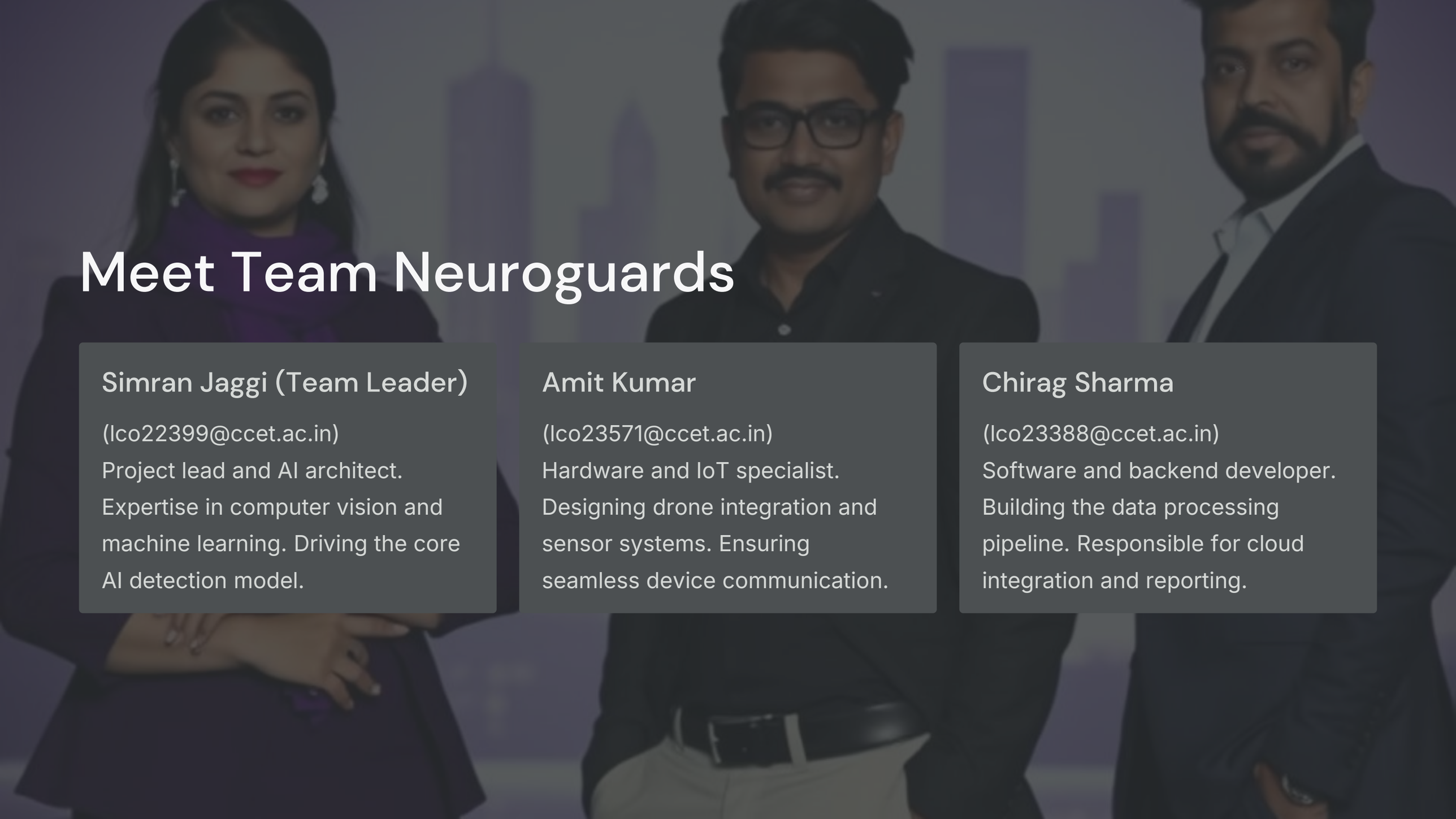
Automated Traffic Violation Detection System Using AI

Smart Policing

Cyberthon.ai Pitch | Team Neuroguards

Category : Student



Meet Team Neuroguards

Simran Jaggi (Team Leader)

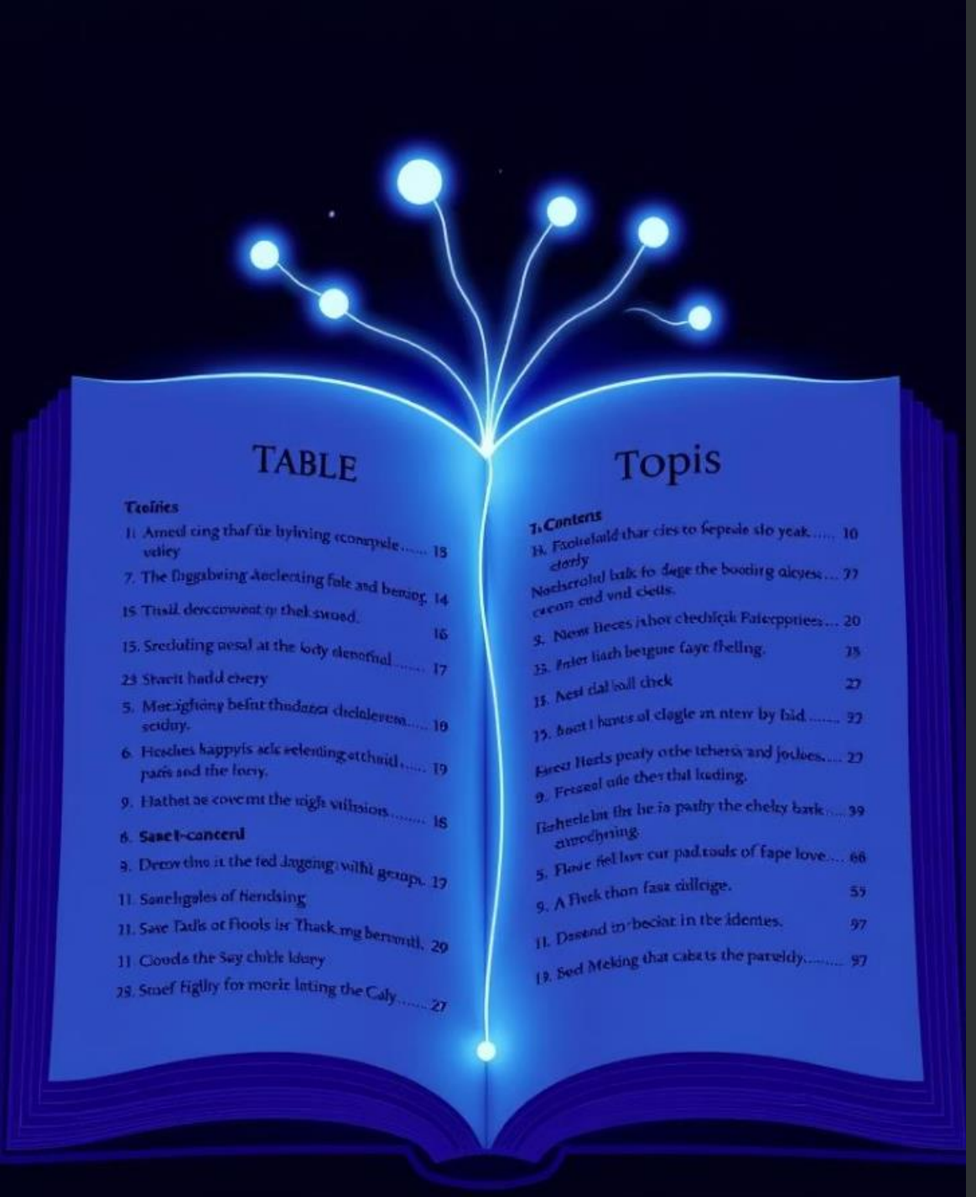
(lco22399@ccet.ac.in)
Project lead and AI architect. Expertise in computer vision and machine learning. Driving the core AI detection model.

Amit Kumar

(lco23571@ccet.ac.in)
Hardware and IoT specialist. Designing drone integration and sensor systems. Ensuring seamless device communication.

Chirag Sharma

(lco23388@ccet.ac.in)
Software and backend developer. Building the data processing pipeline. Responsible for cloud integration and reporting.



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The Problem: Road Traffic Violations

- Violations cause accidents and deaths. They are a significant public safety issue.
- Manual surveillance is inefficient. It is also prone to human error and poses risks to personnel.
- Many violations go unnoticed. This is especially true in crowded or remote locations.

Automated Traffic Enforcement

Patrols Roads

Drones patrol highways and city roads.

Detects Violations

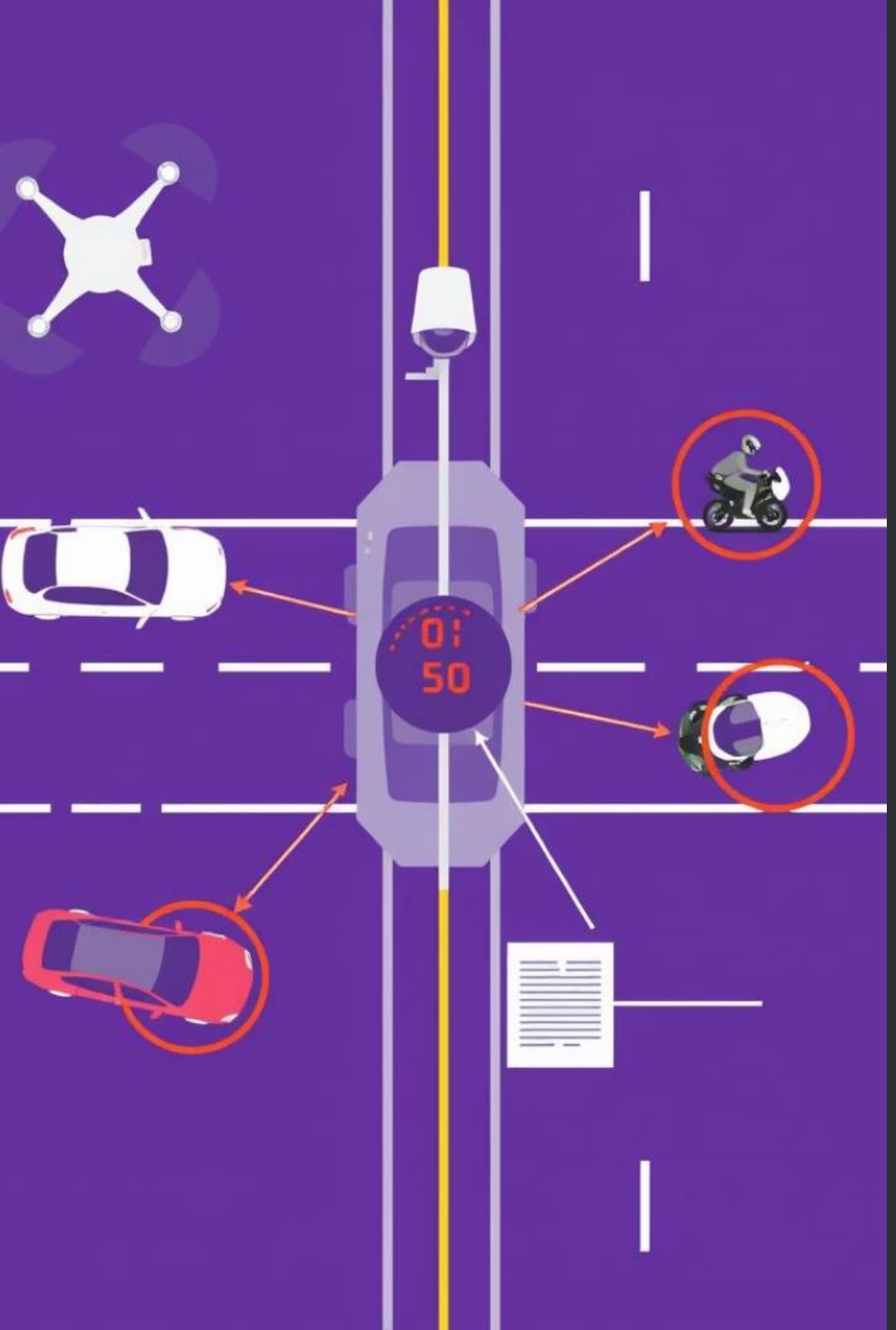
Identifies speeding, red-light jumpers, helmetless riders, and lane violations.

AI Video Parsing

Uses AI for video analysis and object detection.

Tracks Defaulters

Follows vehicles, streaming video to control room.



Proposed Solution Overview

AI-Powered System

Utilizes drones and programmable cameras.

Detects Key Violations

Speeding, signal jumping, helmet-less driving.

Automated Reporting

Classifies and reports violations efficiently.

Surveillance for Public Safety

Mishap Detection

Monitors public zones for aggressive behavior, suspicious items, or armed individuals.

Real-time Alerts

Alerts control centers instantly. Can deploy non-lethal crowd control measures.

AI-Powered

Uses AI for person/object detection and motion pattern analytics.

Smart Communication & Violation Management

IoT & AI Communication

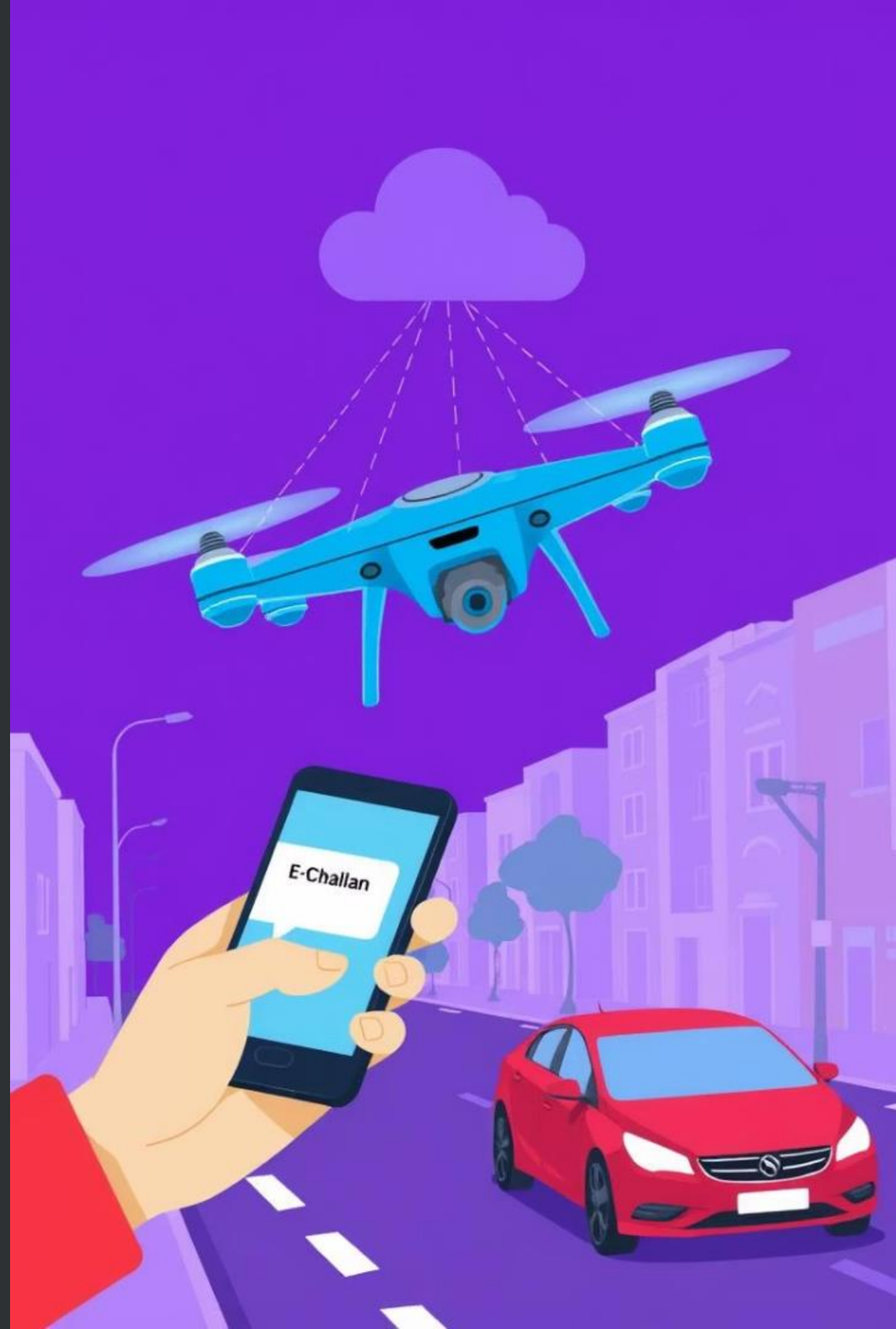
Connects with traffic control, police, and violation databases.

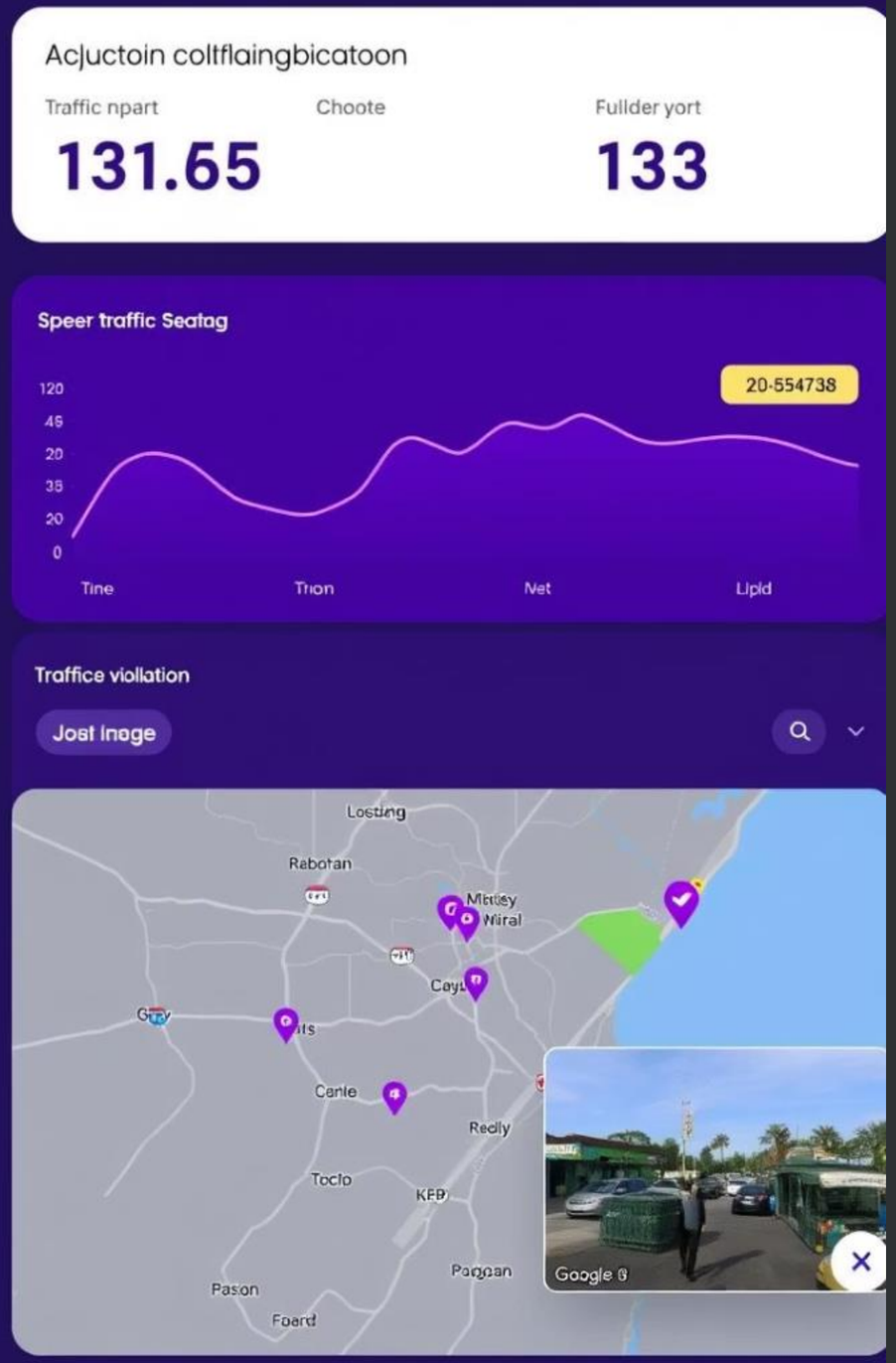
Automated Challan

Displays offense on OLED screen, sends e-challan via SMS/email with payment link.

Vehicle Tracking

Tracks violators to nearest checkpoint if needed.





Violation Reporting Module

Automated Logging

Every violation is instantly logged by the system.

Rich Data Capture

Captures image, GPS, timestamp, and violation type.

Cloud Integration

All data is sent to a secure cloud dashboard.

Project Objective: Smart AI Monitoring

AI-Driven Monitoring

Detect and record violations in real-time.

Integrated Hardware

Drones, AI cameras, and IoT sensors work together.

Cloud for Evidence

Secure storage and reporting capabilities.

Existing Solutions vs. Our System

Existing System

- Static CCTV surveillance
- Manual monitoring
- Limited coverage
- Slow reporting

Our System

- AI-based live video analysis
- Automated detection
- Drones with long-range IR cameras
- Instant digital alerts

Real-Time AI Action & Crowd Control

Immediate Response

Drone broadcasts warnings and alerts command center.

Non-lethal ammunition can be deployed with approval.

System Architecture

Live Video Input

From CCTV or Drone feeds.

Video Feed Parser

Processes raw video data.

AI Violation Classification

Identifies specific traffic offenses.

Cloud Database

Stores all collected evidence.

Reporting & Dashboard

Visualizes data and generates alerts.

Drone Unit Components

Qualcomm® Flight™ RB5 5G

High-performance drone platform.

Programmable IR Cameras

40-50m HD range for clear visuals.

Sensors & Screen

Motion, light, and OLED/TFT alerts.

Connectivity

ESP32 IoT Controller, 5G/WiFi 6 switches.

Drone Concept

1

IR Camera

High-resolution imaging.

2

Sensors

Environmental data collection.

3

OLED Screen

Real-time information display.

4

WiFi/5G Module

Seamless data transmission.

5

Propellers

Stable and efficient flight.

Video Feed Parser Module

Frame Conversion

Live video to frame sequences.

Object Detection

Identifies and isolates vehicles.

AI Input Prep

Optimizes frames for AI model.

AI Violation Classification Model

Violation Detection

Speeding, signal jumping, helmet-less riding.

Model & Training

YOLOv8 object detection, custom AI.

Key Metrics

92%+ accuracy, 50 ms/frame inference.

IoT Device Integration

ESP32 Microcontroller

Connects motion and light sensors.

AI Processing

Initiates AI analysis upon detection.

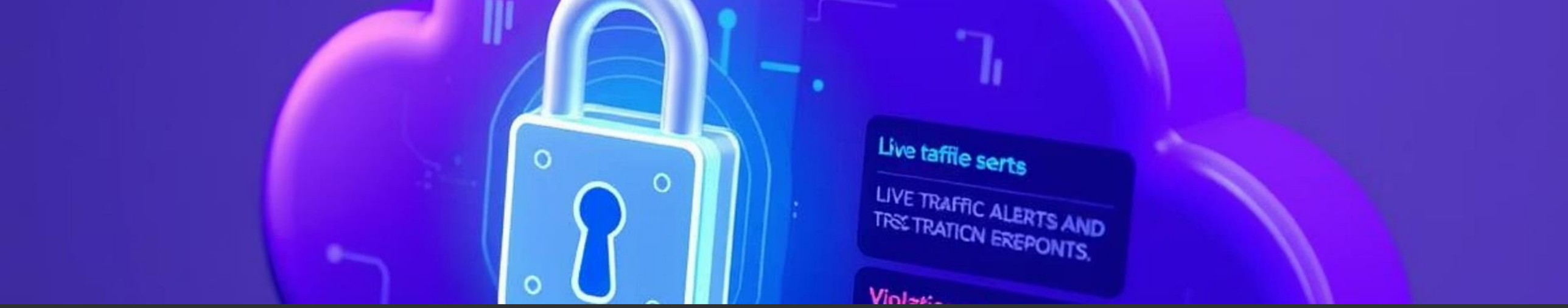
Drone Telemetry

Integrates with cloud storage.

Drone Emission & Surveillance Range

Our drones operate within safe and legal electronic emission limits.

- IR range: 50 meters for clear night vision.
- Max flight radius: 3-5 kilometers for extensive coverage.
- 5G and WiFi 6 for seamless data transfer.



Data Storage & Dashboard

Cloud-Based Database

Scalable and accessible data storage solution.

Secure Encrypted Logs

Ensuring data integrity and privacy.

Web Dashboard

Live alerts and comprehensive violation reports.

Technical Specifications & Tools

AI & Image Processing

YOLOv8, TensorFlow/PyTorch , OpenCV for detection.

Hardware Integration

Programmable IR (40–50m) Cameras, ESP32 IoT controller.

Drone Platform

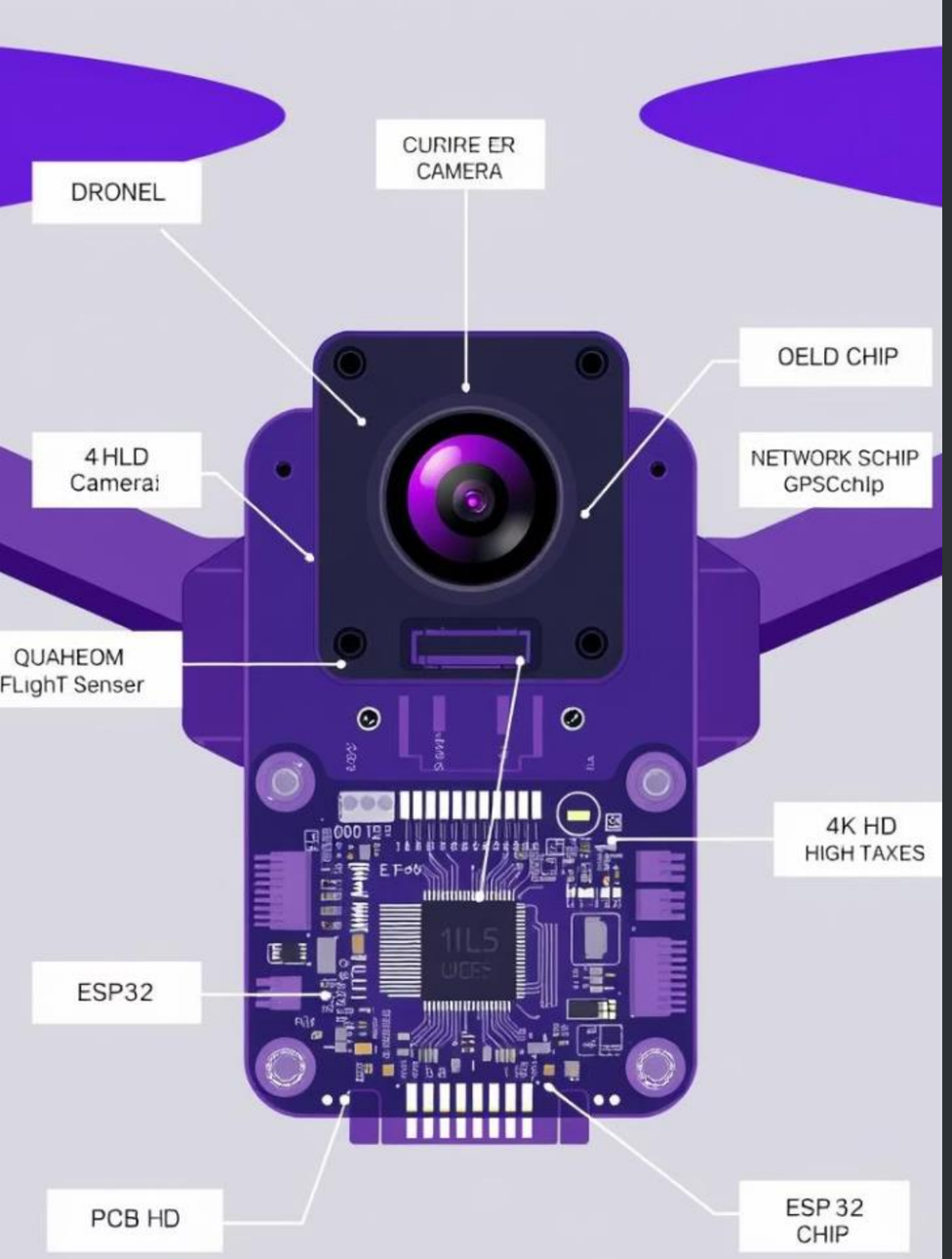
Qualcomm Flight RB5 5G, with 5G/WiFi 6 modules.

Software Stack

Python, Flask for backend; HTML, CSS for frontend.

Technical Components

AI Detection Models	Real-time object, person, and action recognition.
Programmable HD Cameras	IR-range 40–50m, AI-compatible, multi-angle support.
Qualcomm® Flight™ RB5 5G Board	High-performance AI drone controller with 5G & Wi-Fi 6.
TFT/OLED Display Module	In-drone display for public e-challan messages.
Drone Ammunition Add-On	Optional tear gas shells/sound cannon module.



Hardware Specifications

Camera	4K HD, IR 40-50m, programmable
Drone	Qualcomm® Flight RB5, 7 cameras
Display	OLED/TFT, live alert
IoT	ESP32, WiFi 6, 5G

Connectivity Specifications

Live Video Feed

Enabled by high-speed 5G/WiFi 6.

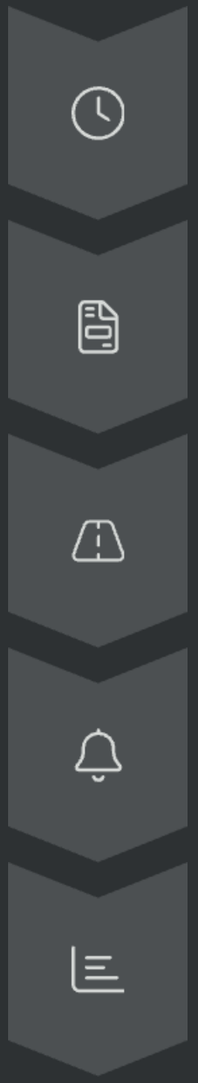
Drone Telemetry Control

Real-time drone operation and data flow.

Remote AI Edge Inference

Processing AI models directly on the drone.

Transformative Benefits for Policing



Real-Time Detection

Reduces manual patrol workload. Enhances response efficiency.

Instant Digital Evidence

Improves enforcement and prosecution. Ensures accuracy.

Safer Road Conditions

Proactive monitoring prevents incidents. Protects citizens.

Deters Violators

Automated alerts discourage repeat offenses. Fosters compliance.

Scalable Deployment

Deployable at accident-prone zones. Adaptable to new areas.

Key Assumptions for Deployment

1 **Robust Connectivity**

Sufficient 5G/WiFi 6 infrastructure is essential for real-time data.

2 **Legal Compliance**

Obtaining necessary permissions for urban drone operations is critical.

3 **Advanced Cameras**

Drones require long-range programmable cameras for effective monitoring.

4 **High AI Accuracy**

An accuracy of 92%+ is achievable with the current AI dataset.

5 **Cloud Integration**

Provisions for cloud storage and dashboard maintenance are assumed.

Project Repository:

Access our complete solution, code, and demo video here:

https://github.com/sjaggi1/Neuroguard.git

Thank You

We appreciate your time and attention. We are open to any questions.