AI-Powered Road Lane & Object Detection System

Problem Statement: Road accidents due to lane departure and Unknowing obstacles are a major concern.

- Lack of real-time assistance for drivers."
- Poor visibility and distractions lead to accidents.
- Need for an automated solution to enhance road safety.

Proposed Solution

An AI-powered camera system that detects road lanes and nearby objects, providing real-time alerts to drivers

- Uses computer vision and deep learning.

- Identifies lane markings and warns if a vehicle drifts.

- Detects nearby objects (cars, pedestrians, obstacles) to avoid collisions.

Key Features

Lane Detection: Identifies lane markings using AI.

- Object Detection: Detects pedestrians, vehicles, and obstacles.
- Real-time Alerts: Immediate warnings for lane departure and hazards.
- Low-Light Adaptability: Works in various lighting conditions.
- Integration: Can be embedded in existing vehicle systems.
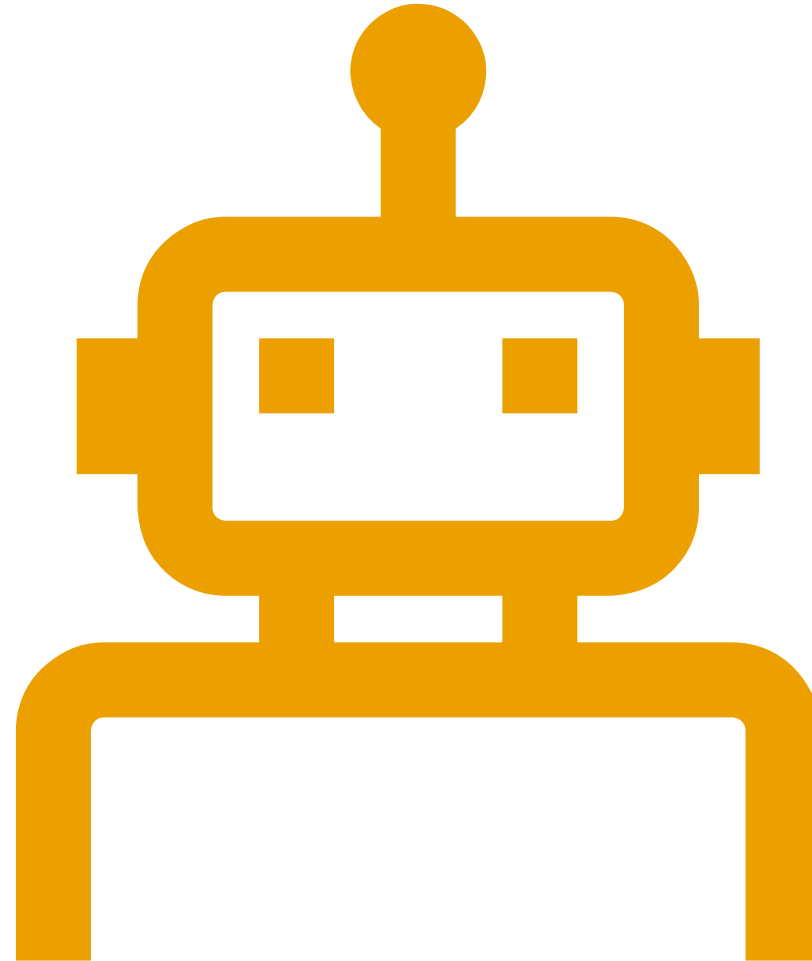
Technology Stack

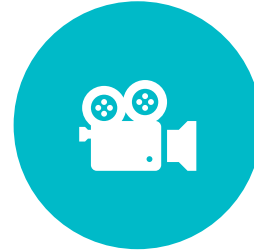"- Programming Languages: Python

- Frameworks: OpenCV, TensorFlow, Py Torch.

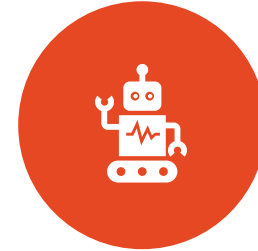- Hardware: High-resolution camera, Raspberry Pi/NVIDIA Jetson.

- Cloud Services: AWS/GCP for data processing.

- AI Models: YOLO, Deep Learning-based lane detection

Architecture Overview

1. CAMERA MODULE: CAPTURES REAL-TIME VIDEO FEED.

2. AI PROCESSING UNIT: RUNS LANE DETECTION AND OBJECT RECOGNITION.

3. ALERT SYSTEM: GENERATES WARNINGS FOR LANE DEPARTURE AND OBSTACLES.

4. CLOUD PROCESSING (OPTIONAL) : STORES AND PROCESSES DRIVING DATA FOR ANALYTICS.
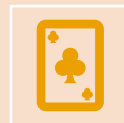
Challenges & Mitigation Strategies

- Low-light conditions: Use infrared cameras for night vision.

- Weather interference: Train models on diverse conditions.

- False positives: Fine-tune AI models to improve accuracy.

- Hardware limitations: Optimize models for real-time processing on embedded devices.

Alternative Approaches

- LIDAR-based system: More precise but expensive.

- Radar-based detection: Effective for moving objects but limited in lane detection.

- Hybrid approach: Combining cameras with LIDAR for better accuracy.