Mustafizur Rahman

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Research Experience:

Current Research: Currently**,** I am developing a mathematical and computational models of hydrogel swelling, diffusion, and responsiveness. My proposed endeavor is to continue developing mathematical models of fluid-structure interactions in hydrogels, with diverse applications in areas such as drug delivery, soft robotics, and environmental sensing The Primary goal of my current research is to establish an effective drug delivery system that would open an avenue to discovering target-specific drugs. This will have a substantial effect on the pharmaceutical industry and drug discovery, as billions of dollars are lost annually on non-specific medicines that are unable to reach diseased tissues.

Research Assistant: I worked as a research assistant under the supervision of Dr. Tania Sharmin Khaleque and worked on a **University Grants Commission of Bangladesh** (UGC) funded project.

Age-structured Model: I am working on an age-structured model and including age-specific considerations in my model to understand infectious illness dynamics. The model includes age-specific vaccine efficacy since age groups respond differentially to vaccination. I consider vaccine cost disparities by age, distribution logistics, and application. Since immunity reduces differently by age group, the model also considers immunity duration to predict booster doses.

MHD Flow: This study investigates the magnetohydrodynamic (MHD) flow and heat transfer characteristics surrounding an exponentially expanding and decreasing sheet and also for cylindrical, taking into account the influence of radiation, source/sink effects, and finally entropy production. Our aim is improving efficiency and reducing thermal energy consumption in various industrial processes using hybrid nanofluid.

MS Thesis: Mathematical Modelling of Filtration: Removal of Arsenic from drinking water. I got **National Science and Technology Scholarship** based on my MS thesis research works.

Undergraduate Project: Effects of thermal radiation and a Heat source or sink on boundary layer flow of hybrid nanofluid heat transfer towards an exponentially stretching/shrinking sheet.

Publications:

1. Aiding (opponent) flow of hybrid copper-aluminum oxide nanofluid towards an exponentially extending (lessening) sheet with thermal radiation and heat source (sink) impact. **Journal of Petroleum Science and Engineering** (Q1, Impact Factor-5.44), Cited by 41. https://doi.org/10.1016/j.petrol.2022.110649

2. Mathematical Modelling of Arsenic Removal Using Filtration, **Alexandria Engineering Journal**, (Q1, Impact Factor-6.8). https://doi.org/10.1016/j.aej.2025.10.037

Poster Presentation: Mustafizur Rahman, Sakil Mojumder, Dr. Tania Sharmin Khaleque, Mathematical Modelling of Arsenic Removal Using Filtration, Alumni UK Symposium on Women in STEM 2023, 6 December, British Council, Dhaka, Bangladesh.

Education:

Doctor of Philosophy (PhD), Computational and Applied Mathematics — Fall-2024-2029 (Expected)
Southern Methodist University

Master of Science (Thesis), Department of Applied Mathematics — 2020-2021
University of Dhaka

- GPA: 3.96 out of 4.00 (2^{nd} *Position*)

Bachelor of Science, Department of Applied Mathematics — 2017-2020

University of Dhaka

- CGPA: 3.73 out of 4.00 (7^{th} *Position*)

Work Experience:

Teaching Assistant — Agust-2024 to Present

Department of Mathematics, Southern Methodist University

Research Assistant — June-2025 to Agust-2025

Department of Mathematics, Southern Methodist University

Lecturer

Institution of Natural Science ,United International University, Bangladesh — January-2024 to July 2024

Research Assistant — July-2023 to July2024

Research Group of Fluid Flow Modeling and Simulation, Department of Applied Mathematics, University of Dhaka funded by **University Grants Commission, Bangladesh.**

Specialized Skills:

Programming Languages: Python, MATLAB, C, C++, Microsoft Office, COMSOL MULTIPHYSICS, Ansys, Wolfram Mathematica, LATEX, Tecplot.

Relevent Course Work from Coursera (Online):

MATLAB: **Exploratory Data Analysis with MATLAB**

Python: Programming for Everybody, Python Data Structure, University of Michigan

Machine Learning: Supervised Machine Learning: Regression and Classification Unsupervised Learning, Recommenders, Reinforcement Learning, Unsupervised Learning, Recommenders, Reinforcement Learning Stannford University

Deep Learning: Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization, Sequence Models, Neural Networks and Deep Learning, Structuring Machine Learning Projects.

Achievements:

- Achieved Scholarship-Ministry of Education, Government of People's Republic of Bangladesh for excellent academic results in Junior School Certificate (2011).
- Achieved Scholarship-Ministry of Education, Government of People's Republic of Bangladesh for excellent academic results in Primary School Certificate (2009).
- Achieved National Science and Technology (NST) Fellowship Under the Government of the People's Republic of Bangladesh.
- Achieved Scholarship-Ministry of Education, Government of People's Republic of Bangladesh for excellent academic results at Undergraduate Level (2020).
- Best Blood Doner (2022), Badhon, the nation's largest blood donation organization.

Others Experience:

- Media and Publication Secretary, Bangladesh Student Association, Southern Methodist University
- Speaker, Youth Science, National Science Congress, Dhaka, Bangladesh.
- Member, Badhon, the nation's largest blood donation organization, Fazlul Haque Hall, Dhaka University
- Member, Debate Society, Gurudyal Govt College, Kishoreganj, Bangladesh.
- Advisor, SafeHands Society- Social Awareness for Corona Pendemic, Kishoreganj, Bangladesh