DEEPAK RAMESH

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EDUCATION

Northeastern University, Boston, MA   **Aug 2024 - May 2026**

MS Robotics | *Coursework: Mobile Robotics, Control Systems, Computer Vision, Verifiable Machine Learning*

Ramaiah Institute of Technology, Bangalore, India   **Aug 2019 - May 2023**

Bachelor in Mechanical Engineering | *Coursework : Kinematics & Dynamics of Machines, Machine Learning*

RESEARCH EXPERIENCE

Research Assistant | Northeastern University   **Oct 2024 - Present**

HARPY - A thruster-assisted bipedal robot   *Boston, MA*

- Developed a QP-based controller using the Variable-Length Inverted Pendulum (VLIP) model and qpSWIFT to compute optimal ground reaction forces and thruster inputs for slope walking under contact and friction constraints
- Integrated Whole-Body Control (WBC) to map optimized forces onto a high-fidelity Harpy model, enabling closed-loop thruster-assisted bipedal walking on 30° inclined slopes with stable gait cycles
- Implemented swing leg control via inverse dynamics and PD tracking, achieving <2% foot placement error along Bezier-curve trajectories and maintaining dynamic stability across gait phases

PROJECTS

Time optimal trajectory planning of an UAV [Report]   **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

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 Intel NUC-ANHi5 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

Visual-Inerial Odometry using Intel Realsense D435i   **Jun 2025 - Jul 2025**

- Implemented a Visual-Inertial Odometry (VIO) pipeline using Intel RealSense D435i camera data, fusing RGB-D and IMU measurements to estimate real-time 6-DoF camera trajectory with <5 cm drift
- Developed a ROS2-based visualization and evaluation workflow, integrating VIO outputs with Rviz for real-time trajectory analysis and performance benchmarking on indoor navigation datasets

6D Deep Object Pose Estimation using RGB camera [Report]   **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

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 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 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
- 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