Abhijit Mahalle

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Domain skills: Robot Perception, Computer-Vision, ROS, Machine Learning, Robotics Software Development, Path-Planning, State-Estimation

EDUCATION

University of Maryland, College Park — **May 2023**
Master of Engineering, Robotics — **GPA: 3.6/4.0**
Courses: Perception, Path-Planning, Robotics Software Development, Machine Learning, Deep Learning, Aerial Robotics, Control Systems

University of Mumbai, India — **May 2018**
Bachelor of Engineering, Mechanical Engg. — **GPA: 8.36/10.0**

SKILLS

Languages and Tools: C++, Python, MATLAB, ROS, Gaezbo, RViz, Linux, Git, Docker
Libraries: OpenCV, PyTorch, TensorFlow, Keras, NumPy, SciPy, sklearn, pandas, GTest, pytest
Controls: MPC, LQG, LQR, PID
Deep Learning: CNN, RNN, LSTM, GAN
Planning: A*, RRT*, Real Time-RRT*, Dijkstra

EXPERIENCE

Maryland Robotics Center | ***Researcher*** — **May 2022 - Present**

- Created a ground-truth dataset for **VIO** and **SLAM** models by fusing data-streams from **event** cameras, classical camera, and **IMUs** for **ego-motion, depth-estimation, scene-segmentation,** and **optical-flow** applications.
- Developed a pipeline to **calibrates** event and classical camera simultaneously by converting event-stream to gray-scale images using **E2VID** deep-learning network.
- Developed a model based on **SfMLearner** to estimate **depth** and **ego-motion** from image sequences using unsupervised learning approach and improved the performance by **7%** over baseline.

Worley | ***Machine Learning Engineer*** — **Jan 2021 - July 2021**

- Developed a **LSTM**-based machine learning model to predict the temperature of distillation columns for inference control and reduced the energy consumption by **40%**.

Piping Design Engineer — **Sept 2018 - Dec 2020**

- Designed piping systems using CAD tools for fluid transfer within the process plants considering chemical process requirements.

ACADEMIC PROJECTS

Structure from Motion | GitHub — **April 2022**

- Reconstructed a **3D scene** and simultaneously obtained **camera poses** from a given set of images using their feature point correspondence, **epipolar geometry, triangulation, bundle adjustment,** and **non-linear optimization**.

Robot Path-Planning | GitHub — **May 2022**

- Implemented **BFS, Dijkstra, A*,** and **Real Time-RRT*** algorithms on **differential-drive** robots.

Home Organizing Robot | GitHub — **Dec 2021**

- Developed a **ROS** package in **C++** with GitHub **Continuous Integration** and **test-driven development** using **Google Test** for **Tiago** mobile manipulator for indoor search and object manipulation.
- Used **MoveBase** for autonomous navigation, **MoveIt** for manipulator control, and **OpenCV** for filtering and object detection.

Human Position Estimator | GitHub — **Oct 2021**

- Developed a software in **C++** by **Agile Iterative Process** that detects and tracks humans using **HOG** descriptor and **SVM** detector.
- Designed unit tests using **GTest**, maintained version control using **Git**, checked build using **Travis CI** and code coverage using **Coveralls**.

Hand-written Digit Recognition | GitHub — **Dec 2022**

- Implemented **Linear SVM**, **Kernel SVM** with linear, polynomial, and RBF kernels, **Logistic Regression**, and **CNN** on **MNIST** dataset.
- Leveraged **Transfer Learning** to train on less data and achieved an increase in accuracy by **42%** over a basic CNN model.

Panorama Stitching | GitHub — **Feb 2022**

- Stitched multiple images to create a **panorama** using Harris Corner detector with **Adaptive Non-Maximal Suppression** for feature matching, **RANSAC**, for removing outliers, **homography,** and **Poisson's blending**.
- Trained a CNN with supervised and unsupervised approach and a **photometric loss** function to estimate homography.

Image Denoising — **Dec 2022**

- Developed a **convolutional auto-encoder** network with **skip connections** using **PyTorch** for general denoising of images in Smartphone Image Denoising Dataset and improved the performance by **10%** over the baseline model.

Sensor fusion using ES-EKF | GitHub — **Jan 2023**

- Fused sensor data from **IMU, LIDAR, GNSS** using **Error State Extended Kalman Filter** to estimate pose of an autonomous vehicle.