Blake Webb

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Education

University of Maryland, Baltimore County (UMBC) — Glen Burnie, MD
Bachelor of Science — Computer Engineering — GPA: 3.4/4.0 — *Aug 2022 – May 2026*

- Heritage Merit Scholarship Recipient
- Louis Stokes Alliance for Minority Participation (NSF) Scholar

Research Experience

Robotics Vision Researcher — Feb 2024 – Present
University of Maryland, Baltimore County — *Baltimore, MD*

- Developed differential camera perception system to reduce visual data bandwidth in robotics.
- Built robotic arm simulation in Gazebo and Blender to evaluate sim-to-real control transfer.
- Implemented real-time OpenCV + ROS2 tracking pipeline.
- **Planned AI upgrades:** RL-based navigation, YOLO-Nano inference integration.

MXene DFT Research – Art Museum Conservation — June 2025 – Aug 2025
UMBC Computational Chemistry Lab — *Baltimore, MD*

- Ran periodic DFT using Quantum ESPRESSO on pollutant adsorption.
- Wrote Python generator for 4×4×1 supercells (10× workflow improvement).
- Analyzed surface relaxation and adsorption energies for MXene sensor coatings.

Immunology Research Assistant — Aug 2021 – Sep 2021
UM School of Medicine — *Baltimore, MD*

- Performed PCR, cloning, minipreps for cancer immunotherapy research.

COVID-19 RNA-Seq Research — Jul 2020 – Aug 2020
Remote

- Performed gene expression + immune response comparative analysis.

Presentations & Abstracts

SURF Undergraduate Research Fest — 2025

- MXene Surface Transformations + Adsorption Energies

LSAMP Research Symposium — 2025

- Low-Bandwidth Differential Camera Tracking Systems

SURF Undergraduate Research Fest — 2024

- Differential Camera Systems in Simulation + Hardware

Projects — Hardware, Robotics, AI

Micromouse Autonomous Maze Solver (Capstone)

- Flood-fill maze traversal, PID motor control, two-wheel PETG chassis.
- ESP32 microcontroller + motor driver + IR distance sensors.
- In progress: reinforcement learning navigation for adaptive policy control.

VLSI Cache Controller (Direct Mapped + 2-WayAssociative)

- Built VHDL cache controller w/ hit/miss logic + LRU replacement.
- Structural HDL → schematic → layout — DRC/LVS clean.
- Simulated with Xcelium + layout built via Cadence Virtuoso.

Multistage BJT Audio Amplifier

- 2-stage design: common-emitter preamp + emitter-follower driver.
- LTSpice simulation matched oscilloscope experimental gain (1300 → 250 w/load).

MXene Microsensor DFT Analysis

- Simulated pollutant adsorption for museum conservation protection.
- Python automated supercells, QE energy calculations tabulated for comparison.

Dofbot ROS2 Differential Camera Robot

- Built object-tracking mobile robot in both simulation + hardware.
- ROS2 Humble, OpenCV, differential frame subtraction tracking.
- Transitioning to NVIDIA IsaacSim + deep vision inference.

Inverted Pendulum Control

- MATLAB nonlinear controller + stabilizing estimator.
- Demonstrated swing-up + balance stability.
- Planned upgrade: model predictive control (MPC) vs RL comparison.

Kalman Filter Web Visualization — Speed Estimator

- Bayesian estimator simulation and webpage demonstrating uncertainty collapse.

FPGA Processor Design

- Custom HDL processor created for Programmable Logic course.
- Future improvement: LLM-generated synthesis optimization scripts.

Digital Butterworth Noise Filter

- Designed in MATLAB using FFT + `butter()` response shaping.
- Shows ML-denoiser vs DSP classical comparison opportunity.

Microwave Landing System — Timing Control Unit

- UART pulse generator for signal-in-space conversion stages.
- Next stage: SPI-buffered output + LSTM predictive smoothing.

Leadership & Service

Resident Assistant, UMBC Housing (47 Residents) Aug 2024–Present
Welcome Week Peer Advisor (Woolie) Fall 2023

Technical Skills

Languages: Python, C/C++, MATLAB, VHDL, Verilog
Tools/Frameworks: ROS2, OpenCV, Gazebo, Quantum ESPRESSO, Blender, LTSpice, Cadence
Domains: Robotics, VLSI, DFT, Signals, Embedded, AI/ML, CV, RL, Controls