung cancer detection and segmentation from CT scans, breast cancer analysis from mammography, and whole-body auto-contouring for radiotherapy planning.
- Built multimodal clinical decision support systems integrating medical imaging with structured and unstructured clinical data (EHRs, reports, metadata).
- Conducted research on longitudinal patient history modeling, disease progression prediction, and risk projection using temporal and multimodal learning approaches.
- Emphasized explainable AI (XAI), uncertainty estimation, and ethical AI practices to ensure transparency, robustness, and clinical relevance of models.
- Supervised technical documentation, experiment tracking, and publication-oriented research outputs, aligning projects with academic and clinical standards.

Backend & AI/ML Lead, *DiagnoTech-AI* 01/2023 – 12/2024 | Dhaka, Bangladesh

- Designed and led the backend development of a scalable, secure Django-based healthcare AI platform, supporting production-grade AI services.
- Architected RESTful APIs, AI inference pipelines, and data flow mechanisms ensuring efficient integration between backend services and frontend applications.
- Developed and deployed containerized AI services using Docker, enabling reproducible environments and reliable model serving.
- Deployed and managed Docker Swarm clusters with load balancing, achieving high availability, fault tolerance, and efficient resource utilization under production workloads.
- Integrated AI pipelines with backend systems while maintaining compliance with healthcare data handling and security best practices.
- Collaborated cross-functionally with AI researchers, product managers, and UI/UX teams to deliver end-to-end, production-ready healthcare AI solutions.

- Maintained high engineering standards through code reviews, automated testing, debugging, and performance optimization.
- Mentored junior engineers and contributed to system-level architectural decisions and long-term technical roadmap planning.

Research Assistant, *North South University* 01/2020 – 07/2024 | Dhaka, Bangladesh
- Conducted research on advanced medical image segmentation, computer vision, and AI-driven diagnostic techniques; contributed to innovative solutions for complex image analysis tasks.
- Published research papers in Q1 journals, focusing on AI applications in healthcare, medical imaging, and mathematical modeling.
- Designed and implemented machine learning algorithms, simulation pipelines, and data-driven optimization frameworks for large-scale dynamical systems.
- Generated high-fidelity simulation data using COMSOL Multiphysics® (v5.5) for projects involving physical systems modeling, aircraft wing shape optimization, and large-scale system dynamics.
- Performed literature reviews, identified new methodologies, and developed frameworks for model reduction, finite-frequency analysis, and time-interval approximation of dynamical systems.
- Created computer-oriented simulations and implemented custom algorithms to validate theoretical findings and apply them to real-world engineering and scientific problems.
- Developed and applied Model Order Reduction (MOR) techniques across domains including second-order descriptor systems, large-scale dynamical systems, and aerospace optimization.
- Assisted in designing and testing data-driven airfoil optimization models leveraging MOR approaches for aerodynamic performance improvement.
- Prepared detailed documentation, technical reports, and research deliverables, ensuring reproducibility and clarity for academic and industrial stakeholders.
- Mentored junior researchers and students, contributed to academic excellence, and supported interdisciplinary collaboration on funded research projects.

Lab Instructor, *North South University* 05/2021 – 07/2024 | Dhaka, Bangladesh
- Delivered laboratory lectures and guided students through hands-on session activities based on prepared lab manuals and course materials.
- Developed, updated, and maintained lab manuals, detailed lab syllabi, and marks distribution in coordination with course faculty.
- Conducted weekly 2 hr 40 min lab sessions, quizzes, viva exams, and lab-related assessments while ensuring structured learning outcomes.
- Evaluated lab reports, quizzes, exam papers, and overall student performance with fairness and academic integrity.
- Maintained 1.5 hours of weekly office hours per section to provide academic support, clarification, and consultation to students.
- Served as a proctor during exams, enforcing academic honesty policies and taking appropriate actions against unfair means.
- Ensured all exam questions and lab syllabus materials were verified and approved by faculty prior to administration.
- Supported smooth course operations through timely communication, documentation, and adherence to institutional academic policies.

Lecturer, *Presidency University* 01/2022 – 12/2022 | Dhaka, Bangladesh
- Taught Engineering Mathematics (Differential Equations) and Java Programming, delivering structured lectures and guiding students through theoretical concepts and practical problem-solving.
- Designed and delivered course outlines, weekly lesson plans, lab materials, and assessments, ensuring alignment with university academic standards.

- Conducted tests, quizzes, assignments, and exams, and evaluated student performance with fairness, transparency, and adherence to academic policies.
- Prepared detailed syllabi, grading schemes, and instructional resources and obtained required faculty approvals prior to distribution.
- Provided academic support and consultation through dedicated office hours, helping students understand complex mathematical concepts, programming logic, debugging, and algorithm design.
- Taught core Java topics, including OOP principles, data structures, control flow, file handling, and introductory software development practices.
- Facilitated lab sessions and hands-on coding activities, monitoring progress, identifying learning gaps, and ensuring students successfully implemented programming assignments.
- Served as an exam proctor, upholding academic integrity and enforcing examination rules and regulations.
- Contributed to enhancing the overall learning environment through effective communication, structured content delivery, and continuous student engagement.

Undergraduate Teaching Assistant, 01/2019 – 04/2022 | Dhaka, Bangladesh
North South University

- Served as a UGA for four core courses: C Programming, Data Structures & Algorithms, Digital Logic Design, Computer Architecture
- Conducted weekly tutorial sessions (4+ hours per course) to reinforce key concepts, provide problem-solving support, and guide students through programming, logic design, and hardware architecture topics.
- Assisted faculty in preparing lesson plans, instructional materials, programming tasks, and problem sets for all assigned courses.
- Taught fundamental and advanced concepts including C syntax, memory management, pointers, recursion, algorithm design, complexity analysis, logic circuits, combinational & sequential systems, CPU organization, pipelining, and architectural design principles.
- Graded assignments, quizzes, lab work, and exam scripts, ensuring accuracy, fairness, and alignment with faculty guidelines.
- Proctored quizzes and exams, actively enforcing academic integrity.
- Provided one-on-one student support during office hours, helping learners troubleshoot code, understand algorithms, and master digital logic and computer architecture fundamentals.
- Supported faculty with course-related administrative tasks, contributing to smooth course delivery and improved student performance.

RESEARCH & SOFTWARE DEVELOPMENT PROJECTS

AI Based Learning Management System for Medical College, *DiagnoTech-Ai* 03/2023 – 12/2023

- Built advanced AI-powered education platforms for medical colleges, including a full Learning Management System and a Radiology Learning Platform, enhancing training for students and medical professionals.
- Engineered a scalable full-stack architecture using React, Node.js, and MongoDB, supporting 1,200+ learners with reliable, high-performance systems.
- Developed a Radiology Learning Platform that analyzes medical images using advanced AI, providing real-time feedback, interactive visualization, detailed annotations, and case-based diagnostic training.
- Created a real-time analytics dashboard with Socket.io , enabling instant tracking of assessments, student engagement, radiology case performance, and learning progression.

- Implemented AI-driven automated grading for quizzes and written responses, reducing instructor workload by 60% while improving assessment accuracy and consistency.
- Designed and integrated adaptive learning features for personalized content delivery, real-time feedback loops, and performance-based recommendations for medical students and radiology trainees.
- Implemented secure authentication, role-based access control, and optimized database schemas to support seamless interaction between students, faculty, and administrators across both platforms.

RadAnalysis – Medical Imaging & Radiotherapy Planning Platform, *BigMatrix Lab* 01/2024 – Present

- Developed an AI-powered radiology and radiotherapy planning platform using PyQt5, U-Net, and nnU-Net, achieving 92–94% accuracy in medical image segmentation.
- Integrated the platform with Elekta treatment planning systems through DICOM RT-STRUCT, enabling seamless clinical workflow compatibility.
- Successfully deployed in real clinical environments at Square Hospital and Bangladesh Medical University, supporting medical professionals in treatment planning.
- Implemented WebSocket-based real-time collaboration and AWS cloud deployment, supporting 50+ concurrent clinical users with high availability.
- Engineered a high-speed batch processing pipeline that reduced export time from 15 minutes to 30 seconds, enabling processing of 200+ scans daily.

Development of Efficient Algorithms to optimize the Solar Thermal state of the Photo- voltaic Panel by analyzing the generated dynamic mathematical model, 01/2023 – 12/2023

Bigmatrix Lab

- Reviewed literature and investigated new methodologies for optimizing the solar thermal state of photovoltaic panels.
- Collected and analyzed data to support algorithm development and model validation.
- Developed mathematical algorithms and computational methods for dynamic model optimization.
- Produced computer-oriented simulations in **Python and MATLAB** for testing and evaluating the proposed algorithms.
- Applied the developed algorithms to selected real-life applications for performance assessment.
- Prepared, maintained, and updated project website materials as required.
- Contributed to writing and preparing research publications.

Model Order Reduction for Aircraft Wing Shape Optimization, *BigMatrix Lab* 01/2022 – 12/2022

- Constructed physical and mathematical models of aircraft wings by analyzing shape deformation caused by aerodynamic drag.
- Generated linear state-space models through system linearization to capture the dynamic behavior of the physical wing structure.
- Applied Reduced Order Modeling (ROM) techniques to remove redundant parameters, accelerate simulations, and optimize computational performance.
- Developed optimized aircraft wing geometries based on reduced mathematical models, enabling smoother analysis and improved aerodynamic performance.
- Conducted research involving control theory, scientific computing, and mathematical algorithm design for Wing Shape Optimization (WSO).
- Contributed to the preparation of scientific manuscripts for publication in peer-reviewed journals.

Developing Mathematical Algorithms and Softwares for the Model Reduction of Large-Scale Dynamical Systems, 01/2020 – 12/2021
BigMatrix Lab

- Generated simulation data for large-scale dynamical systems using COMSOL Multiphysics 5.5.
- Assisted the project supervisor in tasks related to algorithm development and computational modeling.
- Supported research activities involving mathematical analysis, documentation, and preparation of project deliverables.

Model Reduction of Second-Order Descriptor Systems over Finite-Frequency Interval, 01/2020 – 12/2020
BigMatrix Lab

- Reviewed literature and investigated new approaches to establish a framework for the model reduction problem.
- Developed mathematical algorithms for second-order descriptor systems over finite-frequency intervals.
- Produced computer-oriented simulations in Python and MATLAB to validate the developed algorithms.
- Applied the algorithms to selected real-life engineering and scientific applications.

EDUCATION

Friedrich-Alexander University, 10/2025 – present
Masters of Science in Data Science Erlangen-Nuremberg, Germany
Ist Semester Running

North South University, *Bachelor of Science in Computer Science & Engineering (B.Sc in CSE)* 05/2016 – 01/2021
Bashundhara-Dhaka, Bangladesh
Minor in Mathematics
CGPA: 3.75/4.00

NOTABLE PUBLICATIONS

OncoVision: Integrating Mammography and Clinical Data through Attention-Driven Multimodal AI for Enhanced Breast Cancer Diagnosis, 11/2025
arXiv Preprint

Pioneering precision in lumbar spine MRI segmentation with advanced deep learning and data enhancement, 06/2025
Machine Learning with Applications, Elsevier

Integrating Mamba Sequence Model and Hierarchical Upsampling Network for Accurate Semantic Segmentation of Multiple Sclerosis Lesion, 12/2024
International Conference on Life System Modeling and Simulation, Springer Nature Singapore

Efficient aerodynamic design using BézierGAN and model order reduction: A computational study, 09/2024
Results in Engineering, Elsevier

From pixels to pathology: A novel dual-pathway multi-scale hierarchical upsampling network for MRI-based prostate zonal segmentation, 06/2024
Intelligent Systems with Applications, Elsevier

Topology-aware anatomical segmentation of the Circle of Willis: HUNet unveils the vascular network, 05/2024
IET Image Processing

Optimizing Universal Lesion Segmentation: State Space Model-Guided Hierarchical Networks with Feature Importance Adjustment, 04/2024
arXiv Preprint

Automated Segmentation of Multiple Sclerosis Lesions using Deep Learning, 12/2023
26th International Conference on Computer and Information Technology (ICCIT), IEEE

A computationally effective time-restricted stability preserving H 2 -optimal model order reduction approach, 06/2023
Results in Control and Optimization, Elsevier

Reduced Order Modeling of a Class of Descriptor System on Certain Domains with the Application to Blood Flow Through the Carotid, 06/2023
SSRN

Estimating Aerodynamic Data via Supervised Learning, 12/2022
25th International Conference on Computer and Information Technology (ICCIT), IEEE

Sparsity-Preserving Two-Sided Iterative Algorithm for Riccati-Based Boundary Feedback Stabilization of the Incompressible Navier–Stokes Flow, 11/2022
Mathematical Problems in Engineering, Wiley

Computational techniques for H2 optimal frequency-limited model order reduction of large-scale sparse linear systems, 10/2021
Journal of Computational Science, Elsevier

Iterative Rational Krylov Algorithms for model reduction of a class of constrained structural dynamic system with Engineering applications, 01/2021
American Institute of Mathematical Sciences (AIMS)

SVD-Krylov based sparsity-preserving techniques for Riccati-based feedback stabilization of unstable power system models, 2021
Journal of Engineering Advancements

CERTIFICATIONS & ONLINE SPECIALIZATIONS

- Deep Learning Specialization – Coursera
- Machine Learning Specialization – Coursera
- Microsoft Power BI Data Analyst – Coursera

SKILLS

Programming Language
Python, C, C++, Java, JavaScript

Data Science & Analytics
Data Mining, Data Wrangling, Exploratory Data Analysis (EDA), Data Visualization (Matplotlib, Seaborn, Plotly), Microsoft Excel, Power BI, Applied Mathematics for ML (Linear Algebra, Calculus, Optimization)

Frameworks & Libraries
PyTorch, TensorFlow, Scikit-Learn, Pandas, NumPy, Django, ReactJS

Tools & Technologies
Git, GitHub, Docker, Jupyter Notebook, Google Colab, REST APIs, Matlab

Software Engineering Fundamentals
Data Structures & Algorithms, Problem-Solving Techniques, Software Design Patterns & Principles, System Design Basics