

Mohammad Riahi

Embedded Firmware & Biomedical Hardware Engineer | Wearable & Implantable Biosensing

Raleigh, NC | **U.S. Citizen** | mriahi@ncsu.edu | (984) 269-9881

SUMMARY

ECE PhD student at NC State building wireless, ultra-low-power biosensing devices end to end, both battery-powered and battery-free (NFC): **Nordic nRF + Zephyr RTOS firmware, analog front-ends for ECG/EMG** and electrochemical signals, PCB design, enclosures, and **MATLAB/Python signal processing**. Delivered working hardware to external research partners. Seeking an engineering internship developing wearable physiological sensors.

TECHNICAL SKILLS

Firmware & Embedded: C, Zephyr RTOS, BLE, Nordic nRF52840 / nRF54, MSP430FR69xx, QCC3091, CC2640, ATtiny84, NXP KL25Z, Arduino, Raspberry Pi 4, NFC, SPI/I²C, DMA/ISR design

Electronics & Optics: Biopotential AFEs (INA333, driven-right-leg), potentiostats, DAC/ADC interfacing, filter design, LED/photodiode & μ -LED optoelectronics, PCB design, SPICE

Signal Processing & Data: MATLAB, Python, ECG/EMG, PPG/SpO₂, electrochemical (SWV/DPV) analysis, calibration & validation statistics, real-time pose tracking (SLEAP, Bonsai)

Mechanical & Tools: SolidWorks, Fusion 360 (wearable/implant enclosures), Code Composer Studio, MDK-ARM, VS Code

EXPERIENCE

Graduate Research Assistant & Lab Manager, Vazquez-Guardado Lab

Jan 2023 – Present

NC State University (ASSIST Center), Raleigh, NC

- **Delivered ~10 EMG/ECG front-end modules** to Duke University (Dr. Ni), featuring an INA333 amplifier (1000× gain), DRLC noise reduction, custom hydrogel–copper electrodes, and nRF54 BLE integration.
- Built a wireless aptasensor for continuous bevacizumab monitoring on an **nRF52840 BLE potentiostat** (Zephyr RTOS, DAC8831-generated SWV) with pH-driven aptamer regeneration, benchmarked against a commercial potentiostat.
- Engineered a battery-free NFC optogenetic platform that phase-locks implants across two freely moving mice (**47/57 devices within 2.5 mHz, $\leq 0.1\%$ jitter**), controlled in closed loop by SLEAP–Bonsai pose tracking.
- Wrote MATLAB and Python tools for device calibration, signal analysis, and validation statistics, including an automated tuning GUI used to calibrate 57 implantable devices.
- Mentored and supervised 10+ undergraduate and master's students on low-power biomedical device design and research presentations.

Teaching Assistant, BME 207 – Biomedical Electronics

Jan 2021 – May 2021

NC State University, Raleigh, NC

- Taught circuit design, simulation, and measurement across two lab sections, linking theory to practical biomedical systems.

SELECTED PROJECTS

SmartSwaddle – Infant Vital Sign Monitor (Senior Design)

2022

- Designed, fabricated, and tested a double-sided wearable PCB measuring heart rate, SpO₂, temperature, respiration, lung sounds, and body orientation for SIDS prevention; built an efficient Bluetooth data encoding scheme and a MATLAB GUI for live interpretation.

EDUCATION

North Carolina State University

Raleigh, NC

PhD, Electrical and Computer Engineering | GPA 4.0

Expected December 2027

B.Sc., Biomedical Engineering | GPA 3.88/4.0 | Summa Cum Laude

May 2022

Relevant coursework: Embedded System Design, Wearable Biosensors and Microsystems, Biomedical Signal Processing, Medical Instrumentation, Bioelectricity, Microcontroller Applications

PUBLICATIONS & AWARDS

1. Wu, M., ..., **Riahi, M.**, et al. Patterned wireless transcranial optogenetics generates artificial perception. *Nature Neuroscience*, 2025.
2. Hibberd, T. J., ..., **Riahi, M.**, et al. Optogenetic activation of the gut-brain axis using a fully implantable wireless battery-free device. *AJP-GI*, 2025.
3. Efimov, A. I., ..., **Riahi, M.**, et al. Remote optogenetic control of the enteric nervous system via a wireless, battery-free device. *Biosens. Bioelectron.*, 2024.

Awards: Burroughs Wellcome Fund GDEP Award (\$5,000, 2025–27); Provost's Doctoral Fellowship (\$31,200, 2022–23); NCSU Undergraduate Research Award (2022); Silver Medal, 31st National Mathematics Olympiad, Iran (2014)