

# Vaidehi Som

+1(215)397-5735 | [vaidehisom.github.io](https://github.com/vaidehisom) | [somv@upenn.edu](mailto:somv@upenn.edu) | [vaidehi-som](https://www.linkedin.com/company/vaidehi-som) | [VaidehiSom](https://www.github.com/VaidehiSom)

## EDUCATION

**University of Pennsylvania** | Masters Robotics Engineering (Specializing in CV & DL) Aug'22 – May'24  
**Indian Institute of Technology (IIT) Jammu, India** | Bachelors Mechanical Engineering Aug'17 – Jun'21

## WORK EXPERIENCE

**Perception Navigation Engineer** | *Rust, Deep Learning, Computer Vision, SLAM, Sensor Fusion* May'23-Dec'23, May'24-  
*Zipline International Inc. (Drone delivery & Logistics), USA*

- Improving feature matching using learned features. Realtime inferencing as onnx model and rust model. Evaluation metrics to compare classical and DL model
- Improved computer vision **feature detection** by integrating **rolling shutter** in the visual inertial odometry pipeline
- Implemented **incremental adaptive graph batch optimization** in the VIO pipeline serving as ground truth for real-world datasets
- Enhanced VIO initialization process by adding feature **marginalization techniques**, improving stability of system
- Improved **camera calibrations** and **imu extrinsics** by implementing data collection pipeline, **distortion modelling**(fish eye cameras), and performance metrics. included **online calibration** in VIO pipeline
- Adopted advanced **Levenberg-Marquardt** optimizer, resulting in significant improvements in optimization convergence
- Sensor Fusion**: Implemented fusion of GNSS and VIO in **factor graph** in a **tightly coupled** fashion

**Mobile Robotics Software Engineer** | *C++, ROS, Startup, Automated Guided Vehicle, Docker* Aug'21 – Jun'22  
*Addverb Technologies (Warehouse Automation), India*

- Implemented communication protocols(**serial/CAN, UART**) for AMR's **LiDAR** and **IMU** for low-level drivers
- Pipeline creation: Implemented safety relevant **Pure pursuit, Lyapunov(research paper) controller** and safety packages for **navigation** stack using **C++** and **ROS**. Improved odometry with calibration, controllers, and **IMU** using **Kalman filter**
- Achieved a **50%** reduction in testing time through the automation of odometry calibration and sensor testing processes

## PROJECTS

**Stereo Visual Odometry** | *Autonomous Driving, Multi-threading, SLAM, Geometric Computer Vision, C++* [Results/Code](#)

- Implemented **Visual SLAM pipeline** for stereo images to find 3D locations of keypoints, used **GFTT** for feature detection and **triangulation** for 3D point location. Implemented **direct method** and **optical flow** for pose and feature estimation during feature tracking and **Bundle Adjustment** for backend optimization using **g2o**

**Dense 3D reconstruction from point clouds using Octrees** | *C++, PointCloud, Octree, SLAM* [Results/Code](#)

- Implemented **octomap::OcTree** for efficient SLAM mapping, opting for a basic octree structure over RGB-enhanced variants to prioritize occupancy information and simplify map construction
- Employed Octomap's **point cloud** to translate RGB-D and camera pose data into world coordinates, updating the octree map's occupancy probabilities, and compressed the final map into an octomap.bt file for visualization with **octovis**

**Sensor Fusion using UKF- Lidar and Radar** | *Sensor Fusion, Lidar, C++, PCL* [Results/Code](#)

- Implemented **UKF** for **LiDAR** and **Radar** data fusion for real-time vehicle tracking and velocity estimation in dynamic traffic
- Utilized **RMSE** metrics for real-time sensor performance assessment for immediate identification of sensor inaccuracies

### Vision based SLAM

- Backend- **Bundle adjustment** with **ceres** with BAL dataset (C++) [Code](#)
- Implemented **2-view** and **multiple view stereo** algorithms to convert multiple 2D viewpoints into 3D reconstruction [Code](#)
- Recovering 3D transformation between two views using **RANSAC**, Pose recovery and 3D reconstruction
- Augmented Reality with AprilTags using both **PnP** and **P3P algorithm** [Code](#)

**Lidar Obstacle Detection** | *C++, PCL* [Results/Code](#)

- Pipeline for detecting obstacles using **PCL segmentation**, **3D RANSAC segmentation** and **KD-Tree**
- Identified different Obstacles using **Euclidean Clustering** with PCL

## RESEARCH PUBLICATIONS

**LIV: Language-Image Representations and Rewards for Robotic Control** | *Multimodal learning* [Paper](#)  
*Yecheng Jason Ma, Vaidehi Som\*, William Liang\*, Vikash Kumar, Amy Zhang, Osbert Bastani, Dinesh Jayaraman* ICML 2023

**Human-Robot Co-Learning and Feedback Insights using Sequential Transfer Learning**  
*Sequential Transfer Learning for human decision making model during Human Robot CoLearning*

**Secure and Privacy Preserving Proxy Biometric Identities** | *GANs, Python, DL* [Paper/Code](#)  
*Vaidehi Som, Pranav Gunreddy, Harkeerat Kaur, Isao Echizen* Springer 2023

## TECHNICAL SKILLS

**Programming:** C++, Python, Rust, CUDA, Linux, CMake, Git, Docker, VIM, gdb, Git/Github, GTest, Jetson Nano

**Robotics:** ROS(1&2), OpenCV, Eigen, Sensor Fusion, Ceres, g2o, Sensor Synchronization, Optimization (LM, GN), SLAM, GTSAM

**AI/ML:** PyTorch, Pandas, Numpy, ML Ops, GPU, scikit-learn, Scipy, Matplotlib, Weights&Biases, TensorRT, Segmentation