Alizainul Vaghjipurwala, M.Sc.

Mechatronics Engineer

+4915751881840 | valizainul@gmail.com | Address - 70563 Stuttgart, Germany|
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 concpets like **SLAM,** etc.

Work Experiences

Research Engineer (Master Thesis)

Lippstadt, Germany
Hella Forvia GmbH
02/2024 - 08/2024

- **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
Hella Forvia GmbH
08/2023 - 02/2024

- 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
Sodecia India Pvt. Ltd.
07/2019 - 10/2019

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

Education

M.Sc. Mechanical Engineering ISE (Mechatronics Profile)

GPA - 1.9
Duisburg, Germany
Universität Duisburg Essen
10/2021 - 08/2024

- 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
Gujarat Technological University
09/2015 - 06/2019

- 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
Calorx Public School
07/2013 - 03/2015

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 - AliVaghjipur

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 sustainabiliy programs like setting up rain water harvesting, organising clean-up drives and other events and discussions.