

Nirshal Chandra Sekar

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Education

University of Minnesota (UMN), Twin Cities, (PhD in Computer Science)	Sep 2025 (Starting)
• Research: Learning from Human Video Demonstrations, Bi-Manual Manipulation, Imitation Learning	
University of Minnesota (UMN), Twin Cities, (MS in Robotics, 4.0 GPA)	Sep 2023 - Present
• Computer Vision, Machine Learning, Deep Learning, Natural Language Processing	
Vellore Institute of Technology, Vellore, (B.Tech Mechanical Engineering, 3.9 GPA)	Jun 2019 - May 2023

Skills

Programming Languages: Python, C/C++, JavaScript, MATLAB

Libraries: OpenCV, PyTorch, Omniverse Replicator, Open3D, PyBullet, NumPy, scikit-learn

Tools: Git/Github, Linux, Docker, ROS/ROS2, Gazebo, NVIDIA Isaac Sim, Blender, SolidWorks

Work Experience

Robotics: Perception and Manipulation Lab, Graduate Research Assistant UMN	Jan 2024 - Present
• Engineered a Real-Time Segmentation-Guided Grasping Pipeline using SAM, Contact GraspNet, and RealSense L515 lidar camera.	
• Built a Human Demos Guided Novel Object-Part Grasping Network to grasp novel objects from a single video demonstration.	
• Designed a robust sensor fusion framework to enable precise object localization and real-time grasp planning in dynamic environments.	
• Leveraged foundational segmentation models to reduce the need for extensive training data, improving system efficiency and scalability.	
• Conducted extensive testing and validation, ensuring reliable performance in real-world robotic manipulation tasks.	

Nilfisk, Software Engineering Intern Brooklyn Park, MN	May 2024 - Dec 2024
• Developed a custom annotation tool using Segment Anything Model to enhance YOLOv8 object detection and segmentation pipelines.	
• Streamlined annotation workflows to improve labeling efficiency and data preparation accuracy for ML models.	
• Utilized NVIDIA Isaac Sim's Replicator library to generate synthetic datasets for detecting scraps on the factory floor	
• Achieved a robust sim-to-real transfer and a mAP of 92% when validated on real-world data.	

Technical Projects

Bi-Manual Manipulation using Diffusion Policy Github	ROS, PyTorch, OpenCV
• Designed and executed a vision-based (CNN) diffusion policy for bottle uncorking using PyTorch and dual UR5e arms.	
• Trained on 188 teleoperated demos via RealSense L515 LiDAR and D405 stereo cameras, using ROS for data collection and action execution.	
• Achieved a 74.7% task completion rate across 30 rollouts, showcasing effective deployment of learned policies.	

Image Generation using Diffusion Model Github	PyTorch, NumPy
• Coded an unconditioned Denoising Diffusion Probabilistic Model from scratch using a UNet architecture for noise prediction.	
• Implemented the complete forward and reverse diffusion processes and trained on the Stanford Cars dataset .	
• Achieved a FID score of 34.7 between real and generated images.	

3D Semantic Reconstruction Paper	OpenCV, COLMAP, YOLOv8
• Collaboratively performed 3D semantic reconstruction using Structure from Motion (SfM) and Multi-View Stereo (MVS) with COLMAP.	
• Conducted 2D semantic segmentation with YOLOv8 and linked 2D points to 3D points via a voting process.	
• Generated a fully labeled 3D triangle mesh model with 76% semantic labeling accuracy across the reconstructed surface.	

Object Detection using Convolutional Neural Networks	NumPy, OpenCV
• Implemented a feed-forward CNN for image classification and Faster R-CNN for object detection from scratch in CSCI 5980 .	
• Trained models on the PROPS Detection Dataset , achieving 30% mAP and insights into neural network-based object detection.	

Autonomous Navigation and Manipulation for Mobile Robots Github	Mobile Manipulation
• Led implementation of Rapidly-exploring Random Trees (RRT) for real-time motion planning, achieving 93% success rate across 100 rollouts.	
• Generated collision-free trajectories for picking, placement, and hand-off tasks while adhering to kinematic constraints.	
• Utilized Kineval Stencil for simulation, testing, and validation of robot motion planning.	