

# Nazmun Nahar

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## Research Interests

Human-Centered AI for Health · Accessible and Adaptive HCI · Multimodal Data Processing · Assistive Technologies · Health Equity

## Preprints

1. Nazmun Nahar. *Healing Through Generative Vision: A Multimodal AI Framework for Trauma-Informed Therapeutic Visualization*. (2026). [pdf]  
\*Extended version of 2-page idea paper accepted at AIHealth 2026. Explores how AI can support mental health through user-centered visualization.
2. Nahar, Nazmun, et al. *AmarDoctor: An AI-Driven, Multilingual, Voice-Interactive Digital Health Application for Primary Care Triage and Patient Management to Bridge the Digital Health Divide for Bengali Speakers*. arXiv:2510.24724 (2025). [pdf]  
\*MIT Solve Global Health Equity Challenge Award Winner. Platform serving 12K+ users.
3. Shariar Kabir; Nazmun Nahar; et al. *Automatic Speech Recognition for Biomedical Data in Bengali Language*. arXiv:2406.12931 (2024). [pdf]

## Experience

### Research and Development Engineer | Tech Lead

2021–Present

MedAi Limited

Leading development of AmarDoctor, a digital healthcare platform for underserved Bengali-speaking communities, with focus on human-centered design and accessibility.

### Human-Centered AI for Health:

- Designed multilingual symptom-assessment interface that recognizes and translates colloquial expressions to address varying health literacy levels
- Validated clinical decision support algorithm through 185 patient vignette cases, achieving 81% accuracy vs. 50% physician baseline
- Built LLM-based pipeline converting paper medical documents into digital health records to address record loss and damage issues
- Developed system considering stakeholder perspectives including patients with limited health literacy and language proficiency, and clinicians managing paper-based records

### Accessible and Adaptive Interaction:

- Added conversational assistant as unified entry point to reduce complexity for older adults, low-literacy users, and people with limited technological familiarity
- Designed interface improvements based on deployment experience showing users struggled with menu-based navigation
- Created multimodal interface (voice and text) adapting to users' sensory, cognitive, and contextual needs

### Multimodal Data Processing and Assistive Technologies:

- Developed integrated assistive tools supporting everyday health decisions including symptom interpretation and caregiver advice
- Built computer vision-powered dietary recommendation system translating complex medical data into actionable user guidance

### Research Impact:

- Published 2 arXiv papers on accessible healthcare AI
- Won MIT Solve Global Health Equity Challenge 2024 (top 6 of 2,200 submissions)
- Platform facilitated 4,000+ medical consultations serving vulnerable populations

### Technical Implementation:

Python, Django, REST API, PostgreSQL, GenAI (Gemini), Cloud Computing, Knowledge Graphs

## Selected Projects

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- 1. Medical Records Digitization Pipeline** 2025
- **Problem:** Paper-based records block access to patients' long-term medical history at the point of care
  - **Solution:** LLM-powered OCR system for automated clinical data extraction
  - **Impact:** Improves patient safety and treatment accuracy through timely access to historical clinical data
  - **Tech Stack:** Python, Gemini 2.5 Pro, REST API, Knowledge Graph
- 2. AmarDoctor: Digital Healthcare Platform for Bengali-Speaking Communities** 2021–24
- **Problem:** Bengali speakers (200M+ people) lack accessible primary care resources
  - **Solution:** Comprehensive platform with multilingual symptom assessment, conversational interface, and voice interaction
  - **User Impact:** 12,000+ users, 4,000+ consultations
  - **Research Output:** 2 arXiv papers | MIT Solve Award'24 (6/2200) [details]
  - **Features:** Multilingual support recognizing colloquial expressions, conversational assistant replacing menu navigation, voice AI for low-literacy users
  - **Tech Stack:** Django, REST API, PostgreSQL, TypeDB, Data Analytics, Cloud Computing
- 3. Medical History-Based Dietary Recommendation System** 2024
- **Problem:** Patients with chronic diseases struggle to understand complex dietary restrictions
  - **Solution:** Computer vision + medical knowledge system for personalized, visual food guidance
  - **User Benefit:** Automated nutrition recommendations for diabetes, hypertension, kidney disease
  - **Approach:** Translates clinical guidelines into actionable, easy-to-understand recommendations
  - **Tech Stack:** Cloud Vision API, Medical Knowledge Base
- 4. Medical Assistant Chatbot (2023) →LLM-Powered Conversational Interface (2025)** 2023–2025
- **Problem:** Users need to describe symptoms and access care without navigating complex interfaces
  - **Solution:** Started as a RASA-based intent classifier for mental vs. physical health triage; evolved into an LLM-powered assistant that serves as AmarDoctor's primary entry point, handling symptom assessment, appointment booking, and care navigation in natural dialogue.
  - **User Experience:** Natural dialogue-based interface adapting to user abilities and communication styles
  - **Tech Stack:** RASA, Python, NLU, LLMs, API-driven orchestration [github]
- 5. Bengali OCR Using Deep Learning** 2018–19 (*B.Sc. Thesis*)
- Advisor: Prof. Md. Monirul Islam, BUET* [pdf]
- **Problem:** Working on low-resource language technology affecting how AI addresses real human needs
  - **Solution:** Deep learning model achieving 87.3% word recognition accuracy for Bengali text
  - **Impact:** Open-source dataset enabling low-resource language NLP research [Dataset]
  - **Tech Stack:** Keras, TensorFlow, CNN-RNN, OpenCV

## Education

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- B.Sc. Computer Science & Engineering** 2015–2019
- Bangladesh University of Engineering and Technology (BUET)
- Coursework:** Artificial Intelligence, Structured Programming Language, Data Structures, Algorithms, Database, Computer Architecture, Software Engineering and Information System Design, Digital System Design, Computer Networks, Operating System, Computer Interfacing, Basic Graph Theory, VLSI Design, and others.

## Teaching Experience

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- Instructor** *Bangladesh Institute of Science and Technology*
- Taught undergraduate CS courses to classes of 25-30 students. Developed curriculum, designed lab exercises, and assessed student learning. **Courses:**
- CS520223 Microprocessors and Assembly (theory and lab)
  - CS540206 Computer Graphics (lab)
  - CS540219 Network and Information Security (theory)
- Skills developed:** Curriculum design, clear communication of complex concepts, student mentorship, assessment design.

## Technical Skills

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**Research & Analysis:** User research, data analysis (Pandas, NumPy), visualization (Matplotlib, Seaborn)

**AI/ML:** Scikit-Learn, TensorFlow, Keras, OpenCV, Transformers, GenAI, LLM, RAG

**Programming:** Python, C/C++, Java, SQL, PostgreSQL, TypeQL

**Development:** Django, REST API, Git, CI/CD, Firebase

**Cloud:** AWS (EC2, S3, Lambda, API Gateway, Load Balancer, Auto Scaling)

## References

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1. **Dr. Md. Monirul Islam**, Professor, Bangladesh University of Engineering & Technology

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2. **Dr. Mamunur Rashid**, Assistant Professor, Birmingham University, UK

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3. **Dr. Shyamasree Saha**, Co-founder & CTO, MedAi Limited

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