

# ATHARVA MAKARAND PRADHAN

📍 San Francisco Bay Area, CA | 📞 +12672664865 | ✉ atharva.msp20@gmail.com | in LinkedIn | GitHub | Portfolio

## EDUCATION

### University of Pennsylvania, Philadelphia, USA

May 2024

Master of Science - Mechanical Engineering and Applied Mechanics with a specialization in Robotics

GPA : 3.76 / 4.00

Relevant Coursework: Modern Robot Control (LQR, MPC), Advanced Robotics, Feedback Control (PID, Bode plots, root locus, Simulink), Machine Learning, Brain-Computer Interface (Signal Processing, Deep Learning), Design of Mechatronic Systems, Machine Perception

### K.J. Somaiya College of Engineering, Mumbai University, India

May 2022

Bachelor of Technology - Mechanical Engineering

GPA : 9.33 / 10.00

## SKILLS

**Programming Languages & Libraries:** Python (Pytorch, Numpy, Scipy, OpenCV), MATLAB, C, C++, LaTeX  
**Software Tools:** Robot Operating System (ROS), Solidworks, AutoCAD, Simulink, RViz, Linux, Git  
**Embedded Systems:** Arduino, RaspberryPi, ESP32, AtMega32, SPI, I2C, UDP, TCP  
**Rapid Prototyping:** Laser Cutting, 3D Printing, 3D Scanning

## EXPERIENCE

### Robotics Engineer, Research and Innovation

August 2024 - Present

Noah Medical

Pleasanton, CA, USA

#### • Project 1

- Develop a tracking system using OpenCV, Python (prototyping) and C++ (final implementation) to track points by placing virtual markers on camera feed. Improve directional awareness by showing arrows for out-of-frame markers.
- Achieved 0.8-pixel reprojection error using Charuco board calibration; addressed challenges with checkerboard and dot boards for closer points.

• Project 2 - Prototype a custom shape-detection sensor with multiple 9-axis IMUs to estimate endoscope shape. Design custom PCB for this sensor and implement SPI communication for sensor data acquisition. Test and evaluate algorithms for accurate shape sensing based on IMU data.

• Project 3 - Control geared brushless motor in 3 modes (position, torque, and velocity) and switch between these modes during runtime using Elmo drivers by EtherCAT communication.

• Project 4 - Segment endoscope in X-Ray view using YOLOv11.

### Robotics Research Assistant at Figueroa Robotics Lab (GRASP Lab)

May 2023 - July 2024

University of Pennsylvania

Philadelphia, PA, USA

- Design and implement a real-time motion control system utilizing the MANUS Meta Optitrack glove and Optitrack motion capture for pose tracking to enable tele-operation of QB-softhand 2 on a 7-DOF KUKA robot arm.
- Developed and deployed a machine learning model using PCA to reduce hand pose data from 48 to 2 dimensions, mapping it to control the QB-SoftHand 2 and KUKA Arm end-effector. (MATLAB for data visualization)
- Engineer a custom end effector with XELA Tactile sensor for normal and tangential force detection to be attached to KUKA iiwa 7.

### Graduate Teaching Assistant for Introduction to Robotics

January 2023 - May 2024

University of Pennsylvania

Philadelphia, PA, USA

- Guide a cohort of 70+ students on topics encompassing simulation setup using ROS and Gazebo, serial-arm robot kinematics, velocity kinematics, path planning and april tag detection for pick and place along with assisting in debugging code.
- Provide operational assistance in robot lab sessions by facilitating hands-on experience with the 7-DOF Franka Panda Arm.

## TECHNICAL PROJECTS

### Finger Flexion Detection from ECoG Data

- Developed and implemented a Multi-layer Perceptron Regressor model that utilizes a two-layer LSTM network, to leverage past finger motion data for predicting finger flexions from ECoG recordings.
- Evaluated the performance of the predictive algorithm against standard machine learning models using Mean Squared Error and correlation scores, achieving a significant correlation value ( $r = 0.4745$ ) between true finger flexions and model predictions.

### Autonomous VIO-based Quadcopter

- Employed a geometric nonlinear controller for stable control of CrazyFlie 2.0 quad rotor. Integrated A\* motion planning algorithm and minimum-snap trajectory generation for obstacle avoidance, Visual Inertial Odometry (VIO) for state estimation, and Error State Kalman Filter (ESKF).
- Resulted in reducing the average flight time by 25% across 6 maps thus improving the system performance.

### Grand Theft Autonomous Competition - Runner Up (Team of 4)

- Developed and prototyped a ESP32-S2-based autonomous robot with pushing capabilities.
- Employed HTC Vive for localization, IR frequency detection for target tracking and ultrasonic sensors along with time-of-flight for wall following.

### Robot Arm Pick and Place Challenge (Team of 4)

- Implemented path planning techniques to the 7 DOF Franka Panda Arm by employing forward and inverse kinematics where ROS was used as framework and Gazebo as visualization tool.
- Applied the gradient descent algorithm on angle axis representation to estimate joint angles for obtaining required final pose to solve the inverse kinematics problem. Achieved efficient stacking of 4 static blocks in under 2 minutes while utilizing the ROS framework and Gazebo for simulation.

### Design of Rover (Capstone Project, Team of 4)

- Designed and manufactured a 6-wheeled robot with the capabilities of semi-autonomous navigation using IMU, collision prevention using stereo vision, remote sensing (GPS location, temperature and humidity), and data transmission through Radio Frequency (RF).
- Performed seamless system integration of mechanical, electrical, and software components for a unified mechatronic system. One of the three teams from the department to receive INR 10000 scholarship.