

MD SAIFUL ISLAM

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Finite Element Analysis | Soft Materials | Biomechanics | Linear and Non-linear Analysis

Personal Summary

Ph.D. candidate specializing in finite element analysis, soft materials, and biomechanics. Seeking an industrial internship to apply advanced research skills in material science and numerical simulation for real-world innovation.

Highlights

- **Modeling and Simulation:** 4+ years of hands-on FEA experience with ABAQUS (Standard & Explicit) and Python scripting, SolidWorks.
- **Industrial experience:** 3 years as Service Advisor, led a team of Audi experts
- **Writing and communication:** Authored two research publications, delivered several talks and presented posters at conferences
- **Data Analysis and Programming:** MATLAB, Python, OriginPro.
- **Collaborations:** Leading numerical modeling projects at 4Mlab, mentoring researchers, collaborating with teams in Kuwait and the U.S.

Education

University of Louisiana at Lafayette (ULL), R1 Institution | *Expected May 2027*

Doctor of Philosophy (Ph.D.) in System Engineering | GPA: 3.90/4.0

Ph.D. Research: Interdisciplinary (Computational Modeling, Bioengineering, Medical device, Mechanical engineering)

Thesis: Developing a multi-scale finite element framework integrating fibril-reinforced poro-hyperelastic modeling and homogenization for precise cartilage simulations.

Supervisor: Dr. Tanvir Faisal, Assistant Professor, Department of Mechanical Engineering, ULL

University of Louisiana at Lafayette (ULL), R1 Institution | *Dec 2023*

Master of Science (M.Sc.) in Mechanical Engineering | GPA: 3.87/4.0

M.Sc. Research: Interdisciplinary Computational Modeling, Bioengineering, Mechanical engineering

Thesis: Multi-structural fibril-reinforced poro-hyperelastic (MSFPF) finite element modeling approach for advanced understanding of articular cartilage pathomechanics

Supervisor: Dr. Tanvir Faisal, Assistant Professor, Department of Mechanical Engineering, ULL

Islamic University of Technology (IUT), B.Sc. in Mechanical Engineering | *Nov 2017*

Professional Experience

Graduate Research Assistant (GRA) | 4MLAB | UL Lafayette, Lafayette, LA | *Aug 2021-Present*

Advisor – Dr. Tanvir Faisal

Project 1: Multi-scale modeling of articular cartilage comparing healthy and degenerative states.

- Developed a validated micro-FE model to simulate cartilage mechanics and osteoarthritis progression.
- Developing a 3D multi-scale model using homogenization and optimization to link microstructure to bulk behavior.

Project 2: Markerless Motion Capture Analysis of Knee Biomechanics during Military Load Carriage.

- Used markerless motion capture system to study knee mechanics under military load carriage (30–50% body weight).
- Now simulating ground reaction forces from high-intensity drills and integrating them into FEA cartilage models to improve OA risk prediction-critical as 1 in 3 U.S. veterans lives with OA.

Project 3: Data-Driven Constitutive Modeling of Articular Cartilage

- Developed a predictive FEA framework optimizing hyperelastic parameters to match experimental cartilage data.
- Enabled quantitative assessment of osteoarthritis progression through validated tissue-level simulations.

Project 4: Convolutional Neural Network (CNN) based quantification of collagen in cartilage (Joint project)

- Modified pre-trained CNN model to analyze histological image for quantifying tissue collagen content.
- Validate image processed and AI assessed data with FTIR result.

Project 5: Compatible Bio-printing System for surgery

- Conversion of 3D printer to Bio printer (\$1,000) for surgery and bioink printing. PCL-based hydrogel characterization
- CFD analysis for evaluating cell viability (100%) during direct-ink extrusion, leading to publish paper and presentation.

Mentor: 4M Lab, ULL | Undergrad students

- Mentoring 2 undergraduate students through a research apprenticeship on gait analysis and guided senior undergraduates on their capstone projects focused on 3D printer control systems and numerical model development.

Comprehensive exam: NSF Proposal | Proposal writing

- Quantifying Early-Age Concrete Evolution Using Leaky Rayleigh Waves: A Validated Multiphysics Modeling Approach.

Graduate Teaching Assistant | Department of Mechanical Engineering | ULL | Aug 2021-Present

- Taught 4 undergraduate and graduate level engineering and management courses (theory and lab class) of 400+ students. **Courses:** Biomechanics-I, Mechanics of materials, Finite element analysis, Graphical Communications and Design
- Cover-up class, Grading, Invigilation, Solution manual development, Solution classes, Exam question development. Tools: SolidWorks, ABAQUS, LaTeX, Microsoft Suites, Moodle.

Tech Intern | Opportunity Machine | Louisiana, Lafayette, LA | Jun 2025 – Aug 2025

Project 1: AI-Driven Ear-Piercing Safety Assessment with VR Jewelry Visualization

- Developed an AI-driven scanning system that detects safe spots on the human ear for piercing, avoiding critical anatomical areas like blood vessels and dense cartilage.
- Integrated results into an interactive VR simulation that overlays customizable jewelry on safe zones, enabling personalized, risk-free pre-piercing visualization.

Research Assistant (RA) | Tran's Lab | Michigan Tech, Houghton, MI | Jan 2024-Aug 2024

Advisor – Dr. Quang Tran

Project 1: Development of Air-Coupled Finite Element Model for Early-Age Concrete Using Leaky Rayleigh Wave

- Developed innovative non-contact ultrasonic techniques to assess early-stage concrete properties such as setting time, aggregate size and distribution enhancing material analysis.
- Integrated finite element simulations with experimental validation to establish reliable non-destructive testing methods for early age concrete materials.
- **Application:** Improving early-age concrete quality control and durability assessment to optimize construction practices and reduce infrastructure repair costs.

Service Engineer | AUDI AG | Bangladesh, Dhaka | Jan 2019 – Aug 2021

- Led the introduction of mild hybrid technology in Bangladesh, enhancing service efficiency, optimizing inventory and supplier management, and ensuring Audi's quality standards through technical and warranty coordination.

Intern Engineer | Walton Hi-Tech Industries Ltd. | Bangladesh, Dhaka | Oct 2016 – Dec 2016

- Trained in HVAC R&D, gaining hands-on experience in refrigeration and air conditioning technologies.

Professional Events

Launch Academy, Tech entrepreneurship program | Opportunity Machine | Jun 2025

Designing Leadership program | ULL | Aug 2024 – Dec 2024

Carnegie Mellon Forum on Biomedical Engineering | Oral Presentation | Sep 2023

Published Peer Reviewed Journals

- Istiak, A., **Islam, S.**, Adouni, M., Faisal, T. R. (2025). Hyperelastic constitutive modeling of healthy and enzymatically mediated degraded articular cartilage. *Biomechanics and Modeling in Mechanobiology*, 1-17 ([Link](#))
- Dang, Y.H., Dauzat, E., Istiak, A., Jackson, K., Songe, V., West, L., Kayes, M.I., **Islam, M.S.** and Faisal, T.R. (2025). Conversion of an FDM printer to direct ink write 3D bioprinter utilizing an efficient and cost-effective extrusion system. *Annals of 3D Printed Medicine*, 100212. ([Link](#))
- Patwari, A. U., Hasan, S. U., & **Islam, S.** (2021). Development of a Thermo-Acoustic Device for the conversion of sound waves into cold air. *Acta Technica Corviniensis-Bulletin of Engineering*, 14(1), 57-60. ([Link](#))

Journals in Progress

- **Islam, S.**, Adouni, M., Faisal, T. R. (2025). Multi-structural fibril-reinforced poro-hyperelastic (MS-FRPHE) finite element model to investigate the zone-specific mechanics of cartilage and its constituents. *Biomechanics and Modeling in Mechanobiology*. (**Under review**)

Selected Presentation

- **S. Islam**, Istiak, A, I. Kayes, and T. R. Faisal. Zone-specific cartilage mechanics following cartilage degradation: a combined AI (Convolutional Neural Network) and FE approach. 20th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering (CMBBE 2025), Barcelona, Spain. **(Oral)**
- **S. Islam**, T. R. Faisal. Computational Homogenization of the Mechanics of Depth-Dependent Articular Cartilage under Compressive Loading. 41st Southern Biomedical Engineering Conference, (SBEC 2025), Texas, USA. **(Oral)**
- Istiak, A, **S. Islam**, and T. R. Faisal. Multiscale fibril-reinforced poro-hyperelastic model for cartilage and chondrocyte mechanobiology. 19th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering (CMBBE 2024), Vancouver, Canada. **(Oral)**
- **S. Islam**, T. R. Faisal. Advanced Multiscale Modeling of Cartilage: Assessing the Mechanical Influence of Zonal and Radial Cell Variability. 40th Southern Biomedical Engineering Conference, (SBEC 2024), Shreveport, LA, USA. **(Oral)**
- **S. Islam**, T. R. Faisal. Multi-structural Fibril-reinforced Poro-hyperelastic (MSFPH) Finite Element Modeling Approach for the Understanding of Articular Cartilage Pathomechanics. Orthopedic Research Society (ORS) 2024, Long Beach, CA, USA. **(Oral)**
- **S. Islam**, T. R. Faisal. A Multi-Structural Fibril-Reinforced Poro-Hyperelastic (MSFPH) Finite Element Model to Understand the Pathomechanics of Articular Cartilage. 39th Southern Biomedical Engineering Conference, (SBEC 2023), Baton Rouge, LA, USA. **(Oral)**
- **S. Islam**, T. R. Faisal. A multi-structural fibril-reinforced poro-hyperelastic (MSFPH) finite element model is instrumental in understanding the pathomechanics of articular cartilage. Carnegie Mellon Forum on Biomedical Engineering, 2023. **(Oral)**

Awards and Achievement

Full Tuition Aid | Department of Mechanical Engineering | UL Lafayette | *Aug 2021 – May 2026*

Full Tuition Aid | Department of Civil Engineering | Michigan Tech | *Jan 2024 – Aug 2024*

Research Travel Grant | Southern Biomedical Engineering Conference | *2024*

Designing Leadership Program | UL Lafayette | *2024*

BSTF Travel Grant | Bangladesh-Sweden Trust Fund | *2021-2022*

OIC undergraduate study scholarship | Islamic University of Technology | *Jan 2014 – Nov 2017*

Service and Outreach

- **Volunteer**, Biomedical Engineering Society (BMES) Annual Meeting, San Antonio, TX (*Oct 2022*). supported conference operations through diverse roles including registration assistance, session coordination, poster and platform session support, attendee guidance, and special event logistics.
- **Vice President**, Bangladesh Student Association, UL Lafayette (*Jan 2022 – Dec 2023*): Collaborated with international communities to foster diverse cultural exchanges. Billing and payment of BSA sponsored social activities with a \$6000 budget. Led 2 fundraising initiatives, generating \$3000.
- **Member**, Society of Asian Scientists & Engineers, UL Lafayette (*Jan 2022 - Present*)
- **Head of Event Management**, IMechE Student Chapter of IUT (*Jan 2016 - Jan 2017*): Successfully organized two World Bank-supported seminars on Fabrication Lab and 3D printing.
- **Logistic Chair**, Mecceleration 2017, IUT (*2017*): Orchestrated the largest mechanical fest in the country, demonstrating exceptional organizational and leadership skills.