Project Charter: AI-Based Real-Time Vehicle Smoke Detection and Reporting System

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1. Goal

Develop an AI-powered system to detect vehicle smoke emissions in real-time using deep learning and computer vision, automatically reporting offenders to traffic authorities to reduce air pollution and improve urban air quality.

2. Objective

Create an AI-based system with integrated license plate recognition and automated reporting, achieving ≥90% accuracy in detecting smoke-emitting vehicles from live traffic feeds to support pollution control and traffic law enforcement.

3. Business Needs

Vehicular smoke emissions contribute significantly to air pollution and smog in urban areas like Lahore, increasing respiratory and cardiovascular diseases. This system automates detection and reporting, enhancing law enforcement efficiency, supporting sustainable environmental management, reducing monitoring costs, and promoting public health.

4. Budget

Category	Item	Estimated Cost (PKR)
Hardware	HD IP Cameras (2 units)	30,000–45,000
	Edge AI Device (NVIDIA Jetson)	45,000–80,000
	Laptop/Workstation	100,000–150,000
	Networking	10,000–15,000
	Mounts/Accessories	5,000–8,000
	External Storage (optional)	10,000–20,000
Software	Cloud Hosting (Flask/FastAPI)	5,000–10,000
	Development Tools (Python, TensorFlow, OpenCV)	Open-source
	Total Estimated Cost	205,000–328,000

5. Roles and Responsibilities

Project Lead/Backend Developer (Bitf22m037): Coordinate project, develop backend API, manage database, integrate reporting.
CV/AI Developer (Bitf22m026): Design, train, optimize smoke detection models (YOLO/TensorFlow).
System Integrator/OCR Specialist (Bitf22m031): Implement OCR for license plate recognition, integrate with backend.
Frontend Developer/Dashboard Designer (Bitf22m043): Develop user-friendly dashboard for monitoring and visualization.

6. Timeline

• Month 1–2: Planning & Research – Literature review, dataset collection, model design, feasibility study.
• Month 3–6: Development – Model training, real-time detection, backend API development.
• Month 7–8: Testing & Refinement – System validation, performance evaluation, model tuning.
• Month 9: Deployment & Presentation – Integration, deployment, documentation, presentation.

7. SMART Goal

• Specific: Develop AI system for real-time vehicle smoke detection and reporting.
• Measurable: Achieve ≥90% accuracy, ≥20 FPS.
• Achievable: Use proven architectures (YOLOv8/TensorFlow).
• Relevant: Address air pollution and health issues.
• Time-bound: Complete within nine months.

8. OKRs

Objective: Build reliable AI-based vehicle smoke detection and reporting system.
Key Results:
• Achieve ≥90% detection accuracy under varying conditions.
• Process live video feeds at ≥20 FPS from two sources.
• Integrate OCR and reporting with ≥95% license plate recognition accuracy.