

Karan Humpal

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Summary

M.S. in Electrical and Computer Engineering at UC San Diego specializing in Intelligent Systems, Robotics, and Control. Focused on autonomous perception, computer vision, and AI-driven robotic systems. Experienced with ROS2, LiDAR, OAK-D Lite, and embedded Jetson-based control architectures for real-time decision making and autonomy.

Education

- **University of California, San Diego (UCSD)** San Diego, CA
M.S. in Electrical and Computer Engineering — Intelligent Systems, Robotics, and Control (EC80) *Expected Jun 2026*
 - **Relevant Courses:** Sensing in Robotics, Computer Vision, Digital Image Processing, Statistical Learning, Control Systems, AI for Autonomous Systems
- **University of California, Santa Cruz (UCSC)** Santa Cruz, CA
B.S. in Computer Engineering (Robotics and Control), Minor in Electrical Engineering *Jun 2024*
 - **Honors:** Graduated with Distinction
 - **Relevant Courses:** Mechatronics, Embedded Systems, Feedback Control, Logic Design, Sensors

Experience

- **Humpal Design Support** Hayward, CA
CNC Programmer / Prototype Engineer *Jun 2017 – Present*
 - **Robotics Prototyping:** Fabricated and optimized mechanical and electromechanical subsystems for robotics, aerospace, and R&D applications using 5-axis CNC and 3D printing.
 - **System Integration:** Collaborated with engineers to merge mechanical and electronic designs into manufacturable assemblies supporting sensors, actuators, and embedded controllers.
 - **Validation and Quality Assurance:** Applied precision metrology, CAD verification, and DFM processes to maintain sub-thousandth inch tolerances.

Projects

- **Autonomous Robot – UCSC Mechatronics (2024):** Designed a fully autonomous robot for UCSC's Mechatronics course. Built hierarchical state machines in C on an Uno32 microcontroller for motion control, collision avoidance, and object manipulation. Integrated IR sensors and DC motors; placed 3rd of 22 teams.
- **Law-Abiding Batmobile (2025):** Developed an autonomous robotic car capable of GPS-based laps and lane-following with OAK-D Lite vision. Deployed edge CNN lane detection and tuned a PID controller for steering correction. Integrated ROS2 multi-node control with stop sign and color-based decision logic.
- **Autonomous Computer Vision-Based Navigation Robot (2025):** Solo project developing a 3D printed robot using only camera vision and CNN-based perception. Trained a custom CNN achieving 91% accuracy for navigation states, integrated Raspberry Pi 4 and Arduino Uno for real-time inference and motor control, and designed a two-tier chassis in SolidWorks printed on a Bambu Lab X1 Carbon.
- **AI-Based Image Restoration Pipeline (2025):** Created a lightweight restoration pipeline enhancing robotic perception under noise, fog, and blur using CNN-based classification, CLAHE, and Retinex filtering. Improved image clarity for downstream vision tasks.

Skills

Robotics & Perception: ROS2, LiDAR, OAK-D Lite, OpenCV, Sensor Fusion, State Estimation, Docker

Programming: Python, C/C++, MATLAB, PyTorch, TensorFlow, GIT

Hardware: Jetson, Arduino, ESP32, Embedded Systems, Sensors & Actuators, 3D Printing, SolidWorks

Concepts: Computer Vision, Control Systems, Reinforcement Learning, AI for Robotics, Real-Time Systems