

Nasim Mahmud Nayan

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SUMMARY

AI Engineer specializing in trustworthy healthcare AI with expertise in bias mitigation, multimodal diagnostics, and LLM systems for clinical decision support. Built ExplainRAG-based decision support systems and the open-source M-TRUST fairness toolkit, with a proven ability to deliver end-to-end ML pipelines and collaborate effectively across academic and industry teams.

EDUCATION

● Bachelor of Science in Computer Science and Engineering

University of Information Technology and Sciences (UITS) | Dhaka, Bangladesh | (Jan 2019 – Feb 2023)

- **CGPA:** 3.62/4.00 (Ranked 6th in department)
- **Thesis:** A Multi-Disease Prediction Framework: Leveraging Machine Learning and Real-Time Applications for Improved Health Outcomes

RESEARCH EXPERIENCE

● Research Assistant, Medical Cyber-Physical Systems

Shanto-Mariam University of Creative Technology | Jul 2022 – Present

Advisors: Prof. Mohammad Mobarak Hossain, Dr. Jasim Uddin

- Architected an ensemble learning framework for maternal health risk stratification, achieving 99% prediction accuracy and reducing algorithmic bias by 34% across 5,000+ patient records.
- Implemented homomorphic encryption on IoT devices to ensure secure, private, and compliant transmission of pregnancy data.
- Contributed to 3 co-authored papers in high-impact venues (combined 50+ citations), establishing new benchmarks in maternal health AI

● Research Assistant, Healthcare AI & IoT Systems

Rising Research Lab | Aug 2022 – Mar 2023

Advisors: Md. Monirul Islam, Dr. Jia Uddin

- Developed and deployed a multi-disease prediction system (Diabetes, Parkinson's, etc.) with 92% average accuracy and an IoT air quality monitoring network across 5 locations.
- Engineered a full data pipeline, from IoT device data capture to real-time inference.
- Implemented an AutoML pipeline that reduced model development time by 60% while maintaining performance.

● Research Assistant, Computer Vision in Medicine

EMPATHY LAB, Independent University Bangladesh | Jan 2023 – Dec 2024

Advisors: Dr. Ashraful Islam, Dr. Muhammd Usama Islam

- Conducted a systematic review of 125+ papers on healthcare computer vision applications, identifying key research gaps and opportunities.
- Analyzed leading deep learning architectures, such as CNNs and Vision Transformers, for medical imaging and predictive analytics.
- Synthesized findings to inform the lab's research direction in surgical assistance and remote disease monitoring.

PUBLICATIONS

Publication Metrics: 12+ publications | 150+ citations | h-index: 6 | [Google Scholar Profile](#) | [Full list on Google Scholar](#).

Selected Peer-Reviewed Journal Articles

- **Nayan NM**, et al (2025) "An interpretable and balanced machine learning framework for Parkinson's disease prediction using feature engineering and explainable AI ". PLoS One 20(10): e0333418. DOI: 10.1371/journal.pone.0333418
- Hossain, M.M., Kashem, M.A., **Nayan, N.M.**, et al. (2024). "A Medical Cyber-Physical System for Predicting Maternal Health in Developing Countries Using Machine Learning." Healthcare Analytics, 5, 100285. DOI: 10.1016/j.health.2023.100285
- Hossain, M.M, **Nayan, N.M.**, et al. (2026) "A comprehensive maternal health risk prediction dataset from IoT-enabled medical cyber-physical systems in developing countries: Supporting deep learning applications for clinical decision support" BMC Medical Informatics and Decision Making. DOI:10.1186/s12911-026-03343-1

Conference Proceedings (Presented- Oral presentation)

- **Nayan, N.M., et al.** (2023). "SMOTE Oversampling and Near Miss Undersampling Based Diabetes Diagnosis from Imbalanced Dataset with XAI Visualization." IEEE Symposium on Computers and Communications (ISCC), pp. 1–6. DOI: 10.1109/ISCC58397.2023.10218281
- **M. M. Hosaain, M. A. Kashem and N. M. Nayan,**(2024) "Artificial Intelligence-Driven Approach for Predicting Maternal Health Risk Factors," 2024 9th SEEDA-CECNSM, Athens, Greece, 2024, pp. 153-158, DOI: 10.1109/SEEDA-CECNSM63478.2024.00035.

KEY RESEARCH PROJECTS

M-TRUST: Open-Source Fairness Toolkit for Medical AI | [PyPI](#) | [GitHub](#)

- Built a plug-in Python toolkit to detect and mitigate demographic, quality, annotation, and amplification bias in clinical AI.
 - Provided a one-line wrapper API with docs and examples for reproducible adoption across models.
 - Reduced demographic bias by 30.8% on benchmark datasets while maintaining model performance.
- Technologies: Python, PyTorch, Scikit-learn, Pandas, Matplotlib

ExplainRAG-FC-AS: Clinical Decision Support via RAG & LLMs | [GitHub](#) | [Demo](#)

- Structured guideline evidence with thematic clustering and NLI fact-checking before generation.
 - Reached sub-10s queries, mean evidence confidence 0.85; 90% clinician preference vs ranked retrieval.
 - Enabled source-level attribution for traceable, transparent recommendations.
- Technologies: Python, PyTorch, FAISS, K-means Clustering, RoBERTa-large-MNLI, GPT-4, Streamlit.

Multimodal Chest X-ray Diagnosis System with Bias Analysis | [GitHub](#) | [Demo](#)

- Combined CheXNet image features with BioBERT clinical text to classify 14 thoracic diseases.
 - Diagnosed 4.3× cross-modal bias amplification; applied constraints to cut disparities from 7.6% to 4.5%.
 - Added Grad-CAM explanations to improve clinician trust and interpretability.
- Technologies: Python, TorchVision, Transformers (BioBERT), Streamlit, Grad-CAM, Docker

Trustworthy ECG Analysis Platform | [GitHub](#) | [Demo](#)

- Delivered real-time/offline ECG analysis with fairness-aware training and uncertainty estimation.
 - Achieved fairness score >0.9 and 95% accuracy; optimized to <30MB model and <100ms inference for edge.
 - Supported live sensor streams and digitized paper ECGs with natural-language explanations.
- Technologies: Python, PyTorch, ResNet (transfer), SciPy (signal), Streamlit

AWARDS & HONORS

- **Employee of the Month** | Primacy Infotech LTD | August 2023
- **2nd Place** | Inter-university Programming Contest (45 teams) | UITS 2022
- **Fastest Problem Solver** | UITS Victory Day Programming Contest | 2021
- **1st Place** | Inter-university PowerPoint Presentation Competition | UITS 2020

ACADEMIC SERVICE & LEADERSHIP

Peer Review Experience

- Peer Reviewer, Informatics and Health (Elsevier), Aug 2025–Present
- Peer Reviewer, International Journal of Human-Computer Interaction (Taylor & Francis, Q1), Sept 2025–Present

Teaching & Mentoring

- **AI Trainer**, Enhancing Digital Government Economy (EDGE) Project, May 2023 - Nov 2023.
 - Trained 50+ students in ML/AI through hands-on projects, developing a curriculum covering supervised learning, clustering, regression techniques, and model evaluation metrics
 - Created educational materials with clear explanations of complex ML concepts, demonstrating strong communication skills
 - Evaluated student ML models, providing detailed feedback on error modes and improvement strategies

Teaching & Mentoring (Continue)

- **Research Mentor**, UITS Summer Research Program, 2023 & 2024
 - Mentored 2 research groups (total 7 students) on machine learning and IoT projects
 - Guided in a complete research pipeline from literature review to publication
 - Outcomes: 1 paper accepted (Scopus-indexed), 1 under review

University & Community Leadership

- Conference Organizing: Poster Presentation Coordinator, UITS Zero One Fest, 2022
- Leadership: Senior Executive, Research Hub Wings, UITS Computer Club, 2022-2023

PROFESSIONAL EXPERIENCE

Deputy Manager, AI&ML, Technology Division, Brac | May 2026 – Present

- Lead enterprise AI and analytics initiatives by identifying high-impact business use cases and translating organizational challenges into scalable AI solutions.
- Coordinate with AI vendors, internal engineering teams, and business stakeholders to oversee solution planning, technical alignment, implementation, and delivery.

Technologies: Enterprise AI, GenAI, Analytics Strategy, AI Governance, Business Intelligence

Founder & Lead ML Engineer | OgroPath (Self-Founded Venture) Apr 2025 – Present

- Founded AI-powered medical exam platform serving 1,000+ students with 21,000+ question bank and adaptive learning
- Applied research insights on fairness and explainability to educational assessment systems

Technologies: LLMs, NLP, FastAPI, PostgreSQL, React, Docker

AI Engineer, Solynta | Dec 2025 – Present

- Developed RAG-based enterprise wiki system with source attribution ensuring trustworthy knowledge retrieval
- Implemented "no source, no result" verification pipeline for factual grounding in organizational knowledge bases

Technologies: LLMs, NLP, FastAPI, PostgreSQL, Docker

Machine Learning Engineer (Remote), Programming Hero | Dec 2023 – Sep 2025

- Architected AI wellness platform (Microsoft Store) with 95% accuracy posture detection, reducing eye strain by 40%
- Developed context-aware productivity coaching using behavioral analytics and real-time interventions, distinguishing focused work from distractions

Technologies: PyTorch, OpenCV, MediaPipe, OCR, LLM, FastAPI, Docker, Git

AI Engineer, Primacy Infotech Ltd | Jul 2023 – Nov 2023

- Led AI tour planner development for 6 UNESCO sites, reducing itinerary creation time from 2 hours to 5 minutes
- Performed data mining and preprocessing on visitor preference surveys to extract actionable insights for personalized route generation

Technologies: LLM, FastAPI, PostgreSQL, Docker, Streamlit

TECHNICAL SKILLS

- Programming Languages: Python (Expert), C/C++ | 300+ problems solved
- Machine Learning & AI: Supervised/Unsupervised Learning, Deep Learning, Generative AI (LLMs, RAG), Multimodal AI, Explainable AI (XAI), Fairness in ML
- Frameworks & Libraries: PyTorch, TensorFlow, Scikit-learn, OpenCV, Hugging Face, LangChain
- MLOps & Production: Docker, FastAPI, CI/CD, MLflow, Vector Databases
- Research Methods: Experimental Design, Statistical Analysis, Systematic Reviews, Hypothesis Formulation, Scientific & Technical Writing

STANDARDIZED TESTS

- TOEFL: 98/120
- IELTS: 6.5/9.0
- GRE: 307/340 (Q:153, V:154, AWA: 3.0)