Tanvir Rahman Anik

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RESEARCH INTERESTS

Medical Image Analysis · Explainable AI · Multimodal Learning · Generative AI · Natural Language Processing

PROFESSIONAL EXPERIENCE

Research Assistant   *November 2024 – Present*
College of Computer and Information Sciences, Jouf University, Saudi Arabia
Collaborator: Dr. Mohammad Azad | Remote Collaboration

- Conducted a systematic review of 68 studies on diffusion models in medical imaging and health informatics. Analyzed model architectures, clinical applications, and explainability frameworks; identified gaps in XAI adoption (22%) and clinician collaboration (57%). Also contributed 10 evidence-based future research recommendations for the field.
- Developed a stacked ensemble model for knee osteoarthritis diagnosis combining pre-trained transfer learning models (Xception, EfficientNetB5, and InceptionV3) with explainable AI techniques (Grad-CAM, Faster Score-CAM, LIME), achieving 96.93% accuracy in multi-class classification and 86.29% accuracy in binary classification.
- Contributed to a review article on deep learning applications in knee osteoarthritis imaging, analyzing pre-processing techniques, model architectures, and explainable AI frameworks.

Machine Learning Engineer   *May 2025 – Present*
Interactive Cares, Dhaka, Bangladesh

- Developed an enterprise-grade conversational AI interview platform with Next.js App Router (SSR, WebRTC recording), FastAPI backend, role-based authentication, state management (Zustand, React Query), and multimodal AI processing via OpenAI+Gemini with Redis caching, reducing screening time by 70%.
- Built a scalable CV screening platform leveraging FastAPI microservices, OpenAI Assistant APIs with rate limiting controls, and intelligent batch processing, automatically scoring and ranking 500+ candidates while reducing manual review time by 80%.
- Implemented a job recommendation and resume optimization module with a Flask-based backend, retrieving the most relevant job matches for each candidate and generating embedding-based feedback to improve semantic alignment between CV content and job descriptions.

Machine Learning Engineer   *July 2023 – April 2025*
Bista Solutions Inc., Dhaka, Bangladesh

- Fine-tuned Meta-LLaMA 3.1 (8B) using QLoRA with 4-bit quantization, achieving 85.48% exact match accuracy on text-to-SQL generation for ERP databases; demonstrating expertise in high-performance computation and large model optimization.
- Architected and deployed Retrieval-Augmented Generation (RAG) pipelines using Django, LangChain, and ChromaDB, integrating embeddings, vector databases, and retrieval workflows to automate ERP tasks such as inventory, order, and finance management.
- Developed and integrated LSTM-based forecasting modules ($R^2 = 0.87$) for sales trend prediction and business analytics within Odoo's Copilot dashboards, improving inventory planning and decision-making efficiency.
- Executed end-to-end data extraction and automation workflows for PDF and image invoices including annotation, pre-processing, model training, and evaluation; ensuring robust vendor data processing pipelines.

EDUCATION

Ahsanullah University of Science and Technology   *April 2018 – January 2023*
Bachelor of Science in Computer Science and Engineering   **CGPA: 3.378/4.00**
Thesis: "Skin Disease Classification Using Different Machine Learning Techniques"
Supervisor: Md. Emam Hossain | Developed an automated skin disease classification system, achieving 99.33% accuracy with Xception on a dataset of 9,665 medical images.
Relevant Courses: Computer Architecture, Algorithms, Artificial Intelligence, Pattern Recognition, Digital Image Processing, Computer Networks, and Operating Systems.

PUBLICATIONS

Journal Articles

3. **Rahman Anik, T.**, & Azad, M. "*Deep Learning in Knee Osteoarthritis: A Comprehensive Review of Imaging Modalities, Model Architectures, Grading Systems, and Explainable AI.*" (Manuscript in Preparation)

2. Azad, M., & **Rahman Anik, T.** "*A Systematic Review of Diffusion Models in Medical Imaging: Architectures, Taxonomies, Challenges, and Future Directions*" **International Journal of Computer Vision** (Under Peer Review)

1. Azad, M., & **Rahman Anik, T.** "*Automated Diagnosis of Knee Osteoarthritis: A Stacked Ensemble Deep Learning Approach with Explainable AI Techniques.*" **IEEE Access**

Conference Publications

2. **Rahman Anik, T.**, Talukder, P., Faruki, I., Ibn Rahman, I. S., & Hossain, E. (2023). *"Analysis of Automated Skin Disease Classification Exploiting Different Machine Learning Techniques."* **IEEE 13th Annual Computing and Communication Workshop and Conference (CCWC)**, Las Vegas, USA.

1. Mouri, A. G., Talukder, P., **Rahman Anik, T.**, Ibn Rahman, I. S., Joy, S. K. S., & Shawon, M. T. R. (2022). *"An Empirical Study on Bengali News Headline Categorization Leveraging Different Machine Learning Techniques."* **25th International Conference on Computer and Information Technology (ICCIT)**, Cox's Bazar, Bangladesh.

TECHNICAL SKILLS

Programming Languages	Python, C, C++, Java, SQL, HTML, CSS, JavaScript.
Generative AI & LLM Tools	LangChain, LangSmith (observability, tracing, evaluation), HuggingFace Transformers, OpenAI Assistants API, Retrieval-Augmented Generation (RAG), Vector databases.
Frameworks & Libraries	TensorFlow, PyTorch, Keras, Scikit-learn, OpenCV, FastAPI, Django, Flask, Pandas, NumPy, Matplotlib, Seaborn, Android, Selenium WebDriver.
Machine Learning	Supervised & unsupervised learning, Regression, Classification, Clustering, Ensemble Learning, Model Evaluation & Interpretability, CNN, DNN, Transfer Learning, Transformers.
Databases	MySQL, PostgreSQL, Oracle.
Cloud & DevOps Tools	Git/GitHub, Docker, CI/CD Pipelines, Nginx, Virtualization (VMware), Linux, Cloud-based deployment.
Others	LaTeX, Jupyter notebook, Arduino, Proteus, Microsoft Office, Adobe Photoshop, Adobe After Effects.

STANDARDIZED TESTS

IELTS (December 2024): **Overall 7.0** (Listening: 8.0, Reading: 6.0, Writing: 7.0, Speaking: 6.5)

SELECTED PROJECTS

AI-Interviewer | *Next.js, TypeScript, FastAPI, OpenAI+Gemini, Redis, MySQL, Docker*
Full-stack conversational AI interview platform with Next.js 15 frontend, FastAPI microservices, domain-driven architecture, and multimodal processing via OpenAI+Gemini APIs.

CV-Sorter | *FastAPI, OpenAI APIs, MySQL, AWS S3*
AI-powered CV screening platform with async batch processing, intelligent candidate ranking, and real-time job tracking analytics.

LLM Fine-tuning for Text-to-SQL | *Meta-LLaMA 3.1, QLoRA, HuggingFace*
Fine-tuned 8B parameter model using QLoRA with 4-bit quantization, achieving 85.48% exact match accuracy on SQL generation.

Acumen Helpbot | *Django, ChromaDB, Sentence Transformers*
RAG-based chatbot with vector search and embeddings-based retrieval for document Q&A.

Odoo-Copilot | *Django, OpenAI Assistants API, LangChain, ChromaDB*
Agentic ERP chatbot enabling natural-language queries, real-time analytics, and workflow automation through multi-LLM orchestration.

Knee Osteoarthritis Severity Prediction | *TensorFlow, Keras, OpenCV*
Stacked ensemble model for KOA classification from X-rays with explainability via Grad-CAM, Score-CAM, and LIME.

TEACHING EXPERIENCE

Instructor *2018 – 2022*
Aid Academy, Science Coaching Center, Dhaka
- Delivered structured lectures in biology and chemistry to high school and college students.
- Provided personal academic assistance and guidance to students preparing for board exams.
- Designed curricula, created exam materials, conducted assessments, and evaluated student performance.

HONORS AND PROFESSIONAL ACTIVITIES

- Second runner-up, Software Project Showcase, AUST CSE Week 2022.
- Participated in AUST Programming Contests (2018-2021), Soccer Bot & Line Follower Robot competitions.
- Organizing committee member for departmental events, member of AUST Innovation & Design Club (2021-2022),