Abhinav Kumar

Robotics graduate student interested in robot learning and autonomy seeking robotics research and engineering roles

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WORK EXPERIENCE

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

08/2022 - Present

Working in Professor Dmitry Berenson's Autonomous Robotic Manipulation Lab

Achievements/Tasks

- Researching deformable object manipulation and online adaptation of model predictive control to novel environments
- Utilizing online learning techniques including Gaussian Processes to learn implicit representations of novel environments online

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

08/2023 - Present

Achievements/Tasks

- Assisting in instruction of 50 students in topics related to perception, motion planning, machine learning, and mathematical foundations of robotics
- Helping create homework assignments and managing grading staff
- Holding office hours and answering online questions regarding course material

Undergraduate Research Assistant
Georgia Tech Laboratory for Intelligent Decision and Autonomous Robots

08/2020 - 12/2021

Achievements/Tasks

- Conducted research using deep reinforcement learning techniques to improve trajectory optimization for robots in situations with intermittent contact
- Investigated intersection between learning and model based techniques
- Received Georgia Tech President's Undergraduate Research Award

Intern
NASA

01/2020 - 08/2020

Achievements/Tasks

- Implemented transfer learning pipeline using BERT and PyTorch to extract keywords from scientific publications
- Implemented module to crawl through Wikipedia articles and apply TextRank analysis to extract keywords from a Wikipedia subgraph
- Presented poster based on work at AGU Fall 2020

Undergraduate Research Assistant
Georgia Tech Machine Learning and Perception Lab

08/2019 - 08/2020

Achievements/Tasks

- Worked on research project combining symbolic representations and deep learning for automating solving of math problems
- Helped to develop approach as well as implemented associated code
- Used PyTorch to create library and testing framework
- Continued similar work with former members of the lab, leading to publication and oral presentation at EMNLP 2021

SKILLS

Python	●●●●●
PyTorch	●●●●●
ROS	●●●●○
C/C++	●●●○○
Technical Communication	●●●●○
Public Speaking	●●●●○
Project Management	●●●○○

OTHER PROJECTS

Online Adaptation of Manipulation to Novel Environments
- Presented at IROS 2023 Workshop on Leveraging Models for Contact Rich Manipulation
- Uses a Gaussian Process Implicit Surface to learn an implicit representation of obstacle geometries during task execution
- Provides model predictive control a signal to avoid problematic states, such as those near obstacles
- Enables adaptation of manipulation to novel environments within a single episode without prior knowledge of obstacle geometries

Cloth State Tracking
- State filtering for deformable object state estimation using the GarmentNets deep learning system as a backbone
- Utilizes GarmentNets to output cloth mesh. Uses estimate of point cloud dynamics and partial point cloud views to update state over time

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
- SLAM implemented in C++, PID implemented in C, and A* implemented in Python

EDUCATION

M.S. Robotics
University of Michigan Ann Arbor

08/2022 - Present — *3.98*

B.S. Computer Science
Georgia Institute of Technology

08/2017 - 12/2021 — *4.00*

ACHIEVEMENTS

Georgia Tech President's Undergraduate Research Award (08/2021 - 12/2021)