

SAYAN MONDAL

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Work Experience

- **Robotics Engineer, Dexmate** Oct'24 – Present
Working on learning-based dexterous manipulation with a focus on real-world deployment and scalable simulation.
 - Built a **reinforcement learning pipeline** in **NVIDIA Isaac Lab** for a **vision-based bimanual box reorientation** task.
 - Integrated **learned RL policies** with classical motion planning for **hybrid tasks** such as door opening.
 - Developed a **scalable simulation asset pipeline**: sourced 3D objects using **BlenderKit** and **Sketchfab**, processed them with **Trimesh**, converted to USD, and added collision meshes.
 - Created a diverse suite of task environments using sim-ready assets. Combined **object-centric** (e.g., diverse object geometries, classes, masses) and **visual domain randomization** (e.g., textures, lighting, camera pose) to enable robust training of a vision-based generalist policy for manipulation tasks like table cleaning and door opening.
 - Led **sim-to-real transfer experiments** using a **dual-arm robot**, validating learned policies in physical setups.
 - Developed the **control API** for Dexmate's **Vega robot**, enabling PS5-based teleoperation for Cartesian/joint-space control, mobile base navigation, and head orientation.
 - Authored **user-facing documentation** to streamline onboarding and accelerate development for external customers.
 - Assisted in **data collection** by teleoperating the robot using the **Apple Vision Pro** for various manipulation tasks.
- **Teaching Assistant, CMU** Jan'24 - May'24
Course: Visual Learning and Recognition
- **Teaching Assistant, UC San Diego** Various Terms
Courses: Introduction to Autonomous Driving, Signals and Systems, Linear Control, Computer-Aided Analysis and Design, Fundamentals of Solid Mechanics

Education

- ❖ **Carnegie Mellon University, The Robotics Institute** Sept'22 - Aug'24
Master of Science in Robotics **4.10/4.33 GPA**
- ❖ **Carnegie Mellon University** Sept'20 - May'22
Master of Science in Biomedical Engineering **3.88/4.00 GPA**
- ❖ **University of California San Diego** Sept'17 - April'20
Master of Science in Engineering Sciences (Mechanical Engineering) **3.67/4.00 GPA**
- ❖ **Jadavpur University, Kolkata, India** May'12 - June'16
Bachelor of Engineering in Mechanical Engineering **8.00/10.00 GPA**

Selected Graduate Courses

- **CMU** - Planning and Decision-making in Robotics (A) | Robot Learning (A) | Deep Learning (A+) | Learning for 3D vision (A) | Optimal Control and RL (A) | Underactuated Robots (A) | Computer Vision (A+) | Mobile Robots (A)
- **UCSD** - Linear Systems Theory | Parametric Identification | Soft Robotics | Linear Control Design | Nonlinear Systems | Robot Reinforcement Learning | Cooperative Control/ Multi-Agent System

Research Experience

[More demos and projects available on my website](#)

Efficient Quadruped Mobility: Harnessing a Generalist Policy for Streamlined Planning

M.S. in Robotics Thesis, The Robotics Institute, CMU

Jan'23 – Oct'24

- Developed S3D-OWNS, a novel framework integrating a sampling-based high-level planner with a generalist deep reinforcement learning (DRL) locomotion policy for efficient long-horizon quadruped navigation.
- Designed a goal-conditioned DRL policy capable of agile locomotion over diverse terrains including walking, climbing, and jumping.
- Implemented a cost prediction module leveraging GPU parallelism to estimate energy, time, and success likelihood across path segments, enabling near-optimal path selection.
- Reduced planning dimensionality by offloading terrain-specific motion complexity to the learned policy, enabling fast, adaptive planning in cluttered environments.
- Demonstrated superior performance over classical obstacle-avoidance planners using a Unitree Go1 in simulation, with comprehensive ablation studies validating system modularity and efficiency.

Multi-Object Tracking for Recycling Facility Automation

Biorobotics Lab, CMU

May'21-May'22

- Led a five-member team to automate operations at the Gateway Recycling Facility in Pittsburgh.
- Developed a YOLO-based object detection pipeline to identify materials on a conveyor belt; integrated DeepSORT with Kalman filtering to enable multi-camera object re-identification and robust tracking.

Autonomous Driving - Controls and Perception Researcher

Contextual Robotics Institute, UC San Diego

Nov'19-March'20

- Customized and tested AUTOWARE (ROS-based autonomous driving stack) on a Polaris GEM vehicle, focusing on low-level control modules using a kinematic vehicle model.
- Co-developed a scene-aware driving attention prediction model combining raw human gaze data with semantic segmentation, improving attention-based perception for safer and more efficient driving.

Design and analysis of a kirigami-based two-finger microgripper

M.S. in Mechanical Engineering Thesis, UC San Diego

Sept'18 - June'20

- Designed a novel underactuated micro-gripper with a closed-chain linkage mechanism for simultaneous bending and grasping—enabling pick-and-place tasks for mobile microrobots.
- Conducted comprehensive kinematic and static analysis to characterize the workspace and mechanical performance of the gripper.

Publications

1. **Sayan Mondal.** *Efficient Quadruped Mobility: Harnessing a Generalist Policy for Streamlined Planning.* Master's Thesis, Carnegie Mellon University, CMU-RI-TR-24-72, December 2024.
2. A. Pal, **S. Mondal**, H. I. Christensen. "Looking at the Right Stuff" – Guided Semantic-Gaze for Autonomous Driving. In **CVPR 2020 (IEEE/CVF Conference on Computer Vision and Pattern Recognition)**.
3. **Sayan Mondal.** *Design and Analysis of a Kirigami-Based Two-Finger Microgripper.* Master's Thesis, University of California San Diego, 2020. Available at: <https://escholarship.org/uc/item/98t1b6zk>

Skills

- **Programming:** Python, C++, CMake, CUDA, Bash, Java, Julia, MATLAB
- **Robotics & Simulation:** Isaac Lab, Isaac Gym, MuJoCo, Gazebo, MoveIt, ROS, OpenCV, PyBullet, Simulink
- **Machine Learning & RL:** PyTorch, Weights & Biases, RLlib, NumPy, scikit-learn, TensorBoard
- **3D Assets & Visualization:** Blender, Trimesh, USD, MeshLab, Open3D
- **Tools & DevOps:** Git, Docker, VSCode, tmux, conda, bash scripting