Pushkar Dave

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EDUCATION

Northwestern University - Evanston, IL — **MS in Robotics (Sep 2024 - Dec 2025)**
Visvesvaraya National Institute of Technology - Nagpur, India — **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* — **Jun 2025 - Aug 2025**
Robotics Integration Intern

- Automated visual weld inspection by integrating 3D laser scanners & CV based techniques 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* — **May 2023 - Sept 2023**
Robotics Research Intern

- 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* — **Jul 2021 - Oct 2021**
Robotics Intern

- 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

Emergent Locomotion in a Handed Shearing Auxetic (HSA) Actuated Robot — **Apr 2025 - Present**

- Modeled HSA actuators in MuJoCo using spring–motor systems to simulate torsional forces driving extension & contraction
- Built a Python control interface for the soft robots, enabling stateful rolling and crawling behaviors in simulation
- Integrated the Proximal Policy Optimization RL algorithm, to train locomotion models over varied terrain conditions

Low Level Motor Controller using PIC32 — **Feb 2025 - Mar 2025**

- 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 — **Jan 2025 - Mar 2025**

- 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 — **Feb 2025 - Mar 2025**

- 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

Feedback Control of Omnidirectional Mobile Manipulator — **Nov 2024 - Dec 2024**

- 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