

David Aviles

Professional Summary

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Recent Robotics MS graduate with experience in computer vision and machine learning applications. Shown experience in developing computer vision models for object detection, classification, and semantic segmentation. Skilled in Python, OpenCV, PyTorch, and TensorFlow, with practical experience implementing CV solutions for robotic systems and real-world applications. Eager to apply technical knowledge in developing innovative vision-based solutions that optimize operations in commercial settings.

Education

University of Minnesota Twin Cities

College of Science and Engineering | Master of Science

- Concentration: Robotics | Cumulative GPA: 3.4

Minneapolis, MN

2022 – October 2024

University of Minnesota Duluth

College of Science and Engineering | Bachelor of Science in Mechanical Engineering

Minor – Electrical Engineering | Cumulative GPA: 3.5 – Dean's List

2019 – Spring 2021

Skills and Interests

- **Programing languages:** C++, Python, MATLAB
- **Design Tools:** SolidWorks, Onshape, Fusion360, ANSYS FEA
- **Version Control & Collaboration:** Git, GitHub, GitLab CI
- **Operating systems:** Linux(Ubuntu), ROS and ROS2
- **Computer vision and Machine Learning:** OpenCV, Open3D, COLMAP, Keras-Tensorflow, PyTorch, Numpy, SciPy
- **Simulation Environments:** RoboDK, Gazebo, Rviz, Issac Sim

Relevant Experience

University of Minnesota - Agricultural Quadruped Robot

Research Assistant

Minneapolis, MN

06/2021 – Current

- Developed a C++ hardware interface for a 12-DOF quadruped robot that interprets CAN bus messages for locomotion control
- Implemented multi-threading in C++ to significantly reduce motor command latency, resulting in synchronized leg movement and improved stability
- Engineered a real-time control system using ROS and CAN communication protocols to manage 12 independent motors
- Successfully deployed and field-tested in diverse agricultural environments including corn, alfalfa, wheat, and grass fields
- Developed and integrated a ROS-based motion control interface utilizing CAN communication protocols to orchestrate precise control of 12 independent motor systems

Computer vision Projects

Semantic 3D segmentation

February 2023 – May 2023

- Implemented semantic segmentation of 3D point clouds using PointNet and PointNet++ architectures with PyTorch, achieving 60% accuracy in room reconstruction
- Processed and manipulated large point cloud datasets (6+ million points) using resampling techniques while preserving structural integrity
- Applied COLMAP for 3D reconstruction from 2D images, implementing feature extraction and feature matching using SIFT algorithms
- Developed data preprocessing pipelines for deep learning models, including augmentation techniques to enhance model performance

Tool Classification and Sorting System with a UR Cobot 6DOF robot arm

February 2024 – May 2024

- Trained CNN models using TensorFlow and Keras to recognize and classify different types of tools (hammers, screwdrivers, wrenches, pliers)
- Implemented OpenCV for image processing and preprocessing of training data
- Achieved high classification accuracy for real-time tool recognition in varied lighting conditions
- Integrated computer vision system with UR 6DOF Robot arm to automate tool sorting into appropriate bins

Mechatronics – Fetchbot, tracking robot with UWB

September 2023 – December 2023

- Built a tracking robot with embedded systems integration and motor control
- Developed real-time position tracking algorithms using triangulation and sensor fusion
- Implemented networking protocols for communication between robot components