

# Fady Algyar

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## EDUCATION

### New York University (NYU), Tandon School of Engineering, New York, USA.

Master of Science in Robotics, Automation and Control.

Sept 2021-May 2023

- GPA: **3.89/4.0**
- Relevant Courses: Robot Perception, Machine Learning, Robot Localization and Navigation.

### The American University in Cairo (AUC), Cairo, Egypt.

Bachelor of Science in Mechanical Engineering.

Sept 2012-May 2017

- GPA: 3.71/4.0

## ROBOTICS PROFESSIONAL EXPERIENCE

### Visual SLAM Engineer | Nokia Bell Labs: New Jersey, USA.

Jan 2023-Present

- Lead research and development efforts in computer vision to generate **3D maps** of environments for drones operating in challenging environments.
- Design and implement **sensor fusion** algorithms to incorporate prior **visual-inertial odometry (VIO)** poses to improve the robustness and accuracy of **3D map generation**.
- Utilize tools such as **COLMAP** and **ORB SLAM3** to improve the efficiency of the 3D mapping process.
- Collaborate with cross-functional teams, including hardware engineers and machine learning researchers, to integrate computer vision algorithms into real-world systems.

## RESEARCH EXPERIENCE

### Computer Vision Graduate Researcher | NYU: New York, USA.

July 2022 – Present

- Lead research and development efforts in lidar **3D point cloud registration**, implementing a novel **multi-level attention transformer** in **Python** and **PyTorch** to extract multi-scale features scans.
- Conduct extensive experimentation and evaluation of the proposed algorithms on real-world datasets, demonstrating a **threefold reduction in translation error** for pairwise point cloud registration.
- Design and implement an **inlier classification network** using **PyTorch** and **Python**, which utilizes the transformer architecture as a global feature extractor and triplet loss function for inlier points detection.

## PROJECTS

### Motion Planning and Inverse Dynamics Control for SCARA Manipulator (MATLAB, SIMULINK) Dec 2022

- Completed a project on **motion planning** and **inverse dynamics** control for **SCARA** manipulator, involving the design of a trajectory for the end effector using trapezoidal velocity profile and implementation of a **second-order inverse differential kinematics** to generate reference joint values.
- Designed and implemented an **inverse dynamics** control system to independently control the joints, deriving the manipulator dynamics to linearize the control system and fine-tuning the controller parameters (PID) for convergence between the reference and generated joint values.

### Vision Based Pose and Velocity Estimation of Quadrotor (MATLAB)

June 2022

- Designed and implemented a vision-based system for pose and velocity estimation of a quadrotor.
- Conducted experiments by flying the quadrotor over a planar surface with known **April Tags** distributed on it and capturing images using an onboard camera.
- Extracted **feature points** and formed correspondences between the April Tags in the images, calculated the **planar homography** matrix using the correspondences and camera **intrinsics**.
- Estimated **camera pose** from **homography**, enforcing orthonormality constraints on the rotation matrix.
- Computed **Optical Flow** with **KLT** algorithm to estimate the linear and angular velocity of quadrotor.

### Kalman Filter for State Estimation of Micro Aerial Vehicle (MATLAB)

May 2022

- Developed and implemented **extended Kalman filter (EKF)** and **unscented Kalman filter (UKF)** for state estimation of a micro-aerial vehicle.
- Formulated a 15-dimensional state vector for the quadrotor and derived the corresponding **Jacobian matrix** for the EKF, and formulated sigma points for the UKF to propagate the state estimate.
- Designed a **sensor fusion** algorithm to incorporate data from multiple sensors, including **IMU**, and **GPS**, for measurement updates in the filters.
- Analyzed the performance of **EKF** and **UKF** in terms of estimation error and computational complexity.