

# Md Marufi Rahman

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## Education

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<b>University of North Texas (UNT)</b> , Texas, USA	<i>Aug 2019 - present</i>
Ph.D. candidate, Computer Science and Engineering	GPA: 3.85/4.0
<b>Rajshahi University of Engineering &amp; Technology (RUET)</b> , Bangladesh	<i>Mar 2013 - Dec 2017</i>
B.Sc., Electronics and Telecommunication Engineering	GPA: 3.32/4.0

## Research Interests

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Computer vision, Natural language processing, Multimodal Artificial intelligence, Multimedia computing

## Publications

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1. Y. Li, J. Baik, **M. M. Rahman**, I. Anagnostopoulos, R. Li, and T. Shu, "Pareto optimization of CNN models via hardware-aware neural architecture search for drainage crossing classification on resource-limited devices", in *Proceedings of the SC '23 Workshops of The International Conference on High Performance Computing, Network, Storage, and Analysis*, Denver CO USA, 2023.
2. **M. M. Rahman**, JH Oh, Wallapak Tavanapong and Piet C. de Groen, "Content Based Image Retrieval Using Depth Maps for Colonoscopy Images", *2023 In Proceedings of the 16th International Joint Conference on Biomedical Engineering Systems and Technologies*, Lisbon, 2023, pp. 301-308.
3. **M. M. Rahman**, JH Oh, Wallapak Tavanapong, Johnny Wong and Piet C. de Groen, "Automated Bite-block Detection to Distinguish Colonoscopy from Upper Endoscopy using Deep Learning", *2021 16th International Conference on Visual Computing (ISVC)*, virtual, 2021, pp. 216-228.
4. **M. M. Rahman**, M. K. Hosain, S. Ahmed and M. W. A. Azad, "Investigation of coil designs for transcranial magnetic stimulation on realistic head model", *2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC)*, Dhaka, 2017, pp. 279-283.
5. **M. M. Rahman**, J. R. Mou, K. Tara and M. I. Sarkar, "Real time Google map and Arduino based vehicle tracking system", *2016 2nd International Conference on Electrical, Computer and Telecommunication Engineering (ICECTE)*, Rajshahi, 2016, pp. 1-4.

## Employment History

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**Teaching Assistant (and Fellow), UNT** Aug 2019 - Present

- Worked for courses CSCE4350 (fundamentals of database Systems), CSCE5390 (multimedia computing), CSCE5350 (fundamentals of databases), CSCE5050 (application of cryptography), CSCE4355 (database administration), CSCE2110 (computing foundation and data structure), CSCE1030 (problem solving using C++).
- Created programming assignments, graded papers, proctored exams, and mentored students with course-works.

**Research Assistant, Multimedia Information Group** Aug 2020- Present

- Worked on image analysis for the gastrointestinal videos dataset project.
- Explored various key challenges in medical video dataset.
- Experimented with visual question generation from radiology images by using LLM and vision transformer.
- Deployed several deep learning as well as traditional image processing techniques to tackle those challenges using Pytorch, Keras and OpenCV.

## Technical Skills

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Programming	C plus plus, Python, R, Matlab, SQL, CUDA
Framework and Library	Tensorflow, Keras, Pytorch, OpenCV, NLTK, Pandas, Numpy, Scipy
Specializations	Generative AI, LLM, Model Optimization, GPU Acceleration
Cloud Platform	GCP, Azure, AWS
Additional Skill	Git, Docker, CI/CD, Agile/Scrum

## Research Projects

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### **Predicting unexplored area inside the colon** May 2023 - Present

- Colonoscopy cameras can fail to explore certain areas of the colon resulting in inappropriate diagnosis.
- Usually 3D reconstruction is needed to solve this challenge.
- I am developing new ideas to tackle this challenge by using motion detection and deep learning on monocular 2D image instead of 3D reconstruction which will ensure precise analysis with lower cost.

### **The (body) language of social interactions** Jan 2023 - May 2023

- Worked on H20 Social Interaction Dataset which is divided into posture, motion and social interaction images.
- Research goal was to predict social interactions accurately and efficiently.
- For this I developed several multi-label CNNs and object detection models.
- CNN trained with multilabel(posture and motion data) achieved 83% F1 accuracy while CNN only trained with social interaction data achieved 77%.

### **Similarity detection of colonoscopy medical images using depth map** Jan 2022 - Jan 2023

- A similarity measure based on low-level visual features is not effective for some type of images such as colonoscopy images captured from colonoscopy procedures.
- My proposed solution using depth map and new cost metric can compare these type of images and find their similarity in terms of their surface structures with an around F1 accuracy of 86.8 to 92.5%.

### **Predict Colorectal cancer cells using Single Cell Trio-seq data** Aug 2021 - Jan 2022

- Several studies have predicted cancer cells from Single Cell RNA-seq (scRNA-seq) data using only gene expression or DNA methylation.
- Here I have processed high volume of mehtylation data on cloud platform (GCP) and built deep learning models integrating biological information with above two.
- The proposed solution has predicted colorectal cancer cells from tumors and their metastases precisely(with macro average of 85%).

### **Distinguishing Colonoscopy from Upper Endoscopy** April 2020 - May 2021

- One of the fundamental steps for the automated quality feedback system is to distinguish a colonoscopy from an upper endoscopy.
- By detecting this bite-block appearance,it can be distinguished.
- My proposed solution has utilized Hue-Saturation information and two Convolutional Neural Networks (CNNs)to solve the task with Precision (0.78) and Sensitivity (0.81).
- Used Tensorflow, CUDA, OpenCV for this project.