Md. Hasnain Ali

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Research Profile

Deep learning researcher with 3 peer-reviewed publications (Elsevier, MDPI, IEEE) spanning medical image analysis, model interpretability, and 3D human pose estimation. Three years as an undergraduate research assistant at the BioMe lab, University of Rajshahi, preparing clinical imaging datasets, benchmarking CNN architectures, and comparing learned model features against clinician decision criteria. Now an AI/ML engineer who takes ideas from recent papers, such as parameter-efficient fine-tuning, quantization, and context compression, and puts them to work in production LLM and speech systems that run on limited compute. Seeking to extend this work into graduate research on efficient and interpretable deep learning.

Research Interests

Medical Image Analysis, Large Language Models, Efficient and Interpretable Deep Learning

Education

B.Sc. in Computer Science and Engineering, University of Rajshahi – Rajshahi, BD — Jan 2020 – Oct 2025

- **CGPA:** 3.56/4.00
- **Undergraduate Thesis:** *A Comparative Study of Convolutional Neural Networks (CNN) and Quantum Convolutional Neural Networks (QCNN) for Image Classification* – supervised by Sangeeta Biswas, Associate Professor, Dept. of CSE, University of Rajshahi.
- **Key Coursework:** Machine Learning, Deep Learning, Artificial Intelligence, Digital Signal Processing, Data Structures & Algorithms, Operating Systems, Databases, Computer Networks, Linear Algebra

Publications

Journal

1. S. Kumar, S. Biswas, M. A. A. Khan, **M. H. Ali**, and M. H. Shakil, "**Geo-HySTE: Geometric Hybrid Spatio-Temporal Encoder for Enhanced 3D Human Pose Estimation**", in *Computers and Electrical Engineering*, Vol. 139, Article 111375, available online 16 July 2026. ScienceDirect Link

   ***Contribution**: Gathered the datasets and ran the literature review during the project's early phase.*

2. S. Biswas, M. A. A. Khan, **M. H. Ali**, J. Rohdin, S. Pramanik, M. I. A. Khan, S. K. Chakravarty, and B. K. Pramanik, "**Interpreting Deep Neural Networks in Diabetic Retinopathy Grading: A Comparison with Human Decision Criteria**", in *Life*, Vol. 15, No. 9, Article 1473, September 2025. Life Link

   ***Contribution**: Compiled and preprocessed the fundus-photograph dataset, trained and benchmarked the CNN architectures, ran the interpretability analysis against clinician decision criteria, and wrote the original draft.*

Conference Paper

1. M. A. A. Khan, **M. H. Ali**, N. Saha, M. S. S. Shoumik, and S. Biswas, "**Competency Comparison of Deep Neural Networks for Identifying Gender in Color Fundus Photographs**", in *26th International Conference on Computer and Information Technology (ICCIT)*, Dhaka, Bangladesh, 2023. IEEE Link

   ***Contribution**: Assembled and preprocessed the fundus-photograph dataset, trained and compared the CNN architectures, wrote the original draft, and presented the paper orally at ICCIT.*

Research Experience

Undergraduate Research Assistant (Part-time), BioMe – University of Rajshahi, BD — Jan 2023 – Oct 2025

- Built and preprocessed the datasets behind three peer-reviewed studies in medical image analysis and 3D human pose estimation.
- Trained and evaluated multiple CNN architectures and ran interpretability analysis comparing learned model features with clinical grading criteria – quantifying where deep networks diverge from human diagnostic reasoning.

Awards & Achievements

- **2nd Runner-Up, Fragments of Feeling: Contextual Emotion Contest** – Moonmind Research Lab, Aug 2025. Kaggle contest on contextual emotion detection. 58% private-leaderboard accuracy, within 5 points of the winning submission (63%).
- **Champion, AI Hackathon 2025** – Bangladesh Innovation Conclave & BRAC University, May 2025. Selected as one of six winning solutions from 177 team submissions across 70 organizations (top 31 shortlisted for the final showcase).
- **Finalist, BitFest AI Hackathon** – Dept. of CSE, KUET & Brain Station 23, Jan 2025. Advanced from a 250+ team national field; built *BanglaShift* (see Projects).
- **Finalist (Top 7), Datathon 3.0** – Robi Axiata Limited, Jun 2024. Placed in the top 7 of 1,000+ teams (3,500+ participants) in Bangladesh's largest applied data science competition.
- **1st Runner-Up, Poster Presentation** – NACTAR Robotics Olympiad, National Academy for Computer Training & Research, Aug 2022.

Projects

VisionDesk – AI Workforce Activity Analytics | GitHub Apr 2025 – May 2025

- Built the AI service and backend for a real-time workforce-analytics platform: a FastAPI inference service reading RTSP camera streams over TCP with OpenCV, switchable at runtime between a live CCTV camera and an FFmpeg-to-MediaMTX loopback that replays recorded footage for testing.
- Fine-tuned a YOLO detector to classify each worker as working, idle, or away-from-desk, and paired it with desk-region geometry to map people to workstations; detections POST to a Django REST API, and Redis buffers the annotated frames that stream to the dashboard as MJPEG.

***Stack**: Python, PyTorch, Ultralytics YOLO, OpenCV, FastAPI, Django REST Framework, PostgreSQL, Redis, FFmpeg, MediaMTX*

BanglaShift – Banglish-to-Bangla Translation Service | GitHub Jan 2025

- Fine-tuned Llama 3.1 8B Instruct with 4-bit QLoRA (Unsloth + TRL, rank 16) on a 5,006-pair transliteration dataset, completing 180 steps in 8.3 minutes on a single RTX 3090 within 7.3 GB of VRAM.
- Shipped the model as a FastAPI service with MLflow experiment tracking and Model Registry versioning, plus a background retraining endpoint that fine-tunes on user-verified corrections without taking the service offline.

***Stack**: Python, PyTorch, Llama 3.1 8B, Unsloth, TRL, PEFT, FastAPI, MLflow, Docker*

Real-Time Video Surveillance for Construction Worker Safety | GitHub Nov 2024

- Assembled a 13,293-image worker/tool/firearm detection dataset by merging and re-annotating YouTube-GDD and a Roboflow power-tool set into balanced train/validation/test splits.
- Benchmarked 8 YOLO variants (v8–v11) at 640×640 to map the accuracy/latency tradeoff for on-site alerting: YOLOv8x reached 91.4% mAP@0.5 at 5.9 ms/frame, while YOLO11n held 89.4% at 0.65 ms (RTX 4090).

***Stack**: Python, PyTorch, Ultralytics YOLOv8–v11, OpenCV, Roboflow*

Professional Experience

Software Engineer (AI/ML), Vivasoft Limited – Dhaka, BD Nov 2025 – Present

Previea – AI Interview Platform

- Architected the backend and AI infrastructure for an end-to-end interview platform that runs 1,000+ real-time, audio-based candidate assessments per month.
- Designed a job-adaptive LLM scoring pipeline that selects rubric criteria per job and weight-averages per-criterion LLM scores.
- Cut per-interview inference cost by 90% ($5.00 → $0.50) through Anthropic/OpenAI prompt caching, conversation-context compression, and batched token management.
- Integrated Whisper Large v3 for multilingual speech-to-text, transcribing each answer on end-of-speech detection.
- Replaced commercial TTS vendors with self-hosted Piper and Supertonic, removing per-character synthesis cost with no regression in voice naturalness.

***Stack**: FastAPI, Whisper, Piper, Supertonic, Anthropic & OpenAI APIs, Kubernetes*

Novara – End-to-End Recruiting Platform

- Built the first version of a job-recommendation engine used by 1,000+ monthly active users, ranking candidates by a weighted average of embedding-similarity and non-embedding scores across four signals: resume content, location, department, and experience level.
- Developed an OCR-based resume parser that extracts structured candidate fields from PDF and DOCX resumes with varied layouts, reaching 87% field-level extraction accuracy on a 100-resume evaluation set.

***Stack**: Python, Hugging Face Transformers, Embeddings, Tesseract OCR, FastAPI*

Associate Software Engineer (AI/ML), Vivasoft Limited – Dhaka, BD May 2025 – Oct 2025

- Led an R&D initiative replacing third-party GPT API calls with a self-hosted model for HTML-to-JSON structured extraction on CPU-only production infrastructure, reducing inference cost by ∼10x with no loss in output accuracy.
- Benchmarked Llama 3.1 8B, Qwen3 8B, and Jina ReaderLM-v2 (1.5B) on extraction accuracy and CPU latency, selecting the task-specialized 1.5B model over 5x larger generalists to meet the no-GPU deployment constraint.
- Curated and hand-annotated a 5.4K-pair HTML–JSON training corpus, open-sourced on Hugging Face; fine-tuned the selected model on it, then quantized it to 4-bit and served it via llama.cpp for production CPU inference.

***Stack**: Python, PyTorch, Hugging Face Transformers, Jina ReaderLM-v2, llama.cpp, GGUF Quantization*

Technical Skills

- **Machine Learning & Deep Learning:** PyTorch, CNNs, Transformers, Parameter-Efficient Fine-Tuning (LoRA/QLoRA, Unsloth, TRL, PEFT), 4-bit GGUF Quantization, Model Evaluation & Benchmarking, Interpretability (Grad-CAM, Integrated Gradients), CUDA.
- **Computer Vision & Medical Imaging:** Retinal Fundus Image Analysis (DR Grading, Gender Classification), YOLOv8–v11 (Ultralytics), OpenCV, Tesseract OCR, FFmpeg, Dataset Curation & Hand Annotation, Roboflow.
- **Speech & Language Models:** Whisper (ASR), Piper & Supertonic TTS, Hugging Face Transformers, Embeddings, llama.cpp, Anthropic & OpenAI APIs, Prompt Engineering.
- **Experiment Tracking & Reproducibility:** MLflow (tracking, Model Registry), Docker, Git.
- **Languages, Backend & Infrastructure:** Python, SQL, Bash, FastAPI, Django REST Framework, PostgreSQL, MongoDB, Redis, Kubernetes, Linux.

Certifications

- **AWS Certified Solutions Architect – Associate** (SAA-C03) – *Oct 2026*. Verify
- **MongoDB Associate Developer** – *Jul 2026*. Verify

Leadership & Extracurricular Activities

District Team Leader, ICT Olympiad Bangladesh Apr 2022 – Aug 2022

Assistant General Secretary, Model United Nations and International Affairs of Rajshahi College Dec 2017 – Mar 2019

Chief Organizer, Rajshahi College Science Fest 2018 Dec 2017 – Mar 2018

President, Shiroil Govt. High School Debating Club (SDC) Jan 2014 – Jan 2017

Assistant School Secretary, Rajshahi Debate Forum (RDF) Oct 2013 – Dec 2016

Media Mentions

- Featured in The Kishor Alo for achievements in debate, science fairs, and cultural activities, including awards from national science and technology competitions.

References

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