

Road Quality Assessment System Using Computer Vision and GPS-Based Mapping

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Problem Statement

- Road quality affects:
 - Safety
 - Vehicle maintenance
 - Travel comfort
- Current navigation systems:
 - Optimize distance & time
 - Ignore road surface quality
- Indian roads:
 - High variability
 - Monsoon damage
 - Lack of systematic monitoring

**Can we automatically assess
road quality using AI?**

Objectives

- Build pothole detection system for Indian roads
- Adapt pre-trained models using transfer learning
- Develop road quality grading algorithm
- Visualize results on interactive map

Scope

- Dashcam-based detection
- GPS-integrated mapping
- Segment-level quality scoring
- No real time processing.
- No navigation or external integration.

Methodology adopted

Data Collection

- Dashcam videos from Kerala roads
- ~500 annotated images

Model Development

- Transfer learning using YOLOv8
- Training + hyperparameter tuning

GPS Integration

- Extract GPS coordinates
- Map detections to road segments

Road Grading

- Density-based scoring
- Severity-weighted aggregation

Visualization

- Map Based Visualization

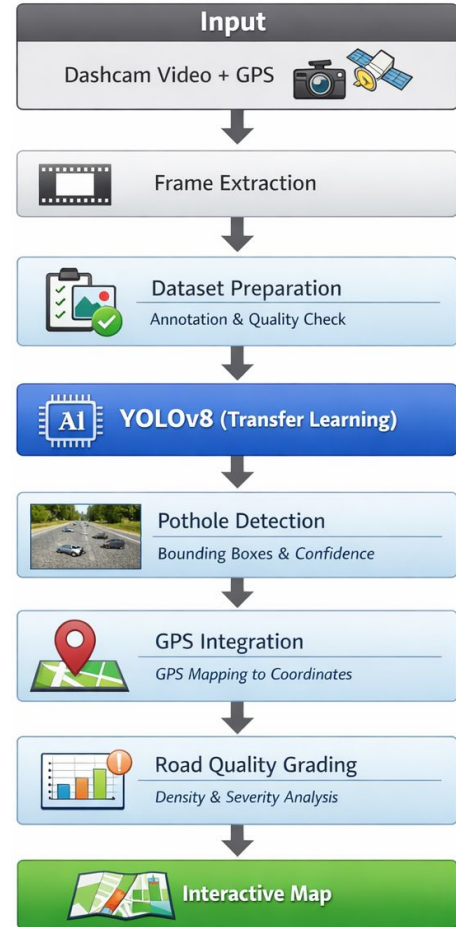
Proposed Technical Architecture

Input: Dashcam video + GPS

Processing: Frame extraction →
YOLOv8 detection → Bounding boxes

Post-processing: Aggregate
detections → Compute quality score

Output: Interactive road quality map



Progress till now

- Literature review.
- Collected sample dataset.
- Made a POC using YOLO.
- Model annotation in progress.



Pothole Detection Test Results

frame_use1_0000.jpg
Detections: 6



frame_use1_0001.jpg
Detections: 6



frame_use1_0002.jpg
Detections: 5



frame_use1_0003.jpg
Detections: 6



frame_use1_0004.jpg
Detections: 5



frame_use1_0005.jpg
Detections: 7



Key findings

- Models trained in other countries (H. Maeda et al) does not adapt to Indian roads.
- High variation in pothole shapes & textures. Counting just number of potholes might not be enough.
- Learned how to setup pipeline for YOLO model training and detection.
- Extraction of GPS can be done easily using OCR.

Possible future works

- Real Time data processing
- Development of mobile application (similar to H. Maeda et al).
- More parameters like accelerometer to detect potholes.
- Navigation using good quality roads.
- Integration with Open Street Map

Thank You

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