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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
- Dissertation: Hemodynamics and Embolic Behavior in Patient-Specific Cardiovascular Anatomies During Cardiopulmonary Bypass

**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