

Mahbubur Rahman Khan

AI/NLP & Research-Oriented Software Engineer

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SUMMARY

Final-year Computer Science and Engineering student (AI Specialization) with research contributions. Builds full-stack AI systems end-to-end — from CPU-optimized deep learning pipelines and agentic RAG architectures to production-grade web and mobile applications.

TECHNOLOGIES AND LANGUAGES

Languages: Python, TypeScript, JavaScript, Kotlin, SQL, Java, C, C++

AI / ML: NLP, RAG systems, OCR pipelines, LLMs, FAISS, deep learning optimization, low-resource NLP

Technologies: React, Node.js, Express, FastAPI, PostgreSQL, Firebase, Redis, Streamlit, Three.js, Git

Other: Bash, $\text{\LaTeX}$, data structures and algorithms, compiler design, databases, research reproducibility, technical writing

WORK EXPERIENCE

Research Assistant | North South University

2025 – 2026

ECE Department, Dhaka, Bangladesh

- Conducted research work leading to manuscripts currently under review at ECCV 2026 and EACL 2026.
- Worked on visual localization and low-resource NLP research involving reproducibility, contextual word information, and efficient model design.
- Contributed to manuscripts on object localization through visual obstruction and spectrally reduced contextual word information for low-resource NLP.

Undergraduate Teaching Assistant | North South University

2024

Dhaka, Bangladesh

- Provided student consultation and academic support for undergraduate coursework.
- Assisted faculty members with course operations, classroom/lab activities, exam invigilation, script checking, and grading-related support.

SELECTED PROJECTS

ItihaasAI

CSE499 Capstone

- Architected a full-stack AI historical archive using React/TypeScript, Node.js/Express, PostgreSQL, and a Python FastAPI AI service, secured with JWT authentication and role-based access control.
- Modeled a historical knowledge graph linking events, people, locations, and documents with full-text search and interactive graph visualization.
- Developed a six-layer fact-verification pipeline combining OCR, fuzzy matching, vector retrieval, and NER to score source credibility and flag tampered evidence.
- Built a GraphRAG-powered bilingual Bengali/English voice assistant for citation-grounded historical Q&A.

CPU-Level Deep Neural Network Optimization

CSE498R Thesis

- Designed a CPU-only deep learning optimization framework spanning vision, NLP, and tokenization workloads using multi-core threading, MKL-accelerated tensor operations, and cache-aware memory layout.
- Scaled U-Net training across 32 CPU cores, cutting training time by 35% from 1924.4s to 1254.0s while reaching 0.8686 validation Dice on a 31M-parameter model.
- Reduced BERT-base CPU training time by 83% from 1033.27s to 171.74s through multi-core parallelization, with further gains from tokenizer-level optimization.

ResumeSync

ATS Resume Optimization Platform

- Built an ATS resume optimization platform with AI-assisted manual and conversational editors and real-time score feedback.
- Developed a Node.js/Express and PostgreSQL backend with LLM-powered keyword extraction, automated PDF export, and Redis-cached analytics.
- Designed a scoring engine that benchmarks resume content against target job descriptions to surface missing keywords and formatting gaps.

Physics Chatbot via RAG + Local LLMs

Educational AI

- Developed an offline RAG-based physics tutor using FAISS vector search and locally hosted LLMs such as Llama 3.2 and Phi-3 to answer concept, formula, and numerical queries with cited sources.
- Achieved ~ 10 ms semantic retrieval across a 562-vector knowledge base, with a Streamlit interface supporting LaTeX-rendered responses.
- Evaluated retrieval accuracy and answer relevance across multiple curriculum difficulty levels to validate tutoring quality.

TeammitDrive

RAG-Based File Search

- Built a RAG-based Telegram bot enabling natural-language file search across aggregated storage options such as Google Drive, Dropbox, and OneDrive.
- Unified multiple cloud storage APIs into a single retrieval layer, allowing users to query files across connected accounts from one chat interface.
- Applied embedding-based semantic ranking over file metadata to surface relevant results beyond exact filename matches.

TeammitLearn

Interactive Physics Simulation

- Developed a Three.js-based interactive physics simulation platform with real-time projectile and motion modeling.
- Exposed an LLM-controllable simulation API for natural-language parameter control and AI-generated practice questions.
- Built a real-time rendering pipeline supporting adjustable physical parameters (gravity, velocity, angle) with instant visual feedback.

InstaBin

Code-Sharing Platform

- Built a React/TypeScript code-sharing platform with multi-language syntax highlighting and shareable public/private links.
- Implemented a distraction-free editor with automatic language detection and theming for improved code readability.
- Designed visibility controls allowing users to toggle snippets between public and private access via shareable links.

Okkhor

Bengali Programming Language

- Designed a Bengali-language programming language prototype, implementing a custom lexer, parser, and AST generator in Python.
- Built a bytecode compiler and stack-based virtual machine with full unit-test coverage.
- Defined a native Bengali-script grammar and token set covering variables, control flow, and function declarations.

TuitionTracker

Android Application

- Developed a native Android tuition-management app using Kotlin, Jetpack Compose, and MVVM with Firebase-backed attendance tracking, payments, and analytics.
- Architected a shared Firestore backend with owner-scoped access rules and automated notification scheduling.
- Built real-time analytics dashboards to track attendance trends and payment status across students.

EDUCATION AND CERTIFICATIONS

B.Sc. in Computer Science and Engineering | North South University

2022 – 2026

AI Specialization Track, Dhaka, Bangladesh

Higher Secondary Certificate | Adamjee Cantonment College

2018 – 2020

Dhaka, Bangladesh

LEADERSHIP AND ACTIVITIES

Core Member | IEEE NSU Student Branch

2022

- Assisted technical workshops and supported student-led engineering and computing initiatives.
- Managed and volunteered in IEEE NSU Student Branch events, including coordination and on-ground execution.

Web Development Lead | Adamjee Cantonment College IT Club

2019 – 2021

- Led the web development team and maintained the official ACCITC website for two years.
- Worked formally with the ACC IT Department on club-related technical initiatives and instructed web development and web security workshops.
- Organized technology fests and served on the judging panel for ACC Talent Hunt.

Organizer | Inter Cantonment TechnoFrenzy

2019

- Coordinated Web Design Competition and IT Olympiad segments for approximately 700 participants.
- Led question setting, evaluation, result preparation, and event execution.

AWARDS AND ACHIEVEMENTS

- Awarded 75% undergraduate admission scholarship based on admission test performance.
- 1st place in Web Development Contest and 3rd place in Programming Contest, ACC Talent Hunt.
- Ranked Top 10 in Inter School and College Programming Contest, National Round.
- Champion, Junior Category — Bangladesh Mathematical Olympiad Regional Round.