ADIB PROTTAY

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EDUCATION

Bangladesh University of Engineering and Technology **June 2023 – June 2024**
Bachelor of Science: Mechanical Engineering
CGPA - 3.60/4.00

ENGLISH PROFICIENCY TEST

International English Language Testing System (IELTS) **October 25, 2024**
IELTS on Computer Academic
Overall Band Score: 7.0

Listening: 7.5	Reading: 7.5
Writing: 7.0	Speaking 6.0

RESEARCH INTERESTS

Natural Fiber and Functional Composites | Soft Robotics | Bio-Inspired Locomotion | System Modeling & Optimization | Thermal Engineering

PUBLICATIONS

1. Saadi, M.A.S.R., **Prottay, A.**, Nur, M.I., Rahman, M.M. "*Ramie Fiber: From Plants to Composites*." **Review manuscript in preparation in collaboration with researchers from Rice University and the University of Houston. (~80 pages).** [Submitted] **View**

2. Prottay, A., Deep, S.S., Ahmed, F. and Zaman, M.T. "The Design and Optimization of a High-Performance Radiator for Eicher Trucks with Extreme Heat Loads," The 9th BSME International Conference on Thermal Engineering. BUET, Dhaka, Bangladesh. December 2024. (Presenter)

3. Prottay, A., Md. Nazib, A.A., Deep, S.S. and Ahmed, F. "Design, Fabrication and Gait Analysis of a Dynamic Hexapod," Proceedings of 8th International Conference on Mechanical, Industrial and Energy Engineering. KUET, Bangladesh. 2025. (Presenter) **DOI:** https://doi.org/10.38032/scse.2025.3.137

THESIS

Thermodynamic and exergo-economic analysis of a transcritical CO_2 cycle integrated with a central tower system.
Supervisor: Dr. Md. Zahurul Haq, Professor, Dept. of ME, BUET

- Conducted undergraduate thesis focused on optimizing a transcritical carbon dioxide (tCO_2) cycle integrated with a solar collector heater utilizing nitrate salt, used to enhance thermal efficiency.
- Thesis includes conducting an exergo-economic analysis of the entire cycle to enhance efficiency and economic viability of sustainable energy systems.
- Used Differential Evolution algorithm and Nelder-Mead Optimization techniques for optimization.

PROFESSIONAL EXPERIENCE

Chevron Bangladesh **March 2025 – July 2025**
Facilities Engineering Intern

- Technical experience in plant maintenance strategies, piping systems, mechanical design, within an energy facility environment and worked on multiple projects like BYIC, JBC.

- Proficient in AutoCAD doing P&ID implementation, with a strong foundation in mechanical engineering principles, project management, and applied thermodynamics.

PROJECTS

1. Numerical Modeling of Magneto-Elastic Soft Millirobot Locomotion

Independent Researcher | **View Projects**

- Developed a physics-based simulation engine in Python to model the non-linear dynamics of magneto-elastic soft millirobots, reproducing multimodal locomotion strategies (Walking, Rolling, Jumping) presented in *Hu et al., Nature (2018)*.
- Numerically solved non-linear Euler-Bernoulli beam equations coupled with magnetic torques using BVP solvers, successfully capturing large-deformation bifurcations.
- Validated simulation accuracy by conducting a comparative analysis against published experimental data for beam deflection and locomotion, visualizing the results through 3D dynamic animations.

2. Dynamic Simulation & Control of a HASEL-Actuated Jellyfish Robot

Independent Researcher | **View Projects**

- Replicated and extended the dynamic model of the soft jellyfish robot from Wang et al. (*Science Advances*, 2023), implementing non-linear fluid–structure interaction and soft-body deformation using a recursive kinematic chain.
- Architected a decoupled ROS-like node structure (PID controllers, Physics nodes, Swarm Manager) to simulate and control a 5-robot swarm operating in a single column.
- Designed and tuned a closed-loop PID controller that achieved stable vertical trajectory tracking across a 0.1–2.5 Hz actuation bandwidth under realistic hydrodynamic disturbances.
- Developed numerical ODE-based simulations coupling actuation, deformation, and hydrodynamics, producing behavior consistent with experimental trends reported in the original study.

3. Design, Fabrication and Gait Analysis of a Dynamic Bio-Inspired Hexapod

Project Supervisor: Dr Kazi Arafat Rahman, Associate Professor, Dept. of ME, BUET

- Designed and analyzed a bio-inspired hexapod robot with a high-speed dynamic tripod gait for stability and efficient motion.
- Optimized foot-end trajectories and validated torque requirements for effective leg coordination.
- Successfully built a fully operational hexapod robot, demonstrating expertise in mechanical design, electronics, and programming.

4. The Design and Optimization of a High-Performance Radiator for Eicher Trucks with Extreme Heat Loads

Project Supervisor: Saif Al-Afsan Shamim, Lecturer, Dept. of ME, BUET | **View Projects**

- Designed, fabricated, and evaluated a cost-effective aluminum radiator for Eicher Trucks, maintaining standard dimensions.
- Conducted theoretical heat transfer calculations and predicted performance using convection and NTU-effectiveness methods.
- Identified material limitations in aluminum tanks during experimental tests, highlighting trade-offs between cost and durability.

EXTRA-CURRICULER EXPERIENCE

BUET Robotics Society **June 2023 – June 2024**

General Secretary

- Organized workshops on Image Processing, Advanced Trash Collector Robot, and ML Mastery.
- Executed Robo Carnival 2024, drawing 400+ participants from 15 universities and colleges.
- Established teams to fund and prepare BUET teams for national competitions and collaborated with ICT Division and Science and Technology Ministry for further improvement of robotics culture.

INDUSTRIAL TRAINING

North West Power Generation Company Limited, Sirajganj (1025 MW) **November 2023**

- Completed a three-week industrial training at NWPGCL in Sirajganj, focusing on power generation.
- Received comprehensive training on the operation and maintenance of key components in the Combined Cycle Power Plant (CCPP), including RMS & GBC, Compressor, Combustion Chamber, Gas Turbine (GT), Heat Recovery Steam Generator (HRSG), Steam Turbine (ST), Cooling Tower.

TECHNICAL SKILLS

Programming Language: Python (**NumPy, SciPy, Matplotlib, Pandas**), MATLAB, C

Simulation & Modeling: Multi-body Dynamics, Soft Body Mechanics (Euler-Bernoulli), ODE/BVP Solvers, Fluid-Structure Interaction (FSI), Decoupled Nodal Architectures.

Control & Optimization: PID Control, Differential Evolution, Genetic Algorithms, Nelder-Mead, Bayesian Optimization, Swarm Control (Leader-Follower)

Design and Fabrication: SolidWorks, AutoCAD, CNC Machining, Microcontrollers (Arduino)

REFERENCES

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