Muhammad Fadli Alim Arsani

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EDUCATION

University of California San Diego — San Diego, CA
B.S. Electrical Engineering - Robotics, Machine Learning & Control (GPA: 3.84) — *September 2020 - June 2024*
- **Relevant Graduate-level courses:** Robotics Sensing and Estimation, Computer Vision, Convex Optimization, Robotics Planning and Learning
- **Relevant Undergraduate-level courses:** Statistical Learning, Machine Learning, Deep Learning, C++, Linear and Non-Linear Optimization, Controls Theory, Data Structures and algorithms

WORK EXPERIENCE

Software Engineer — Pleasanton, CA
AEye Inc. — *Jan 2024 – Current*
- Improved the **C++ SDK** and its **Python bindings** for AEye's LiDAR, eliminating Python-C++ interface bottlenecks to achieve a **6x performance boost** in point cloud processing **(166 Hz → 1000 Hz)**.
- Built **high-throughput data analysis pipeline**, delivering insights to support **customer-facing documentation.**
- Validated 60+ LiDAR units, ensuring quality standards and **contributing to Q4 revenue targets.**
- Wrote a **ROS2 driver (C++)** for AEye's LiDAR, enabling **seamless integration with robotics ecosystems.**
- Developed Python-based sensor manager system, improving workflows and **reducing operational complexity.**
- Led the redesign of our calibration framework, improving **maintainability** and **partner adoption readiness**.

Perception Software Engineer Intern — Pittsburgh, PA
Moss Robotics Inc. — *July 2023 – September 2023*
- Overcome limitations of single-scan **LiDAR** data by implementing a **point cloud accumulator** module.
- Enhanced **tree/plant tracking and detection** by implementing a **real-time data association** algorithm.
- Improved **tree detection** and **row-following** accuracy with **deep learning (YOLO)** and **parallel line fitting**.
- **Optimized** real-time performance using **ROS2 Components** and **Behavior Trees**.
- Automated **trees/pots counting** through **tree block identification** by introducing a **graph-based** approach.
- Developed all the software **entirely in C++**, ensuring high performance and maintainability.
- **Doubled perception stack's efficiency**, **enhanced detection by 100%**, **made inventory counting 2x faster**.

Research Software Engineer — San Diego, CA
Existential Robotics Lab, Contextual Robotics Institute (CRI) UC San Diego — *January 2022 – July 2023*
- Built implementations & visualizations of **mobile robot algorithms** for **localization**, **mapping**, & **controls**.
- Implemented various robotics algorithms like **Particle Filter, SLAM, A* search, RRT, etc**.
- Programmed a **navigation environment** in **PyBullet real-time physics simulation engine**.

PROJECTS

LiDAR-based SLAM: Pose Graph Optimization with ICP — *Winter 2024*
LiDAR, SLAM, Python, Occupancy Mapping, Iterative Closest Point, IMU, Localization, GTSAM
- Built **LiDAR**-based (full) **SLAM** system for **differential-drive robot**, integrating data from multiple **sensors.**
- Implemented **ICP** (from scratch) for **point-cloud registration**, enhancing **pose estimates** between scans.
- Optimized trajectory through **pose graph optimization** with **loop closure** constraints using **GTSAM**.

Robust Orientation Tracking for Panoramic Stitching with Projected Gradient Descent — *Fall 2023*
Python, JAX, IMU, Gradient Descent, Kalman Filters, Robotics, Sensor Fusion, Quaternion
- Implemented Projected Gradient Descent (PGD) for **3D orientation tracking** of a rotating body.
- Demonstrated the algorithm's precision with **panoramic image stitching**.
- Implemented **7-state EKF**, achieving accurate response to rapid movement changes and **real-time** adaptability.

TECHNICAL SKILLS

Programming Language: C++, Python, C

Concepts/Libraries/Tools: ROS2, Point Cloud Library (PCL), PyTorch, JAX, OpenCV, Eigen, Linux, Boost, OpenGL SLAM, Parallel Programming, Image Processing, Object Detection, State Estimation, Mapping, Localization, Planning, Behavior Trees, Digital Signal Processing (DSP), ESP32, Raspberry Pi, Jetson Nano