

Niyem M. Bawana

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EDUCATION

Georgia Institute of Technology Ph.D. in Electrical and Computer Engineering	Atlanta, GA Summer 2026
New Mexico Institute of Mining and Technology M.Sc. in Mechanical Engineering	Socorro, NM 2021
University of South Florida M.Sc. in Electrical Engineering	Tampa, FL 2019
Stellenbosch University Exchange Program, Department of Mechanical Engineering	Stellenbosch, South Africa 2015
Université de Lomé B.Sc. in Applied Physics	Lomé, Togo 2008

EXPERTISE

Sensor & System Modeling: Physics-based modeling, transducer behavior, multiphysics simulation (COMSOL), signal-chain modeling, calibration workflows, system identification

Circuit & ASIC-Level Analysis: SPICE simulation, transient/frequency-domain analysis, noise/linearity considerations, op-amp/MOSFET characterization, layout interpretation

Signal Processing: Analog/digital filtering, spectral analysis, noise mitigation, waveform decomposition, feature extraction

Software & Tools: MATLAB/Simulink, Python, COMSOL, TensorFlow/PyTorch, SolidWorks, data pipeline design, algorithm prototyping

AI/ML for Sensing: Physics-informed ML, surrogate models, generative modeling, multimodal fusion, optimization algorithms

Digital Logic & Computer Systems: Combinational and sequential logic design, Boolean algebra and minimization, FSM design and timing analysis, datapath and control unit design, memory hierarchy (cache/virtual memory), instruction set architecture (ISA), pipelining, performance analysis, and computer organization/architecture fundamentals

Hardware Description & Digital Design: Verilog/SystemVerilog (RTL design, testbenches, simulation), combinational and sequential circuit implementation, synthesis concepts, timing constraints, and FPGA-based prototyping

Other: C++ (basic), uncertainty quantification, statistical analysis

EXPERIENCE

Teaching

Georgia Institute of Technology Atlanta, GA

Instructor

- Fundamentals of Digital System Design (ECE 2020) Spring 2026
- Circuits and Electronics (ECE 3710) Aug 2024 – Fall 2025

Georgia Institute of Technology	Atlanta, GA
<i>Teaching Assistant</i>	
• ECE 3741 – Experiments in Analog Electronics	Spring 2023
• ECE 3043 – Electronic and Analog Electronic Circuits	Summer 2022
• ECE 3741 – Experiments in Analog Electronics	Fall 2022
• ECE 3550 – Feedback Control of Dynamic Systems	Fall 2021
New Mexico Institute of Mining and Technology	Socorro, NM
<i>Teaching Assistant</i>	
• MENG 431L – Fluid and Thermal Systems Laboratory	Fall 2020
• MENG 210L – Sophomore Design and Measurement Laboratory	Fall 2020
• MENG 405L – Dynamics and Control Systems Laboratory	Spring 2019
Department of Education	Togo
<i>High School Physics Teacher</i>	2008 – 2014
<i>Industry</i>	
SOS Togo Energy	Togo
<i>Applied Scientist</i>	2016 – 2017
• Conducted experimental testing and data collection for energy systems performance evaluation	
• Performed data analytics on field measurements to support system design and optimization decisions	
Stellenbosch University / Eskom	Stellenbosch, South Africa
<i>Research Intern</i>	2015
• Modeled and simulated a concentrating solar power system to track and harness optimal solar radiation	
• Collaborative project between the Department of Mechanical Engineering and Eskom, South Africa’s national energy utility	

PROJECTS

Data-Driven Approaches for NDE of GFRPs	2021 – Present
<i>Ph.D. Research, Georgia Institute of Technology</i>	
• Architect full sensing pipelines integrating transducer physics, waveform propagation models, and signal-processing algorithms for material characterization	
• Develop end-to-end system models (physical + electrical + algorithmic layers) enabling rapid evaluation of design tradeoffs and prediction of sensor performance	
• Create multiphysics simulation environments (COMSOL) to model sensor excitation, material interaction, noise behavior, and calibration requirements	
• Build MATLAB/Python toolchains for algorithm prototyping, system-level validation, and performance prediction across operating conditions	
• Use first-principles analysis to study sensitivity, dynamic range, spatial/temporal resolution, dispersion effects, and system optimization	
• Lead cross-functional collaboration between optics, materials, and signal-processing teams to integrate sensor models with downstream algorithms	
Robust Touch-Sensing Interface for Access-Control Applications	Spring 2026
<i>Interdisciplinary Capstone Project – ECE 2020, Georgia Institute of Technology</i>	

- Mentoring one ECE 2020 student and one Mechanical Engineering student on design of a robust touch-sensing interface for industrial access-control applications
- Guiding integration of capacitive and force-based touch sensing with FSM logic, SolidWorks mechanical design, and microcontroller-based data acquisition

Spatiotemporal Graph Models for Wave-Based Sensing 2025 – Present

- Map sensor response fields into 3D graphs to quantify spatial coupling, signal propagation, and cross-layer dependencies

Cross-Modality Ensemble Sensing for Damage Detection 2024 – Present

- Fuse ultrasonic, photonic, and electromagnetic sensors to enhance robustness, noise tolerance, and system calibration

Swarming Drones Energy Management 2019 – 2021

M.Sc. Thesis, New Mexico Institute of Mining and Technology

- Optimized drone positioning for energy management using MATLAB-based optimization scripts

Predictive Failure Modeling of Inductive Machines Under Thermal Stress 2018 – 2019

M.Sc. Thesis, University of South Florida

- Developed predictive failure models for induction machines under thermal stress using MATLAB Simulink

Modeling and Simulation of an NTC Thermocouple 2008

B.Sc. Project, Université de Lomé

- Modeled and simulated the behavior of an NTC thermocouple for sensor characterization

MENTORSHIP

Georgia Institute of Technology

Interdisciplinary Capstone Project Mentor – Touch-Sensing Interface

Spring 2026

- Mentoring one ECE 2020 student and one Mechanical Engineering student on design of a robust touch-sensing interface for industrial access-control applications
- Guiding capacitive/force-based sensor integration, FSM-based logic design, SolidWorks CAD, and system-level validation

Georgia Institute of Technology

Interdisciplinary Capstone Project Advisor – Biomedical Sensor Systems

2023 – 2024

- Advised a team of two biomedical engineering students on a sensor-based physiological monitoring system
- Guided circuit design, analog signal conditioning, and microcontroller-based data acquisition
- Mentored students through system design, prototyping, testing, and technical documentation
- Facilitated integration of electrical engineering principles with biomedical applications

Georgia Institute of Technology

Undergraduate Research Mentor – Nondestructive Evaluation Projects

2022 – Present

- Mentored undergraduate students in COMSOL Multiphysics simulation for electromagnetic wave propagation and material characterization
- Guided students through experimental design, data collection, signal processing, and analysis for nondestructive testing applications
- Supervised interdisciplinary capstone projects involving sensor integration and data analytics

PUBLICATIONS

Published

- [J1] DJ Silitonga, P Pomarède, **N.M. Bawana**, H Shi, NF Declercq, DS Citrin, “Automated Classification of Subsurface Impact Damage in Thermoplastic Composites Using Depth-Resolved Terahertz Imaging and Deep Learning,” *Composites Part B: Engineering*, 113033, 2025.
- [J2] M Hassanalian, A Mirzaeinia, **N. Bawana**, F Heppner, “Energy Management of Echelon Flying Northern Bald Ibises with Different Wingspans and Variable Wingtip Spacing,” *Journal of Bionic Engineering*, 19(1), 44–61, 2022.
- [J3] Z Rubin, **N. Bawana**, M Hassanalian, “Flight Pattern Formations and Their Effects on Drag: Experimental Study and Flow Visualization,” *AIAA Aviation 2020 Forum*, 2783, 2020.
- [J4] **N. Bawana**, Z Rubin, M Hassanalian, “Adaptive Formation Flight of Fixed-Wing Cooperative Swarming Drones: Analytical Study and Aerodynamic Analysis,” *AIAA Propulsion and Energy 2020 Forum*, 3956, 2020.
- [J5] **N. Bawana**, A Mirzaeinia, M Hassanalian, “Energy Management of Migratory Birds through Flock Mutation,” *2020 Gulf Southwest Section Conference*, 2020.
- [J6] KM Segbefia, K Wala, W Atakpama, Y Laré, **N. Bawana**, F Folega, et al., “Comparaison de la performance de deux types de foyers améliorés traditionnels: Foyer à argile du Togo et foyer Malgache,” *Journal de la Recherche Scientifique de l’Université de Lomé*, 20(1), 13–22, 2018.
- [J7] DJ Silitonga, P Pomarède, **N.M. Bawana**, H Shi, NF Declercq, DS Citrin, “Detection of Low-Velocity Impact Damage in Woven-Fabric Reinforced Thermoplastic Composite Laminates by Deep-Learning Classification Trained on Terahertz-Imaging Data,” *26ème Congrès Français de Mécanique*, 2025.

Theses

- [T1] **N.M. Bawana**, “Deep Learning-Enabled Terahertz Nondestructive Evaluation,” *Georgia Institute of Technology*, Ph.D. Dissertation, 2026.
- [T2] **N.M. Bawana**, “Swarming Drones: Bioinspiration and Energy Saving Opportunities,” *New Mexico Institute of Mining and Technology*, M.Sc. Thesis, 2021.
- [T3] **N. Bawana**, “Thermal Response in a Field Oriented Controlled Three-Phase Induction Motor,” *University of South Florida*, M.Sc. Thesis, 2019.

Under Review

- [R1] **N.M. Bawana**, P Pomarède, DJ Silitonga, F Meraghni, NF Declercq, DS Citrin, A Locquet, “Deep Learning for Automated Damage Detection and Localization in Glass Fiber Reinforced Polymer Laminates via X-ray Micro-Computed Tomography,” *NDT & E International*, Under Review.

In Preparation

- [P1] **N.M. Bawana**, P Pomarède, DJ Silitonga, A Locquet, F Meraghni, DS Citrin, NF Declercq, “Terahertz Imaging with Weakly Supervised Deep Learning for Impact Damage Localization and Severity Assessment in GFRP,” In Preparation.

- [P2] **N.M. Bawana**, P Pomarède, DJ Silitonga, A Locquet, F Meraghni, DS Citrin, NF Declercq, “Attention-Augmented Convolutional Networks for Physics-Aligned Terahertz Damage Characterization in GFRP Composites,” In Preparation.
- [P3] **N.M. Bawana**, et al., “Spatiotemporal Graph Learning for High-Dimensional Sensor Data,” In Preparation.

AWARDS

- **ECE-STEER Fellowship**, Georgia Institute of Technology – Tech to Teaching program for effective college teaching
- **Global Award Achievement**, University of South Florida – Innovation-based award recognizing research excellence
- **Fulbright Scholarship**, U.S. Department of State, 2017–2019 – Prestigious scholarship for academic excellence and international exchange
- **Pafroid Scholarship**, European Union, 2015 – Merit-based fellowship for innovative ideas in science and engineering

CERTIFICATIONS

- Deep Learning Specialization (DeepLearning.AI)
- Machine Learning (Stanford Online)
- Google Advanced Data Analytics (Coursera)
- Power Electronics Specialization (Coursera)