Mizanur Rahman Jewel

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Research Interests

Multimodal AI, Computer Vision, Remote Sensing, Data Fusion, Large Vision–Language Models (LVLMs), Image Captioning, Situational Awareness

Education

Missouri University of Science and Technology — Rolla, Missouri
Ph.D. in Computer Science; GPA: 4.0/4.0; Supervisor: *Dr. Sanjay Madria* — Aug 2023 –Jul 2027 (expected)

Bangladesh University of Engineering and Technology — Dhaka, Bangladesh
B.Sc. in Computer Science and Engineering; GPA: 3.44/4.0 — Feb 2015 –Apr 2019

Skills

- **Programming Languages:** Python, C/C++, Java, R, Assembly
- **Data Processing Frameworks:** Hadoop, Spark
- **Database:** SQL, MySQL, MongoDB, Redis
- **Tools & Frameworks:** PyTorch, TensorFlow, Docker, Hugging Face Transformers, Fast-API, OpenCV, Scikit-Learn, Linux, CUDA, Git, Ouster Studio
- **Web Design Frameworks:** Django

Work Experience

Missouri University of Science and Technology — Rolla, Missouri
Graduate Research Assistant, Wireless to Cloud Computing Lab — *Aug 2023–Current*

- Designed multimodal architecture for generating Underground Mine Post-Disaster Situational Awareness using Multimodal Data(Ongoing)
- Created a large-scale multimodal dataset consisting of LiDAR, thermal, image, text, and gas sensors readings(Ongoing)

Reve Systems — Dhaka, Bangladesh
Senior Software Engineer — *May 2023 –July 2023*

- Worked in Bangla Spell Grammar Checker Project, Created web APIs

Software Engineer — *May 2019 –Dec 2021*

- Developed Bangla Screen Reader software using assistive technology
- Bangla Corpus Creation, Data Analysis, WEB API, ML/DL models implementation for Bangla Spell and Grammar Checker

Selected Publications

1. **MR. Jewel**, M. Elmahallawy, S. Madria and S. Frimpong, "Explaining the Unseen: Multimodal Vision-Language Reasoning for Situational Awareness in Underground Mining Disasters," 2026 IEEE/CVF Winter Conference on Applications of Computer Vision(**Accepted**), Tucson, Arizona

2. **MR. Jewel**, M. Elmahallawy, S. Madria and S. Frimpong, "Dis-mine: instance segmentation for disaster-awareness in poor-light condition in underground mines," 2024 IEEE International Conference on Big Data (**Big Data**), Washington DC, USA, 2024, pp. 6279-6288

3. T. Jahin, MH. Abrar, **MR. Jewel**, T. Tasnim, MS. Bayzid and A. Rahman, "An alignment-free method for phylogeny estimation using maximum likelihood," BMC bioinformatics(2025), 26(1), 77.

Research Experience

Underground Mine Post-Disaster Situational Awareness by Bootstrapping Language with LiDAR and Thermal: Developed BLLiT, a multimodal LiDAR–thermal–text framework, and curated post-disaster mine dataset to generate grounded scene descriptions and enhance situational awareness for underground emergency response (ongoing).

Multimodal Disaster Situation Explainer(MDSE) Using Vision-language Model:

- Built MDSE, a segmentation-aware vision–language model (dual-path visual encoding + cross-attn + LoRA) and created the UMD underground mine disaster image–caption dataset.
- Achieved strong captioning performance on disaster benchmarks: UMD CIDEr/SPICE = 0.70/0.53 and DNICC19k CIDEr/SPICE = 0.66/0.49, plus strong generalization on retrieval (COCO R@1 = 0.88, Flickr30k R@5/R@10 = 1.00/1.00

Instance Segmentation in Low-Light Underground Mines Environment:

- Developed DIS-Mine, a low-light instance segmentation pipeline combining image enhancement with SAM + Mask R-CNN fusion via feature-matched mask alignment for underground mine scenes.
- Introduced the ImageMine dataset and achieved 86% F1 and 72% mIoU, outperforming prior baselines for disaster-awareness in low-light mines.

Bangla Spell & Grammar Checker (NLP Pipeline): Developed Bangla text corpora and an end-to-end NLP pipeline with ML/DL models and web APIs for real-time Bangla spell and grammar correction in user-facing applications.

Relevant Graduate Course-works

Machine Learning in Computer Vision | Advanced Topics in Artificial Intelligence | Analysis of Algorithms | Large Language Models | Advanced Bioinformatics using LLMs | Intro to Data Mining

Additional Significant Projects

- **Radiogenomic Classification of Brain Tumor using MRI Sequences:** Co-developed an end-to-end radiogenomic pipeline (multi-sequence MRI → NIfTI, SAM-based tumor segmentation, DenseNet-169 + SVM ensemble) to predict MGMT promoter methylation on RSNA-MICCAI, achieving up to **67.54% AUC** and **70% accuracy**.
- **C-MAMBA: Controlled Synthetic Protein Sequence Modeling with MAMBA:** Developed and fine-tuned C-MAMBA, a controlled protein language model using property-specific control tags on a curated ProtHyena subset, generating synthetic protein sequences with lower perplexity and faster training than Transformer baselines.
- **Bangla Screen-Reader for Ubuntu:** Developed a Bangla screen-reader for Ubuntu by extending the open-source **Orca** screen reader with real-time Bangla text-to-speech output to support visually impaired users.

Award & Mentorship

- NSF Local I-CORPS, Great Lakes Region
- Mentored two undergraduate researchers on deep learning and multimodal AI projects under the REU program (2025)
- Reviewer for WACV 2026, ACM SIGSPATIAL 2025, Big Data 2024
- Travel Grant for WACV PhD Consortium 2026