Abdul Mohaimen Al Radi

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Summary

I'm a **research assistant** at the University of Dhaka's Department of Computer Science and Engineering, specializing in **Computer Vision** and **Deep Learning**. My primary research interests include **image restoration, Novel View Synthesis, and 3D reconstruction.** I am currently working on 3D reconstruction from monocular single images, and image deblurring through Visual Autoregressive Modeling.

Education

University of Dhaka Dhaka, Bangladesh
*Bachelor of Computer Science and Engineering (CGPA **3.72** out of 4.0, **top 10%** of class)* *Class of **2024***

Publications

FULL LIST AVAILABLE AT **Google Scholar**

[1] **Abdul Mohaimen Al Radi**, Prothito Shovon Majumder, Md. Mosaddek Khan **Blind Image Deblurring with FFT-ReLU Sparsity Prior** *IEEE/CVF Winter Conference on Applications of Computer Vision*

[2] Syed Mumtahin Mahmud, Mahdi Mohd Hossain Noki, Prothito Shovon Majumder, **Abdul Mohaimen Al Radi**, Md Haider Ali, Md Mosaddek Khan **Vision Transformer and FFT-ReLU Fusion for Advanced Image Deblurring** *(Under Review)*

[3] Mosarrat Jahan, Fatema Tuz Zohra, Md. Kamal Parvez, Upama Kabir, **Abdul Mohaimen Al Radi**, Shaily Kabir **An end-to-end authentication mechanism for Wireless Body Area Networks.** *Smart Health By Elsevier, impact factor(5.19)*

Experience

University of Dhaka Dhaka, Bangladesh
Research Assistant at The Cognitive Agents and Interaction Lab *Spring 2023 - Present*

- **Computer Vision and Image Restoration** Working on combining traditional image restoration techniques (with added novelty to those techniques) and fast deep learning models to create fast inference image restoration pipelines. The work involves a deep look into image priors, Fourier domain, and small data problems.
- **Cyber Security and Cryptography** I developed cryptographic schemes for Wireless Body Area Networks, gathering performance data on mobile devices, desktops, and Microcontrollers (STM32 arm-cortex processors). I integrated TCP/IP and wireless protocols to analyze safety against potential attacks.
- **Mentoring Undergraduate Thesis** Currently mentoring two groups of undergraduate thesis teams working on Deep Learning and Image Restoration. The mentoring involves co-supervising their projects and collaborating on parts of the project that align with my previous works.

Freelance Contract Dhaka, Bangladesh
Part-time Trainer For Large Language Models *January 2024 - Present*

- **Training for Large Language Model** Provided programming improvement completions for Large Language Models in different fields like Matlab, Javascript, Java, C++, Python, Algorithms, Sorting, etc. I critiqued 240 different completions by popular LLMs and provided an ideal completion for them as a part of a project to improve the LLM efficacy in programming.

Research Work

Image Restoration

- **Domain-Independent Blind Image Deblurring with Fast Fourier Transform and ReLU Sparsity Prior** Blind image deblurring is the process of extracting a sharp image and blur kernel from a blurry image. Typically, a blurry image is modeled as the convolution of a sharp image with a blur kernel. Hence, there are two unknowns to be discovered, making it an ill-posed problem. In this literature, a prominent approach to this problem was to use statistical assumptions about a specific domain of images (I.E texts, low-light, natural, etc) that deblurs well for those domains. However, there was no general statistical assumption that works well across all types of images. Our work provides a new statistical prior, (ReLU sparsity) that works competitively in all domains of images.

Cyber Security

- **An end-to-end authentication mechanism for Wireless Body Area Networks** A secure authentication mechanism is proposed for Wireless Body Area Networks (WBANs) to protect medical data and enable efficient analysis by healthcare professionals. It utilizes hashing and encryption within a network architecture involving a central hospital server, patient devices, body sensors, and medical professional mobile devices. Authentication protocols resist network attacks, with system performance evaluated using Network Simulator 3 for metrics like throughput, packet-loss ratio, and authentication time. CPU cycles and energy consumption data were collected using optimized algorithms for various device types.

Skills

- **Programming Skills:** C/C++, Java, JavaScript, ReactJS, NodeJS, Python, FastAPI, Kotlin, Dart, Matlab
- **ML/DL Libraries:** Pytorch, Keras, CUDA, Tensorflow, scikit-learn, opencv
- **Hardware Skills:** Micro-controllers/processors, Embedded Systems
- **Version Control:** Git

Competitive Programming Career

- **National High School Programming Contest 2016** Regional position **3rd**, National Position **top 10%**
- **National High School Programming Contest 2017** Regional Position **4th**, National position **top 10%**
- **Leading University Intra University Programming Contest 2017** Invited as a high school student, position **Champion**
- **Battle of Brains 2019 Champion** in first year category and **fourth** in overall category
- **Code Samurai Hackathon 2022 Top 50** finalist from nation
- **AUST Inter-University Programming Contest 2022 Top 10%** position in team contest
- **International Collegiate Programming Contest Dhaka Regional Preliminary 2020 Top 8%** position in team contest
- **Problems from Codeforces, Uva, LightOJ, SPoj, AtCoder** Solved total **871** problems

Projects

- **Limits of Gaussian Splatting With Fewer Images 2024** Gaussian Splatting is a very fast way to achieve novel view synthesis. It works well with sparse data but still requires point clouds. In this project, I tested the limits of Gaussian Splatting with fewer images and concluded that it is not well suited if the images are less than 50 in number and will not be useful to synthesize novel views with a single image.
- **3D Reconstruction Quality from Single Image With Multi-Object Interaction 2024** There is a need for generative elements in 3D reconstruction from a single image. This project tested the limits of diffusion models tested with single images that has multi-object interaction. The results from most of these models were unsatisfactory as the diffusion models are not generalizing to complex object geometry. This project also tested the efficacy of using Segmentation to isolate different objects to generate their 3D models separately and place them in 3D space consistent with the input image. However, this approach was not that fruitful without a strong in-painting component to fill up the gaps by removing objects during segmentation.

- **Apellai, a subsonic client for music streaming app 2020** Apellai provides a fast and efficient mobile app solution for users with extensive music libraries and podcasts who prefer not to store them locally. Built on Kotlin, it enables streaming directly from a Subsonic server, offering features like filtering, searching, media controls, and server switching. Link to The Github Repository

- **Habitrix, a habit tracking app for healthy lifestyle 2021** Our habit-tracking app lets users set and monitor habits like daily walking distance, and visualizing progress across days, weeks, and months. It also features a smart to-do list that prioritizes tasks based on user-set parameters like deadline, importance, and enjoyment, all wrapped in a seamless mobile experience built with Flutter. Link to The Github Repository

- **Deversorium, a new hostel management system with integrated meal system 2023** Our app offers tailored solutions for Bangladeshi hostels, with easy room booking, meal planning, and streamlined rent payments. Developed using ReactJS, NodeJS, ExpressJS, and MongoDB, it efficiently serves both hostel owners and tenants. Link to The Github Repository

Reference List

- **Dr. Md. Mosaddek Khan** Associate Professor. Ph.D. at University of Southampton, United Kingdom, **Bachelors Thesis Supervisor**. mosaddek@du.ac.bd. Phone: +880 1768-408402.

- **Dr. Mosarrat Jahan** Associate Professor. Ph.D. at University of New South Wales, Sydney, **Adviser**. mosarratjahan@cse.du.ac.bd Phone: +880 1817-566316