Md Badrul Hasan

mdbadrh1@umbc.edu |
Google Scholar | Website

EDUCATION

Ph.D., Mechanical Engineering
University of Maryland Baltimore County (UMBC), Baltimore, MD
Jan 2019 – Present

M.S., Mechanical Engineering
University of Maryland Baltimore County (UMBC), Baltimore, MD
Dec 2022

B.Sc., Mechanical Engineering
Bangladesh University of Engineering and Technology (BUET)
2017

WORKSHOPS & TRAINING

• *Structure-Preserving Scientific Computing & Machine Learning: Summer School & Hackathon,* University of Washington, Seattle — NSF/PIMS supported cohort of 40 graduate students (June 2025).

AWARDS & SCHOLARSHIPS

• AIAA Professor Kirti "Karman" Ghia Memorial Award — Best Student Paper (Jan 2025).

• Graduate Student Association (GSA) Professional Development Grant, UMBC (May 2025; Dec 2024).

• University Technical Scholarship, BUET (2013–2017).

TECHNICAL SKILLS

• Programming: Python, MATLAB, Fortran

• CFD & Modeling: WRF, NUMA, Ansys Fluent, COMSOL; LES/SGS modeling; HPC/GPU computing

• Data/ML: PyTorch; geospatial/remote sensing analysis; model validation

• Tools: SolidWorks, AutoCAD, Linux, Git

MEDIA & RECOGNITION

• Research featured in UMBC News: "*Modeling Hurricanes with Machine Learning*" (Jan 2025).

EXPERIENCE

***Graduate Research Assistant,* Computational Mechanics Lab, UMBC (Jan 2020 – Present)**
• Conducting *a posteriori* tests of invariance-embedded ML models for hurricane boundary layer flows, integrating ML closures into WRF. (UMBC COEIT Interdisciplinary Proposal Award, 2025).

• Developing ML-based backscatter-admitting sub-grid-scale (SGS) models to improve hurricane boundary layer simulations.

• Advancing physics-informed neural network methods to detect stealthy, long-term cyberattacks on wind energy assets. (UMBC Cybersecurity Leadership Grant, 2024).

***Graduate Research Assistant,* Joint Center for Earth Systems Technology (JCET), UMBC (Jan 2020 – June 2022)**
• Quantified numerical dissipation in WRF and NUMA; compared model behavior for hurricane intensification studies (NSF AGS-2121366).

• Processed radar/remote sensing (IWRAP) datasets for NOAA/AOML/HRD.

***Graduate Teaching Assistant,* UMBC (Jan 2019 – May 2024)**
• ENME-432L (Fluids/Energy Lab); ENME-423 (HVAC Design) — labs, instruction, and assessment.

SELECTED PUBLICATIONS

• **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 (JAMES), 14, e2021MS002897

• **Hasan, M. B.**, Yu, M., Oates, T. (2025). Invariance-embedded Machine Learning Sub-grid-scale Stress Models for Meso-scale Hurricane Boundary Layer Flow Simulation: Model Development and a priori Studies. arXiv:2504.14473 (Under Review).

LEADERSHIP & SERVICE

• **Treasurer,** Bangladesh Student Association, UMBC (2019–2020) — Managed association funds and coordinated social events in collaboration with UMBC Graduate Student Association.

• **Vice President**, BUET Photographic Society (2017) — Organized national-level photography exhibitions and inspired interdisciplinary student participation.