HACKXTREME'26

CUBEAISOLUTIONS Tech Pvt Ltd

The "Eco-Pulse" Edge AI for Smart Cities

Problem Statement: "Urban environments are struggling with 'silent' inefficiencies—leaking water pipes, overflowing waste bins, and energy-bleeding streetlights—that cost cities millions and waste vital resources. Current monitoring systems rely on sending massive amounts of raw data to the cloud, which is slow, expensive, and consumes enormous amounts of electricity."

- **The Challenge:** Develop an **Edge-First AI Solution** that processes sensor data (vibration, sound, or low-res images) directly on low-power hardware (like ESP32 or Raspberry Pi) to detect and report infrastructure failures in real-time.
- **The Constraint:** The AI must perform "Anomaly Detection" on the device itself and only alert the central database when a genuine issue (like a pipe burst or waste overflow) is detected.

Key Objectives for Participants:

- **Edge Inference:** Deploy a lightweight model (TinyML) that can run on hardware with limited RAM/CPU.
- **Autonomous Alerting:** The system should not just "monitor" but "classify." For example, it must distinguish between a heavy truck passing by and a genuine structural vibration in a bridge.
- **Self-Sustaining Logic:** Optimize the code for extreme battery efficiency so the device can run for months on a single charge or small solar panel.
- **Actionable Dashboard:** Create a "City Command Center" map that visualizes these real-time alerts for maintenance crews.

Target Impact:

- **Resource Conservation:** Reducing water and energy waste by catching leaks and faults within minutes rather than weeks.
- **Reduced Carbon Footprint:** By moving the "brain" to the edge, you eliminate the massive carbon cost of constant 24/7 data streaming to global data centers.
- **Operational Savings:** Cities can move from "Reactive Maintenance" (fixing things when they break) to "Predictive Maintenance" (fixing things before they fail).