Abhinav Kumar

Robotics Ph.D. Candidate

Interested in constraint-aware learning and planning for dexterous manipulation problems, seeking research internship

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EDUCATION

Ph.D. Robotics
University of Michigan Ann Arbor

05/2024 - Present *Advisor: Dmitry Berenson*

M.S. Robotics
University of Michigan Ann Arbor

08/2022 - 05/2024

B.S. Computer Science
Georgia Institute of Technology

08/2017 - 12/2021

WORK EXPERIENCE

Graduate Student Research Assistant
University of Michigan Ann Arbor: ARM Lab

08/2022 - Present

Achievements/Tasks

- Currently developing methods to allow dexterous hands to autonomously detect and recover from external perturbations or execution errors
- Interested in interleaving planning and learning techniques and incorporating strong physical domain knowledge into learning
- Previously worked on deformable object manipulation and constraint-aware online learning of environment geometries
- 1 paper accepted to IEEE RA-L, 1 to ICRA

Graduate Student Instructor: Intro to Algorithmic Robotics
University of Michigan Ann Arbor

08/2023 - 12/2023

Achievements/Tasks

- Assisted in instruction of 50 students on perception, motion planning, machine learning, optimization, and mathematical foundations of robotics
- Wrote homework, managed grading staff
- Held office hours, managed course Piazza page

SKILLS

Robot Learning	●●●●●
Trajectory Optimization	●●●●●
PyTorch	●●●●●
ROS	●●●●○
C/C++	●●●○○

PROJECTS

Diffusion Informed Probabilistic Contact Search (DIPS)

- Enables contact mode planning using a combination of diffusion and graph search
- Uses planned contact modes to define trajectory optimization problems
- Accepted to ICRA 2025 (https://arxiv.org/abs/2410.00841)

Constraint Obeying Gaussian Implicit Surfaces (COGIS)

- Uses a Gaussian Process Implicit Surface to learn an implicit representation of obstacle geometries during task execution through contact interactions
- Ensures constraint satisfaction of geometries by refining set of estimated contacts
- Accepted to IEEE RA-L (https://arxiv.org/abs/2410.00157)

MBot Autonomy Stack

- Autonomous differential drive wheeled robot that performs LIDAR SLAM, plans paths with A*, and executes trajectories using PID
- Includes functionality for autonomous frontier exploration, allowing for efficient mapping of unknown environments

AWARDS/OTHER

Best Paper Finalist - CoRL 2024 Workshop on Learning for Dexterous Manipulation

Presented Diffusion Informed Probabilistic Contact Search (DIPS)

Georgia Tech President's Undergraduate Research Award - Fall 2021

Research salary award