Harrison Bounds

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PORTFOLIO: harrisonbounds.github.io

Education

Northwestern University **Sep. 2024-Present**
M.S. in Robotics (Expected Dec. 2025) *Chicago, IL*

University of Central Arkansas **Aug. 2020-Dec 2023**
Bachelor of Science in Computer Science *Conway, AR*

Skills

Programming Languages: C++, Python, C, Java, SQL, LaTeX, Node.js
Software: ROS/ROS2, Gazebo, Linux, PyTorch, OpenCV, Git, Bash, CoppeliaSim, Genesis Unit testing
Hardware: Raspberry Pi, Arduino, NVIDIA Jetson, Soldering, 3D printing
Robotics: SLAM, Reinforcement Learning, Legged Locomotion

Experience

Clustering Algorithm Research | *Research Assistant* | *University of Central Arkansas* **Jun 2023-May 2024**
- Collaborated with a research team to publish a comparative study on the Jancey K-Means algorithm in C++
- Built an Online K-Means algorithm from scratch using C

Machine Learning and Text-Based GANs | *Research Assistant* | *University of Central Arkansas* **Sep 2023-May 2024**
- Classified malware anomalies using random forest models
- Produced a synthetic dataset with text-based Generative Adversarial Networks

Windstream Communications | *Software Engineer Intern* | *Little Rock, AR* **May 2022-Dec 2022**
- Developed enterprise-level chatbots using BotPress and Python
- Designed and deployed APIs and microservices following Domain Driven Design principles
- Performed continuous integration/deployment pipeline, pull requests, and user acceptance testing

UCA Makerspace | *Ambassador Maker* | *Conway, AR* **Jun 2021 – May 2022**
- Prototyped robotics projects for engineers with Python, 3D Printing, and AutoCAD

Publications

- **Harrison Bounds**, M. Emre Celebi, Jordan Maxwell, Color quantization using an accelerated Jancey k-means clustering algorithm, J. Electron. Imaging 33(5), 053052 (2024)

Projects

Hexapod Learning to Walk | *C++, Reinforcement Learning, Inverse Kinematics, Python* **Jan 2025**
- Designed and built a six-legged robot that uses inverse kinematics to move with a tripod gait
- Trained a locomotion policy with using the proximal policy optimzation algorithm
- Simulated the successful model in Genesis to visualize the learned gait

Doodle Droid | *ROS 2, Image Processing, Computer Vision, Motion Planning* **Nov 2024**
- Located and processed an image with OpenCV for a 7-DoF arm to draw a live portrait
- Calibrated robot arm using AprilTags to move to correct z height
- Utilized ROS 2 and the MoveIt API to develop a motion planner, including a Cartesian path to execute trajectories

Quadreped Locomtotion | *Reinfrocement Learning, PPO, Simulation, Sim-to-Real* **Feb 2025**
- Used Proximal Policy Optimzation to train the unitree go2 robot dog to perform different tasks
- Created detailed reward functions for the dog to sprint, climb, jump, and strafe

Autonomous RC Car | *Convolutional Neural Networks, Behavioral Cloning, Imitation Learning* **Jan 2023**
- Led development of an open-source autonomous RC car project in Python, with custom hardware
- Created a custom Convolutional Neural Network that predicts steering and throttle based on an input image
- Constructed a controller mapping using PyGame to control the RC car
- Set up electronics deploying a Raspberry Pi, motor driver, servo controller, voltage regulator, and on-board power source

Interactive Path Planner | *ROS2, C++, A-Star* **March 2025**
- Read SLAM maps to publish an 2D occupancy grid fro universal use
- Published a path between a start and goal node using the a-star algorithm
- Made the markers iteractive so the path can be updated dynamically

Sketch Prediction | *Python, Deep Learning, PyTorch, Convolutional Neural Networks* **Jun 2023**
- Created and trained a Neural Network with PyTorch that recognizes a sketch belonging to 1 of 250 categories
- Produce user sketches using a gui interface as input to the model

Mobile Manipulation Simulation | *Motion Planning, PI Control, Controls* **Dec 2024**
- Implemented PI Control, and generated trajectories for YouBot to retrieve an object and bring it to a goal