INTELLIGENT TRAFFIC MANAGEMENT USING FUZZY LOGIC & MACHINE LEARNING

Empowering Sri Lanka's traffic with Fuzzy Logic and Machine Learning for a smoother, smarter journey

PROJECT ID : **25-26J-330**

Meet Our Supervisors

Supervisor

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Co Supervisor

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Problem Definition

- Illegal parking causing congestion
- Traffic violations increasing
- Fixed-timer signals create delays
- No predictive warnings for drivers

Research Gap

No prediction-based warning system

There is no system that warns drivers before they commit a violation

No dynamic fine engine

There is no system that calculates fines based on real traffic impact or obstruction severity.

No adaptive signals using AI

Traffic lights do not adjust automatically using real-time vehicle count or emergency detection

No Sri Lankan driver scoring model

There is no scoring system that rates driver behaviour based on local violation patterns

Overall System Concept

Predict parking Violations

Identifies early stopping patterns to predict upcoming parking violations.

Detect Violations

Automatically detects lane, direction, and stopping violations.

Adapt traffic signals

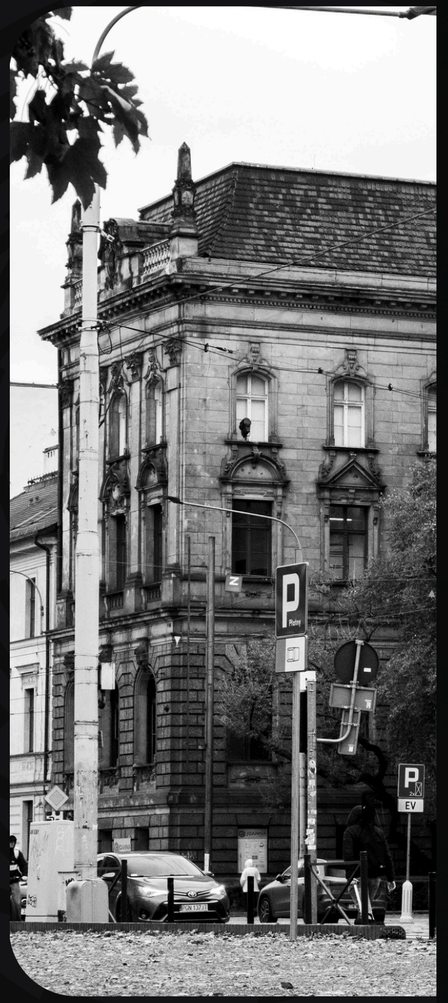
Signal timing adapts to local traffic flow and priority vehicles.

Prevent accidents

Reduces accident risk through early detection.

Architecture Overview

- Data Acquisition
- Vehicle Detection
- Fuzzy Logic Processing
- Signal Control & Alerts



DATA INPUT SOURCES

- Public CCTV
- Real-time Traffic Video
- Custom Mobile Video
- Open Traffic Datasets

AI PROCESSING CORE

- YOLOv8 Vehicle Detection
  Puill.ng intent Prediction.
- Behavior Violation Detection
- Accident Risk Features

INTELLIGENT CONTROL SYSTEMS

- Predict Parking Violations
- Dynamic Fine Engine
- Driver Scoring System
- Accident Risk Prediction

DECISION MAKING

- Violation Decisions
- Signal Timing Optimization
- Risk Assessment Engine
- Alert Generation Logic

OUTPUT SYSTEMS

- Arduino-controlled Traffic Lights
- Voice & App Warnings
- Driver App Score View
- Dashboard

Parking Behaviour & Traffic Impact Analysis - IT22925572

- Parking behaviour detection (YOLOv8)
- DeepSORT parking duration tracking
- Predictive voice warning system
- Dynamic fine engine based on impact

SMART TRAFFIC VIOLATION DETECTION- IT22900890

- YOLOv8 violation detection
- driver score system
- Score reduces by violation type
- Daily score reset

FUZZY LOGIC CONTROLLER FOR ADAPTIVE SIGNAL CONTROL - IT22363848

- Fuzzy Logic adaptive signal control
- Vehicle count-based timing change
- Emergency vehicle priority system
- Reduces congestion at peak times

ACCIDENT RISK PREDICTION & DASHBOARD - IT22337580

- Accident risk scoring model
- Live dashboard visualization
- Speed + violations + density fusion
- Hotspot + trend analysis

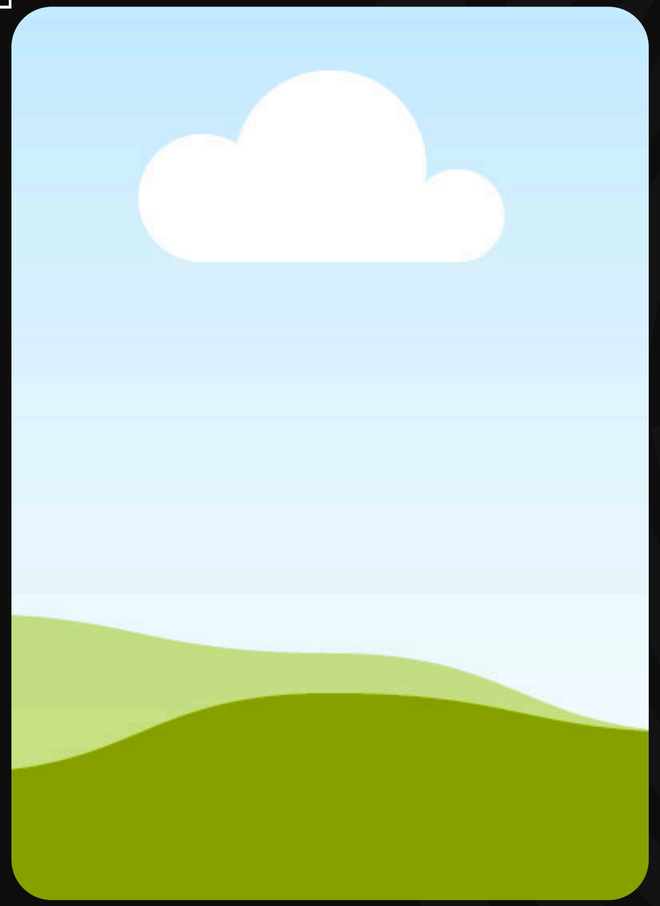
Technology Stack

- YOLOv8, DeepSORT, OpenCV.
- Scikit-Fuzzy, Python
- Arduino signal control
- Streamlit dashboard, Roboflow

Dataset Strategy

- Hybrid dataset: CCTV + phone recordings
- 20–30 short clips for training
- Roboflow annotation (YOLO format)
- Local SL traffic conditions

Current Progress



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Design Excellence

- Predictive, real-time decision-making
- Optimized for Sri Lankan traffic conditions
- Modular architecture with clear data flow
- YOLOv8 + DeepSORT + Fuzzy Logic integrated smoothly

Standards / Best Practices

- PEP8 coding standards
- GitHub version control
- YOLOv8 annotation standards
- Agile sprint workflow

User Requirements

- Early warning for violations
- Adaptive signal control
- Driver awareness system
- Accident prevention dashboard

Functional Requirements

- Detect stopping/parking
- Predict violation intention
- Dynamic fine generation
- Driver scoring updates
- Adaptive light timing

Risk Mitigation

- Dataset shortage → real recordings
- Accuracy issues → fine-tuning
- Hardware issues → simulation backup
- Timeline delays → parallel tasks

Commercialization Potential

- Deployable in city councils
- Smart parking enforcement
- Adaptive signal automation
- Dashboard as SaaS solution

Demo Preview

- Parking intent detection
- Predictive voice warn sample
- Driver scoring UI
- Adaptive signal simulation

Conclusion

- Predictive + preventive approach
- AI + Fuzzy Logic reduces congestion
- Strong progress and clear impact
- Thank you – Q&A