

AKSHAY LADDHA

| 1259 Sunny Ct, San Jose CA 95116 |

Email: aladdha@wpi.edu

LinkedIn: <https://www.linkedin.com/in/akshay-laddha-095b02159>

Github: <https://github.com/AkshayLaddha943>

P: (774)-578-4926

EDUCATION

Self-Driving Car Engineer Nanodegree, Udacity

December 2022 – March 2023

Relevant Topics: Object Detection and Tracking with 3D Lidar Point Clouds, Sensor Fusion using LiDAR and Radar, Developing a TTC system

Worcester Polytechnic Institute (WPI), Worcester, MA

August 2021 – May 2023

Masters of Science in Robotics Engineering, Cumulative GPA: **3.59/4.0**

Mumbai University, India

August 2017 – June 2021

Bachelor of Engineering, Electronics, Cumulative GPA: **8.13/10.0**

SKILLS:

Programming Languages: Python, C++, C#

Tools: VS Code, Arduino, Mbed Studio, ROS (Noetic, Foxy), Docker, Anaconda, Blender

Operating System: Windows 10, Ubuntu (20.04, 21.04), Raspbian, MacOS

ML Framework/Packages: Tensorflow, Pytorch, Detectron2, TorchCV

Hardware: Arduino (Uno, Nano 33 BLE Sense), STM Nucleo-F401RE, NVIDIA Jetson Nano

Deep Learning Algorithms: Artificial Neural Network, Convolutional Neural Network

Contributing Writer, Medium - <https://medium.com/@akshmahesh>

WORK & RESEARCH EXPERIENCE

Tesla Inc – Software Development Intern (Low Voltage Test)

September 2022 – April 2023

- Writing automated python3 scripts for Tesla Model 3, Model Y, Semi and Cybertruck involving GPIOs, ADCs, Hall sensor, HSDs
- Created CAN scripts to install device drivers & verify communication for all functions of body controllers including Audio, Autopilot and Bluetooth
- Incorporated test cases based on Vehicle Schematics to ensure a 100% efficiency and cycle time of <75 sec on Contract Manufacturers machines
- Developed Ansible playbooks to automate deployment line and push software across 100+ machine lines in a single command line

Arrow Electronics (eInfochips) – Engineering (Sensor Fusion) Intern

June 2022 – Aug 2022

- Performed Sensor Fusion on Turtlebot3 (burger) with IMU, Wheel Odometry and GPS using Extended Kalman Filter on ROS2 (Foxy) and Gazebo 11.x.
- Devised C++ script to add noise to Gazebo's odometry data & facilitate a comparative analysis of FastSLAM, GraphSLAM and EKF-Based SLAM
- Performed Scene Segmentation using U-Net and DenseNet based off the images captured and preprocessed from Raspi Camera interfaced with Jetson
- Developed a Human Pose Estimation Pipeline with Pytorch using COCO dataset -
 1. **Training:** Generating heatmaps and developing an FCN model and PCK to evaluate performance of the keypoint estimation
 2. **Transfer Learning:** Inferencing with ResNet and Detectron2 for Pose Estimation achieving an accuracy of close to 75%
- Established a communication channel between Jetson Nano & STM32 Board using UART to extract and create dataset from on-board IMU and microphone and perform Motion Detection and Audio sampling using torchaudio package

Mathematics Department, WPI - Teaching Assistant

Feb 2022 – May 2022

- Conducted office hours, quizzes, exams and graded assignments for MA 1024: Calculus IV which included topics: vector functions, partial derivatives and gradient, multivariable optimization, double and triple integrals, polar coordinates, other coordinate systems and applications

Manipulative & Environmental Robotics Labs, WPI – Research Assistant (Ensemble Learning for Robot Grasping)

Aug 2021 – May 2022

- Research work on an Ensemble Learning Methodology combining multiple existing robotic grasp synthesis algorithms to obtain better success rates
- Training is focused on CNN-based experts including generative grasping CNN and graph recognition CNN on Cornell and Jacquard Dataset
- Training and stacking Resnet16 architecture with the CNN based experts in order to diversify the model for large range of 3D objects

Cloud Counselage Pvt Ltd – Artificial Intelligence Intern

Mar 2020 – Aug 2020

- Prepared a customer-support chatbot using Deep Neural Networks, Natural Language Processing and deployed it on a web server using Flask
- Worked out a solution for a Deep Learning problem statement using a custom Forward and Backward propagation.

RoboVR - Technical Intern

Dec 2019 – Jan 2020

- Developed sports humanoid robots by interfacing DC motors, with a L293D Motor Driver, an ultrasonic sensor with Arduino Uno R3.
- A Bluetooth module attached to either arms of the robot interacts with the Android app to handle the robot movements

RELATED PROJECTS

Indoor Scene Classification using Pytorch and Arduino Nano 33 BLE Sense (TinyML Project)

June 2023

- The project involved building a dataset by acquiring images from OV7670 Camera Module in conjunction with Arduino Nano BLE
- The camera frames were captured and transferred over a serial port using pyserial library and converted to appropriate color format for preprocessing
- Since the dataset is being fed to a pre-trained architecture MobileNet v2, the images were accordingly resized and transformed to the correct dimensions
- The trained model was further deployed on Arduino Nano 33 BLE board by converting it to a TFlite file and quantizing

Sensor Fusion and SLAM on an AMR using Extended Kalman Filter and Isaac ROS VSLAM

May 2023

- The project involved developing a XACRO model of an Autonomous Mobile robot using ROS2 Humble and NVIDIA ISAAC Sim
- The custom robot fused data from LiDAR and Radar using Unscented Kalman Filter performing sensor fusion with robot_localization package of ROS
- Performance of SLAM algorithms RTAB-Map & ISAAC ROS VLAM were compared against a warehouse environment

MultiNet: Real-time Joint Semantic Reasoning for Autonomous Driving (Deep Learning Course Project)

Mar 2022

- Developed a unified encoder-decoder architecture system using Pytorch to jointly perform depth and surface estimation and semantic segmentation
- Experiments were performed using versions of VGG16 and Resnet as encoders with VGG16 offering a good trade-off between performance & speed
- Implementation was carried out on NYUv2 dataset indicating a competitive strategy with multiple CNN based multi-task architectures
- A FCN-VGG16 outperforms for a single task while Multi-Net2 (resnet101) achieves a PA and mIoU of 76 and 54 resp. for multi-tasks

Crime Pattern Detection Analysis (Machine Learning Course Project)	<i>Oct 2021</i>
<ul style="list-style-type: none"> ➤ Model uses time series regression with regularization techniques to predict crime rate of each state leading to an r2_score of 81% ➤ For classification, model uses various algorithms (Decision Tree, KNN, SoftMax) and further fetches a final prediction using an Ensemble Learning technique resulting in an highest accuracy of 88.92% using Max-Voting technique ➤ The project was performed on Google Colab using Python 3.8 version 	
Payload Drone System using Pixhawk autopilot, Infrared range sensor & Arducam camera (IEEE Sponsored)	<i>Jan 2021</i>
<ul style="list-style-type: none"> ➤ The Payload UAV system uses Pixhawk 2.4.8 as the flight controller ➤ An Arducam 5MP camera attached to the UAV allowed calculating the drone velocity using optical flow vectors and pose using OpenCV ➤ The UAS-UAS communication was carried out using Arduino Mega and nrf24 Transceiver (SPI Protocol) achieving a distance of 150m ➤ State Estimation was performed using Unscented Kalman Filter fusing data from IMU, Infrared range sensor and Camera 	
Chatbot – Using Deep Learning and Natural Language Processing (Internship Project)	<i>July 2020</i>
<ul style="list-style-type: none"> ➤ Developed a chatbot using three-layer Neural Networks and NLTK Python library ➤ The training data was supplied in the form of a JSON file consisting of one word tags and the questions pertaining to the tag ➤ Chatbot achieves an accuracy of 95.72% and comfortably interacts and answers questions pertaining to company policies and regulations ➤ The project was performed on Anaconda: Spyder software with Python 3.7 version 	
Smart Illumination system using Arduino, LDR and Potentiometer (Hackathon Project)	<i>July 2020</i>
<ul style="list-style-type: none"> ➤ Designed a smart illumination system using Arduino Uno as the primary board ➤ The Illumination was modelled in two formats – <ul style="list-style-type: none"> ✓ <i>Potentiometer</i>: Manually tuning the brightness of LED’s ✓ <i>LDR Module</i>: An obstruction to the LDR Module automatically lights up the LED’s 	
Live Electricity consumption reading using voltage sensor and Android app (Final year Project)	<i>May 2020</i>
<ul style="list-style-type: none"> ➤ The project involves monitoring live electricity reading with the aid of voltage and current sensor ➤ An android app designed using Android Studio with a detailed stat and UI to provide users with a comfortable and legit reading of their usage ➤ The project was performed using Node MCU and a load (in the form of any heating appliance) connected 	

GUIDED PROJECTS

- Real Time Object Detection System using Encoder-Decoder Architecture and Pre-Trained YOLO Model
- Detecting Spam comments on Youtube using Random Forest Classifier and Scikit learn
- Real Time Motion Detection System using OpenCV 4 and Python 3.8
- Ultrasonic sensor Line-Follower Robot Simulation using V-REP Simulator and MATLAB
- Multi-Task Display Program using Mbed OS and STM32F401 Nucleo-64 Development Board

CERTIFICATIONS

- Embedded System Essential with Arm: Get Practical with *Hardware, edX (2022)*
- State Estimation and Localization for Self-driving cars, *Coursera (2021)*
- Introduction to Self-driving cars, *Coursera (2021)*
- Artificial Intelligence for Robotics, *Udacity (2020)*
- TinyML3: Fundamentals of TinyML, *edX (2020)*
- Machine Learning A-Z™: Hands-on Python & R in Data Science, *Udemy (2019)*

PUBLICATIONS

Unmanned Aerial Vehicle Network for Remote Estimation & Supply Drop in Flooded Areas	<i>Oct 2020</i>
International Research Journal of Engineering & Technology IRJET-V7I10199.pdf	
<ul style="list-style-type: none"> • Paper presents a novel idea of UAV-UAV communication using a flight controller interfaced with a Raspberry Pi and nrf24 Transceiver • The paper highlights the use of FPV camera system and a Pi Noir Camera V2. • The system ensures an optimal flight time with the selection of appropriate components with suitable ratings for the use-case. 	
IoT Based Smart Shopping Cart System for Customer Experience Optimization	<i>Jan 2021</i>
International Journal of Scientific Research in Engineering and Management https://tinyurl.com/vyh7fbkt	
<ul style="list-style-type: none"> • Presented an idea of a smart shopping cart using Arduino mega 2560 interfaced with RFID tags and an LCD screen • The proposed system offers a seamless shopping experience with quick and spontaneous payment option at the end of the trip. 	

IEEE LEADERSHIP EXPERIENCE

Student Volunteer, IEEE Bombay Section	<i>May 2020 – June 2021</i>
➤ Volunteer member of the New Project Initiatives Committee, IEEE Bombay Section	
Secretary, IEEE UCOE Student Branch	<i>July 2020 – Aug 2021</i>
➤ Established our college as an active student branch by regularly conducting contests, seminars and activities for the students	

ACHIEVEMENTS

- Silver medalist - secured a 2nd rank in my Engineering branch
- Winner – LUMINO, National Level Hackathon
- Runner-up – LUMINO 2.0 National Level Hackathon
- Travel grant awardee from IEEE for the ‘2019 Young Professionals Conference’ held at Austin, Texas
- Secretary of IEEE Student Branch and Head of ‘New Project Initiatives’ Committee at IEEE Bombay Section
- Grade B - ‘RIO+24 War & Peace’ – International Decade for the Rapprochement of Cultures IDRC India