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Nafis M. Arefin

Education

University of Tennessee Knoxville (UTK) — Knoxville, TN, USA
PhD, Biomedical Engineering — 2022 - 2025
- Advisor: Dr. Bryan Good
- Research Area: Fluid Dynamics, Biomechanics

University of Technology Sydney (UTS) — Sydney, Australia
MS, Mechanical Engineering — 2019 - 2021

International Islamic University Malaysia (IIUM) — Kuala Lumpur, Malaysia
BS(Hons.), Aerospace Engineering — 2014 - 2018

Technical Skills

CAD Tools: SolidWorks, Blender, SpaceClaim, MeshLab, Fusion 360, Creo
CFD Tools: OpenFOAM, ANSYS, COMSOL, STAR CCM+
Programming: `Python`, `C++`, `MATLAB`

Experience

Graduate Research Assistant, UTK | Knoxville, TN, USA — Jan 2022 - Present
- Applying **Computational Fluid Dynamics (CFD)**, **Fluid–Structure Interaction (FSI)**, & **Langrangian Particle Tracking (LPT)** techniques to simulate emboli transport and hemodynamics within the total cardiovascular system.
- Processing **CT & MRI imaging** datasets to segment anatomical structures, reconstruct patient-specific geometries, and generate digital twins for physiologically accurate simulations and predictive modeling.
- Designing and prototyping cardiovascular devices and anatomical models using **CAD** and **3D-printing** for experimental trials and design optimization.
- Conducting in-vitro **Particle Image Velocimetry (PIV)** experiments to capture flow fields, validate simulation accuracy, and study thrombus formation and growth.

Graduate Teaching Assistant, UTK | Knoxville, TN, USA — Aug 2023 - May 2025
- Conducted tutorial and laboratory classes for Fluid Mechanics (AE 341) and Mechanics of Materials sections (ME 321), instructing cohorts of up to 125 undergraduate students a semester.
- Designed and graded examination materials in alignment with course learning objectives and held regular office hours to provide individualized academic support.

Biomedical Design Intern, Medicision | Sydney, Australia — Oct 2020 - Jun 2021
- Designed and tested **3D-printed** miniature CubeSat prototypes for **microgravity cancer cell culture** experiments and spaceflight **biocompatibility.**
- Conducted **CFD** & **FEA** on CubeSats designed for biomedical applications, focusing on thermal regulation and aerodynamic stability.

Engineering R&D Intern, Bangladesh Airlines | Bangladesh — Jun 2017 - Sep 2017
- Assisted in the planning and execution of C-check and D-check maintenance inspections for Boeing 737-800 and Boeing 777-200 aircraft, ensuring compliance with regulatory and airworthiness standards.
- Analyzed structural and aircraft performance data and supported documentation, and reporting in collaboration with R&D and Maintenance Planning departments.

Publications

1. **N. Arefin**, B. Good. Patient-Specific Hemodynamic Simulations of Emboli Transport in the Abdominal Aorta Assessing Kidney and Liver Injury. *Computers in Biology and Medicine*, (In review) 2025.
2. **N. Arefin**, B. Good. Investigation of cardiopulmonary bypass parameters on embolus transport in a patient-specific aorta. *Biomechanics and Modelling in Mechanobiology*, 2024.
3. M. A. Mohimin, **N. Arefin**, P. Das. Cerebral Aneurysm Hemodynamics in Low Hematocrit Conditions: Numerical Simulations and Analysis. *SSRN, Elsevier.* 2023.
4. S. Khan *et al.*, **N. Arefin**. Assessment of different turbulence models in simulating axisymmetric flow in suddenly expanded nozzles. *International Journal of Engineering & Technology*, 2018.
5. S. Khan *et al.*, **N. Arefin**. Design development of a gravity powered fan using gear transmission. *International Journal of Engineering & Technology*, 2018.

Manuscripts Under Preparation

1. **N. Arefin**, B. Good. Influence of Cannula Orientation on Emboli Transport and Atherosclerotic Plaque Disruption: Stroke Risk Assessment in Patient-Specific Aortas Across Different Age Groups.
2. **N. Arefin**, B. Good. Assessing the Risk of Cerebral Occlusion: Fluid–Structure Interaction Analysis of the Circle of Willis.
3. H. Li, **N. Arefin**, B. Good. Flow-Induced Thrombosis in Aneurysmal Arteries: A Combined Particle Image Velocimetry (PIV) and Planar Laser-Induced Fluorescence (PLIF) Study.

Conference Presentation

1. **N. Arefin**, B. Good. Computational Investigation of Embolic Injury in Patient-Specific Aortas During Cardiopulmonary Bypass. *ASME Summer Bioengineering Conference*, 2025 (New Mexico, USA).
2. **N. Arefin**, B. Good. Computational Analysis of Stroke Risk During Cardiopulmonary Bypass in Adult and Pediatric Anatomies. *Summer Biomechanics, Bioengineering, and Biotransport Conference*, 2024 (Wisconsin, USA).
3. **N. Arefin**, B. Good, A. Cripps. The Influence Of Hemodiluted Blood Viscosity On Patient Hemodynamics During Cardiopulmonary Bypass. *Summer Biomechanics, Bioengineering, and Biotransport Conference*, 2023 (Colorado, USA).
4. M. A. Mohimin, **N. Arefin**. Cerebral Aneurysm Hemodynamics In Low Hematocrit Conditions: Numerical Simulations and Analysis. *14th International Conference on Mechanical Engineering, BUET*, 2023 (Dhaka, Bangladesh).

Professional Certification

Professional Engineer (ID: 354829)
National Professional Society of Engineers, Australia 2021 (Permanent)

Professional Membership

- **American Society of Mechanical Engineers (ASME)**
- **American Heart Association (AHA)**
- **Biomedical Engineering Society (BMES)**
- **Engineers Australia (EA)**

Awards and Honors

Distinguished Research Travel Award
Dept. of Mechanical, Aerospace & Biomedical Engineering, UTK 2023, 2025

Summer Research Grant
Office of Research, Innovation & Economic Development (ORIED), UTK 2023

Professional Engineering Scholarship
Faculty of Engineering and IT (FEIT), UTS 2018

Best Final Year Research Project
Faculty of Engineering, IIUM 2018

Dean's List Award
Faculty of Engineering, IIUM 2015

Gold Medallist & Country Topper (Mathematics)
UNSW International Competitions for Schools (ICAS) 2009

1st Runner-up, National Mathematical Olympiad
Bangladesh Mathematical Olympiad 2009

References

Bryan C. Good, PhD
Assistant Professor, University of Tennessee Knoxville bgood6@utk.edu

A. Colleen Crouch, PhD
Assistant Professor, University of Tennessee Knoxville acrouch5@utk.edu

M. Saidul Islam, PhD
Senior Lecturer, University of Technology Sydney mohammadsaidul.islam@uts.edu.au

M. Marufuzzaman Khan, PhD, MD
Research Scientist, Harvard Medical School mkhan10@bidmc.harvard.edu