



Alizainul Vaghjipurwala, M.Sc.

Mechatronics Engineer

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D.O.B - 02. Sept, 1997 | Nationality - Indian | GitHub - [AliVaghjipur](#) | LinkedIn - [Alizainul Vaghjipurwala](#)

Summary

AI/ML engineer with a strong foundation in **Multimodal Sensor Fusion, Deep Learning, Computer Vision** and **Generative AI**. Experienced in developing Autonomous Driving Functions for **Localization, Perception** and **Trajectory planning** of vehicles. Proficient in building and deploying scalable machine learning solutions using modern frameworks such as PyTorch, TensorFlow, and OpenCV. Solid understanding of 2D/3D perception, sensor data processing, **state estimation (Kalman/particle filters, Monte Carlo Methods)** and MLOps practices. Skilled in working with Maps (3D OpenDRIVE maps, Here HD maps, OSM) as well as concepts like **SLAM**, etc.

Work Experiences

Research Engineer (Master Thesis)

Lippstadt, Germany
02/2024 - 08/2024

Hella Forvia GmbH

- Thesis Title:** Ego-vehicle self-localization and trajectory identification using GPS-IMU sensor-fusion, Stereo Cameras and OpenDRIVE maps.
- Designed a **Deep Learning** -based **virtual sensor** framework to simulate GPS data during signal loss, enhancing localization robustness in challenging environments.
- Built a trajectory prediction model using vehicle telemetry and road topology data, enabling more intelligent path estimation under uncertainty.
- Engineered method to build lane level constraints from map data to enhance localization robustness.
- Applied **signal processing** and ML techniques for sensor data analysis to detect patterns and anomalies in driving behavior.

Engineering Intern

Lippstadt, Germany
08/2023 - 02/2024

Hella Forvia GmbH

- Contributed to the development of **3D object detection** and **tracking** using **YOLOv8**, as well as Lane detection for improved perception accuracy.
- Developed automated map parsing system for converting OpenDRIVE map data into MATLAB structures, enabling rapid prototyping.
- Built road network graphs using data from OpenDRIVE maps.
- Calibrated stereo and monocular cameras using Chessboard images.

Graduate Engineer Trainee

Halol, Gujarat, India
07/2019 - 10/2019

Sodecia India Pvt. Ltd.

- Planning and optimization of production by analyzing inventory, requirements and sales data.

Education

M.Sc. Mechanical Engineering ISE

GPA - 1.9

(Mechatronics Profile)

Duisburg, Germany
10/2021 - 08/2024

Universität Duisburg Essen

- Machine Learning, Deep Learning, Computer Vision, Reinforcement Learning
- Control Theory, Model Predictive Control, Vision-Based Control
- Mathematical Optimization, Signal Processing, Kalman & Particle Filters
- Kinematics & Dynamics of Robotic Systems, Sensor Fusion

B.E. Mechanical Engineering

Gujarat, India
09/2015 - 06/2019

Gujarat Technological University

- Bachelor thesis: City Efficient Cars - Redesigning cars for reducing space occupied in the cities while in idle/parked condition

Highschool (Qualification for University Education)

Godhra, India
07/2013 - 03/2015

Calorx Public School

Skills

Python

Matlab / Simulink

C++

Pytorch

TensorFlow

OpenCV

Scikit-learn

Numpy

Pandas

Matplotlib

PCL

Keras

ROS

GIT

AWS

MLOps

Docker

Github

GNSS / GPS

IMU

Cameras (Mono, Stereo)

LiDAR

Analytical Thinking

Communication

Presentation

Team work

Curiosity

Quick learner

Key Projects

GitHub - [AliVaghjipur](#)

LiDAR-Camera Fusion for 3D Object Detection

- Implemented state-of-the-art sensor fusion pipeline using **KITTI dataset**, achieving 89% detection accuracy.
- Integrated **YOLOv5** with point cloud processing for robust **3D object detection** and **tracking**.
- Developed custom data preprocessing pipeline handling multi-sensor synchronization.

Advanced Lane Detection

- Applied Sobel and color thresholding with CLAHE for robust feature extraction under varying lighting.
- Implemented sliding window and memory-based lane tracking for frame-to-frame stability.
- Estimated lane curvature and vehicle offset in real-world units; overlayed results on video frames.
- Enhanced robustness with ROI masking and temporal smoothing for challenging environments (e.g., shadows, glare, tight curves).

Autonomous Vehicle Behavioral Cloning

- Developed end-to-end deep learning system for autonomous vehicle control using behavioral cloning.
- Implemented **data augmentation** pipeline improving model generalization by around 35%.
- Achieved 97% successful autonomous navigation in various weather and lighting conditions.

Core Expertise

Multimodal Sensor Fusion, Artificial Intelligence, Machine Learning, Deep Learning, Reinforcement Learning, Computer Vision, Large Language Models (LLMs), Natural Language Processing (NLP), ML Pipeline Design, TensorFlow, PyTorch, Cloud Platforms (AWS), Containerization, Transformers.

Certifications and Courses

The Complete Self Driving Car Course - Applied Deep Learning

UDEMY

- Deep Neural Networks, Convolution Neural Networks, Multiclass Classification, Image recognition, Polynomial Regression, leNet, Data Augmentation, Object Detection.

AWS Machine Learning Foundations

UDACITY

- Object Oriented Programming (OOP), Reinforcement Learning, AWS DeepRacer, Generative AI, AWS DeepComposer, AR-CNN, GAN.

Deep Learning with MATLAB

Mathworks MATLAB

- Deep Network Design, Image Classification, Deep Learning for Computer Vision, Regression, Sequence Classification, Data Processing, Pattern Identification.

Reinforcement Learning with MATLAB

Mathworks MATLAB

- Deep Reinforcement Learning, Q-Learning, Deep Q-Networks (DQN), Agent-Environment Interaction, State, Action, Reward, Action-Value Function (Q).

Languages

- **German** - Upper Intermediate (B2)
- **English** - Native/Bilingual (C1)
- **Hindi** - Native

Hobbies and Interests



AI



Physics



Basketball



Quizzing



Volunteering

References

Dr. -Ing. Rainer Kauschke | Hella Forvia GmbH | rainer.kauschke@forvia.com

Dr. -Ing. Francisco Geu Flores | Universität Duisburg Essen | francisco.geu@uni-due.de

Key Projects

GitHub - [AliYaghjipour](#) 

Stable Diffusion model from scratch

- Built a Stable Diffusion model from scratch using **PyTorch**, building a complete **text-to-image** and **image-to-image Transformer based** generation pipeline, gaining deep insights into **generative AI** models.
- Developed all components like the **Variational Autoencoder (VAE)** for latent encoding, a transformer-based text encoder and a U-Net with attention for denoising, CLIP and DDPM scheduler, developing complete end-to-end generative AI model.

Boston Housing Price prediction (model + deployment)

- Developed and deployed a Boston Housing Price Prediction web app using Flask, HTML, and Postman for API testing, serving a pickled Linear Regression model.
- Containerized the application with **Docker** and automated deployment using **GitHub Actions** and Render/Heroku, ensuring seamless **CI/CD**.
- Built and trained the model on the Boston Housing dataset, implementing **data preprocessing**, **feature engineering**, and model serialization for production readiness.

Volunteering

Social worker, Head coordinator

National Service Scheme (NSS), India

- Lead a team of 70 volunteers, organizing various events for underprivileged children, focussing on their education and overall development.
- Educating people in rural regions, farmers and dairy workers about the various government schemes.

Volunteer

Share A Book India Association (SABIA), India

- Book donation drives to build libraries in Government Schools in rural areas.

Volunteer

Campus Garten, Germany

- Community gardening at the university campus along with sustainability programs like setting up rain water harvesting, organising clean-up drives and other events and discussions.