Samaksh Judson

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Education

Carnegie Mellon University — Pittsburgh, PA
Master of Science in Mechanical Engineering (CDM) — Dec 2024
Coursework - Deep Reinforcement Learning for Control, Path Planning and Decision Making, Visual Learning and Recognition, Optimal Control and Reinforcement Learning, Introduction to Deep Learning, Engineering Computation

Birla Institue of Technology and Science, Pilani — Pilani, India
Bachelor of Engineering in Mechanical Engineering — June 2023
Coursework - Autonomous Mobile Robotics, Robotics, Foundations of Data Science, Control Systems

Skills

Programming Languages: Python (NumPy, PyTorch, Pandas, OpenCV, Matplotlib), C, C++, Julia
Robotics Frameworks: ROS1, ROS2, Gazebo, RViz, Isaac Sim, Mujoco
Development Tools: Git, Docker, Kubernetes, API WebSocket integration, Cloud deployment (AWS/GCP), Bash scripting

Work Experience

Onward Robotics | ROS, Docker, CUDA, C++, Python, bash — Pittsburgh, PA
Robot Software Engineer, Planning and Perception — March 2025 - Current

- Engineered CUDA kernels to accelerate robotic perception, learning-based vision, and motion planning modules, reducing inference latency by **26%** and increasing throughput by **65%** across multi-sensor data streams.
- Leveraged deep learning for object detection and 3D scene reconstruction, improving obstacle localization accuracy by **18%** and enhancing environment understanding for adaptive decision-making in unstructured settings.
- Collaborated with cross-functional teams—including hardware, systems, and software engineers—while implementing WebSocket and REST API interfaces for cloud communication.

fprime AI | Python, C++ — Pittsburgh, PA
Intern — Feb 2025 - March 2025

- Fine-tuned vision, language, and audio foundation models to infer high-level contextual cues for a productivity-monitoring state machine, achieving **81%** state transition accuracy under real-world conditions.
- Developed a multimodal fusion network with modal dropout to maintain performance under sensor occlusion or signal loss, boosting task recognition accuracy by **22%** over unimodal baselines in dynamic environments.

Kantor Lab | ROS1, ROS2, Docker, PyTorch, C++, Arduino — Pittsburgh, PA
Graduate Research Assistant — May 2024 – Aug 2024

- Developed distributed, asynchronous pipelines for real-time 3D point cloud modeling and occluded fruit detection, integrating YOLOv4 for segmentation (mAP **91.3%**), RAFT_stereo for depth estimation (EPE **0.56 px**), and DeepSORT for tracking (IDF1 **87.6%**).
- Implemented RANSAC-based visual–inertial odometry, reducing pose RMSE by **12%**.

Projects

Learning Based Sensor Fusion | Python, ROS2

- Simulated multi-sensor driving scenarios in CARLA to generate synchronized camera, LiDAR, and radar streams for large-scale fusion model training and evaluation.
- Developed a BEVFusion+ based perception architecture integrating image and point cloud modalities for unified 3D object detection and scene understanding.
- Deployed the perception stack in ROS2, enabling real-time visualization, topic introspection, and cross-sensor debugging within the autonomy pipeline.
- Optimized the fusion backbone with modal dropout and dynamic sensor gating to maintain detection reliability under partial sensor failure or camera dropout, improving robustness by **28%** in degraded conditions.

Segmentation on Open-Source Datasets | Python, Computer Vision

- Developed a novel method to generate labeled synthetic data, augmenting open-source datasets to enhance training size, resulting in an **8%** improvement in test accuracy due to better generalizability.
- Refined feature representations and utilized high-quality object masks to improve classification accuracy for detailed parts like hair and facial features on divergent test data.

Imperative Path Planning | Python, ROS, Isaac Sim, AWS

- Developed a novel unsupervised approach to train a path planning policy for robot perception and navigation.
- Mitigated the disadvantages of conventional unsupervised learning techniques by employing bi-level trajectory optimisation to achieve **SOTA** zero-shot performance in obstacle avoidance and waypoint generation.