Raktimjyoti Parashar

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Profile

Skilled AI professional with 5+ years of experience in machine learning algorithms, model development, and Python programming. Proficient in using ROS, Docker, TensorFlow, PyTorch, OpenCV and Pandas libraries, with expertise in Computer Vision and NLP for robotic applications.

Skills

Programming and Scripting — Python (NumPy, Pandas, scikit-learn, TensorFlow, PyTorch), SQL, MATLAB, CUDA

Data Manipulation and Analysis — Data cleaning, visualization and preprocessing, EDA, Statistical analysis, Feature engineering, Time series analysis

Frameworks and Tools — Docker, Git, AWS Cloud

Artificial Intelligence & Machine Learning — Random Forest, Linear Regression, SVM, Decision Tree, ARIMA, Keras, Sci-kit Learn, Deep Learning Algorithms (CNN, Transformers, ViT), NLP, RAG

Computer Vision — OpenCV, Open3D, YOLO, NeRF, Structure from Motion (SfM), Optical Flow, 3D Reconstruction, Kalam Filters, EKF, DeepSORT

Professional Experience

Research Engineer, *GRASP* 06/2023 – Present | PA, USA

- Developed a 6-DOF, occlusion-aware object tracking pipeline using computer vision models (SE(3)-TrackNet, Segment Anything, XMem) and Realsense depth camera, which enabled computing optimal grasp poses for robotic handling of novel objects in cluttered environments. Integration was done using ROS.
- Engineered a robust pipeline for reconstructing detailed 3D models from raw point cloud data using Log-GPIS and Open3D frameworks. This initiative has improved the accuracy of robot perception systems, enabling finer control and interaction with complex environments, and has been instrumental in refining the lab's autonomous robotic systems.
- Collaborated with a cross-functional team to create a Neural Radiance Field (NeRF) representation of indoor spaces to accurately model and navigate around obstacles using vision-based systems only. This work has paved the way for developing more intuitive and safer autonomous navigation solutions in environments where traditional sensors might fail.
- Worked on synthetic data generation to fine-tune and enhance the accuracy of various object detection and tracking models.
- Designed a pipeline for thermal camera based human detection using deep neural network for human and object detection in low-light settings. Created training dataset using ThermalGAN.
- Worked on LiDAR-Depth Camera Sensor Fusion onboard AgileX SCOUT using ROS (Robot Operating System) and created Python scripts for data acquisition, preprocessing, and fusion, enhancing accuracy by 80%.

Education

Master of Science, *University Of Pennsylvania*
Mechanical Engineering and Applied Mechanics 08/2021 – 05/2023 | Philadelphia, USA

Bachelor of Technology, *Manipal Institute Of Technology*
Mechanical Engineering and Manufacturing Technology 06/2013 – 09/2017 | Karnataka, India

Projects

- **Structure from Motion (SfM):** Implemented SfM pipeline to recover 3D transformation between two views using SIFT feature matching, 8-point algorithm with RANSAC filtering, camera pose estimation and point triangulation.
- **3D Reconstruction using Stereo Vision (Visual Odometry):** Performed stereo rectification, block matching with SAD, SSD and ZNCC kernels, and left-right consistency check to build disparity map and reconstruct point cloud using stereo camera for visual odometry.
- **Augmented Reality (AR) with AprilTags:** Developed an AR application by solving the PnP, P3P and Procrustes problem.
- **Real-time robot localization and mapping:** Developed **SLAM** (Simultaneous Localization and Mapping) for a 2D world, combining sensor measurements and motion data to create an environment map.
  Improved robot tracking accuracy with an estimated final robot pose error margin of less than 5% and accurate identification of landmarks, enhancing autonomous navigation capabilities and reducing localization errors by 40%.
- **Cancer Prediction:** Pioneered the implementation of advanced machine learning and deep learning models for the accurate detection and segmentation of polyps from colonoscopic images, using PyTorch, OpenCV, Scikit-learn, pandas, numpy, albumentations. Enhanced diagnostic precision by developing algorithms that surpass traditional methods, aiding medical professionals in identifying subtle abnormalities that might not be visible to the human eye, thereby significantly improving patient outcomes in colorectal cancer screenings.