Vaidehi Som

+1(215)397-5735 | vaidehisom.github.io | somv@upenn.edu | vaidehi-som | 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

- Implementing ground truthing tool for navigation, calibration, and tag detection for improved navigation pipeline
- Improving feature matching using learned features. Realtime inferencing as onnx model and rust model. Evaluation metrics to compare classical and DL model
- 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
- **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

Semantic Segmentation using SegFormers | *Python, Transformers, ResNet-50* *Results/Code*

- Implemented Segformers, integrating Efficient Self-Attention, Mix-FFN, Overlap Patch embedding, and Dice loss
- Used the 3k images from imbalanced BDD 100K dataset to achieve a Mean Intersection over Union (IoU) score of 77.07%

Multi Object Detection and Tracking | *Python, DeepSORT, YOLO8* *Results/Code*

- Developed a Multiple Object Tracking System with **DeepSORT** and **YOLOv8**, employed Kalman filtering and the **Hungarian** algorithm for improved data association. Deployment done on NVIDIA Triton Inference Server via Docker optimizing dynamic batching. Converted the model to **TensorRT**, achieving increased throughput and reduced latency on **NVIDIA Jetson Orin**.

Neural Network optimization using Quantization and Pruning | *Python, Deep Learning, KD loss* *Results/Code*

- Quantized CNN-based architectures to make them **4x** smaller and **2x** faster in Pytorch
- Set up **Knowledge Distillation** to reduce inference time by **12x** and affecting results only by **13%** on segmentation pipeline

Panoptic Segmentation using SOLOv2 | *Scene Segmentation, EfficientPS, PyTorch* *Results/Code*

- Developed an innovative panoptic segmentation model by integrating the SOLOv2 architecture into the EfficientPS framework, significantly enhancing **instance segmentation** accuracy through the adoption of SOLOv2's **Focal Loss** and **DiceLoss** by **75%**

NeRF based 3D Reconstruction and Neural view Synthesis | *NeRF, C++, LibTorch, CUDA*

- Optimized NeRF using **LibTorch**, **CUDA** acceleration and JIT programming; training MLP for 3D position mapping using 2D static scene views; calculated **camera parameters**, executed ray-based stratified sampling, and applied volume rendering

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