Muhammad Fadli Alim Arsani

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EDUCATION

University of California San Diego — **San Diego, CA**
M.S. Intelligent Systems, Robotics, & Controls - Electrical Engineering — *Winter 2024 - Spring 2025*
- Relevant courses: Sensing & Estimation in Robotics, Advanced Computer Vision, Robotics Planning & Learning, Robot Reinforcement Learning, Convex Optimization, Linear Systems Theory, Nonlinear systems, Statistical Learning, Multi-Agent Systems

University of California San Diego — **San Diego, CA**
B.S. Electrical Engineering - Machine Learning & Controls — *Fall 2020 - Fall 2023*
- Relevant courses: Robotics, Computer Vision, Deep Learning, C++, Python For Data Analysis, Linear and Non-Linear Optimization, Machine Learning Algorithms, Intro To Autonomous Vehicles, Controls Theory, Signals and systems, Data Structures and algorithms, C Programming, Circuits Theories

TECHNICAL SKILLS

Programming Language: C++, Python, C

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

WORK EXPERIENCE

Perception Software Engineer Intern (Autonomous Driving) — **Pittsburgh, PA**
Moss Robotics Inc. — *July 2023 – September 2023*
- Overcome limitations of single-scan **LiDAR** data by implementing a **point cloud accumulator** module.
- Improved detection output and enabled **real-time tracking** by developing a **multi-sensor fusion** module.
- Improved **tree detection** and **row-following** accuracy with **deep learning (YOLO)** and parallel line fitting.
- Automated tree/pot counting and tree block identification by introducing a **graph-based** approach.
- Enabled zero-intervention row-to-row navigation by building an **exit detection algorithm**.
- Enhanced real-time performance by enabling **multi-threaded**, **thread-safe** perception stack components.
- Developed all the software **entirely in C++**.

Research Software Engineer — **San Diego, CA**
Existential Robotics Lab, Contextual Robotics Institute (CRI) UC San Diego — *September 2022 – June 2023*
- Built implementations & visualizations of **mobile robot algorithms** for **localization**, **mapping**, & **controls**.
- Implemented various robotics algorithms like **Octree Mapping, Particle Filter, SLAM, A* search, 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 estimations** between scans.
- Created a **2D occupancy grid map** and **texture mapping** from **RGBD** images, improving map representation.
- 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, 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.
- Performed **comparative analysis** between the PGD & EKF approach, highlighting potential future work.