Daksh Adhar

| +1-412-287-0335 | dadhar@andrew.cmu.edu | linkedin.com/in/daksh-adhar | github.com/a-daksh |

Education

Carnegie Mellon University - School of Computer Science Aug. 2024 – May 2026
Master of Science in Robotic Systems Development | GPA: 4.25/4 Pittsburgh, PA
Current Coursework**:** Optimal Control and Reinforcement Learning, Manipulation Estimation and Control, Robot Mobility, Robot Autonomy, Computer Vision, Systems Engineering for Robotics

Indian Institute of Technology, Guwahati July 2020 – May 2024
Bachelor of Technology in Engineering Physics | GPA: 8.27 / 10.00 Guwahati, India
Relevant Coursework**:** Computational Physics, Simulation Techniques, Reinforcement Learning, Fundamentals of AI

Research Experience

Biomimetic Robotics & Artificial Intelligence Laboratory, IIT Guwahati Jan. 2023 – May 2024
Research Internship, Prof. Shyamanta M. Hazarika Guwahati, India
- Developed a testing framework on PyBullet and OpenAI Gym environment for training bionic hand grasp RL policies
- Formulated a reward function and used Soft Actor-Critic algorithm to enable grasp-and-lift of deformable objects
- Applied domain randomization for Sim2Real transfer, achieving a 38% slip reduction and 14% decrease in deformation
- Increased stability with adaptive sliding mode control, improving slippage by 103.35% and deformation by 197%

Invention Factory, IIT Gandhinagar | Patent May 2022 – July 2022
Summer Internship, Prof. Nithin V. George Gandhinagar, India
- Built a Raspberry Pi-based wearable to improve spatial hearing performance for hearing-impaired
- Utilized a TDoA Algorithm with a 4-microphone setup to achieve directional sound detection with 10° resolution
- Integrated haptic motors to convert sound direction information into tactile feedback, reducing response time by 30%

Projects

AR assisted Robotic Total Knee Arthroplasty Ongoing
- Collaborating with a team of four to develop a robotic system for knee surgery, achieving 2 mm and 2° accuracy.
- Utilizing a RealSense depth camera for real-time bone tracking and registration, replacing invasive tracking methods.
- Designing a planning subsystem that dynamically updates as surgical pins are drilled, adapting to anatomical changes.
- Integrating a custom 3D-printed drill end effector with ROS, enabling drill activation based on trajectory position.

Kalman Filter-Based Sensor Fusion for Multi Camera Hand Tracking | GitHub Feb. 2023 – April 2024
- Employed Kalman filters to fuse dual camera sensors, improving joint angle estimation for prosthetic hands
- Used MediaPipe for hand tracking to achieve accurate joint estimation without the need of camera calibration
- Integrated YOLO for real-time hand-object interaction tracking to evaluate fused model using Grasp Quality Index

Pluto Drone Control and Trajectory Planning | GitHub Dec. 2022 – Feb. 2023
- Developed a Python interface for the Pluto Drone, implementing MSP with ~40ms latency over a socket connection
- Engineered a RealSense Camera and an ArUco tag-based system, achieving 95% accuracy in drone localization
- Designed a PID controller utilizing real-time vision data as feedback, enabling trajectory following with ~7% overshoot

Publications

Robustifying a RL agent-based bionic reflex controller through an adaptive sliding mode control Nov. 2024
Journal Paper at Cambridge University Press, Robotica Cambridge/Robotica
Grasp force optimization as a Bilinear Matrix inequality problem: A Deep-learning approach Dec. 2023
6th National Conference on Multidisciplinary Design, Analysis and Optimization arXiv/2312.05034
Reinforcement Learning-Based Bionic Reflex Control for Anthropomorphic Robotic Grasping Sept. 2023
Arxiv Paper arXiv/2312.05023

Skills

Programming/Frameworks: Python, C++, MATLAB, Julia, StableBaselines3, OpenAI Gym, ROS, MoveIt
Simulation Tools/3D modelling: MuJoCo, PyBullet, Gazebo, Tetrahedral Meshing, SolidWorks, Fusion 360
Robotics Tools/Microprocessors: Kinect, RealSense, Arduino, Raspberry Pi, Intel 8085, PCB designing

Honors

Narotam Sekhsaria Foundation Scholar, 2024 - $25,000 merit-based scholarship awarded to 15 out of 5500 applicants
JN Tata Endowment, 2024 - $12,000 merit-based scholarship awarded to 50 out of 10,000 applicants
6th National Conference on Design, Analysis and Optimization, 2023 – Awarded best research topic out of 20 groups
International Rover Challenge, 2023 - Finalists with 9 others for YUVAAN mars rover, Mars Society South Asia