James Williams

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EDUCATION

Michigan State University, College of Engineering East Lansing, Mi

Technology Engineering, Mechatronics Concentration, CS minor, GPA: 3.4 May 2024 - Present

Mechatronics, Embedded Systems, Control Systems, Circuits, Data Structures, Machine Vision, Smart Agricultural Systems

SKILLS

- **Hardware: PCB design, embedded circuits, wiring diagrams, breadboarding, soldering**
- **Programming: Python, C++, C#, Java**
- **Robotics & Controls: ROS2, PID tuning, GNSS/RTK, sensor fusion**
- **Tools & Frameworks: OpenCV, Git, Xcode, VSCode, CAN-bus communication**

EXPERIENCE

Undergraduate Research Assistant – Michigan State University East Lansing, Michigan

Department of Biosystems and Agricultural Engineering September 2025 - Present

- Developed and validated autonomous tractor guidance achieving ±2 cm accuracy using RTK-GNSS with radio-based base station corrections and hydraulic steering control
- Designed a custom data-logging application to record latitude/longitude and cross-track error (XTE) to CSV, enabling quantitative accuracy analysis via Python histograms and trajectory plots
- Tuned AGOpenGPS PID steering parameters and resolved oscillatory steering and GNSS correction dropouts by transitioning to a radio-linked RTK base station

PROJECTS

Vision tracking piglet mortality reducer East Lansing, Michigan

September 2024 - Present

- Built a YOLOv8-based vision system to classify pig posture (standing, sitting, lateral lying, etc.) using 1,000 annotated images across 5 classes under varying lighting conditions
- Trained and evaluated models on Michigan State University's HPCC cluster and deployed real-time inference to operational swine-farm camera systems
- Improved model reliability through strict annotation standards and iterative dataset refinement; identified domain-shift limitations during cross-farm deployment

Open-Source Contributor – AgOpenGPS Autosteer System

- Developed a custom fork of the AgOpenGPS codebase to implement a standalone data-tracking pipeline, separating UI frontend and backend logic for GNSS and control telemetry logging
- Integrated existing AGOpenGPS outputs into a custom analytics workflow to support accuracy evaluation and control tuning
- Validated custom tooling using software simulation and live tractor field operation; currently preparing changes for main-branch integration

Autonomous agriculture robot

- Developed a ROS2-based autonomous wheeled robot for simulated agricultural field environments
- Implemented OpenCV-based vision pipelines to classify objects (e.g., good vs. defective eggs) and support navigation decision-making
- Validated perception and control behavior in simulation prior to hardware deployment