

SHAHARIAR RYEHAN

MSc Acoustic and Vibration Engineering | MEMS sensors, transducers and modelling

Email: sryehan@gmail.com | Phone: +49 670 757210 | Location: France (willing to relocate)

Website: shryehan.netlify.app | ORCID: 0000-0001-6241-4979 | GitHub: github.com/sryehan

PROFESSIONAL SUMMARY

Engineer and applied mathematician working on MEMS sensors, acoustic and vibration transducers, and physical modelling. Erasmus Mundus scholar with an MSc from three European universities and an MSc thesis at Hahn-Schickard on a MEMS photoacoustic CO₂ sensor, covering design, finite element and equivalent-circuit modelling, and full experimental validation. Three peer-reviewed journal publications, including one Q1 article in 2026. Experienced in COMSOL, MATLAB, Python, LTspice, LabVIEW and laser-based vibration measurement. Looking for a PhD position in MEMS, transducers, acoustics, vibration or sensor development.

EDUCATION

MSc in Acoustic and Vibration Engineering (Erasmus Mundus Joint Master WAVES)

University of Coimbra, Universitat Politècnica de Valencia, Aix-Marseille University | Portugal, Spain, France | 2024 - 2026

- Fully funded Erasmus Mundus scholarship of the European Commission. CGPA 7.7.
- Courses: vibration and structural dynamics, waves in continuum media, acoustic metamaterials, piezoelectric and electroacoustic transduction, ultrasound and non-destructive evaluation, acoustic imaging and arrays, simulation methods (FEM, FDTD), programmable instrumentation, digital signal processing, nonlinear systems.
- Taught, examined and defended entirely in English. Thesis defence September 2026.

BSc (Honours) in Applied Mathematics

Hajee Mohammad Danesh Science and Technology University (HSTU) | Bangladesh | until 2024

- CGPA 3.69 out of 4.00. Research assistant in nonlinear partial differential equations, fractional calculus and soliton theory; two journal articles published from this work.

RESEARCH EXPERIENCE

MSc Thesis Researcher - MEMS photoacoustic CO₂ sensor

Hahn-Schickard, Institute for Micro Assembly Technology | Villingen-Schwenningen, Germany | February 2026 - August 2026

- Designed a tunable multi-neck acoustic resonator for an in-house AlN-on-Si piezoelectric MEMS cantilever microphone, from CAD geometry to fabricated prototype.
- Built an equivalent-circuit (lumped-element) model derived from the transfer matrix method, in which every branch corresponds to one geometric feature; added the MEMS cantilever as an additional branch.
- Model predicted the main resonance at 893.4 Hz against 883.7 Hz measured, and reduced design iteration from 3-4 hours of finite element simulation to a few seconds.
- Ran COMSOL thermoviscous acoustic simulations and modal energy participation analysis to assign each measured resonance to a physical sub-volume, confirmed experimentally by component removal tests.
- Built and aligned the optical bench with DFB (4.26 μm) and VCSEL (2 μm) lasers, mechanical chopper, gas-mixing bench and Zurich MFLI lock-in amplifier; measured CO₂ from 5 ppm to 5000 ppm, extracting quality factor 30.7 and limit of detection about 73 ppm.

Research Intern - nonlinear waves in granular metamaterials

Laboratoire de Mécanique et d'Acoustique (LMA), CNRS | Marseille, France | 3 months, 2025

- Studied wave propagation from Hertzian contact to Pochhammer-Chree rod dynamics using discrete element simulation, bifurcation and chaos analysis. Published in Chaos, Solitons and Fractals (2026, Q1).

Independent Researcher - silicon photonic ring resonators for gas sensing

Self-directed project, manuscript in preparation | Remote | 2026

- Automated ring-resonator layout and frequency-response simulation in GDSFactory and SAX, targeting CO₂ detection near 2 μm on a chip-scale platform.

Laboratory Projects - WAVES programme

Aix-Marseille University, UPV Gandia, University of Coimbra | France, Spain, Portugal | 2024 - 2026

- Piezoelectric transducer design, finite element modelling and hands-on assembly in the electrical engineering laboratory at UPV Valencia.
- More than twenty LabVIEW measurement projects with remote instrument control, oscilloscopes and function generators.

- Curved MEMS microphone array for object detection and passive acoustic imaging; near-field beamforming; full-waveform inversion; laser vibrometry study of nonlinear gong vibration; Zener-diode noise source characterisation with entropy and Lyapunov analysis.

TECHNICAL SKILLS

Simulation and modelling: COMSOL Multiphysics (thermoviscous acoustics, pressure acoustics, solid mechanics, heat transfer, drift-diffusion), ANSYS, LTspice, equivalent-circuit and lumped-element modelling, transfer matrix method, finite element analysis, FDTD solver written from scratch, LAMMPS, discrete element method.

Programming: MATLAB, Python, LaTeX, Git.

Design and fabrication: SolidWorks, Ansys Speos, GDSFactory, KLayout, MEMS wafer-level process exposure (oxide and AlN layers, lithography, metal patterning, dicing), CNC-machined prototypes, die-level assembly.

Instrumentation and measurement: Zurich Instruments MFLI lock-in amplifier, Polytec MSA-100-3D laser Doppler vibrometer, LabVIEW, Keithley source measure unit, oscilloscopes, function generators, DFB and VCSEL laser sources, mass flow controllers, wavelength modulation spectroscopy (2f/1f).

Analysis: modal analysis, frequency response and quality factor extraction, system identification, signal processing, nonlinear dynamics, bifurcation and chaos analysis, soliton and nonlinear PDE methods, Lie symmetry analysis.

Languages: Bengali (native), English (fluent, C1), French (intermediate, B1), German (basic, A1).

JOURNAL PUBLICATIONS

- S. Ryehan, M. I. Z. Soma, M. T. Islam, T. Rahman. From Hertzian contact to Pochhammer-Chree dynamics: solitons, chaos and bifurcation in granular metamaterials. *Chaos, Solitons and Fractals*, 2026 (Q1).
- M. T. Islam, S. Ryehan et al. The effect of Brownian motion and noise strength on solutions of the stochastic Bogoyavlenskii model with conformable fractional derivative. *Optik*, 2023.
- M. T. Islam, S. Ryehan et al. A variety of solitons on the oceans exposed by the Kadomtsev-Petviashvili modified equal width equation. *Journal of Ocean Engineering and Science*, 2022.

MANUSCRIPTS SUBMITTED OR IN PREPARATION

- A geometry-derived, experimentally calibrated lumped-element model of a multi-mode MEMS photoacoustic resonator for CO₂ sensing. In preparation, *Sensors and Actuators A: Physical*.
- Kerr-soliton-driven photonic crystal fibre sensor for non-invasive blood glucose detection. Submitted, *Optics Letters*.
- Acoustically driven control of Majorana zero modes via nonlinear phononic solitons. Submitted, *Physical Review B*.
- Further manuscripts on voltage-dependent permittivity in MOSFET potential distribution, VCSEL-pumped silicon photonic ring resonators, variable-order fractional chaotic systems (under revision) and Rossby solitons.

CONFERENCE CONTRIBUTIONS

- On the acoustic investigation of complex and fractionally graded materials by physics-informed neural networks. Forum Acusticum - Euronoise 2025, Malaga, Spain (poster).
- GREENMAP: FDTD and FEM noise modelling with GIS. CPD Climate Week 2025.
- Microphone-array based health risk assessment. ICASDS 2025, Dhaka, Bangladesh.

AWARDS AND ADDITIONAL ACTIVITIES

- Erasmus Mundus Joint Master Scholarship (WAVES), European Commission, 2024-2026, fully funded through competitive international selection.
- Author of Mathematical Olympiad Handbook (Bengali, 160 pages, 2021); organiser and instructor for mathematics and physics olympiad programmes.
- Creator of a daily Blender animation series explaining MEMS devices, published on LinkedIn.

REFERENCES

Ananya Srivastava, Hahn-Schickard, Institute for Micro Assembly Technology (MSc thesis supervisor).

Michael Darche, CNRS, Aix-Marseille University and Centrale Marseille (academic instructor, MSc thesis).

Prof. Dr. Md. Tarikul Islam, Department of Mathematics, HSTU.

Full contact details available on request.