LIAM BRAY

ROBOTICS SOFTWARE ENGINEER

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EDUCATION

James Martin High School · Arlington, TX — Class of 2028

- **Rank 1 of 804** · GPA 4.0 UW / 4.947 W · ACT 34 · AP 5s: Calculus BC, Physics 1, Computer Science A, Statistics
- UT Arlington dual enrollment: Calculus III, Differential Equations & Linear Algebra; spring: Stochastic Models and Simulation
- Independent coursework: Stanford EE263 Linear Dynamical Systems, MIT 6.832 Underactuated Robotics, MIT 12.006J

ENGINEERING EXPERIENCE

CRANE · Cross-Domain Robotics Autonomous Navigation Engine · Sole developer — 2025–present

- Architected a **Unity 6 / PhysX** simulator that runs one **ROS 2** autonomy stack across boats, submarines, ground robots, and drones through shared physics, actuator, sensor, and controller interfaces.
- Implemented **Fossen marine hydrodynamics**, rotor-level drone dynamics at 1 kHz, and LiDAR, RGB-D, GNSS, and IMU models with noise; headless workers run **25.8 simulated seconds per wall-clock second** on modest consumer hardware.
- Developed **Bayesian real-to-sim calibration** that tunes the simulator from real robot logs. Best of Fair, Red River SEF 2026.

Computer Science Lead · RoboBoat · MHSeals, James Martin HS — Apr 2025–present

- **Autonomy:** lead development of the boat's ROS 2 stack: dual-EKF localization, **RTAB-Map SLAM** that now maps and localizes on the water, Nav2 with an **MPPI** controller on LiDAR costmaps, and behavior-tree missions.
- **Perception:** real-time 13-class **CNN detector** (YOLO-style) on a **Jetson Orin**, fused with LiDAR in a 3D **multi-object tracker**.
- **Field testing and system ID:** built a test console for on-water and **simulation-in-the-loop** runs, with session logging and agent guardrails; open-water **thruster characterization** found a 6.2°/s yaw drift, canceled with a decoupling matrix.
- **Safety and team:** fail-safe watchdogs (link, geofence, flight controller); Docker/Git workflows for 15+ developers; taught **ROS 2, Nav2**, and Python to **30+ students**. Placed ahead of MIT and Cornell multiple times.

Co-Founder and Computer Science Lead · Project Nebula (501(c)(3)) · RoboSub — 2024–present

- A ~$650 garage-built AUV ran autonomously at RoboSub 2026 with color-based detection, Kalman-filter state estimation, and thrust allocation; won the **Discovery and Spirit of RoboSub Awards** among 58 teams.
- Co-founded a robotics-education nonprofit reaching **1,150+ students in five states** and **10+ teams**.

Computer Science Lead · FIRST Robotics (FRC) — 2025–present

- Implemented **swerve drive kinematics** and autonomous routines in Java/WPILib; team advanced to state.

Developer Tools · Creator — 2025–present

- **astro_dock**: containerized ROS 2 workspace used by both robotics teams on laptops, Jetsons, and Raspberry Pis. **Research cluster:** turns spare computers into simulation workers (2,140 jobs in its first nine days). **cx:** Rust terminal app that maps every computer and robot on the network, including the boat's onboard computers, and works offline in the field.

RESEARCH

- **Papers:** four accepted in 2026: workshop papers at IROS and IEEE BigData (first author) and NeurIPS (second author), and an IEEE SustainableAIoT-Afrasia conference paper (second author); two more submitted.
- **Safe LLM commands:** a physics verifier cut acceptance of infeasible commands across 17 open-weight LLMs from **54% to 6.9%**, with 0 violations in 1,024 simulated episodes.

LEADERSHIP

- **Founder, Martin Science & Engineering Research Society: 60+ members**; oversee 7+ projects from 16 students.
- **Eagle Scout:** raised **~$5,000** and led **20 volunteers** through **200+ hours** to build a tetherball court and soccer goals.

SKILLS

Languages	Python, C++, C#, Java, Rust, TypeScript/JavaScript, Bash, LaTeX
Autonomy	ROS 2 (Nav2, MPPI, behavior trees, TF2), EKF/UKF sensor fusion, RTAB-Map SLAM, thrust allocation
Simulation	Unity/PhysX, Gazebo, Fossen marine dynamics, rotor-level drone dynamics, Bayesian system ID
Vision & ML	CNN object detection, multi-object tracking, reinforcement learning (PPO), PyTorch, OpenCV
Infrastructure	Docker, Git/GitHub, pytest, Linux administration, Jetson and ODROID embedded Linux
Hardware & CAD	Designed and wired complete robots (Onshape, Fusion 360); KiCad PCBs, ESP32/RP2040, pneumatics

HONORS

Best of Fair (Robotics & Intelligent Machines), Red River SEF 2026 · Texas SEF Finalist (2×) · 2nd Place CS, Fort Worth SEF 2025 (~600 competitors) · 2nd Place, OU Math Day 2025 (~360) · AIME Qualifier (top ~5%) · CyberPatriot Platinum (top 1%)