SASANK POTLURI

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EDUCATION

Northeastern University, Khoury College of Computer Science **Boston, MA**
Master of Science in Robotics and Automation **May 2024**

- ***Coursework:*** *Computer Vision, Sensor Fusion, Deep Learning, Reinforcement Learning, Advanced Control Theory, Autonomous Field Robotics, Robot Motion Planning*

Manipal Institute of Technology **Karnataka, India**
Bachelor of Technology in Mechanical Engineering **Jul 2020**

- ***Coursework:*** *Machine design, Manufacturing Technology, CAD, Non-Linear Optimization, Heat transfer, Control Systems, Algorithms, Machine Learning*

PROFESSIONAL EXPERIENCE

Silicon Synapse Lab, Northeastern University **Boston, MA**
Research Assistant | C++, Matlab, Simulink, Python, Docker, PyTorch **Nov 2023 – Present**

- Implemented a closed loop MPC control on a snake robot using motor encoders and odometry from Motion Capture, to navigate in uneven surfaces
- Developed an end-to-end object detection and segmentation pipeline to annotate and train models and used it to compute pose of contact and dock
- Deployed the model on Nvidia Orin using docker, achieving real-time detection with a Realsense camera at 15 FPS and 3cm accuracy
- Generated Occupancy map by segmenting traversable point cloud in unstructured environments and utilized it for path planning

Danfoss Autonomy **Minneapolis, MN**
Autonomy Systems and Machine Learning Co-op | C++, ROS, PyTorch, CANalyzer, Nvidia IsaacSim, TensorRT **Jan 2023 – Aug 2023**

- Adapted LIO-SAM for a 6-axis IMU with GPS, performed system integration, and FMEAs for SLAM companies for mapping in GNSS denied areas
- Developed and cross-compiled C++ code for Ethernet communication between SLAM controller and Danfoss controller to transfer Pointclouds
- Delivered drive-by-wire based vehicle motion control interface with pacmod ECU & Danfoss embedded controller XM100 facilitating safety conditions
- Designed and 3D-printed a fixture to house Lidar and Camera together and performed Lidar-Camera Fusion to use in Pedestrian detection
- Utilized Kalman Filter to fuse data from wheel encoders and GPS to test path planning on an Ackerman-steered vehicle, used OXTS as the ground truth
- Performed 3D-object detection using YOLO-v8 and DBSCAN on the colored pointcloud generated from LiDAR camera fusion
- Developed a decoder for Unimatch network to parallelly compute optic flow and 3D detection, achieving a 9.87 AP3D on 3D detection without fine-tuning
- Built training pipeline leveraging Nvidia-IsaacSim to train YOLO-v8 on Synthetic Forklift data, achieved 48.8map for real-world forklift detection
- Pruned 50% of YOLO-v7 model while maintaining 52.8 mAP, and deployed on Adlink camera to detect Fruits and People at 21 FPS on a farm

Formula Manipal **Karnataka, India**
Structural Design and Manufacturing Engineer | CATIA, Ansys, Solidworks, Matlab, Hyperworks **Jan 2017 – Apr 2019**

- Performed dynamic simulation of a racecar on track in Matlab and used the data to design Suspension-links and Rims of the car, ultimately reducing 5.6 Kgs
- 3D-printed and added composite reinforcement to Intake-Manifold, achieving over 50% weight reduction compared to prior versions
- Designed and manufactured Carbon-fiber Seat, and Aero-package and won second place for design in Formula Bharat 2019

PROJECTS

- **Ball Catching Robotic Arm:** Trained YOLO-v8 model to segment a ball and determined its 3D location based on diameter using a monocular camera for trajectory prediction. Trained an RL agent using PPO in Pybullet to reach a point and deployed the model to catch the ball in real-time
- **Bundle adjustment on Buddha images:** Implemented SFM pipeline for sparse 3D reconstruction from images, used SIFT to extract, match and triangulate 3D keypoints. Applied bundle adjustment on calculated keypoints and poses using GTSAM to get an overall optimized pose estimates
- **Feature Detection and Image mosaic:** Applied Superglue and other classical feature detectors to compute image matches for an underwater archaeological site. Stitched the images by computing homographies between them and optimized the pose graph using GTSAM to enhance the mosaic
- **3D Object Tracking using Multi-view Images:** Achieved an Object tracking accuracy of 15.1% by implementing an Extended Kalman Filter on 3D object-detections. Implemented a tracking decoder on PETR-v1 model, achieved an accuracy of 20.8%, and conducted comparative analysis
- **Neural Radiance Fields Implementation:** Built a NeRF model from scratch and trained it to create novel views of the scene and achieved a PSNR of 28.29
- **Single Image Super-Resolution:** Developed Transformer model for 4X image upscaling, obtained an 8.94 PSNR, further improved it to 9.15 PSNR using a GAN model to discriminate between high resolution and super-resolution images
- **Performance comparision among SLAM algorithms:** Collected camera, LiDAR, IMU and GPS data of test vehicle driving in urban environment by writing ROS publisher node in C++. Utilized the collected data to test LeGO-LOAM and ORB-SLAM3 and compared their results and failure cases
- **Diffusion Networks Implementation:** Implemented a diffusion network from scratch and trained it on CIFAR-10 images to generate synthetic images
- **Valet Vehicle Parking using Hybrid Astar:** Implemented Hybrid-Astar for planning Differential drive, Ackermann & Truck-Trailer configuration considering non-holonomic kinematic constraints developed in C++ and ROS2

EVIDENCE OF EXCELLENCE

- Implemented model predictive control on a snake robot to control and navigate and explore uneven surfaces
- Pruned 50% of YOLO-v7 model with 52.8mAP and deployed on Adlink camera to detect Fruits and People at 21 FPS on a farm
- Secured 3rd place in FSAE Bharat 2019 and 2nd place in the design event of the competition

SKILLS

Languages and Frameworks: C++, C, Python, ROS, Matlab, PyTorch, TensorFlow, GTSAM, ONNX, TensorRT, OpenCV, NumPy, SciKit, Matplotlib, R
Softwares and Tools: Nvidia IsaacSim, Docker, SQL, NoSQL, Google Cloud Platform, Azure, Gazebo, Linux, CATIA, Solidworks, Ansys, Hyperworks, Simscale