



INTEL UNNATI INDUSTRIAL TRAINING PROGRAM- 2024

**PRESENTED BY TEAM
ALL FOR ONE**

PROBLEM STATEMENT



PS - 13



**Vehicle Movement Analysis and Insight
Generation in a College Campus using Edge AI**

Unique Idea Brief :

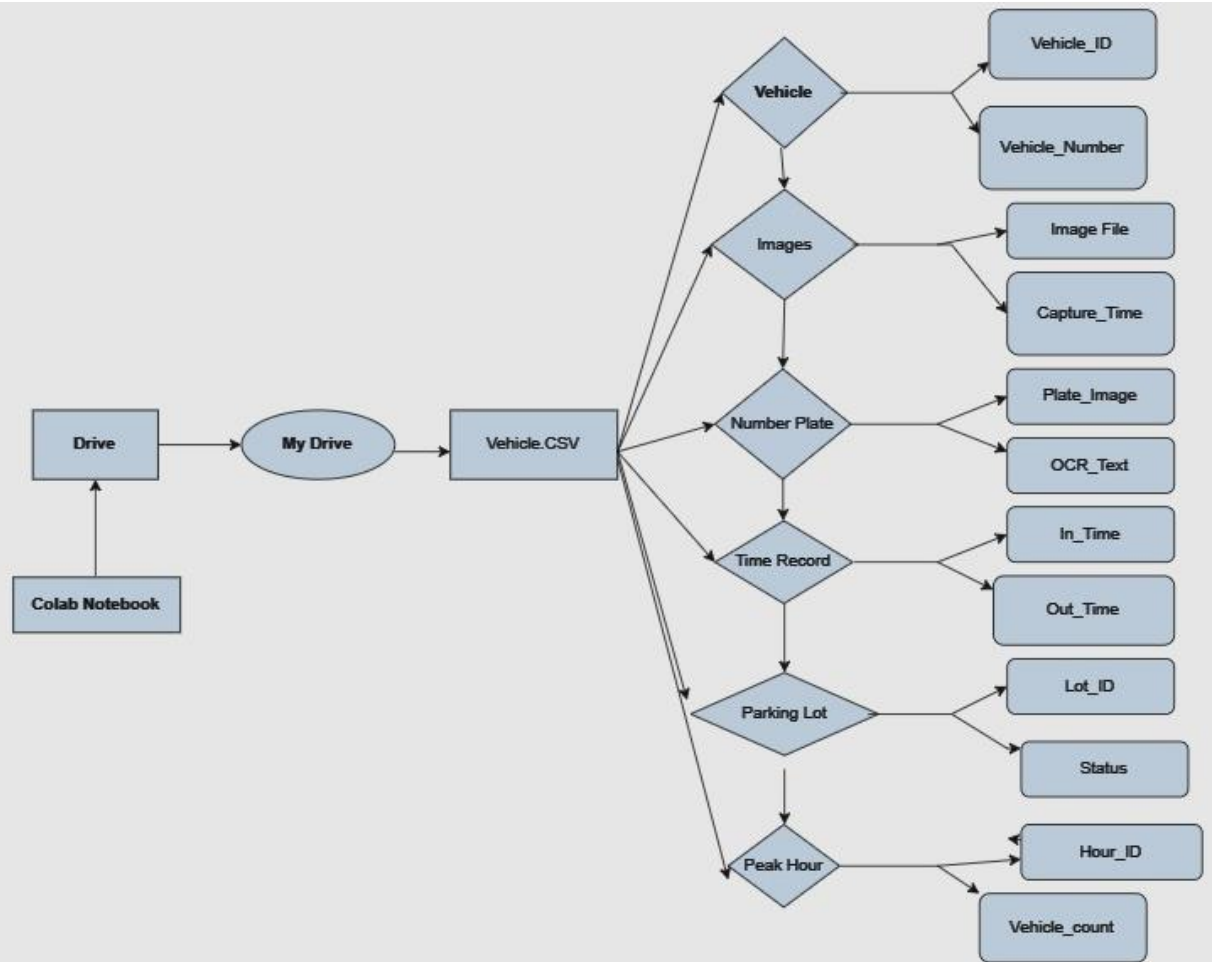
- **Objective:** Develop an intelligent vehicle movement analysis and insight generation system for a college campus using Edge AI.
- **Technologies Used:** Image processing and optical character recognition (OCR).
- **Key Functions:**
 - Monitor vehicle movements.
 - Analyse parking lot utilization.
 - Generate actionable insights.
- **Benefits:**
 - Enhance campus security.
 - Optimize parking lot usage.
 - Provide data-driven insights for better management of vehicle traffic.

Process Flow

- **Image Acquisition:** Capture images of vehicles entering and exiting the campus using cameras.
- **Preprocessing:** Resize and convert the images to grayscale. Apply bilateral filtering and edge detection.
- **Contour Detection:** Detect contours to identify potential number plates.
- **Number Plate Extraction:** Extract and mask the number plate area from the image.
- **OCR Processing:** Use Tesseract OCR to recognize the vehicle number from the extracted number plate.

- **Time Recording:** Generate random in-time and out-time for each vehicle.
- **Data Storage:** Store the vehicle number, in-time, out-time, and total time in a CSV file.
- **Data Analysis:** Load the CSV file and analyze the vehicle counts per hour to determine peak hours and vehicle presence.
- **Visualization:** Create visualizations like bar charts to display the number of vehicles per hour and parking lot utilization.
- **Parking Lot Management:** Simulate the parking lot with random vehicle assignments and generate a combined CSV file for vehicle positions and in-times.

Architecture Diagram





DIRECTORY STRUCTURE

Vehicle-Movement-Analysis/

```
|— Images/
|   |— vehicle1.jpg
|   |— vehicle2.jpg
|   |— vehicle12.jpg
|— vehicles.csv
|— parking_lot.csv
|— vehicle_analysis.py
|— README.md
```

TECHNOLOGIES USED



- **Python:** Programming language for implementing the solution.
- **OpenCV:** Library for image processing.
- **Tesseract OCR:** Tool for optical character recognition.
- **Pandas:** Library for data manipulation and analysis.
- **Matplotlib:** Library for creating visualizations.
- **NumPy:** Library for numerical operations.

Team Members and Contributions

Member 1 - [T. Deekshith]

- Captured images of vehicles.
- Organized the image dataset.
- Ensured image quality for processing.

Member 2 - [Sai Indranale]

Image Processing and Contour Detection

- Implemented image preprocessing techniques.
- Detected contours and extracted number plates.
- Developed methods for accurate number plate extraction.

Member 3 - [Gondi Sireesha]

OCR Implementation and Data Extraction

- Integrated Tesseract OCR for vehicle number recognition.
- Extracted and stored data in a structured format.
- Ensured accurate OCR results.

Member 4 - [Morrennagari Hari Chandana]

Code Implementation and Integration

- Wrote and integrated the main code for vehicle analysis.
- Managed data flow.
- Ensured smooth operation of the system.

Member 5 - [T. S. Roshini]

Data Analysis and Visualization

- Analyzed vehicle movement data.
- Created visualizations for peak hours and parking lot usage.
- Generated valuable insights from the collected data

**Thank
you**

