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, Mapping, Localization, Planning, 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.
- Enhanced **trees/plants tracking and detection** by implementing **fast real-time data association** algorithm.
- Improved **tree detection** and **row-following** accuracy with **deep learning (YOLO)** and **parallel line fitting**.
- Automated **trees/pots counting** through **tree block identification** by introducing a **graph-based** approach.
- Optimized real-time performance and efficiency by leveraging **ROS2 Components** and using **Behavior Trees**.
- 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 – current*

- Built implementations & visualizations of **mobile robot algorithms** for **localization**, **mapping**, & **controls**.
- Implemented various robotics algorithms like **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.