

# Pushkar Dave

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<https://pushkardave.com>

## EDUCATION

Northwestern University - Evanston, IL  
Visvesvaraya National Institute of Technology - Nagpur, India

MS in Robotics (Sep 2024 - Dec 2025)  
BS in Electrical Engineering (2020 - 2024)

## SKILLS

**Programming:** C++, Python, C, MATLAB, C#, Bash, Unit Testing

**Robotics:** ROS 2, ROS, SLAM, Robot Kinematics, Control Systems, Computer Vision, MuJoCo, MoveIt, OpenCV, Gazebo, RViz

**Software:** Linux, RTOS, Git, Docker, CMake, PX4, QGroundControl, Unity, Genesis, CoppeliaSim

**Machine Learning:** PyTorch, Reinforcement Learning, Deep Learning, Autoencoders, CNNs

**Hardware:** Onshape, Quadrotors, Quadrupeds, Embedded Systems, Microcontrollers, ESP32, PIC32, UART, SPI, I2C

## EXPERIENCE

Caterpillar Inc. Decatur, IL  
Robotics Integration Intern

Jun 2025 - Aug 2025

- Integrated 3D laser scanners & CV based techniques to automate visual weld inspection on production lines
- Improved scan quality and resolution by dynamically adjusting sampling rate to welding robot velocity

Multi-robot Systems Group, Czech Technical University Prague, Czechia  
Robotics Research Intern

May 2023 - Sept 2023

- Developed a triangulation algorithm in C++ to correct vertical drift for the leader UAV in a swarm system
- Performed localization using follower UAVs by fusing UVDAR, IMU, RangeFinder data with a Kalman Filter
- Analyzed and recorded ROS simulation metrics and debugged plots to set up real world experiments

IvLabs, VNIT Nagpur, India  
Robotics Intern

Jul 2021 - Oct 2021

- Implemented PD control system and minimum snap trajectory generation for quadrotors in MATLAB
- Designed a state space quadrotor model and solved seventh-order polynomial functions for trajectories
- Experimentally modeled a tethered quadrotor by modeling it as a damped spring-mass system

## PROJECTS

### Low Level Motor Controller using PIC32

- Designed and implemented a DC motor control system in C using PIC32 with dual interrupt architecture
- Programmed firmware featuring PWM signal generation, state machine, encoder communication with UART
- Achieved 98% trajectory tracking using PID tuning running on 5KHz current control and 200Hz position control

### Collaborative Mapping using a Quadruped and Quadrotor

- Created occupancy grids using ORB feature extraction, FLANN feature mapping, loop closure using RTABMap in C++
- Optimized ROS 2 middleware, enabled data throttling and transport relay to achieve lossless camera streaming
- Deployed multi-session mapping to generate an exhaustive and feature-rich point cloud

### Reinforcement Learning on a Quadruped

- Formulated and trained locomotion policies for Unitree Go2 for tasks like jumping, strafing and crawling
- Implemented an Actor-Critic network structure, integrated into a proximal policy optimization algorithm using PyTorch
- Designed reward functions and tuned parameters to train and visualize the task within 100 episodes

### Whack-a-Mole with 7-DOF Robot Arm

- Developed a Python & ROS 2 MoveIt package to detect colored moles, plan trajectories and control a servo-driven hammer
- Applied OpenCV to detect mole illumination events, caching positions for millisecond-level reaction time

### Feedback Control of Omnidirectional Mobile Manipulator

- Generated a cartesian trajectory, simulated kinematics, and implemented feedforward control on a KUKA youBot in Python
- Utilized modern screw theory to transform twists into commanded speeds using Jacobian pseudoinverse
- Verified the calculations and implementation using ODE physics simulation in CoppeliaSim