

MD Miraj Arefin

[Portfolio](#) | [LinkedIn](#) | mirajarefin1999@gmail.com | [GitHub](#)

Research Interests

- ◆ Robotics and Intelligent systems
- ◆ Machine learning, Artificial Intelligence
- ◆ Legged robotics, Soft robotics, Surgical robotics, Exoskeleton, UAV
- ◆ Non-linear dynamics, Control

Research Experiences

Research Project

September 2023 – March 2024

"Fixed Wing VTOL for Emergency Medical Vaccine Supply"

Project Supervisor: Dr. Md. Ashraful Islam

- ◆ Designed and constructed a hybrid fixed-wing VTOL aircraft having a take-off weight of 8kg.
- ◆ Utilized SolidWorks, Blender, Adobe Illustrator for design and laser cutting, 3d printing technology to build the frame.
- ◆ Designed the vehicle with a modular structure for easy disassembly and transportation.
- ◆ Achieved successful takeoff and landing at an altitude of 40 meters and a flight time of approximately 5 min. in VTOL mode.

Research Project

March 2023 - Present

"Flash Graphene Synthesis in Bulk Quantity"

Project Supervisor: Dr. Md. Abdullah Al-Bari

- ◆ Built a machine for the production of turbostratic graphene, capable of generating temperatures up to 3000K in ~50 milliseconds.
- ◆ Developed a control system to achieve high-frequency electric discharge at ~300V DC.
- ◆ Successfully produced ~100 milligrams of turbostratic graphene per batch from carbon black as feedstock.

Undergraduate Thesis

March 2022 – September 2023

Thesis Title: *"Thermodynamic Analysis of Cascade Refrigeration System for Low-Temperature Application Using Low Global Warming Potential Refrigerants"*

Thesis Supervisor: Dr. Dipayan Mondal

- ◆ Performed a thermodynamic analysis of a cascade refrigeration system using REFPROP 10.0a for low-temperature applications with low-GWP and zero ODP refrigerants.
- ◆ Investigated the impact of superheating and sub-cooling on COP, compressor work, and heat transfer efficiency.

Undergraduate Project

February 2020 - March 2022

Project Title: *"Construction and Performance Test of a Floating UAV for Water Sample Collection"*

Project Supervisor: Dr. Md. Abdullah Al-Bari

- ◆ Developed a quadcopter capable of lifting more than 500g weight for water sample collection from surface of the water source.
- ◆ Successfully landed on the surface of a pond and collected 50ml water sample.

Publications and Conferences

- [1] R. Sarker, M. F. Rabbi, J. Becker, **M. M. Arefin**, I. Zahan, M. Arifuzzaman, M. M. Rahman, M. A. A. Bari, M. G. Kibria, "Investigating the Shear and Thermal Properties of Additively Manufactured Wood-PLA Bio-composites". ([Manuscript](#))
- [2] **M. M. Arefin**, A. A. Bari, "A mini-review on synthesis, characterization, and application of Flash Graphene". ([Manuscript](#))
- [3] M. T. Rana, **M. M. Arefin**, H. A. Begum, M. S. Islam, "Experimental Insights into LQR-Controlled Penta Copter Blimps: Design, Construction and Output Evaluation". (Under Review at Journal of Results in Engineering) ([Manuscript](#))
- [4] **M. M. Arefin**, D. Mondal, and M. A. Islam, "Thermodynamic Analysis of Cascade Refrigeration System using Low GWP Refrigerants for Low-Temperature Application", Energy Convers. Manag. X 2024;24:100722. <https://doi.org/10.1016/j.ecmx.2024.100722>
- [5] M.T. Rana, **M. M. Arefin**, N. Sharmin, H. A. Begum, M. F. Raihan, A. Rahman, "Dynamic Modeling and Propulsion System Analysis with LQR-Based Control System for Enhanced Performance of a Lighter-Than-Air Aerial Drone", in DELTAs-2024.
- [6] N. S. Mooaz, **M. M. Arefin**, S. R. Dhruvo, and A. Ahmed, "Transforming UAV Design: Coandă-Based Lift Generation for Enhanced Aerial Performance," in 7th International Conference on Electrical Information and Communication Technology (EICT 2023), IEEE, 2023. <https://doi.org/10.1109/EICT61409.2023.10427637>

Academic Credentials

Bachelor of Science in Mechanical Engineering

January 2018 – May 2024

Khulna University of Engineering & Technology (KUET), Khulna-9203

CGPA : 2.62/4

Standardized Test Scores

IELTS – 27th December, 2024

Overall	Listening	Reading	Writing	Speaking
7	7.5	8	6	6

Graduate Record Examination (GRE) – 8th October, 2024

Total	Quantitative	Verbal	AWA
302	165	137	3.5

Technical Skills

CAD	SolidWorks, AutoCAD, KeyShot, Blender
Programming	Python, C/C++, MATLAB
Frameworks and Libraries	ROS, Numpy, Matplotlib, Pandas, TensorFlow, OpenCV,
Operating Systems	Ubuntu, Windows 10
Hardware Skills	Arduino, Raspberry Pi, STM32, Pixhawk/ArduPilot
Operating Skills	3D Printer, CNC, Laser Cutter, Vinyl Cutter, Lathe Machine
Others	MS Word, MS PowerPoint, MS Excel, Adobe Illustrator, Adobe Photoshop

Certificates

DeepLearning.AI TensorFlow Developer	April 2, 2020
DeepLearning.AI (Credential)	
Ordered Data Structures	May 12, 2020
University of Illinois Urbana-Champaign (Credential)	
Programming for Everybody (Getting Started with Python)	April 30, 2020
University of Michigan (Credential)	
Object-Oriented Data Structure in C++	November 23, 2019
University of Illinois Urbana-Champaign (Credential)	

Activities

FabLab KUET	May 2022 – April 2023
<u>Designation:</u> Student Operator	
<ul style="list-style-type: none">Operated and maintained fabrication equipment, including 3D printers, CNC machines, and laser cutters.Mentored students in improving their project designs and prototyping skills.Instructed fabrication technologies to over 100 students from various universities.Organized project competitions to inspire and motivate students in robotics.	
LOOP	March 2022 - February 2023
<u>Designation:</u> Project Manager	
<ul style="list-style-type: none">Arranged workshops to instruct more than 100 students on how to build and program robots using Arduino.Mentored multiple student groups to enhance the design and functionality of their robots.	
CADers	April 2020 - April 2022
<u>Designation:</u> Information and Technology Officer	
<ul style="list-style-type: none">Arranged workshop on AutoCAD and SolidWorks for over 200 students.Created tutorials on AutoCAD and SolidWorks to serve as learning resources for students.	
KUET Mars Rover (Team Durbar)	June 2019 - March 2023
<u>Designation:</u> Sub-Team Lead (Control system and Software sub-team)	
<ul style="list-style-type: none">Led the design and building the rover using the rocker-bogie mechanism.Led the control system and software sub-team to develop and implement the drive system for the rover.Designed and constructed a manipulator arm capable of lifting over 5 kg.Wrote a custom library in C++ to ease the high level control of the rover.	

Achievements

International Planetary Aerial Systems Challenge	Rank -09/27
Organized By Mars Society South Asia, May 2021	
Indian Rover Design Challenge	Rank -10/28
Organized By Mars Society South Asia, July 2021	
Line Follower Robot Challenge – Ignition 2018	Final Round
National Tech Competition organized by Department of Mechanical Engineering, KUET	

References

Dr. Md. Helal-An-Nahiyen Professor Department of Mechanical Engineering Khulna University of Engineering & Technology, Bangladesh Email: nahiyen@me.kuet.ac.bd	Dr. Md. Abdullah Al Bari Assistant Professor Department of Mechanical Engineering King Fahd University of Petroleum and Minerals, Saudi Arabia Email: mdabdullahal.bari@kfupm.edu.sa
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