

DEEPAK RAMESH

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EDUCATION

Northeastern University, Boston, MA

Aug 2024 - May 2026

MS Robotics | Concentration: Mechanical Engineering

Coursework: Mobile Robotics, Control Systems, Pattern Recognition & Computer Vision, Verifiable Machine Learning

Ramaiah Institute of Technology, Bangalore, India

Aug 2019 - May 2023

Bachelor of Engineering in Mechanical

Coursework : Kinematics & Dynamics of Machines, Design of Machine Elements, Machine Learning and Intro to Python

RESEARCH EXPERIENCE

Research Assistant | Northeastern University

Oct 2024 - Present

HARPY - A thruster-assisted bipedal robot

Boston, MA

- Developed a high-fidelity model of a thrust assisted bipedal robot in Simscape enabling testing and validation of control algorithms
- Formulated a Quadratic Programming (QP) optimizer leveraging qpSWIFT to estimate ground reaction forces (GRF) and contact wrenches for closed-loop feedback control
- Designed and implemented a Whole-Body Controller in MATLAB integrating QP-based force optimization and thruster control via PID feedback loops, achieving 30° incline slope walking
- Implemented low-level joint torque control using inverse dynamics with PD tracking in Pinocchio, ensuring <2% foot placement error along Bezier-curve trajectories

PROJECTS

Reinforcement Learning policy for F1TENTH Autonomous Racing

May 2025 - Jul 2025

- Developed a full autonomous racing pipeline for a 1/10th-scale autonomous racecar, implemented a Model Predictive Contouring Control (MPCC) in ROS2 C++ to follow a precomputed raceline deployed on an NVIDIA Jetson Nano for real-time control
- Developed a Soft Actor Critic (SAC) policy in PyTorch with Stable-Baselines3, incorporating reward shaping to improve lap times by 15% over baseline controllers in both simulation and hardware experiments
- Integrated Hokuyo 2D LiDAR scans with wheel-encoder odometry via Adaptive Monte Carlo Localization to output a fused 2D pose to the controller, improving robustness to slip and ensuring reliable high-speed lap tracking across track layouts

6D Deep Object Pose Estimation using RGB camera

Feb 2025 - Mar 2025

- Developed a real-time 6-DoF object pose estimation system by training a multi-stage Convolutional Neural Network with VGG-19 backbone in PyTorch to predict belief and affinity maps integrating OpenCV's EPnP + RANSAC for accurate pose recovery
- Generated 40K+ synthetic RGB images using BlenderProc and designed data pre/post-processing pipelines, enabling zero-shot sim-to-real inference at 15–20 FPS on consumer-grade GPUs
- Achieved 92% ADD accuracy and strong real-world generalization, evaluated with KPD/AUC metrics, supporting robotic perception and vision-based planning tasks

Time optimal path planning of an UAV

Feb 2025 - Mar 2025

- Developed an autonomous flight stack for an UAV using A* as a global planner and a MIQP based receding horizon local planner solved using the Gurobi C++ API to obtain a time optimal path achieving 20% faster trajectories than conventional QP methods
- Developed the entire stack in ROS2 C++ integrating LIDAR based SLAM to develop real-time costmaps and obtain convex collision-free corridors for the MIQP planner and validated in Gazebo simulation environment

PROFESSIONAL EXPERIENCE

Strider Robotics | IISc

Jul 2023 – Jul 2024

Associate Mechanical Engineer

Bangalore, India

- Spearheaded the full product development lifecycle for a quadruped robot's leg, from concept design to manufacturing, prototyping and testing with a team of two interns
- Developed a leg drive mechanism for a quadruped robot, utilizing SolidWorks and executing FEA in MSC Nastran to achieve a 21% weight reduction, resulting in a 10% increase in runtime
- Developed automated test rigs leveraging Arduino and Raspberry Pi platforms, implementing Python-based data acquisition and control scripts to execute >1M cycle durability tests, enabling performance validation under rigorous industrial standards

Strider Robotics | IISc

Jan 2023 – Jun 2023

Mechanical Design and Analysis Intern

Bangalore, India

- Developed a linkage mechanism for the quadruped robot's leg after evaluating multiple mechanisms using Rigid body dynamics tool in ANSYS, reducing backlash by 30% resulting in a robust and stable gait
- Rapid prototyping of concepts using FDM 3D printing techniques to accelerate iterative product development and functional validation

TECHNICAL SKILLS

- **Robotics & Control:** ROS 2, MPC, LQR, PID, whole-body control (WBC), AMCL/EKF, trajectory optimization (QP/MIQP)
- **Simulation & Modeling:** MATLAB, Simulink, Simscape, Gazebo, Issac Sim
- **Programming & tools:** Python, C++, OpenCV, PyTorch, Git, Docker
- **CAD & CAE:** Catia V5, SolidWorks, Fusion 360, ANSYS, MSC Adams, MSC Nastran