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   **4.10/4.00 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

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"**, *MS thesis, 2024*.
2. Anwesan Pal, **Sayan Mondal**, Henrik I. Christensen,**"Looking at the right stuff"**- **Guided semantic-gaze for autonomous driving**, *IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2020*.
3. **Sayan Mondal**, **"Design and analysis of a kirigami-based two-finger microgripper"**, *MS thesis, 2020*.

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