Tanvir Ahmed Khan

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Professional Summary

Recent Electrical and Electronic Engineering graduate student from BUET with strong expertise in AI/ML, computer vision, and medical imaging. Demonstrated research experience in multimodal large language models and medical AI applications. Published researcher with hands-on experience in deep learning, model optimization, and domain-specific AI solutions.

Education

Bangladesh University of Engineering and Technology (BUET) **Dhaka, Bangladesh**
Bachelor of Science in Electrical and Electronic Engineering **March 2025**
Major: Communication and Signal Processing (CSP)
CGPA: 3.86/4.00 **— Rank:** 40/213 **(Top 20%)**

Relevant Coursework: Artificial Intelligence & Machine Learning, Digital Image Processing, Random Signals & Processes, Robotics & Automation, Microprocessor & Embedded Systems, Wireless Communication, Digital Signal Processing, Control Systems, Digital Electronics

Research Interests

- Model Compression & Optimization – Pruning, Sparsity, Quantization, Zeroth-order Optimization, Low-rank decomposition
- Healthcare AI Applications – Medical Image Classification, Segmentation, MRI Diffusion
- Trustworthy Machine Learning – Model understanding, Black-box Attack

Research Experience

Undergraduate Thesis Research **Nov 2023 – Mar 2025**
Development of a Multimodal Medical Assistance Chatbot for Domain-Specific Applications
Supervisor: Dr. Mohammad Ariful Haque, Professor, Dept. of EEE, BUET

- Applied supervised fine-tuning on LLaVA-7B using dermatological QA datasets for medical domain adaptation
- Improved disease classification accuracy by 15% using guided prompts with DINOv2 vision encoder and GRPO
- Enhanced conversational performance through Knowledge Graph-based Retrieval-Augmented Generation (RAG)
- Implemented Direct Preference Optimization (DPO) for better human-aligned responses in medical consultations

Presentation Materials

Publications

1. **Tanvir Ahmed Khan**, Aranya Saha, Ismam Nur Swapnil, Mohammad Ariful Haque, *"The Effect of Compression Techniques on Large Multimodal Language Models in the Medical Domain"*
   PREPRINT: Arxiv
2. Shadman Sobhan, Aranya Saha, **Tanvir Ahmed Khan**, Abduz Zami, *"Skin Cancer Classification Using Pre-trained CNNs: A Transfer Learning Approach Addressing Imbalanced Data Challenges"*
   PRESENTED at the 2nd International Conference on Next-Generation Computing, IoT and Machine Learning (NCIM 2025), Bangladesh, June 2025.
3. Shadman Sobhan, Abduz Zami, Mohiuddin Ahmed, Tanvir Mahtab Zihan, **Tanvir Ahmed Khan**, Aranya Saha, *"A Multi-Stage Deep Learning Approach to Tuberculosis Detection with Explainable Insights"*
   PRESENTED at the 2nd International Conference on Next-Generation Computing, IoT and Machine Learning (NCIM 2025), Bangladesh, June 2025.

Technical Skills

Programming Languages: C, C++, Python, MATLAB
AI/ML Frameworks: PyTorch, PyTorch Lightning, Keras, Hugging Face Transformers, scikit-learn
Data Science & Analysis: Pandas, NumPy, Matplotlib, OpenCV, PIL
Development Tools: Git, Jupyter Notebook

Circuit Design & Simulation: PSpice, LTSpice, Proteus, Altera Quartus
Design Software: AutoCAD, SolidWorks

Key Projects

- **Structural Pruning of Multimodal Large Language Models**
  - Investigated layer-wise pruning strategies for reducing LLaVA model size while maintaining performance in medical tasks
  - Achieved 20% model compression with minimal accuracy degradation using structured pruning techniques
  - Evaluated pruning impact on downstream performance and analyzed compression-accuracy trade-offs

- **Electrical Circuit Netlist Generation from Circuit Images Using LLaVA**
  - Developed a novel Visual Question Answering (VQA) pipeline to extract netlist data from circuit schematics
  - Fine-tuned LLaVA vision-language model on custom circuit diagram dataset with 85% accuracy
  - Automated circuit analysis workflow reducing manual netlist creation time by 70%

- **Skin Cancer Classification Using Deep Learning Models**
  - Applied transfer learning with ResNet, EfficientNet, and DenseNet to classify seven types of skin lesions
  - Addressed severe class imbalance using advanced data augmentation and focal loss techniques
  - Achieved 89% accuracy on HAM10000 dataset with robust performance across all lesion types

- **UVC Disinfection Robot**
  - Designed and implemented autonomous mobile robot using Arduino for UVC-based surface disinfection
  - Integrated multiple IR sensors for obstacle detection and implemented safe path navigation algorithms
  - Developed safety protocols with automatic UVC shutdown when human presence detected

Professional Experience

- **Robotics Bootcamp Instructor, Institute of Robotics and Automation**
  BUET, Dhaka *June – July 2025*
  - Delivered a lecture on sensors as part of an introductory robotics course.
  - Designed and supervised hands-on lab experiments for participants.

- **Industrial Attachment, Bangladesh Satellite Company Limited**
  Gazipur, Bangladesh *June 2024*
  - Gained hands-on experience in satellite communication systems and base station operations.
  - Observed satellite infrastructure and ground station control systems in real-time.
  - Witnessed scheduled satellite maneuvers and orbital adjustment procedures.
  - Developed understanding of commercial satellite operations and telecom systems.

Honors & Awards

Dean's List Award **2022, 2023**
Bangladesh University of Engineering and Technology (BUET)
- Recognized for outstanding academic excellence in 1st and 2nd years of undergraduate studies
- Maintained consistently high academic performance with CGPA above 3.70 in all semesters

References

Dr. Mohammad Ariful Haque
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Bangladesh University of Engineering and Technology
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Relationship: Thesis Supervisor

Dr. Hafiz Imtiaz
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Relationship: Academic Advisor