Nusrat Munia

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Research Interest

Multimodal Learning, Generative Models, Medical Imaging, AI Fairness

Education

University of Kentucky Lexington, KY, USA
PhD in Computer Science Aug 2023–Present

- Advisor: Dr. Abdullah-Al-Zubaer Imran
- Specialization: Multimodal AI for medical diagnosis and climate change

University of Dhaka Dhaka, Bangladesh
M.S. in Computer Science and Engineering Mar 2020–Feb 2023

- Thesis Title: Extractive Text Summarization based on Named Entity Recognition
- Advisor: Dr. Muhammad Asif Hossain Khan

University of Dhaka Dhaka, Bangladesh
B.S. in Computer Science and Engineering Jan 2016–Dec 2019

- Thesis Title: Bangla Abstractive Text Summarization using Encoder-Decoder Model
- Advisor: Dr. Muhammad Asif Hossain Khan

Research Experience

University of Kentucky Lexington, KY, USA
Graduate Research Assistant Aug 2023-Present

- Multimodal data analysis
  Developing a multimodal AI model for crisis detection and damage assessment, integrating vision-language models and fairness evaluation.
- Generative dermatology AI model
  Developed a generative model using diffusion transformers to mitigate biases in skin disease classification.

University of Dhaka Dhaka, Bangladesh
Graduate Student Researcher Mar 2020-Feb 2023

- Text summarization
  Developed extractive and abstractive text summarization models, leveraging BERT for entity-based content selection and LSTM for generating coherent summaries.

Industry Experience

TigerIT Bangladesh Ltd. Dhaka, Bangladesh
Software Engineer- Machine Learning Jun 2021–Jul 2023

- Neural Machine Translation:
  Worked on training and developing English to Bangla and Bangla to English translation system.
- Banglish Language Detection:
  Developed a model that can detect "Banglish"(Bangla text written with English letters) text.
- Banglish Transliteration:
  Developed and trained a model from manually generated dataset that can transliterate Banglish words to Bangla words.
- Commchat Messaging Application:
  Worked on maintaining backend web-server and implementing new features and fixing bugs.

Publications

1. **Munia, N.**, Zhu, J., Nasraoui, O., Imran, A., "Differential attention for crisis event analysis," *CVPR 2025 Workshop on Multimodal Foundation Models (MMFM)*, 2025.

2. **Munia, N.**, Imran, A., "Class-N-Diff: Classification-Induced Diffusion Model Can Make Fair Skin Cancer Diagnosis," *IEEE Engineering in Medicine and Biology Society Conference (EMBC)*, 2025.

3. **Munia, N.**, Imran, A., "Prompting medical vision-language models to mitigate diagnosis bias by generating realistic dermoscopic images," Accepted for oral at *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2025.

4. Eskandari, S., Eslamian, A., **Munia, N.**, Alqarni, A., Cheng, Q., "Evaluating Deep Learning Models for Breast Cancer Classification: A Comparative Study," *Medical Imaging 2025: Digital and Computational Pathology.*

5. **Munia, N.**, Imran, A., "DermDiff: Generative diffusion model for mitigating racial biases in dermatology diagnosis," *MICCAI Advancing Data Solutions in Medical Imaging AI (ADSMI)*, 2024. [Top 13%]

Presentations

Talks:

- *Prompting medical vision-language models to mitigate diagnosis bias by generating realistic dermoscopic images* Apr 2025
  CCTS Spring Conference, Lexington, KY
- *Prompting medical vision-language models to mitigate diagnosis bias by generating realistic dermoscopic images* Apr 2025
  ISBI 2025, Houston, TX
- *Generative Dermatology AI for Diagnostic Bias Mitigation* Mar 2025
  CS Keeping Current Seminar, Lexington, KY
- *DermDiff: Generative diffusion model for mitigating racial biases in dermatology diagnosis* Oct 2024
  MICCAI ADSMI 2024, Marrakesh, Morocco
- *Generative Diffusion Model for Mitigating Racial Biases in Dermatology Diagnosis* Apr 2024
  CCTS Spring Conference 2024, Lexington, KY

Posters:

- *Class-N-Diff: Classification-Induced Diffusion Model Can Make Fair Skin Cancer Diagnosis,* Jul 2025
  EMBC 2025, Copenhagen, Denmark
- *Differential attention for crisis event analysis,* Jun 2025
  CVPRw MMFM 2025, Nashville, Tennessee
- *DermDiff: Generative diffusion model for mitigating racial biases in dermatology diagnosis* Oct 2024
  MICCAI ADSMI 2024, Marrakesh, Morocco

Selected Research Projects

- **Crisis Event Data Analysis** 2025
  Funded by NSF EPSCoR. Developing AI models to analyze multimodal data, ensuring fairness for vulnerable communities in different counties of Kentucky
- **Bias Mitigation in Dermatology AI** 2024
  Funded by Unite Pilot Grant. Developed diffusion generative models to generate adequate samples for minor subgroups and build a fair diagnosis model
- **Breast Cancer Classification** 2024
  Conducted a comparative analysis of SOTA models for classifying breast cancer using histopathology images.
- **Extractive Text Summarization** 2022

Developed a BERT-based model to extract summaries from large news documents depending on Named Entities in the sentences.

- **Abstractive Text Summarization** 2019
  Developed a LSTM-based seq-to-seq model to generate abstractive summaries from large news documents.

Teaching Experience

University of Kentucky Lexington, KY, USA
Graduate Teaching Assistant

- CS-216: Introduction to Software Engineering Techniques (Fall 2024)
  Worked as a Lab Instructor, led lab sessions, helped students with assignments, held office hours, and graded lab assignments and exams.

Acheivements & Awards

- **Graduate Student Block Funding**, by Stanley and Karen Pigman College of Engineering 2025
  The Travel Grant to present my paper at the ISBI 2025.
- **Fellowship**, by ICT Division, People's Republic of Bangladesh 2021
  The fellowship for conducting research work contributing to the ICT sector of Bangladesh.
- **Bracathon 3.0**, A National Level Hackathon organized by BRAC, Bangladesh 2019
  Team: DU_Revenant, Champion
- **NSU Inter-University Girls' Programming Contest** 2018
  Team: DU_Dreamers, 10^{th} *Position, out of pre-selected 60 teams*
- **National Girls' Programming Contest** 2017
  Team: DU_Dreamers, 5^{th} *Position, out of pre-selected 100 teams*
- **Board Scholarship** 2016
  Higher Secondary Certificate Exam 2015, Dhaka Board

Technical Skills

- **Programming:** Python, Javascript, C, C++, Java
- **Data Science Tools:** PyTorch, NumPy, Tensorflow
- **Database:** MySQL, SQL, MongoDB, Firebase
- **Web:** HTML, JavaScript, CSS, Flask, Jinja, PHP
- **Development:** Software Design Pattern, Git

Professional Activities

Conference Peer Review:

- Reviewer, IEEE International Symposium on Computer-Based Medical Systems (CBMS) 2025

Service:

- Treasurer, Association of Data and Computation (ADC), University of Kentucky *May 2025 –Present*

Professional Affiliations:

- Student Member, Medical Image Computing and Computer Assisted Intervention Society (MICCAI)
- Student Member, Institute of Electrical and Electronics Engineers (IEEE)
- Student Member, IEEE Engineering in Medicine and Biology Society (EMBS)

Online Courses

- **Generative Adversarial Networks (GANs)** at Coursera *[Certificate]* 2021
- **Deep Learning Specialization** at Coursera *[Certificate]* 2020
- **Natural Language Processing with Sequence Models** at Coursera *[Certificate]* 2020
- **Natural Language Processing with Attention Models** at Coursera *[Certificate]* 2020