SAKIB MAHMUD

Research Associate | Bioengineering & Biomedical AI | Biosensors & Wearables | Medical Imaging | Computational Biomechanics

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Research profiles: Google Scholar | ResearchGate | Web of Science | Scopus | ORCID | Personal Website

RESEARCH PROFILE

Electrical Engineer (BSc Hons., MSc) and multidisciplinary bioengineering researcher working at the interface of biomedical AI, medical image computing, physiological signal processing, wearable and biosensor technologies, and computational biomechanics. Research integrates deep learning, multimodal and foundation-model methods, biomedical instrumentation, signal/image processing, finite-element and physics-based modeling, and experimental validation to develop translational healthcare technologies. Contributed to more than 10 funded academic, clinical, and industry projects involving Qatar University, QNRF, Hamad Medical Corporation, Sidra Medicine, and external partners, with 57 peer-reviewed journal publications spanning diabetic-foot technologies, medical imaging, cardiovascular and neurological sensing, wearable health monitoring, biomechanics, biosensing, and computational healthcare. Experienced across the full research lifecycle, including study conception, competitive grant development, IRB/ethics preparation, biomedical dataset creation, experimental and computational workflow design, model validation, scientific writing, intellectual-property development, and multidisciplinary project coordination.

RESEARCH INTERESTS

- **Translational Bioengineering for Diabetes & Wound Care:** AI-enabled diabetic-foot and wound assessment, multimodal RGB-thermal analysis, plantar sensing, digital biomarkers, and computational approaches that complement wound-healing and regenerative technologies.
- **Biomedical Devices, Biosensors & Wearable Intelligence:** Smart insoles, physiological and biomechanical sensors, biomedical instrumentation, IoT-enabled health monitoring, and intelligent point-of-care or wearable diagnostic systems.
- **Biomedical AI & Medical Image Computing:** Medical image segmentation, classification, registration, multimodal imaging, foundation-model adaptation, computer-aided diagnosis, and robust cross-domain medical AI.
- **Computational Biomechanics & Human Movement:** Multimodal estimation of 3D kinetics from smart insoles, IMUs, plantar-force measurements, and body kinematics; musculoskeletal applications, physics-informed learning, and finite-element modeling.
- **Physiological Signal Processing & Digital Health:** AI-based analysis and reconstruction of PPG, ECG, EEG, EMG, Doppler, radar, and other physiological signals for cardiovascular, neurological, and continuous health monitoring.
- **AI-Enabled Biosensing & Computational Diagnostics:** Machine learning for biosensors and spectroscopic data, including SERS/Raman microbial diagnostics, multimodal data fusion, domain generalization, personalized health, and clinically deployable decision-support systems.

EDUCATION

Qatar University — Doha, Qatar
Master of Science (MSc) in Electrical Engineering | 2021 – 2023

- **CGPA:** 3.31/4.00; graduated in good standing.
- **Thesis (3 Q1 journal publications):** Deep Learning Techniques for Kidney Disease Detection.
- **Supervisor:** Muhammad E. H. Chowdhury, Department of Electrical Engineering, Qatar University.
- **Thesis-derived studies:** Kidney Cancer Detection; Kidney Stones Segmentation; Prenatal Hydronephrosis Severity Classification.
- **Relevant coursework:** Digital Signal Processing, Applied Statistical Analysis, Applied Numerical Analysis, Applied Research Methodology.

Qatar University — Doha, Qatar
Bachelor of Science (BSc) in Electrical Engineering — Honors | 2016 – 2020

- **CGPA:** 3.51/4.00; graduated with distinction and completed the Qatar University Honors Program.
- **Senior Design Project (2 Q1 journal publications):** Design and Implementation of a Novel Real-time Wearable System for Early Detection of Diabetic Foot Ulcer (DFU).
- **Supervisor:** Muhammad E. H. Chowdhury, Department of Electrical Engineering, Qatar University.
- **Project-derived studies:** Electronic- and Photonic-sensor-based smart insoles for diabetic-foot monitoring.
- **Relevant coursework**: Biomedical Engineering, Artificial Neural Networks, Signals & Systems, Signal Processing & Filtering, Sensors & Instrumentation, Embedded Systems, Control Systems.

PROFESSIONAL EXPERIENCE

Qatar University — Doha, Qatar
Research Associate — Full-time | July 2023 – Present

- Conduct and coordinate multidisciplinary bioengineering research across biomedical AI, medical imaging, wearable and multimodal sensing, physiological signal processing, and computational biomechanics; manage end-to-end workflows spanning study conception, data acquisition, computational/experimental design, model development, validation, dissemination, and project reporting.
- Develop, curate, and manage biomedical datasets—including multimodal medical images, physiological signals, wearable/biomechanical measurements, and clinical/experimental data—with emphasis on data organization, preprocessing, annotation and quality control, reproducibility, and preparation of analysis-ready research datasets.
- Contribute substantially to competitive research-grant development, including major multi-million-QAR proposals, by preparing scientific rationale and literature synthesis, objectives, methodology, work packages, milestones, deliverables, translational impact, and supporting technical documentation.

- Prepare and support IRB/ethics submissions and amendments, study protocols, data-management and governance documentation, and supporting materials for human-subject and clinical research; contribute to research translation and intellectual-property development through invention disclosures, patent documentation, and supporting technical materials.
- Author and co-author journal manuscripts, review articles, book chapters, grant/progress reports, technical documents, figures, and reviewer responses; coordinate research activities and documentation with clinicians, engineers, data scientists, and external academic/industry partners.

Iberdrola Innovation Middle East — Doha, Qatar
Data Scientist — Contract | July 2023 – July 2024

- Developed and validated deep-learning and multimodal-fusion methods for non-intrusive load and occupancy monitoring using large multichannel smart-meter datasets; contributed to data curation, reproducible analysis, technical reporting, and peer-reviewed publications.

Hamad Medical Corporation — Doha, Qatar
Research Assistant — Part-time | January 2022 – August 2023

- Co-developed the HMC-QU-AHN clinical ultrasonography (US) benchmark dataset using data from Hamad Medical Corporation and Sidra Medicine, including case organization, data curation, quality control, clinically guided labeling/ROI workflows, and preparation of analysis-ready imaging data.
- Developed YOLO-based US-ROI detection, kidney/fluid segmentation, and deep-learning models for automated antenatal hydronephrosis detection and severity grading from renal ultrasound images.
- Contributed to IRB/ethics submissions, amendments, clinical study protocols, data-governance documentation, and other supporting materials required for human-subject and clinical-data research.
- Supported research-grant/proposal development, literature review, manuscript preparation, result/figure generation, technical and progress reporting, reviewer responses, and research dissemination across the HMC–QU collaborative program.

Qatar Computing Research Institute (QCRI), HBKU — Doha, Qatar
Summer Research Intern — Bioinformatics | May 2023 – July 2023

- Investigated Mendelian-disease RNA-seq abnormal-gene discovery using variational autoencoders, including RNA-seq data preprocessing, anomaly-detection analysis, abnormal-gene prioritization, interpretation of findings, and documentation of reproducible methods/results.

Qatar University — Doha, Qatar
Research Assistant — Full-time | June 2020 – June 2023

- Executed multidisciplinary healthcare and bioengineering projects spanning biomedical signals, medical imaging, wearable devices, biomechanics, implants, biosensors, and IoT health monitoring; acquired, organized, curated, and quality-checked datasets from physiological signals, medical images, gait/biomechanical measurements, smart-insole systems, and experimental platforms.
- Designed and validated deep-learning and signal/image-processing pipelines for Doppler restoration/classification, PPG/ECG vital-sign estimation, EEG/ECG reconstruction, hip-implant analysis, DSPN gait/EMG monitoring, medical-image analysis, and smart-insole sensing.
- Contributed to competitive grant proposals, IRB/ethics documentation, study protocols, invention disclosures and patent-related technical materials, literature reviews, manuscripts, review articles, book chapters, technical/progress reports, figures, and reviewer responses across multiple funded projects.
- Supported experimental planning, biomedical hardware and prototype development, finite-element/computational studies, reproducible analysis, and multidisciplinary collaborations with Qatar University, HMC, Sidra Medicine, and external research partners.

Qatar University — Doha, Qatar
Research Assistant — Part-time | August 2018 – May 2020

- Developed electronic and photonic smart-insole systems for diabetic-foot monitoring, including sensor integration, embedded data acquisition, plantar-pressure/temperature experiments, dataset preparation, classical machine-learning analysis, and system validation.
- Contributed to the design and evaluation of an ECMO training emulator and supported literature review, research documentation, poster/manuscript preparation, experimental activities, and coordination with clinical collaborators during early translational bioengineering projects.

Omdena — Remote
Lead / Junior Machine Learning Engineer — Contract | July 2021 – February 2022

- Led technical tasks in distributed international AI teams working on EV charging-demand characterization and climate/geopolitical risk modeling using time-series analysis, remote sensing, and satellite-image segmentation; coordinated modeling workstreams and documented methodologies/results for external partners.

Additional Technical Experience
AI / Data Science / IoT / Electrical Engineering Internships | 2019 – 2022

- Completed focused internships with Zaka + Microsoft, The Sparks Foundation, Data Glacier, and Engineering Consultants Group (ECG), covering AI pipelines, cloud fundamentals, API/model deployment, IoT/computer vision, and electrical-building systems.

FUNDED RESEARCH PROJECTS

AI-powered smart insole for real-time 3D plantar kinetics monitoring
QU Collaborative Grant — QUCG-CENG-26/27-942 | March 2026 – Present

- Developed and evaluated unimodal AI frameworks for estimating comprehensive 3D plantar kinetics from distributed smart-insole vGRF data and, independently, from full-body kinematics.
- Currently developing a flexible multimodal (Fleximodal) fusion framework integrating smart-insole measurements and body kinematics for robust, subject-generalizable 3D kinetics estimation.

SmartWoundCare: AI-enabled diabetic foot ulcer severity classification from thermal and visual images
QU High Impact Grant — QUHI-CENG-25/26-721 | July 2025 – February 2026

- Developed a multimodal RGB-thermal pipeline for diabetic-foot-ulcer severity assessment and performed cross-modal image registration to improve anatomical alignment.
- Applied 2D foundation models (e.g., SAM) for foot segmentation and generated consensus masks for downstream multimodal analysis.
- Integrated registered thermal and visual information for multiclass DFU classification and evaluated clinically relevant cross-modal representations.
- Evaluated and compared early-, feature-, and decision-level fusion strategies.

QSCare: Smart wearable AI-based cardiovascular disease detection system
QU High Impact Grant — QUHI-CENG-22/23-548 | June 2022 – June 2023

- Extracted Internal Carotid Artery (ICA) and Middle cerebral artery (MCA) waveforms from transcranial Doppler audio.

- Restored low-quality Doppler waveforms using 1D CycleGANs.
- Developed Self-ONN-based deep classifiers for healthy/ICU discrimination.

Severity stratification of antenatal hydronephrosis using deep learning and ultrasonography
HMC Internal Grant — MRC-01-21-1027 | January 2022 – August 2023

- Created a benchmark ultrasound dataset (HMC-QU-AHN) for Antenatal Hydronephrosis (AHN) in Qatar based on data collected from HMC and Sidra Medicine.
- Developed an AI-enabled application for AHN detection and severity grading from segmented kidney and/or fluid regions from renal ultrasound images.

Smart wireless biomimetic composite implants for bone revision surgery retardation
QNRF Grant — NPRP11S-0102-180178 | July 2021 – May 2022

- Designed 3D hip-implant/femur/pelvis models using Fusion360.
- Performed finite-element analysis (FEA) in ANSYS across gait scenarios.
- Developed a YOLO-CNN-based pipeline for X-ray-based loosening classification.
- Developed an in vitro experimental setup in collaboration with HMC.

Contactless ANFIS-EMG wearable device for diabetic sensorimotor polyneuropathy
QNRF Grant — NPRP12S-0227-190164 | April 2021 – June 2021

- Developed ML-based wearable methods for distal symmetric polyneuropathy (DSPN) monitoring using gait-cycle and EMG data.

COVIDCARE: IoT platform for remote monitoring of COVID-19 vital signs
QU Emergency Response Concept Development Grant — ERCD-CENG-2020-1 | December 2020 – March 2021

- Developed wearable PPG/ECG acquisition hardware and DL methods for physiological parameter estimation.

Smart insoles for diabetic foot monitoring
QNRF Undergraduate Research Experience Program (UREP) — UREP23-031-2-014 | January 2020 – May 2020

- Developed smart insoles for early detection of DFU using electronic and photonic sensors to measure plantar pressure and temperature simultaneously in real time.
- Classical ML methods were used to classify patients with diabetes mellitus (DM) according to disease severity.

Extra-Corporeal Membrane Oxygenation (ECMO) emulator development
UREP22-003-2-001 | August 2018 – October 2019

- Developed an ECMO Emulator for training clinicians.
- Attended seminars and hands-on ECMO training sessions at Hamad General Hospital and Al-Wakra Hospital in Qatar.

E-Tawfeer: Secure edge-based energy-efficiency platform using AI for behavioral change
QNRF Grant — NPRP14S-0401-210122 | August 2024 – June 2025

- Contributed to the design and development of smart plugs and AI-driven energy-management methods for residential environments.
- Implemented federated-learning concepts for privacy-preserving distributed analytics.
- Conducted a comprehensive review of deep reinforcement learning (DRL) for the Energy Internet.

Non-Intrusive Presence Detection from Smart Meter Data
QU External Grant — QUEX-CENG-IBERDROLA-23/24-2 | July 2023 – July 2024

- Developed a near-real-time, non-intrusive household appliance load monitoring framework (NILM) using multichannel, aggregated smart-meter data.
- Designed a cascaded, DL-driven non-invasive load and occupancy monitoring (NILOM) framework. NIOM was guided by NILM for improved performance. The resulting NILOM framework fused smart-meter-derived metadata to improve the robustness and reliability of household occupancy detection.

RESEARCH OUTPUT SUMMARY

- **57** peer-reviewed journal articles (**49** Q1, **6** Q2, **1** Q3, **1** Q4); plus **3** conference papers, **1** book chapter, and **2** research posters.
- Primary research themes include biomedical AI, medical imaging, physiological signal processing, wearable sensing, biosensors, biomechanics, biomedical devices, diabetic-foot technologies, and computational healthcare, with additional cross-domain AI work in energy and engineering.
- Translational outputs include patent/IP contributions; released research software: **SuperONN-Layers** and **SERS-D2DNet + SuperRaman**; published datasets are hosted on Zenodo and Kaggle.

PEER-REVIEWED JOURNAL PUBLICATIONS

2026 Machine learning-enabled label-free SERS for microbial sensing: Toward robust, generalizable, and deployable workflows. Talanta, Elsevier (Q1; Review).
2026 Enhancing kidney stone segmentation in computed tomography images through successive scope reduction and intra-framework feature transfer. Biomedical Signal Processing and Control, Elsevier (Q1).
2026 SERS on analyte-enriched blood for rapid, culture-free sepsis recognition and causative pathogen identification with super-operational neural networks. Talanta, Elsevier (Q1).
2026 A comprehensive review of deep reinforcement learning applications from centralized power generation to modern energy internet frameworks. Renewable and Sustainable Energy Reviews, Elsevier (Q1; Review).
2026 Deep learning-based cross-device standardization of surface-enhanced Raman spectroscopy for enhanced bacterial recognition. Spectrochimica Acta Part A, Elsevier (Q1). | Code | Dataset
2025 3D foot kinetics estimation from distributed vGRF from smart insoles via 1D domain transformation. IEEE Journal of Biomedical and Health Informatics (Q1).
2025 A cascaded deep learning framework for simultaneous non-intrusive load and occupancy monitoring using multi-channel aggregated smart meter data. Journal of Building Engineering, Elsevier (Q1).
2025 Deep learning-based beat-to-beat arterial blood pressure estimation using distant radar signals. Neural Computing and Applications, Springer Nature (Q1).
2025 Optimizing energy efficiency through precise occupancy detection: A tailored CNN architecture for smart buildings and beyond. Neural Computing and Applications, Springer Nature (Q1).
2025 Multimodal feature fusion and ensemble learning for non-intrusive occupancy monitoring using smart meters. Building and Environment, Elsevier (Q1).

2025 Rapid wall shear stress prediction for aortic aneurysms using deep learning: a fast alternative to CFD. Medical & Biological Engineering & Computing, Springer Nature (Q2).
2024 A novel 1D generative adversarial network-based framework for atrial fibrillation detection using restored wrist photoplethysmography signals. Biomedical Signal Processing and Control, Elsevier (Q1).
2024 Stress transfer, stress shielding, and micro-movement analysis in the implanted femoral bone region with various hip implant stem materials: a finite element approach. Materials Today Communications, Elsevier (Q1).
2024 GearFaultNet: Novel network for automatic and early detection of gearbox faults. IEEE Access (Q1).
2024 QU-GM: An IoT-based continuous glucose monitoring system using photoplethysmography, blood pressure, and demographic data. IEEE Access (Q1).
2024 ECG waveform generation from radar signals: A deep learning perspective. Computers in Biology and Medicine, Elsevier (Q1).
2024 Restoration of magnetohydrodynamic corrupted 12-lead ECG through deep learning for cardiac monitoring during MRI. Engineering Applications of Artificial Intelligence, Elsevier (Q1).
2024 ExoventQ: A novel low-cost portable negative pressure ventilator design and implementation. IEEE Access (Q1).
2023 Automated grading of prenatal hydronephrosis severity from segmented kidney ultrasounds using deep learning. Expert Systems with Applications, Elsevier (Q1).
2023 Wearable wrist-to-finger photoplethysmogram translation through restoration using super operational neural networks based 1D-CycleGAN for enhancing cardiovascular monitoring. Expert Systems with Applications, Elsevier (Q1).
2023 GCDN-Net: Garbage classifier deep neural network for recyclable urban waste management. Waste Management, Elsevier (Q1).
2023 Restoration of motion-corrupted EEG signals using attention-guided operational CycleGAN. Engineering Applications of Artificial Intelligence, Elsevier (Q1).
2023 LGI-rPPG-Net: A shallow encoder-decoder model for rPPG signal estimation from facial video streams. Biomedical Signal Processing and Control, Elsevier (Q1).
2023 Deep learning framework for liver segmentation from T1-weighted MRI images. Sensors, MDPI (Q1).
2023 Robust and novel attention-guided MultiResUNet model for 3D ground reaction force and moment prediction from foot kinematics. Neural Computing and Applications, Springer Nature (Q1).
2023 Advancement in total hip implant: A comprehensive review of mechanics and performance parameters across diverse novelties. Journal of Materials Chemistry B, Royal Society of Chemistry (Q1; Review).
2023 Laser-induced graphene based smart insole to measure plantar temperature. IEEE Sensors Journal (Q1).
2023 A novel deep learning technique for morphology-preserved fetal ECG extraction from maternal ECG using 1D-CycleGAN. Expert Systems with Applications, Elsevier (Q1).
2023 Kidney cancer diagnosis and surgery selection by machine learning from CT scans combined with clinical metadata. Cancers, MDPI (Q1).
2023 A deep learning framework for the detection of abnormality in cerebral blood flow velocity using transcranial Doppler ultrasound. Diagnostics, MDPI (Q1).
2023 Fetal ECG extraction from maternal ECG using a deeply supervised LinkNet++ model. Engineering Applications of Artificial Intelligence, Elsevier (Q1).
2023 MultiResUNet3+: A full-scale connected multi-residual UNet model to denoise electrooculogram and electromyogram artifacts from corrupted electroencephalogram signals. Bioengineering, MDPI (Q2).
2023 PCovNet+: A CNN-VAE anomaly detection framework with LSTM embeddings for smartwatch-based COVID-19 detection. Engineering Applications of Artificial Intelligence, Elsevier (Q1).
2023 Self-Attention MHDNet: A novel deep learning model for detection of R-peaks in ECG signals corrupted with magnetohydrodynamic effect. Bioengineering, MDPI (Q2).
2023 Automated measurement of penile curvature using deep learning-based novel quantification method. Frontiers in Pediatrics, Frontiers (Q1).
2023 Deep learning-based middle cerebral artery blood flow abnormality detection using flow velocity waveform derived from transcranial Doppler ultrasound. Biomedical Signal Processing and Control, Elsevier (Q1).
2023 NDDNet: A deep learning model for predicting neurodegenerative diseases from gait pattern. Applied Intelligence, Springer Nature (Q2).
2023 Design and performance evaluation of a novel spiral head-stem trunnion for hip implant using finite element analysis. Materials, MDPI (Q1).
2023 Fiber Bragg gratings-based smart insole to measure plantar pressure and temperature. Sensors and Actuators A: Physical, Elsevier (Q1).
2023 Surface acoustic wave sensors for hip implant: A numerical and computational feasibility investigation using finite element methods. Biosensors, MDPI (Q1).
2023 NABNet: A nested attention-guided BiConvLSTM network for robust prediction of blood pressure components from reconstructed arterial blood pressure waveforms using PPG and ECG. Biomedical Signal Processing and Control, Elsevier (Q1).
2023 MLMRS-Net: EEG motion-artifact removal using multi-layer multi-resolution spatially pooled 1D signal reconstruction. Neural Computing and Applications, Springer Nature (Q1).
2022 M2ECG: Wearable mechanocardiograms to electrocardiogram estimation using deep learning. IEEE Access (Q1).
2022 PPG2ABP: Translating photoplethysmogram signals to arterial blood pressure. Bioengineering, MDPI (Q2).
2022 Lightweight end-to-end deep learning solution for estimating respiration rate from photoplethysmogram signal. Bioengineering, MDPI (Q2).
2022 A review of biomaterials and associated performance metrics analysis in pre-clinical finite-element models and implementation stages for total hip implant systems. Polymers, MDPI (Q1; Review).
2022 Design and implementation of a smart insole system to measure plantar pressure and temperature. Sensors, MDPI (Q1).
2022 PCovNet: A presymptomatic COVID-19 detection framework using deep learning on wearables data. Computers in Biology and Medicine, Elsevier (Q1).
2022 QUCoughScope: An intelligent application to detect COVID-19 patients using cough and breath sounds. Diagnostics, MDPI (Q1).
2022 A shallow U-Net architecture for reliably predicting blood pressure from photoplethysmogram and electrocardiogram signals. Sensors, MDPI (Q1).
2022 An investigation to study the effects of Tai Chi on human gait dynamics using classical machine learning. Computers in Biology and Medicine, Elsevier (Q1).
2022 HipXNet: Deep learning approaches to detect aseptic loosening of hip implants using X-ray images. IEEE Access (Q1).
2021 COVID-19 infection localization and severity grading from chest X-ray images. Computers in Biology and Medicine, Elsevier (Q1).
2021 Detection and severity classification of COVID-19 in CT images using deep learning. Diagnostics, MDPI (Q1).
2021 COVID-19 vaccine willingness and hesitancy among residents in Qatar: a quantitative analysis based on machine learning. Journal of Human Behavior in the Social Environment (Q1).
2019 Towards next-generation cannulation simulators. Qatar Medical Journal (Q3).
2018 Towards the design and implementation of a human circulatory system for extracorporeal membrane oxygenation simulation. The Egyptian Journal of Critical Care Medicine (Q4).

CONFERENCE PAPERS, BOOK CHAPTER & POSTERS

Conference Papers:

- Deep Learning Technique to Denoise Electromyogram Artifacts from Single-Channel Electroencephalogram Signals — 8th International Conference on Signal, Image Processing and Embedded Systems (SIGEM), 2022.
- Classification of Viral, Bacterial, and COVID-19 Pneumonia using Deep Learning Framework from Chest X-Ray Images — SIGEM, 2022.

- Preliminary Implementation of the Next Generation Cannulation Simulator — IEEE Student Conference on Research and Development (SCOReD), 2019.

Book chapter: Rotational Vibration-Based Piezoelectric Energy Harvesting with Bandwidth Enhancement Through Magnetic Oscillators.

Posters:

- Design and Implementation of a Wearable Smart Insole for Studying Altered Vertical Ground Reaction Forces in Diabetic Sensorimotor Polyneuropathy — 13th Annual UREP Competition, 2021.
- QUCoughScope: An Artificially Intelligent Mobile Application to Detect Asymptomatic COVID-19 Patients using Cough and Breathing Sounds — Artificial Intelligence and Medicine: Bringing Digital Breakthroughs to the Bedside, 2023.

INTELLECTUAL PROPERTY & RESEARCH RESOURCES

Patents & Intellectual Property:

- Co-inventor on one provisional patent application (**QUCG-CENG-26/27-942**); non-provisional patent application in preparation.

Published Datasets:

- Multi-Instrument SERS Dataset — Zenodo (2026, v1.0.0); 29,545 SERS spectra from five instruments across 20 analyte classes; data files accessible by request; DOI: 10.5281/zenodo.23372983.
- COVID-QU-Ex Dataset — Kaggle (2022).
- Aseptic Loose Hip Implant X-Ray Database — Kaggle (2022).

Research Software (GitHub):

- SuperONN-Layers — MIT-licensed, reusable PyTorch and TensorFlow/Keras Super-ONN layers: polynomial 1D/2D forward/transposed operations with fixed or trainable receptive-field offsets.
- SERS-D2DNet + SuperRaman — MIT-licensed research implementation accompanying the 2026 cross-device SERS study, covering spectral translation, 20-analyte classification, training, and evaluation (exact paper-result reproduction not established).

TECHNICAL SKILLS

Bioengineering & Healthcare: Biomedical instrumentation, biosensors, wearable devices, physiological signals, medical imaging, image registration, computational biomechanics, diabetic-foot technologies, finite-element modeling, research translation, and digital-health prototyping.

Research Development, Governance & IP: Competitive grant writing, major multi-million-QAR proposals, IRB/ethics submissions, study protocols, biomedical dataset governance, patent/invention-disclosure documentation, manuscripts, book chapters, technical reports, and multidisciplinary project coordination.

AI & Machine Learning: PyTorch, TensorFlow, scikit-learn; classical ML, deep learning, CNNs, generative models, time-series learning, computer vision, segmentation and multimodal learning.
Programming & Data: Python, MATLAB, R, C++; SQL/PostgreSQL; NumPy, SciPy, Pandas; statistical analysis and data analytics.
Signal & Image Processing: Python and MATLAB; biomedical/electrical signals, medical imaging, image processing, signal restoration and feature engineering.
Embedded Systems & Instrumentation: Arduino, ESP32, Raspberry Pi, NI ELVIS II+, LabVIEW; sensors, instrumentation and IoT prototyping.
Engineering Modeling: ANSYS, COMSOL, Fusion 360, Blender, MATLAB/Simulink; finite-element analysis, 3D modeling, and physics-based simulation.
Visualization & Productivity: Matplotlib, Tableau, Power BI, R; Microsoft Word, Excel, PowerPoint, Visio, Teams, OneDrive; LaTeX/Overleaf.
Cloud & Development: Microsoft Azure, Google Cloud Platform, Visual Studio Code, PyCharm; Git-based workflows and basic web/API deployment experience.

CERTIFICATIONS & SPECIALIZATIONS

- Biomedical (Biomed) Comprehensive (CITI Program).
- Google Advanced Data Analytics Professional Certificate (Coursera).
- Google Data Analytics Professional Certificate (Coursera).
- IBM AI Engineering Professional Certificate (Coursera).
- Google AI Essentials (Coursera).
- Excel Skills for Business Specialization (Coursera).
- The Complete SQL Bootcamp: Go from Zero to Hero (Udemy).
- Microsoft Azure certifications: AZ-900, DP-900, AI-900.
- Circular Economy - Sustainable Materials Management (Coursera).

AWARDS & DISTINCTIONS

- Awarded QU Internal Grant 2026–2027 (**QUCG-CENG-26/27-942**).
- Qatar National AI Competition — IDEA category participant (2022).
- Nominated for the 13th Annual QNRF-UREP Competition (**UREP23-031-2-014**; 2021).
- Secured 3rd place in the 12th annual UREP Competition (**UREP22-003-2-001**; 2020).
- Graduated with Honors; completed Qatar University Honors Program and received Distinguished Student Award (2020).
- Qatar University College of Business Poster Competition — 1st Place (2018).
- Qatar University Mathematics Championship Level 2 — 4th Place (2018).
- Dean's Award in six semesters (2016–2018).

LANGUAGES

Bangla — Native | **English** — Bilingual | **Arabic, Urdu, Hindi** — Limited working proficiency