

PRAKRUT KOTECHA

Robotics Researcher

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prakrutk



RESEARCH STATEMENT:

My research focuses on developing Physics-Guided World Models that unify analytical mechanics with deep learning to enable truly adaptive robotic control. I aim to formulate architectures, such as Lagrangian Neural Networks (LNNs), that embed fundamental physical symmetries and conservation laws directly into latent dynamics. By integrating these physics-constrained models into hybrid RL-MPC frameworks, I seek to bridge the gap between high-level task planning and low-level inverse dynamics. Ultimately, my goal is to leverage these frameworks for unsupervised skill discovery, allowing robots to autonomously organize diverse motor primitives and complex behaviors without the need for manual reward engineering.

PUBLICATIONS

Conference Paper

Prakrut Kotecha, et al. "Neural Predictive Control using Lagrangian Neural Networks for Quadruped Locomotion". 2026 IEEE 22nd Conference on Automation Science and Engineering (CASE) (Under Review)

Prakrut Kotecha, et al. "STRIDE: Structured Lagrangian and Stochastic Residual Dynamics via Flow Matching". 2026 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (Under Review)

Prakrut Kotecha, et al. "Real-Time Gait Adaptation for Quadrupeds using Model Predictive Control and Reinforcement Learning". 2025 Eleventh Indian Control Conference (ICC-11) [Website] [Paper]

Prakrut Kotecha, et al. "Investigating Lagrangian Neural Networks for Infinite Horizon Planning in Quadrupedal Locomotion". 7th International Conference of The Robotics Society, Advances In Robotics 2025 🏆 Awarded Best Poster Presentation [Paper]

Prakrut Kotecha, et al. "A Hierarchical Manipulation Planning Framework Combining Striking, Pushing, and Pick & Place Motion Primitives". IEEE 20th Conference on Automation Science and Engineering (CASE) 2024 [Video] [Paper]

Patent

Prakrut Kotecha, et al. "Navigation System for a vehicle and a method for navigation." published (2019)
CBR Ref. Number: 201921049473 [Video]

PROJECTS

Combining RL and MPC for Biped walking

📅 January 2024 - May 2024

📍 IISc

Guide: Prof. Shishir N Y (Assistant Professor at IISc)

- In this work, we have analyzed and compared two H-step lookahead methods under the learned model and value function.

EDUCATION

PhD in Cyber-Physical System

Indian Institute of Science

📅 August 2023 - Current

Guide: Dr. Shishir Kolathaya

CGPA: 8.80

Thesis topic: Discovering, Learning, and Deploying Skills through Physics-Guided World Models.

B.Tech. in Mechanical Engineering

Visvesvaraya National Institute of Technology

📅 July 2018 - May 2022

CGPA: 8.07

Bachelor's Thesis Topic: Modelling, Control and Simulation of Quadruped Robot [Thesis]

SKILLS

Python

MATLAB

C/C++

Java

PyTorch

jax

CasaAdi

Gekko

SolidWorks

Fusion 360

Blender

Gazebo+ROS

GIT

HTML

LaTeX

WSL

PRESENTATIONS

- Poster presentation: "Real-Time Gait Adaptation for Quadrupeds using Model Predictive Control and Reinforcement Learning". at 2025 IEEE-RAS 24th International Conference on Humanoid Robots [Website]

- One of the contributions of this work is the theoretical proof, finding an optimality bound for the value function for TD-MPC.
- We tested it on different bipedal systems and derived some significant inferences that would benefit future work along these lines.

[\[Report\]](#) [\[Video\]](#) [\[Presentation\]](#)

Reconfigurable Robot (QHUMuS) - (Snake-Quadruped-Humanoid)

📅 August 2020 – January 2021 📍 IvLabs

Guide: [Prof. Shital Chidarwar](#) (Professor at VNIT, Nagpur)

- Designed a novel reconfigurable robotic system that transitions between serpentine, wheeled-quadruped, and humanoid motion modes without reconfiguration.
- We developed a control framework for serpentine gaits, including lateral undulation, linear progression, side winding, rolling, and wheeled quadruped walking. Also, unique transition gaits were developed between the system's various mobility modes of locomotion.

[\[Video\]](#)

EXPERIENCE

Loco-Manipulation for Humanoid Robots

Advanced Humanoid Research Lab, Infosys Limited

📅 February 2026 - Current 📍 Bangalore, India

- Implementing learning-based approaches for integrated locomotion and manipulation, focusing on end-to-end trajectory generation and obstacle avoidance.

Non-Prehensile manipulation

International Institute of Information Technology

📅 January 2022 – March 2023 📍 Hyderabad, India

Advisor: [Prof. Nagamanikandan G](#) (Assistant Professor at IIIT, Hyderabad)

- Developed a framework for Hybrid Manipulation using a Mobile manipulator.
- Using mathematical program with complementarity constraints did planar pushing for taking a cube from one position to another using only sticking mode of contact.
- Integrated planar pushing and striking with pick-and-place to make a generalised framework.

[\[Video\]](#) [\[Presentation\]](#)

Development of control policy for Quadruped Robot

Indian Institute of Space Science and Technology

📅 May 2021 – September 2021 📍 Remote Intern

Advisor: [Prof. Sam Zachariah](#) (Adjunct Professor at IIST, Scientist at ISRO)

- Worked on a Hybrid dynamics-based controller to produce dynamic walking gait for Quadruped.
- Implemented a controller based on classical control theory using inverse kinematics and dynamics, in Matlab. Further imported the model in Gazebo and tested various gaits in same.

[\[Report\]](#) [\[Presentation\]](#)

- Poster presentation: "Investigating Lagrangian Neural Networks for Infinite Horizon Planning in Quadrupedal Locomotion". at AIR 2025, IIT Jodhpur, India [\[Poster\]](#)
- Oral presentation: "A Hierarchical Manipulation Planning Framework Combining Striking, Pushing, and Pick & Place Motion Primitives". at CASE 2024, Bari, Italy [\[Presentation\]](#)
- Oral presentation: "Combining RL and MPC for Biped walking" at CyPhySS 2024, Bangalore, India

OTHER PROJECTS

- [Collision Cone Control Barrier Function for Obstacle Avoidance in UAVs](#) [\[Presentation\]](#)
- [Visual Learning Based Optimal Control and Navigation](#)[\[Report\]](#) [\[Presentation\]](#)
- [Passive Walker](#)[\[GitHub\]](#)
- [OsWaT 2.0 \(Omni Directional Wall traversing Robot v2.0\)](#)[\[Design Images\]](#)

COURSEWORK

University Courses:

- E1 277 Reinforcement Learning
- E0 230 Computational Methods of Optimisation
- E1 242 Nonlinear systems and control
- CP 275 Formal Analysis and Control of Autonomous Systems

Online Courses:

- MIT 6.832 Underactuated Robotics - Russ Tedrake, MIT
- CS287 Advanced Robotics - Pieter Abbeel, UC Berkeley
- Introduction to Reinforcement Learning - David Silver, DeepMind
- Control of Mobile Robots - Georgia Institute of Technology
- Robotics: Aerial Robotics - University of Pennsylvania

EXTRA-CURRICULAR

- **Conducted workshop** Walmart Centre For Tech Excellence's Reinforcement Learning Workshop 2025 & 2026 [\[Link\]](#)
- **Attended workshop:** Bangalore Neuromorphic Engineering Workshop [\[Link\]](#)
- **Teaching Assistantship** for Foundation of Robotics Course at IISc
- **Volunteer** for Cyber-Physical Systems Symposium (CyPhySS) 2024.
- **Alumni Secretary** of IvLabs- The Robotics and AI Lab of VNIT.
- **Conducted workshops** on topics such as Image Processing, Microcontrollers, CAD, etc, for 100+ students under the IEEE student chapter.