MD BADRUL HASAN

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Google Scholar Profile ◇ Personal Website

EDUCATION

University Of Maryland, Baltimore County (UMBC) *January, 2019 - Present*
Ph.D. in Mechanical Engineering
Department of Mechanical Engineering

University Of Maryland, Baltimore County (UMBC) *December, 2022*
M.S. in Mechanical Engineering
Department of Mechanical Engineering

Bangladesh University of Engineering and Technology (BUET) *2013 - 2017*
B.Sc. in Mechanical Engineering
Department of Mechanical Engineering

WORK EXPERIENCE

Computational Mechanics Laboratory, UMBC January, 2020 - Present
Graduate Research Assistant

· Working on machine learning based model development of back-scatter admitting sub-grid-scale (SGS) processes for hurricane simulations.
· Detecting Stealthy Long-term Cyber Attacks on Wind Energy Assets with Physics-informed Neural Network Technologies. (UMBC 2024 Cybersecurity Leadership Exploratory Grant)

Joint Centre for Earth Systems Technology (JCET), UMBC January, 2020 - June, 2022
Graduate Research Assistant

· Compared the numerical dissipation of different weather prediction models like WRF and NUMA with Dr. Stephen Guimond supported by the National Science Foundation (NSF) under grant AGS-2121366.
· Visualized and Compared the remote sensing radar data from Imaging Wind and Rain Airborne Profiler (IWRAP) with Dr. Stephen Guimond.

University Of Maryland, Baltimore County (UMBC) January, 2019 - May, 2024
Graduate Teaching Assistant

· Conducted the lab demonstrations and grading on ENME-432L, Fluids/Energy Lab with Dr. Meilin Yu.
· Assisted Dr. James Baughan on teaching and grading on the ENME-423, HVAC Design.

TECHNICAL STRENGTHS

Programming Languages	Python, Matlab, Fortran
Modeling and Analysis	Ansys, Solidworks, COMSOL, AutoCad
Software & Tools	PyTorch, MS Office, LabView

PUBLICATIONS

Journals

· **Hasan, M. B.**, Guimond, S. R., Yu, M., Reddy, S., Giraldo, F. X. (2022). The Effects of Numerical Dissipation on Hurricane Rapid Intensification with Observational Heating. *Journal of Advances in Modeling Earth Systems*, 14, e2021MS002897. [https://doi.org/10.1029/2021MS002897]

· **Hasan, M. B.**, Yu, M., and Oates, T. (2025), Invariance-embedded Machine Learning Sub-grid-scale Stress Models for Meso-scale Hurricane Boundary Layer Flow Simulation I: Model Development and *a priori* Studies. (2025) [https://arxiv.org/abs/2504.14473]. (*In Preparation*)

Conference Proceedings

· **Hasan, M. B.**, Yu, M., Xiao, H. (2023). Sub-grid Scale Modeling of Meso-scale Hurricane Boundary Layer Flows using Machine Learning. In *AIAA SCITECH 2023 Forum*. (p. 2487) [https://doi.org/10.2514/6.2023-2487]

· **Hasan, M. B.**, Yu, M., Oates, T. (2025). Comparison of Several Machine-Learning-Enhanced Sub-grid Scale Stress Models for Meso-scale Hurricane Boundary Layer Flow Simulation. In *AIAA SCITECH 2025 Forum*. (p. 2212) [https://doi.org/10.2514/6.2025-2212]

· **Hasan, M. B.**, Yu, M., Oates, T. (2025). Evaluating Machine Learning-Enhanced Sub-Grid Scale Stress Models With Invariance Embedding for Meso-Scale Hurricane Boundary Layer Flows. In *ASME 2025 Fluids Engineering Division Summer Meeting (FEDSM)* (Accepted)

Oral and Poster Presentations

· Invariance-Embedded Machine Learning Sub-Grid-Scale Stress Models for Meso-Scale Hurricane Boundary Layer Simulations, *2025 Research Symposium on Environmental and Applied Fluid Dynamics*, The George Washington University, May 2025.
· Assessment of Invariance-Embedded Machine Learning Models for Sub-Grid Scale Stress in Meso-Scale Hurricane Boundary Layer Flows, *COEIT Research Day Talks 2025*, Physical Systems Session, April 2025.
· Sub-grid Scale Modeling of Meso-scale Hurricane Boundary Layer Flows using Machine Learning, *COEIT Research Day Talks 2024*, AI/ML Session, April 2024.
· Sub-grid Scale Modeling of Meso-scale Hurricane Boundary Layer Flows using Machine Learning, *Poster Session of the COEIT Research Day-2024*, April 2024.
· The Effects of Numerical Dissipation on Hurricane Rapid Intensification with Observational Heating, *Poster Session of AGU Fall Meeting-2021*, December 2021.
· The Effects of Numerical Dissipation on Simulating Hurricane Intensification with Observational Heating, JCET GRA Seminar Series: Fall 2021. December 2021
· The Effects of Numerical Dissipation on Simulating Hurricane Intensification in a Realistic Regime, *Poster Session of AGU Fall Meeting-2020*. December 2020.
· The Effects of Numerical Dissipation on Simulating Hurricane Intensification in a Realistic Regime, JCET GRA Seminar Series: Fall 2020. December 2020
· The Effects of Numerical Dissipation on Simulating Hurricane Intensification in a Realistic Regime, Seminar Series: Fall 2020, Department of Mechanical Engineering, UMBC. November 2020

AWARDS AND SCHOLARSHIPS

2025 AIAA Professor Kirti "Karman" Ghia Memorial Award
Inaugural recipient for best student paper, Comparison of Several Neural Network-Enhanced Sub-grid Scale Stress Models for Meso-scale Hurricane Boundary Layer Flow Simulation, awarded by the Fluid Dynamics Technical Committee (FDTC) at AIAA SciTech 2025.

Graduate Student Association (GSA) Professional Development Grant, December 2024, UMBC
Provided support for professional development and thesis-related research expenses.

University Technical Scholarship (2013–2017)
Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

LEADERSHIP AND INVOLVEMENT

Bangladesh Student Association, UMBC September, 2019 -August, 2020
Treasurer

· Maintained the association's fund and worked with Graduate Student Association, UMBC to organize different social events for Bangladeshi graduate students.

Buet Photographic Society February, 2017 -October, 2017
Vice President

· Organized numerous national level photography exhibitions and workshops in Bangladesh, also inspired students from different engineering departments to take photography as a hobby along with their studies.

NEWS & ONLINE FEATURES

UMBC News Feature

· **Modeling Hurricanes with Machine Learning**
Article highlighting our research on hurricane simulation methods using ML-based models. (January 2025)