Ojas Ajitkumar Mandlecha

Philadelphia, PA, 19104 | +1 (248) 938 3209 | ojas.mandlecha07@gmail.com | Linkedin | Github | Portfolio

Education

University of Pennsylvania | Master of Science in Robotics | **GPA:** 3.89 / 4.0 *Aug 2022-May 2024*

- Courses: Computer Vision, Perception, Machine Learning, Deep Learning, Physics-Informed Deep Learning, Path & Motion Planning, Localization & Mapping

Vishwakarma Institute of Technology | B. Tech in Mechanical Engineering | **GPA:** 8.94 / 10 *Aug 2018-Jun 2022*

Experience

Urban Transportation Associates | Cincinnati, Ohio *Jun 2023-Dec 2023*
Algorithms Intern | ML/DL Dept. Lead

- Developed & optimized YOLO-v3 model pipeline for real-time bike detection with 98 F1 score and 100 FPS. Deployed model on Jetson Nano using ONNX, TensorRT and integrated it with GPS data & main CPU using MQTT protocol.
- Integrated 3D stereo camera & GPS data and enhanced passenger counting to an accuracy of 97% through camera calibration, noise reduction, and cloud integration.

The Robotics Forum | VIT, Pune, India *Sept 2019-Aug 2021*
Technical Lead

- Integrated ML/DL technologies, deploying a YOLOv5-Tiny model on Jetson Nano with TensorRT for real-time ball detection in challenging environments.
- Developed ML-driven distance estimation algorithm with data analysis for enhancing trajectory prediction. Conceptualized, designed, & executed various mechanisms and robots, leading cross-functional teams while representing the university.

Academic Projects

Image Segmentation and Object Detection | *Computer Vision, Deep Learning*

- **SOLO**: Implemented end-to-end instance segmentation pipeline from: '*Segmenting Objects by Location*' to classify and generate masks for 3 categories (Vehicles, People, Animal) on COCO dataset. | [github]
- **YOLO**: Implemented network from: '*YOLO: Real-Time Object Detection*' to predict bounding boxes over 3 categories. Found location of object and classified using semantic labels. (mAP = 0.74) | [github]
- **SegFormer**: Implemented the SegFormer-BO from: '*SegFormer*' that combines transformers with lightweight multilayer perceptron (MLP) decoders to segment semantically over 3 distinct categories, achieving a 0.35 MIoU. | [github]

BEV Semantic Segmentation System | *Computer Vision, Deep Learning* | [github]

- Developed IPM-based system to obtain BEV images from multi-view camera images segmented semantically by building a Segformer pipeline.
- Implemented a U-Net architecture featuring homography-enabled Transformers with a multi-input encoder-decoder framework & achieved a 55.31% MIoU.

Text-driven Dynamic Virtual Background | *Computer Vision, Deep Learning* | [github]

- Implemented a Stable diffusion based Text2Scene pipeline, achieving a 67 % improvement in consistent scene generation & generated panoramic images with photo realism rated at 8/10.
- Optimized the Neural Radiance Fields (NeRF) pipeline by introducing cross-patch attention mechanisms resulting in 12.8% increase in FID score.

Localization and Estimation | *SLAM, Motion Planning*

- Developed a Quaternion-based Unscented Kalman Filter (UKF) to track 3D orientation using IMU. | [github]
- Integrated the inertial orientation and odometry with a 2D LIDAR scan to localize the robot using Particle Filter to build the occupancy grid map. | [github]

Autonomous VIO-based Quadrotor | *VIO, Sensor Fusion, Path Planning*

- Implemented Dijkstra and A* algorithms to compute a collision-free trajectory in a 3D environment and developed a nonlinear geometric controller to stabilize the quadrotor.
- Built an Error State Kalman Filter (ESKF) for pose estimation of the quadrotor using IMU and stereo pair sensors.

Robotic Gripper Arm | *Robotic Manipulation, Motion planning*

- Developed a software algorithm for a robotic Franka Emika Panda Arm using forward and inverse kinematics, object detection and identification (AprilTags), pose estimation and obstacle avoidance to stack static and dynamic blocks.
- Tested the algorithm in simulation environment (Gazebo) as well as on the Franka Emika Panda.

3D Reconstruction From Multi-View Images | *Computer Vision* | [github]

- Performed SIFT for feature matching and used RANSAC for robust camera pose estimation. Computed a 3D point cloud from images using Structure from Motion and Bundle adjustment.

Others

- Design, Fabrication and Control of an Ornithopter | *Biomimicry, CFD, FEA* | [github]
- Applying Filters based on Human Emotion | *Computer Vision, Deep Learning* | [github]
- Canny Edge Detection • Laplacian Blending • Homography Estimation • Image Morphing • Poisson Image Editing |

Skills

Programming Languages: Python, C, C++, MATLAB
Frameworks & Libraries: PyTorch, ROS, Gazebo, Pandas, Keras, TensorFlow, NLTK, NumPy, OpenCV, matplotlib, Sklearn
Developer Tools & Technologies: Linux, Git, VS Code, CUDA