KULSUM ALI

519 697 1598 | kfali@uwaterloo.ca | www.linkedin.com/in/kulsum-ali

EXPERTISE

Technical Skills

- MATLAB, Python, C# & C++
- 3D Printing (FDM & SLA)
- NOVA Electronics 3D Printer, KiCAD
- Laser Cutting, CNC Milling
- Falstad, LTSpice
- Proficient in Microsoft Office.
- Canva, Wix, Figma, Biorender
- OnShape, SolidWorks, AutoCAD, Fusion360
- Soft-Lithography and Microfabrication
- Design Expert (DoE Software)
- Technical Documentation & Data Analysis

Soft Skills

- Communication Skills
- Collaborative Skills
- Leadership Skills
- Problem-Solving Skills

EDUCATION

University of Waterloo

BASc, Biomedical Engineering

Medical Device Specialization, Co-op Program (Distinction)

Sept 2021 - April 2026

MASc, Mechanical & Mechatronics Engineering

Thesis-Based: Antibiotic Resistance Detection Device

Sept 2026 - April 2028

MAJOR ACHIEVEMENTS

Peer-Reviewed Journal Publication

M. ShafieiDarabi, Q. Mao, W. Cui, M. Courtney, R. Miranda, K. Ali, L. LeSergent, R. Tjandra, Z. Abbasi, L. P. Lee, and C. L. Ren,
"Microwave biosensor for amylase detection in drainage fluid to monitor anastomotic leakage," *Biosensors and Bioelectronics*, vol. 290, p. 117990, Dec. 2025, doi:10.1016/j.bios.2025.117990.

Final Year Design Project Awards Apr 2026

- **Baylis Capstone Design Award**
- **Engineer of the Future Fund**
- **Program & Faculty Sustainability Awards**
- **iCapstone Guests' Choice Award**
- **Quantum Valley Investments Problem Pitch**
- **Glocal Foundation Fund**

President's Scholarship ($2000) Sept 2022

Student of Excellence June 2019 - 21

Ontario Scholar June 2021

WORK EXPERIENCE

Waterloo Microfluidics Lab I University of Waterloo

Biosensing & Microfluidics Researcher **Jan 2025 - April 2026**

- Designed and fabricated PDMS/polymer microfluidic devices using soft lithography, SLA/FDM 3D printing, laser cutting, and CNC milling, with iterative improvements through rapid prototyping.
- Supported the design, fabrication, and testing of microfluidic platforms for biomedical applications, including protein purification and biosensor-based anastomotic leakage detection.
- Conducted experimental testing and prototype optimization to improve device functionality, reliability, and integration with biosensing workflows.

McGuire Lab I University of Western Ontario

Microfluidic Device Researcher **May - August 2024**

- Developed a cell stretching device to compare traction force in treated vs. untreated smooth muscle cells, helping to understand how different drugs affect traction force and contribute to advancements in disease mitigation.
- Collaborated with master's students to conduct myograph experiments, aiming to identify the most effective drugs for muscle relaxation.

Structural Biomechanics Lab | University of Waterloo

Structural Biomechanics Researcher **Sept - Dec 2024**

- Designed and 3D printed foot forms for experiments analyzing stress-strain behavior and material properties related to Metatarsal fracture risk.
- Modified foot form designs using **SolidWorks** to optimize structural accuracy.
- Developed and implemented data processing code on **MATLAB** to clean up noisy graphs by removing outliers and improving data reliability.

VCycene Inc. I Markham ON

Biotech Engineering Intern **Sept - Dec 2023**

- Designed & executed Design of Experiments (DoE) using **Design Expert** for compost chambers, optimizing key parameters and increasing composting efficiency.
- Conducted literature reviews, developed SOPs, and performed Germination Soil & NPK tests, contributing to informed decision-making and process improvement.
- Assembled 6 compost chambers, showcasing hands-on engineering skills in **soldering & crimping** cables, **laser cutting**, and **3D printing** for streamlined test runs.

Materials Interactions with Biological Systems Lab | University of Waterloo

Biomaterials & Cellular Analysis Researcher **Jan - Apr 2023**

- Developed a novel protocol for extracting DNA and RNA from tear-film neutrophils to facilitate further research into their recruitment patterns.
- Collected flow cytometry data to identify trends in surface receptor expression on neutrophils.
- Designed professional scientific graphics using **Biorender** to illustrate research findings for a PhD student's thesis paper.

NOTABLE PROJECTS / OTHER EXPERIENCE

Project Echo **July 2023**

- Designed and engineered an EMG-based prosthetic hand grasper, integrating custom circuitry with an Arduino microcontroller to enable precise go-no-go commands for intuitive control by hand amputees.
- Utilized 3D printing and FEA in Onshape and Solidworks to collaboratively create an ergonomic, robust grasper design. Conducted thorough testing using lab devices to ensure functionality and meet safety standards.

Final Year Design Project **Sept 2025 - Apr 2026**

- Developed a point-of-care biosensing device to detect enzyme-driven antibiotic resistance within 15 minutes, supporting faster clinical decision-making without conventional culture-based testing.
- Designed and optimized the device's mechanical system, sample-handling workflow, fluid-flow pathway, and temperature-control components for reliable point-of-care use.
- Conducted validation experiments and iterative prototype testing to assess device performance, usability, and detection reliability.
- Secured over $16K in project funding and awards, including the Baylis Capstone Design Award, Engineer of the Future Fund, and iCapstone Guests' Choice Award.