TechXNinjas

Presents

paranoX 2.0

A 3-Months National-Level Innovation Hackathon

BUILD · PITCH · WIN

SmartLane AI

Team Name: Source Code

Track: Artificial Intelligence (AI)

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Problem Statement & Flow of Solution

Lethal Traffic Problem:

1. Our cities run on 20th-century fixed timers. This "one-size-fits-all" approach causes gridlock, wasting **20-25%** of all commute time and costing billions in fuel.
2. For emergency services, this inefficiency is fatal.

Ambulances are "repeatedly delayed by urban congestion and blocked signals." (Times of India, Jul 2025)
In India, **36-42%** of trauma patients already face over 6-hour delays in reaching care (The Lancet).
These avoidable delays are directly linked to worse clinical outcomes.

Traditional Approach:

i. Case studies like the EVPS trial on NH-66 (Thiruvananthapuram) use radio-wave communication.
ii. The Problem: This is a partial fix. It saves **~10 seconds per signal** but fails in heavy congestion. It can't clear a jam in front of the ambulance.

Junction Type	2021 Accidents	2022 Accidents
Traffic Light Signal	8,573	9,746
Police Controlled	7,256	8,804
Stop Sign	4,494	5,060
Flashing Signal	5,093	4,927
Uncontrolled	73,155	74,348

Our Solution:

SmartLane AI is a low-cost, software-based solution that transforms any existing traffic camera into a dynamic, real-time traffic management "brain."

USP (Unique Selling Point)

The Emergency Override Protocol:

A Two-Stage Hybrid AI Engine: We found that a single YOLO model, while fast, can struggle to accurately distinguish an ambulance from a van in a complex scene. We solved this by building a hybrid pipeline for maximum speed and accuracy.

Stage 1: YOLOv8 (The "Vehicle Detector")

It scans the entire frame at high speed. Detects and counts all vehicles to manage general traffic flow.

Stage 2: CNN (The "Ambulance Detector")

A dedicated "safety protocol" that only watches for emergency vehicles.

1. **Our Dual-Purpose Solution: SmartLane AI is built differently. It runs two modes at once:**
   a. Flow Mode: Manages normal traffic for maximum efficiency.
   b. Priority Mode: A dedicated "safety protocol" that only watches for emergency vehicles.
2. **The Absolute Override: "Priority Mode"** has ABSOLUTE PRIORITY. The instant an ambulance is detected, all "Flow Mode" logic is bypassed. The system proactively clears the intersection to save critical, life-changing seconds.
3. **The Result:** The instant an ambulance is detected, all normal traffic-counting logic is bypassed. The system proactively clears the intersection to save critical, life-changing seconds.
4. **Our True USP:** We built a system that understands the critical difference between traffic and priority.

Innovation & Uniqueness

The "Traditional" (Govt.) Approach:

- Case studies like the EVPS trial on NH-66 (Thiruvananthapuram) use radio-wave communication.
- The Flaw: This is a partial fix. It saves ~10 seconds per signal but fails in heavy congestion. It can't clear a jam in front of the ambulance. It's reactive, not proactive.

V/S

The "SmartLane AI" Approach:

1. Zero New Hardware: Unlike costly RFID/radio systems, our solution is a pure software upgrade. It works with any existing CCTV camera, making it infinitely scalable and affordable.

2. Proactive, Not Reactive: Our AI sees the congestion with the ambulance. It doesn't just ask for a green light; it intelligently manages the entire intersection's flow to clear the path before the ambulance arrives.

3. The Hybrid AI Engine (YOLO + CNN): We use YOLO for high-speed detection (finding all cars) and a custom CNN for high-accuracy classification (confirming "is this an ambulance?"). This gives us the speed of a detector and the pinpoint accuracy of a classifier, eliminating false positives.

Feasibility & Impact

Technology Stack:

- YOLOv8 Object Detection
- CNN Ambulance Classification
- Streamlit Framework
- Open CV

- **1. SMART (Social Impact):**
  - Drastically reduces traffic congestion and gridlock.
  - Creates faster, less frustrating commutes for citizens.
- **2. SUSTAINABLE (Environmental Impact):**
  - Up to **30% reduction** in vehicle idle time at intersections.
  - This directly translates to lower fuel consumption and fewer CO2 emissions.
- **3. SAFE (The USP):**
  - The Override Protocol clears intersections *before* emergency vehicles arrive.
  - This turns our system from a "nice-to-have" efficiency tool into a "must-have" safety platform for any smart city.

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Frontend & Backend Website Link

1. **Live Demo Link:** https://paranox-sourcecode.hf.space
2. **Sample Images Link:** https://drive.google.com/drive/folders/1WckPDjZbwzid75kEKzjJm7JISalLUygb?usp=sharing
3. **CNN Model Training Link:** https://colab.research.google.com/drive/1v-TD755AdnonZuIX0nXLbM2DvF281xiu?usp=sharing
4. **GitHub Repo Link:** https://github.com/lovnishverma/SMARTLANE-AI

Scan to open our Project: