

MD MARUF BILLAH

Ph.D. Student at Department of Mechanical Engineering

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Education

August 2023 to Present	Ph.D. in Mechanical Engineering (Pursuing) Virginia Tech Laboratory: Advanced STRuctures and Optimization- ASTRO (Supervised by Dr. Pinar Acar)
August 2019 to December 2021	M.Sc. in Mechanical Engineering Chittagong University of Engineering and Technology (CUET) summa cum laude Thesis title: Mechanical properties characterization of injection molded rattan fiber reinforced polypropylene composite materials (Supervised by Dr. Md. Sanaul Rabbi)
July 2014 to October 2018	B.Sc. in Mechanical Engineering Bangladesh University of Engineering and Technology (BUET) awarded with HONOURS, top 10% Thesis title: Strain rate and temperature effects on mechanical properties of SAC-intermetallic compounds: A molecular dynamics study (Supervised by Dr. Mohammad A. Motalab)

Employments

August 2024 to December 2024	Graduate Teaching Assistant, Department of Mechanical Engineering Virginia Tech Course: ESM 4734 - An Introduction to the Finite Element Method
July 2019 to July 2023	Lecturer → Assistant Professor, Department of Mechanical Engineering, Chittagong University of Engineering and Technology (CUET) Courses: Engineering Dynamics, Machine Design, Mechanics of Machinery and Vibrations, and Mechanical Engineering Drawing. Thesis supervision: Dependency of tensile behaviors of Ag ₃ Sn and Cu ₃ Sn on crystal size and direction: A molecular dynamics study. Effect of medium's density on efficiency of hydrocyclone separator in sorting of waste plastics for recycling.
May 2019 to July 2019	Lecturer, Department of Textile Engineering, Green University of Bangladesh Courses: Fundamental of Mechanical Engineering

Research Interests

- Computational Design
- Multi-scale Modeling
- Inverse Design of Materials
- Uncertainty Quantification
- Computational Mechanics
- Composite Materials

(Leading Contributions)

- June 2025 M. M. Billah, M. N. T. Kilic, M. M. Hasan, Z. E. Eger, Y. Mao, K. Wang, A. Choudhary, A. Agrawal, V. Sundararaghavan, and P. Acar, "MicroProcSim: A Software for Simulation of Microstructure Evolution", *Integrating Materials and Manufacturing Innovation*. (doi.org/10.1007/s40192-025-00405-6)
- November 2024 M. M. Billah, M. Elleithy, W. Khan, S. Yıldız, Z. E. Eger, S. Liu, M. Long, and P. Acar, "Uncertainty Quantification of Microstructures: A Perspective on Forward and Inverse Problems for Mechanical Properties of Aerospace Materials", *Advanced Engineering Materials*. (doi.org/10.1002/adem.202401299)
- March 2024 M. M. Billah, and P. Acar, "Design of polycrystalline metallic alloys under multi-scale uncertainty by connecting atomistic to meso-scale properties", *Acta Materialia*. (doi.org/10.1016/j.actamat.2024.119879)
- October 2023 M. M. Billah, M. S. Rabbi, K. A. Rahman and P. Acar, "Temperature and strain rate dependent tensile properties of titanium carbide/nitride MXenes", *Materials Chemistry and Physics*. (doi.org/10.1016/j.matchemphys.2023.128581)
- November 2022 M. M. Billah, A. Aad, S. Das and R. Paul, "Dependence of mechanical and thermal deformation behaviors on crystal size and direction of Cu₃Sn intermetallic: A molecular dynamics study", *Alexandria Engineering Journal*. (doi.org/10.1016/j.aej.2022.11.025)
- August 2022 M. M. Billah, S. Das, A. Aad and R. Paul, "Tensile properties dependency on crystal size and direction of single crystal Ag₃Sn intermetallic compound: A molecular dynamics study", *Journal of Materials Research and Technology*. (doi.org/10.1016/j.jmrt.2022.07.188)
- April 2022 M. M. Billah, R. I. Siddiquee, M. Motalab, R. Paul and M. S. Rabbi, "Effects of temperature and strain rate on tensile properties of (Ag,Cu)-Sn intermetallic compounds: A molecular dynamics study", *Journal of Materials Research and Technology*. (doi.org/10.1016/j.jmrt.2022.03.141)
- February 2022 M. M. Billah, M. S. Rabbi, and A. Hasan, "Injection molded discontinuous and continuous rattan fiber reinforced polypropylene composite: Development, experimental and analytical investigations", *Results in Materials*. (doi.org/10.1016/j.rinma.2022.100261)
- February 2021 M. M. Billah, M. S. Rabbi, and A. Hasan, "A review on developments in manufacturing process and mechanical properties of natural fiber composites", *Journal of Engineering Advancements*. (doi.org/10.38032/jea.2021.01.003)

(Supportive Contributions)

- July 2025 Y. Mao, M. Hasan, M. M. Billah, Y. Li, S. Chakrabarty, C. S. Lee, K. Wang, M. N. T. Kilic, V. Gupta, W. Liao, A. Choudhary, P. Acar, and A. Agrawal "An AI-driven framework for time-series processing-microstructure-property prediction", *Scientific Reports*. (doi.org/10.1038/s41598-025-06894-x)
- October 2024 MA S. Siddiqui, MS Rabbi, R. U. Ahmed, and M. M. Billah "Biodegradable natural polymers and fibers for 3D printing: A holistic perspective on processing, characterization, and advanced applications", *Cleaner Materials*. (doi.org/10.1016/j.clema.2024.100275)
- November 2023 R. Chowdhury, M. M. Billah, S. Roy, S.C. Banik, and A. Barua "Analyzing the effect of the density of medium on efficiency of hydrocyclone separator in sorting of PVC and PET using CFD", *Results in Materials*. (doi.org/10.1016/j.rinma.2023.100497)

- November 2023 MS Rabbi, S. Das, T. Tasneem, M. M. Billah, A. Hasan, “Effect of nano-filler on the manufacturing and properties of natural fiber-based composites: a review”, *Journal of Engineering Advancements*. (doi.org/10.38032/jea.2023.04.001)
- November 2022 A. Hasan, M. S. Rabbi, M. M. Billah and M. A. Hasib, “Effect of Chemical Treatments on Properties of Injection Molded Nypa Fruticans Fiber Reinforced Polypropylene Composite”, *Heliyon*. (doi.org/10.1016/j.heliyon.2022.e11967)
- Marh 2022 A. Hasan, M. S. Rabbi, and M. M. Billah, “Making the lignocellulosic fibers chemically compatible for composite: A comprehensive review”, *Cleaner Materials*. (doi.org/10.1016/j.clema.2022.100078)

Conference Proceedings

(Leading Contributions)

- January 2025 M. M. Billah, and P. Acar, “Design of Functionally Graded Inconel 718 Alloy Structures by Developing Material Property Closures”, *AIAA SCITECH 2025 Forum*. (doi.org/10.2514/6.2025-1746)
- July 2019 M. M. Billah, R. I. Siddiquee, and M. Motalab, “Temperature dependent mechanical properties of inter-metallic compounds in nano-solder joints”, *AIP Conference Proceedings*. (doi.org/10.1063/1.5115965)

(Supportive Contributions)

- January 2025 W. Khan, M. M. Billah, and P. Acar, “Microstructural Uncertainty Propagation over Meso and Macro-Scale Mechanical Properties of Aerospace Metallic Alloys”, *AIAA SCITECH 2025 Forum*. (doi.org/10.2514/6.2025-1748)
- December 2024 K. Wang, Y. Mao, M. Hasan, M. M. Billah, M. N. T. Kilic, V. Gupta, W. Liao, A. Choudhary, P. Acar, A. Agrawal, “Deep Learning Based Inverse Modeling for Materials Design: From Microstructure and Property to Processing”, *2024 ICMLA*. (doi.org/10.1109/ICMLA61862.2024.00038)

Submitted Manuscripts

- Submitted M. M. Billah, and P. Acar, “Process-informed property evolutions of microstructures”, *Acta Materialia*. (Preprint: dx.doi.org/10.2139/ssrn.5198175)
- Submitted M. M. Billah, W. Khan and P. Acar, “Enhancing Structural Stability Through Microstructure-Informed Functionally-Graded Materials Design”, *International Journal of Mechanical Sciences*. (Preprint: dx.doi.org/10.2139/ssrn.5384601)

Presentations

- A Conference Paper on 2025 AIAA SciTech Forum and Exposition, Orlando, USA
Paper title: Design of Functionally Graded Inconel 718 Alloy Structures by Developing Material Property Closures
- A Conference Paper on 8th BSME International Conference on Thermal Engineering, Dhaka, Bangladesh
Paper title: Temperature dependent mechanical properties of inter-metallic compounds in nano-solder joints

Awards and Achievements

- Pratt Fellowship, 2025-26 Academic Year (Offered by Research and Innovation, Virginia Tech)
- Lockheed Martin Student Paper Award in Structures, 2025 AIAA SciTech Forum and Exposition
Paper title: Design of Functionally Graded Inconel 718 Alloy Structures by Developing Material Property Closures
- Outstanding Doctoral Student Award, Nominated for 2024-25 Academic Year (College of Engineering, Virginia Tech)
- Hord Scholarship, Spring 2025 (Offered by Department of Mechanical Engineering, Virginia Tech)
- Pratt Fellowship, 2023-24 Academic Year (Offered by Department of Mechanical Engineering, Virginia Tech)
- Best Research Publication Award 2023 (Offered by Directorate of Research & Extension, CUET)
Article title: Temperature and strain rate dependent tensile properties of titanium carbide/nitride MXenes
- Best Research Publication Award 2022 (Offered by Directorate of Research & Extension, CUET)
Article title: Dependence of mechanical and thermal deformation behaviors on crystal size and direction of Cu₃Sn intermetallic: A molecular dynamics study
- Scholarship of University Merit, 2016 (For achieving CGPA of 3.95 or above in Level 3, BUET)
- Scholarship of University Stipend, 2015 and 2017 (For achieving GPA of 3.95 or above in Term-I, II of Level 3, BUET)
- Scholarship of Dean List, 2017 and 2018 (For achieving CGPA of 3.75 or above in Level 3 and 4, BUET)
- Higher Secondary Scholarship (Offered by Dinajpur Education Board)
- 1st Runner-up in CAD Contest, 2018 (Organized by Association of IPE, BUET)
- 1st Place in First-round of CAD Contest, 2017 (Organized by Association of IPE, BUET)
- 2nd Runner-up (Senior) in Mechanical Engineering Olympiad, 2018 (Organized by ME Association, BUET)

Reviewer

- Journal of Materials Research and Technology
- Results in Engineering
- Advances in Nano Research, An International Journal
- Materials Today Communications
- International Conference on Mechanical Engineering and Renewable Energy (ICMERE)

Software Skills

- C, MATLAB, Python- Programming Language
- SOLIDWORKS- Computer-aided Design Platform
- LAMMPS- Molecular Dynamics Simulator
- Abaqus- Mechanical Modeling & Analysis
- Proteus- PCB Design and Circuit Simulator Software
- VMD, OVITO- Molecular Modeling & Visualization Tool

Trainings

- CITI Training Program, Basic Responsible Conduct of Research Course (2024)
- Foundation Training for Teacher, A training program by IQAC, CUET (2020)
- Workshop on Research Methodology, A training program by CRHLSR, CUET (2020)
- SQUARE Pharmaceuticals Limited, Industrial Training in Dhaka Unit, Kaliakoir, Gazipur (2018)
- Nuclear Technology Workshop, A joint training program between MEPHI and BUET (2018)

Extracurricular Activities

- Chief Moderator, Rangpur Division Association, CUET (2021-2023)
- Coordinator, Level 1 Students of Mechanical Engineering Department, CUET (2021-2023)
- Vice President, Greater Rangpur Students' Welfare Association-GRSWA, BUET (2017-2018)
- Volunteer and Blood Doner, BADHAN, BUET Zone (2014-2018)
- Mess Manager, Titumir Hall Dining, BUET (2017)

Professional Memberships

- Member, Bureau of Research Testing and Consultancy (BRTC), CUET (2019-2023)
- Member, Academic Committee of Undergraduate Studies, CUET (2019-2023)
- Member, Organizing Committee of 5th and 6th International Conference on Mechanical Engineering and Renewable Energy (ICMERE) (2019-2023)

Languages

- Bengali- Fluent
- English- Proficient

References

Dr. Pinar Acar	Dr. Md. Sanaul Rabbi	Dr. Mohammad A. Motalab
Associate Professor	Professor	Professor
Dept. of Mechanical Engineering	Dept. of Mechanical Engineering	Dept. of Mechanical Engineering
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