KIRAN SUVAS PATIL

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EDUCATION

University of Maryland - College Park | M.Eng. in Robotics – 3.9/4 — Aug 2022 – May 2024

KLS Gogte Institute of Technology - Belagavi | B.E. in Electronics & Communication – 8.45/10 — Aug 2015 – May 2019

SKILLS

C | C++ | Python | CUDA | MATLAB | Simulink | PLC | Git | PyTorch/PyTorch3D | TensorFlow | Scikit-Learn | NumPy | Pandas | Matplotlib | OpenCV | Jupyter | ROS/ROS2 | MoveIt | Gazebo | Blender | Maya | Open3D | CloudCompare | AWS | Linux | SQL | HuggingFace | 3D-CAD | SolidWorks | Fusion360 | Docker | Kubernetes | Arduino | RPi | Jetson

TECHNICAL EXPERIENCE

Robotics Algorithms & Autonomous Systems (RAAS) Lab , UMD | Research Assistant — Feb 2024 – May 2024

- Adapted Neural Implicit Scalable Encoding SLAM, originally designed for RGBD images, to work efficiently with RGB images alone, enhancing its applicability to outdoor environments.
- Integrated a depth estimation module into the SLAM framework, enabling accurate depth perception using monocular RGB images. Conducted extensive tests in real-world outdoor environments.

Perception and Robotics Group (PRG), UMD | Graduate Research Assistant — May 2023 – Aug 2023

- Built an underwater oyster detection system employing the YOLOv8 segmentation task. Modeled an underwater environment with an oyster bed in Blender to produce realistic underwater images for testing.
- Applied Deep-WaveNet over the rendered scene to enhance the underwater imagery, improving the mAP by 18.65%.

Dept. of Computer Science & Engineering, IIT Bombay | Summer Intern — May 2018 – July 2018

- Designed and implemented a multi-robot system for autonomously solving jigsaw puzzles, including firmware development for Firebird V (ATMEGA 2560-based robot), localization using Aruco markers, and path planning exploration.
- Developed Python software for robot localization using Aruco markers and Xbee communication. Additionally, explored diverse path-planning algorithms for the multi-robot setup.

PROJECTS

Occlusion Resilient Object Detection for Industrial Settings | Blender, AWS, Python, ROS2, C++, Gazebo

- Generated a 60k+ image synthetic dataset using Blender for 3D modeling and scripting. Trained a YOLOv9 model, achieving a mAP@0.5 of 0.67 for occluded object detection. Deployed the trained model onto the backend of a ROS node.
- Utilized AWS S3 for scalable dataset storage and AWS Lambda to automate preprocessing, reducing data processing time by 30%.

RecolorNeRF | PyTorch3D

- Decomposed neural radiance field into layers with associated learnable color-palettes for efficient and user-friendly color editing of 3D scenes. Optimized the model by integrating UNet architecture, improving LPIPS by 40.83%.
- For analysis, crafted a custom NeRF dataset employing InstantNGP for efficient generation and used Dense Prediction Transformer (DPT) for improved quality.

Terraformers - UMDs Univ Rover Challenge team | Software subteam lead | ROS2, Arduino, Jetson

- Guided the software sub-team to achieve the rover's software requirements. Simulated motion planning for the manipulator arm using the MoveIt ROS motion planning toolbox, optimizing trajectory planning and collision avoidance.
- Constructed an autonomous navigation perception system for the rover's localization and obstacle detection.

PointNet | Open3D, PyTorch3D

- Executed PointNet, a deep net architecture on point clouds (as unordered point sets) for 3D Classification & Segmentation, achieving a test accuracy of 97.58% & 88.52% respectively. Also, conducted a robustness analysis on the learned model.
- Automated 3D Shape Detection, Segmentation, and Clustering for point-clouds using Open3D with python.

Single View to 3D | PyTorch3D

- Generated 3D models (voxels, point-clouds, and meshes) from RGB images using the R2N2 ShapeNet dataset, with F1 scores of 86.95, 96.47, and 88.18 respectively. Explored various loss and decoder functions for regressing the 3D models.

ARIAC - Agile Robotics for Industrial Automation Competition by NIST | ROS2, C++, Gazebo, MoveIt

- Programmed robotic solutions to address industrial automation challenges, including kitting and assembly, using ROS2 and Gazebo. Optimized processes to handle faulty/flipped parts, high-priority orders, and part shortages.
- Developed a dynamic pick-and-place algorithm for the UR10e robot with MoveIt, integrating sensors and RGBD cameras for real-time part detection and tracking on a moving conveyor belt.

All Terrain Rescue Bot - B.E. Final Year Project | ROS, C++, Python, SolidWorks, Jetson, Arduino, RPi

- Designed and developed modular, wireless-controlled robot prototype for traversing challenging terrains.
- Built the robot using SolidWorks for design and Eagle for custom PCBs. ROS enabled communication while live-streaming, perception, and thermal capabilities were deployed with a Jetson Nano for enhanced functionality.