DHYEY MIHIR SHAH

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EDUCATION

University of Pennsylvania	*MSE Robotics: 3.93 GPA*	2024-2026
Pandit Deendayal Energy University	*B.Tech Electrical Engineering: 9.03 CPI*	2018-2022

WORK EXPERIENCE

Research Assistant – GRASP LAB, Figueroa Robotics Lab | *University of Pennsylvania* — Sept 2025 – Present

Designing and building a lightweight elbow exoskeleton, conducting a comparative study of classical and learning-based control strategies under time-varying human dynamics. Implementing an sEMG- and IMU-based sensor fusion to estimate user intent and fatigue, enabling adaptive torque assistance and quantitative evaluation of tracking accuracy, effort reduction, and robustness across varied lifting tasks and subjects.

Research Assistant – GRASP LAB, Kod*Lab | *University of Pennsylvania* — Jan 2025 – Nov 2025

Built a simulation for a Slot-Hopper Template as a reduced order model representing the complex dynamics for a quadrupedal robot. I then implemented an active damping controller to stabilize vertical energy and body pitch, counteracting the template's natural preflex responses. Finally, I derived a kinematic template–anchor mapping that transferred COM motion, pitch dynamics, and leg actuation to a Mini-Cheetah model, enabling stable and periodic gait behaviors.

Computer Vision Software Engineering Intern | *ModalAI. Inc, USA* — Jun 2025 – Aug 2025

Developed real-time image processing pipelines for UAVs using the VOXL2 Mini and IMX664 module. Incorporated a novel and robust non-learning-based sky segmentation algorithm, utilizing the non-sky pixel mask for a custom AWB and AE correction for deployment on the VOXL-Portal. Explored various GPU-accelerated filtering techniques to improve camera calibration, color enhancement, and parameter tuning for an ROI-based stabilization method on the camera server.

Junior Research Fellow – Human Centered Robotics Lab | *IIT Gandhinagar* — Sept 2022 – May 2024

Research aimed at developing adaptive control frameworks for a multi-modal, cable-driven ankle exoskeleton. Also worked to develop smart insoles for real-time gait-phase detection and ground reaction force measurement using differential pressure sensors and a custom-trained CNN. I also assisted with data collection and facilitated human-subject experiments to assess balance responses in elderly participants using VR.

TECHNICAL PROJECTS

Real-Time MPC Planning and Control for Autonomous F1/10 Racing — Jan 2026 - Present

Engineering a full autonomy stack for a 1/10-scale F1 racecar using ROS2, integrating Model Predictive Control for high-speed race-line optimization in real-time using a 2D LiDAR. Implementing cubic spline trajectory generation for local planning, RRT* for global path planning, Pure Pursuit for tracking, and particle-filter-based localization, along with ADAS features to ensure safe, robust, and fast navigation in dynamic racing environments.

End-to-End Autonomous Drone Racing Using Deep Reinforcement Learning — Oct 2025 - Dec 2025

Implemented a PPO-based reinforcement learning pipeline for autonomous quadrotor racing, emphasizing end-to-end policy learning in Isaac Sim while also testing it on the Crazyflie hardware system. Formulated physics-informed reward functions and observation encodings to balance stability with aggressive maneuvering through gate sequences, while leveraging curriculum learning and domain randomization in Isaac Lab for policy robustness.

VAE-Augmented Imitation Learning for Scalable Robot Manipulation — April 2025 – May 2025

Used latent trajectory representations to improve Behavioral Cloning for robotic manipulation tasks in a kitchen environment, by training a Variational Autoencoder on low-dimensional state data to capture motion intent, phase, and context to reduce reliance on vision in constrained environments. Integrated an LLM to translate natural language instructions into 3D spatial goals, enabling multi-object manipulation, and achieving efficient task execution in Robosuite simulations.

GPS-Denied Autonomy via Visual-Inertial Odometry for UAVs — Mar 2025 - April 2025

Programmed an autonomy stack for the CrazyFlie 2.0 by integrating VIO-based state estimation with trajectory planning and SE(3) control. Utilized real-time sensor data from noisy IMU and stereo features to enable robust tracking with a local planner in obstacle-rich environments, achieving reliable, collision-free navigation in simulation and hardware testing.

Pick, Place, Stack Execution for Static and Dynamic objects using Franka Emika Panda — Oct 2024 – Dec 2024

Built a motion planning and control pipeline for a 7-DOF Franka Emika robotic arm using ROS and Gazebo. Integrated Geometric Inverse Kinematics and bidirectional RRT for precise pick-place-and-stack tasks for static and dynamic objects, optimizing object detection via complementary filtering and validating performance through strategic stacking in a competitive setting.

Autonomous Navigation and Target Engagement Robot Car — Oct 2024 – Dec 2024

Designed and assembled a mobile robot to compete in a strategic game, integrating autonomous navigation using the HTC Vive lighthouse, wall-following using ToF sensing, and target-attacking capabilities using a custom control architecture. Implemented real-time WiFi control and developed robust mechatronic systems to achieve precise ramp traversal and combat functionality.

Vision based Terrain Classification for a Cable-Driven Ankle Exoskeleton — Sept 2023 – May 2024

Deployed a real-time gait classification system with Intel RealSense D435i camera by training a custom CNN using PyTorch and OpenCV, optimized for deployment on NVIDIA Jetson Nano. Designed a vision based high-level controller for cable-driven exoskeleton to apply gait-adaptive force profiles

RESEARCH CONTRIBUTIONS

Machine Learning Driven-Wearable Sensor System for Foot Landing Classification in Badminton | *Published: IEEE TENCON'24*

INDUSTRY COMPETITIONS

SICK $10K LiDAR Challenge 2025-26 | *Ongoing: Advanced to Phase 2 as one of the Top 15 teams Nationwide (USA & Canada)*

TECHNICAL SKILLS

Programming Languages: C/C++, Python, C#, SQL, MATLAB, LabVIEW, HTML/CSS
Robotics Software and Systems: ROS2, Gazebo, IsaacSim, IsaacLab, Drake, OpenSim, MuJoCo, OpenCap, Onshape, Unity, Git, Proteus, Microchip xIDE, Vicon Nexus, AMTI NetForce, Biometrics Analysis Software, iEEG, ArduinoIDE