MD MAHMUDUL BARI HRIDOY

Postdoctoral Associate, Department of Mathematics, Virginia Tech
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RESEARCH INTERESTS

Deterministic and stochastic mathematical modeling; data-driven modeling; mathematical epidemiology; seasonality in epidemic models; applied dynamical systems; differential equations; population dynamics; and disease transmission dynamics.

EDUCATION

Ph.D. in Applied Mathematics **Jan 2023 – Aug 2025**
Texas Tech University *Lubbock, TX*
Advisors: Linda J.S. Allen and Angela Peace
Dissertation: Infectious Disease Dynamics in Heterogeneous Populations: Stochastic, Seasonal, and Structured Epidemic Models with Intervention Strategies

M.S. in Applied Mathematics **Aug 2019 – Dec 2022**
Texas Tech University *Lubbock, TX*

B.Sc. (Hons.) in Mathematics **Jan 2014 – Aug 2018**
University of Dhaka *Dhaka, Bangladesh*

PROFESSIONAL EXPERIENCE

Postdoctoral Associate **Aug 2025 – Present**
Department of Mathematics *Blacksburg, VA*
Virginia Tech

Graduate Part-Time Instructor (GPTI) **Aug 2020 – Aug 2025**
Department of Mathematics and Statistics *Lubbock, TX*
Texas Tech University

Research Assistant **Jan 2023 – Aug 2023**
Department of Mathematics and Statistics *Lubbock, TX*
Texas Tech University
Project Title: Age-structured Malaria Transmission Model with Vaccination.

Mathematics Tutor **Aug 2019 – Jul 2020**
Department of Mathematics and Statistics *Lubbock, TX*
Texas Tech University

Intern **May 2017 – Jul 2017**
Dutch-Bangla Bank Limited (DBBL) *Narayanganj, Bangladesh*

AWARDS

JMM Graduate Student Travel Grant **2025**
American Mathematical Society (AMS) *Seattle, WA*
Seattle Convention Center

AMS Sectional Travel Grant **2024**
American Mathematical Society (AMS) *San Antonio, TX*
University of Texas at San Antonio

Dissertation Research Award **2024**
Graduate School *Lubbock, TX*
Texas Tech University

Best Presentation Award **2024**
Graduate Student Research Day (GSRD) *Lubbock, TX*
Texas Tech University

SIAM Graduate Scholarship **2024**
Texas Tech University Chapter of SIAM *Lubbock, TX*
Texas Tech University

SIAM TX-LA Sectional Meeting Travel Award **2023**
Society for Industrial and Applied Mathematics (SIAM) *Lafayette, LA*
University of Louisiana at Lafayette

TTU Graduate School Travel Award **2023**
Society for Mathematical Biology Annual Meeting *Columbus, OH*
Ohio State University

Study Abroad Travel Grant **2020**
The Bangladesh-Sweden Trust Fund (BSTF) *Dhaka, Bangladesh*

Distinction Award in Mathematics **2009**
University of New South Wales *Sydney, Australia*
International Competitions and Assessments for Schools (ICAS)

JOURNAL PUBLICATIONS

1. Mahmudul Bari Hridoy, Linda J.S. Allen, **Investigating Seasonal Disease Emergence and Extinction in Stochastic Epidemic Models**. *Mathematical Biosciences*, 2025, 109383. doi: 10.1016/j.mbs.2025.109383.
2. Mahmudul Bari Hridoy, **An Exploration of Modeling Approaches for Capturing Seasonal Transmission in Stochastic Epidemic Models**. *Mathematical Biosciences and Engineering*, 2025, 22(2), 324–354. doi: 10.3934/mbe.2025013.
3. Mahmudul Bari Hridoy, Angela Peace, **An Exploration of the Interplay Between Treatment and Vaccination in an Age-Structured Malaria Model Using Non-Linear Ordinary Differential Equations**. *Healthcare Analytics*, 7, 2025, 100386. doi:10.1016/j.health.2025.100386.

PEER-REVIEWED CONFERENCE PROCEEDING

4. Mahmudul Bari Hridoy, S M Mustaquim, **Data-Driven Modeling of Seasonal Dengue Dynamics in Bangladesh: A Bayesian-Stochastic Approach**. *16th Biomedical Engineering International Conference (BMEiCON)*, 2024, 10896349. doi:10.1109/BMEiCON64021.2024.10896349.

RESEARCH IN PROGRESS

5. Mahmudul Bari Hridoy, H.K. Das, **A Stochastic Approach to Metapopulation Modeling: The Role of Network Geometry and Human Mobility**. Anticipated submission: Spring 2025.
6. Mahmudul Bari Hridoy, Linda J.S. Allen, **A Data-Driven Exploration of Cross-Hemispheric Influenza Dynamics in a Stochastic Two-Patch Framework**. Anticipated submission: Spring 2025.
7. Mohammad Mihrab Chowdhury, Mahmudul Bari Hridoy, Md Sakhawat Hossain, **Comparing the Impact of Flu and COVID-19 Vaccines on Hospitalization and Mortality Rates: A Winter Season Study**. Anticipated submission: Summer 2025.
8. Fahad Mostafa, Mahmudul Bari Hridoy, **Modeling Hazard Function Using Higher-Order ODEs in Dynamical Survival Analysis**. Anticipated submission: Summer 2025.

PRESENTATIONS

Joint Mathematics Meetings (JMM) **Jan 2025**
Seattle Convention Center *Seattle, WA*
Invited Talk: *Harnessing Seasonality: Enhancing Disease Control Strategies by Investigating Seasonal Disease Emergence in Stochastic Epidemic Models*.

The 16th Biomedical Engineering International Conference (BMEiCON 2024) **Nov 2024**
Hybrid *Pattaya, Thailand*
Talk: *Data-Driven Modeling of Seasonal Dengue Dynamics in Bangladesh: A Bayesian-Stochastic Approach*.

AMS Sectional Meeting **Sep 2024**
University of Texas at San Antonio *San Antonio, TX*
Talk: *Modeling Drug Sensitivity and Mitigation in a Multi-Strain Age-Structured Malaria Model*.

SMB MathEpiOnco **Feb 2024**
Virtual
Talk: *Synergizing Health Strategies: Exploring the Interplay of Treatment and Vaccination in an Age-Structured Malaria Model*.

SIAM TX-LA Sectional Meeting **Nov 2023**
University of Louisiana at Lafayette *Lafayette, LA*
Invited Talk: *Investigating Patterns of Disease Emergence in Stochastic Epidemic Models with Seasonality*.

Biomathematics Seminar **Oct 2023**
Texas Tech University *Lubbock, TX*
Talk: *Seasonal Drivers of Disease Emergence in Stochastic Epidemic Models*.

SMB Annual Meeting **Jul 2023**
Ohio State University *Columbus, OH*
Poster: *Seasonal Disease Emergence in Stochastic Epidemic Models*.

TEACHING EXPERIENCE

Graduate Part-Time Instructor (GPTI) **Aug 2020 – Present**
Department of Mathematics and Statistics, Texas Tech University *Lubbock, TX*

Primary instructor: developed course content including syllabi, lesson plans, and assignments; delivered effective lectures; created and graded assessments; provided timely feedback; and held regular office hours for student support.

- **MATH 1331: Introductory Mathematical Analysis II**, class size: 120 Spring 2025
- **MATH 1452: Calculus II with Applications**, class size: 90 Fall 2024
- **MATH 1451: Calculus I with Applications**, class size: 55 Summer 2024
- **MATH 1451: Calculus I with Applications**, class size: 85 Spring 2024
- **MATH 1451: Calculus I with Applications**, class size: 110 Fall 2023
- **MATH 1331: Introductory Mathematical Analysis II**, class size: 120 Fall 2022
- **MATH 1330: Introductory Mathematical Analysis I**, class size: 125 Spring 2022
- **MATH 1330: Introductory Mathematical Analysis I**, class sizes: 50, 70 Fall 2021
- **MATH 1320: College Algebra**, Hybrid, class size: 120 Spring 2021
- **MATH 1320: College Algebra**, Synchronous online, class size: 120 Fall 2020

MENTORSHIP

Undergraduate Student Mentor **Jun 2022 – Jul 2022**
National Science Foundation (NSF) *Lubbock, TX*
Assisted Dr. Linda J. S. Allen in mentoring the Research Experiences for Undergraduates (REU) participants
Project Title: Demographic and Environmental Variability on Population and Disease Extinction.

MEMBERSHIP

Vice President-SIAM TTU Chapter **Aug 2023 – Jul 2024**
Society for Industrial and Applied Mathematics (SIAM) *Lubbock, TX*

Member **Aug 2019 – Present**
American Mathematical Society (AMS) *Lubbock, TX*
Society for Mathematical Biology (SMB)
Society for Industrial and Applied Mathematics (SIAM)

Head of Volunteer Management **Jan 2010 – Mar 2013**
Volunteer for Bangladesh (VBD) *Narayanganj, Bangladesh*
Led teams of over 100 volunteers and closely managed large scale events

PROFESSIONAL SERVICE

Reviewer: *Journal of Mathematical Biology* (2025–Present)
Reviewer: *Scientific Reports* (2025–Present)
Reviewer: *International Journal of General Medicine* (2025–Present)

RELEVANT COURSEWORK & SKILLS

Coursework: Biomathematics, Biostatistics, Mathematical Modeling in Epidemiology, Mathematical Statistics, Data Science, Linear Algebra, Real Analysis, Numerical Analysis, Control Theory, Numerical Bifurcation Analysis, Ordinary Differential Equations (ODE), Partial Differential Equations (PDE), Adaptive Dynamics.

Programming & Software: MATLAB, Python, R, C, C++, Fortran, XPPAUT, Mathematica, Maple, Excel, SQL.

REFERENCES

Dr. Lauren M. Childs
Associate Professor
Department of Mathematics
Virginia Tech
Blacksburg, VA 24061-1026
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Phone: 540-231-8265

Dr. Angela Peace
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Texas Tech University
Lubbock, TX 79409-1042
Email: a.peace@ttu.edu
Phone: 806-834-1014

Dr. Linda J.S. Allen
Paul Whitfield Horn Professor Emeritus
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