

# ABHISHEK SINGH KUDAVALE

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## EDUCATION

### Masters of Science – Mechatronics

10/2022 – present | Siegen, Germany

Universität Siegen

Focus: ADAS, Object-oriented Programming (C++ and Python), Machine Learning, Deep Learning, Embedded Systems, Computer Vision, Control Theory, Sensorics, Electric Machine, Project Management

### Bachelor of Engineering – Mechanical Engineering

08/2016 – 05/2020 | Hyderabad, India

Vasavi College of Engineering

Focus: Programming Languages (C and C++), Database Management, Fluid Mechanics, Machine Design, Thermodynamics, FEM Simulation, CAD/CAM, Automobile Engineering, Physics, Mathematics

## PROFESSIONAL EXPERIENCE

### Master Thesis Student

08/2025 – Present | Gifhorn, Germany

IAV GmbH

- Integrate temporal information across video frames to enhance parameter extraction and scene understanding using computer vision and Vision language models outputs.
- Develop and deploy a multimodal AI framework that merges CV and VLM outputs into the existing pipeline for scenario generation from raw video while maintaining low latency.

### Workstudent

05/2025 – 07/2025 | Berlin, Germany

IAV GmbH

- Researching potential cybersecurity attack scenarios on vehicles and developing experimental plans for implementing a Design of Experiments (DoE) AI agent to enhance system resilience.
- Conducting experiments on test vehicles and contributing to initiatives aimed at strengthening the automotive sector's digital presence and improving customer engagement.

### Student Research Assistant

10/2023 – 11/2024 | Siegen, Germany

Universität Siegen

- Integrated deep learning-based 6D pose estimation with the Kalman filter and adjusted noise parameters dynamically during network optimization and evaluation.
- Optimize model performance by 22.88% compared to the original study through algorithm fine-tuning and applying data processing to real-world 6D IMU data.

### Graduate Engineering Trainee

10/2020 – 11/2021 | Hyderabad, India

Technique Design Group

- Designed and built 3D models using CATIA V5 CAD tool and developed prototypes. Researched, Optimized and managed fabrication and real-world testing for three projects.
- collaborated with a 5-member cross-functional team and coordinated with three clients to contribute to the successful completion of cutting-edge design projects.

## PROJECTS

### Fine-Tuning Large Language Model for spam classification

02/2025 – 04/2025

Proficiencies: LLM Pipeline, Token Embedding, Attention Mechanism, Transformer Architecture, GPT2

- Understanding the stages of building a Large Language Model involves efficient conversion of words into context vectors using 12 attention heads.
- Fine-tuning a pretrained transformer-based LLM with 10,000+ spam classification examples and accomplished 97.21% and 95.67% accuracy on Train and Test dataset, respectively.

## **Robustness and Fairness in Deep Learning**

05/2024 – 07/2024

Proficiencies: CNN, Python, Adversarial Training, Computer Vision, Transfer Learning, Classification

- Performed PGD training on the CIFAR-10 dataset and studied the class distribution of misclassification and introduced batch sampling to ensure an equal number of classes in a batch.
- Implemented PGD training while considering 3 distinct robust loss rules and achieved 84% and 76% accuracy on targeted and untargeted attacks, respectively.

## **Semantics Segmentation on Cityscape Dataset**

02/2024 – 04/2024

Proficiencies: Deep Learning, Cluster Computing, Cityscapes , Data Visualizations, CUDA

- Enhanced model performance by 10% on pre-recorded CityScapes dataset, achieving an 87% IoU accuracy. Accomplished this through transfer learning and data augmentation techniques.
- Developed a training, testing, and validation pipeline that reduced training time by 15% by utilizing parallel processing with GPU and optimizing batch size and learning rate.

## **Pick and Place Manipulator LEGOEV3 Robot**

12/2023 – 03/2024

Proficiencies: Matlab, Simulink, Robot Kinematics & Dynamics, PID Control, Motion Planning

- Programmed robot kinematics and dynamics using MATLAB for collision free trajectory, reducing processing time by 20%. Automated trajectory planning and control through Simulink.
- Designed and tuned PID feedback controller in MATLAB to optimize robot movement accuracy by 15%, increasing smooth and real-time control of robotic joints.

## **Image Classification Challenge on Custom Dataset**

11/2023 – 01/2024

Proficiencies: Deep Learning, Python, Pytorch, NumPy, Pandas, Data Pipeline, Data Agumentation

- Trained a custom 8 Christmas classes image dataset on EfficientNet-b4, achieving 98% and 96.20% training and testing accuracy, respectively.
- Improved optimal performance by conducting fine hyperparameter tuning, scheduling, and regularization strategies. Obtained the highest test accuracy compared to all tested models.

## **Lane Line Detection**

11/2023 – 01/2024

Proficiencies: Python, OpenCV, Data Preparation, Images & video data, Computer Vision

- Engineered an image processing pipeline that ranges from preparing raw data to extracting relevant features to enhance lane detection with 82% IoU accuracy.
- Experimented with a custom edge detection algorithm and applied Gaussian blur and Hough line detection, obtaining a 10% improvement in true positive cases.

## **SKILLS**

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**Technical Skills:** CAN Networks, Git, Artificial Intelligence (AI), Robotics, Sensor Data Fusion, Kalman Filter, Applied Mathematics, Statistical Analysis, Software Development, ROS, AI Algorithms, Neural Networks, LiDAR & Radar, Image Processing, Signal Processing, LLMs, Data Visualization, Data Science, AI Agents, RAG Pipeline, Docker, Literature Research, Documentation, LaTeX, MS Office

**Programming & Simulation Skills:** C++, Python, Matlab, Simulink

**Data Frameworks:** PyTorch, Tensorflow, NumPy, Pandas, Matplotlib, OpenCV, Scikit-learn, SpaCy

**Environments:** Visual Studio Code, Jupyter Notebook, PyCharm, Linux

## **LANGUAGES**

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**English:** C1

**German:** A2

**Telugu & Hindi:** Native



Abhishek Singh Kudavale