

# Edge AI Project Ideas for Real-Time Road Anomaly Detection

These ideas are specifically designed for the ARM Edge AI Hackathon with strict Raspberry Pi constraints. Each idea is lightweight, innovative, and feasible for real-time on-device deployment.

## 1. Road Anomaly Detection with Severity Scoring

Detect road anomalies such as potholes and obstacles and estimate their severity using bounding box size, confidence score, and position in the frame. This avoids extra sensors and keeps computation low.

**Innovation:** Lightweight severity estimation on edge devices.

## 2. Anomaly Logging and Road Quality Index

Log detected anomalies with timestamps and generate a simple road quality score based on anomaly frequency. This adds analytical value beyond detection.

**Innovation:** Turning raw detections into actionable road-condition insights.

## 3. Adaptive Inference for Power and Performance Optimization

Dynamically adjust inference frequency. Run at low FPS when no anomaly is detected and switch to full FPS when an anomaly appears.

**Innovation:** Intelligent power-aware inference on Raspberry Pi.

## 4. Low-Light Robust Road Anomaly Detection

Use simple image preprocessing techniques such as histogram equalization and gamma correction before inference to improve detection in poor lighting conditions.

**Innovation:** Improved robustness without increasing model complexity.

## 5. Lightweight Dataset Adaptation for Indian Roads

Fine-tune a lightweight object detection model on a small, custom dataset representing local road conditions such as uneven roads and unmarked speed breakers.

**Innovation:** Domain adaptation with minimal data and compute.

## Conclusion

These ideas focus on practicality, real-time performance, and edge optimization. They are well-aligned with hackathon judging criteria and Raspberry Pi hardware limitations.