THE PROBLEM

55 Million Potholes. $26.5B in Damage. Most Never Reported.

Reporting a civic issue takes 15–20 minutes of forms, phone calls, and wrong departments. Most citizens just give up.

Snap it. Report it. Fix it.

55M
Potholes on US roads

$26.5B
Annual vehicle damage

$117B
Annual infrastructure funding gap

15–20
Minutes to file a complaint today

Issues covered:

- Potholes
- Cracked Pavement
- Road Debris
- Broken Signs
- Faded Markings

Sources: AAA, TRIP, National Surface Transportation Commission

HOW CIVICLENS WORKS

One Photo. Ten Seconds. Filed.

01

Citizen Takes Photo

Open app, tap Report, snap or upload a photo of any road issue

02

EfficientNetV2 Classifies

Custom model trained on 14,000+ civic images — 80% confidence threshold before proceeding

03

Gemini Vision Generates

AI writes the complaint — cause, fix time, department routing. Only called if issue detected.

04

Complaint Filed + Pinned

Saved to database, routed to the right city department, pinned live on the incident map

Duplicate Detection

Flags if same issue reported within 100m

Live Incident Map

Color-coded pins by severity across the city

Department Routing

Auto-routes to Roads, Sanitation, Electrical

Admin Dashboard

Real-time analytics, priority queue, status tracking

TRAINING DATASET

Six Classes. 7,200 Images. Balanced Set.

7,200	6	80/10/10
Total Images	Classes	Train/Val/Test

Potholes

~1,200 images

Cracked Pavement

~1,200 images

Road Debris / Obstruction

~1,200 images

Broken Road Signs

~1,200 images

Faded Lane Markings

~1,200 images

Normal Road ✓

~1,200 images

📦 Source: Roboflow Universe:
Multiple road defect datasets merged, **deduplicated** & **cleaned**

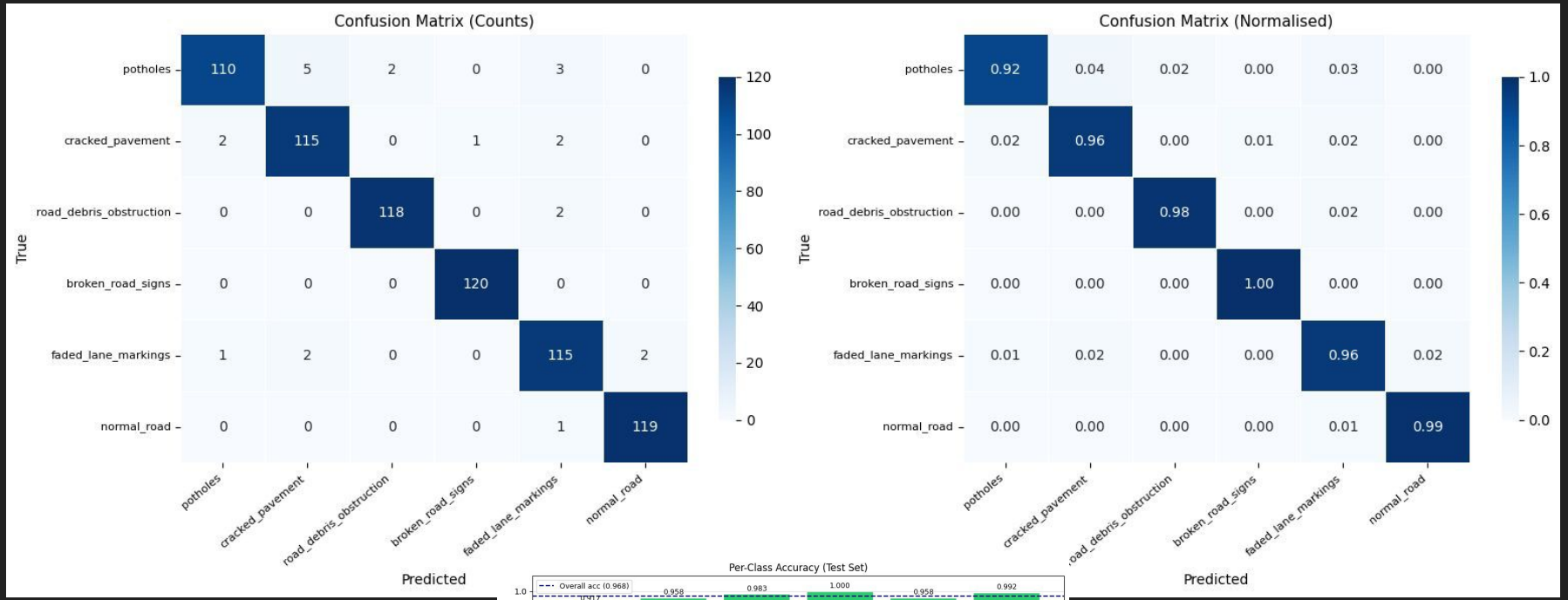
🎨 Synthetic data:
<100 bing search & manually annotated images for each class

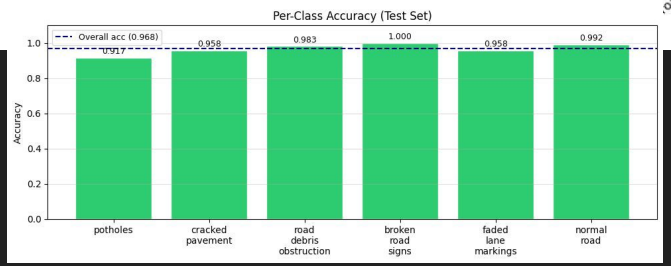
⚖️ Balanced to ~1,200 imgs/class
Corrupt & undersized files removed before training

LOSS CURVES


Training & Validation Loss
Loss progression over 8 epochs
Val spike: 2.14
2.25
1.87
1.50
1.12
0.75
0.37
0.00
Loss
Ep 1
Ep 2
Ep 3
Ep 4
Ep 5
Ep 6
Ep 7
Ep 8
Train Loss
Val Loss

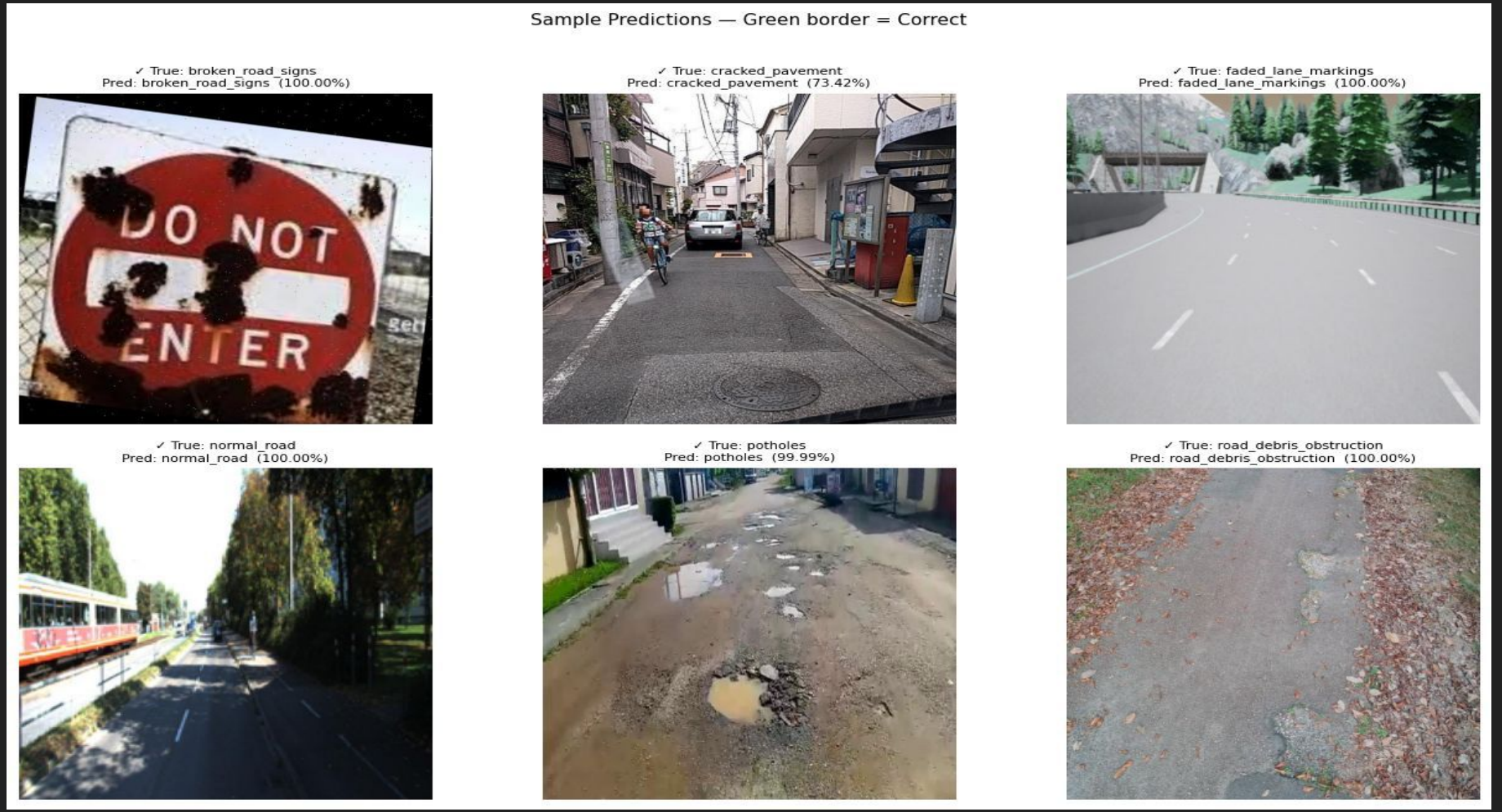
TEST ACCURACY





~ 800 images

EVALUATION


Sample Predictions — Green border = Correct
✓ True: broken_road_signs
Pred: broken_road_signs (100.00%)
DO NOT
ENTER
✓ True: cracked_pavement
Pred: cracked_pavement (73.42%)
✓ True: faded_lane_markings
Pred: faded_lane_markings (100.00%)
✓ True: normal_road
Pred: normal_road (100.00%)
✓ True: potholes
Pred: potholes (99.99%)
✓ True: road_debris_obstruction
Pred: road_debris_obstruction (100.00%)

Inference Pipeline — End-to-End Flow

OpenAI Enrichment — Inputs & Outputs

INPUT TO OPENAI

Original Road Image

Full-resolution photo from mobile app upload

Classifier Result

Damage class (e.g. pothole, crack, subsidence)

Confidence Score

Numeric score >= 0.70 from EfficientNetV2-S

The classifier's damage type is passed directly in the prompt for grounded, context-aware analysis.

enriches

OPENAI RETURNS

Title

Severe pothole cluster on carriageway

Description

Multiple deep potholes posing structural risk

Severity

High — immediate action required

Likely Cause

Water ingress + freeze-thaw cycle

Est. Fix Time

4–6 hours, full patching crew

Department

Roads & Infrastructure Division

Confidence Routing — Decision Thresholds

Zone 1 — conf < 0.60

- Classified as normal road
- OpenAI call is SKIPPED
- Logged as: Clear Road
- No issue ticket created

Zone 2 — 0.60 to 0.70

- Damage possible but uncertain
- Flagged for manual review
- Human inspector assigned
- Issue held pending verification

Zone 3 — conf >= 0.70

- Damage class confirmed
- Image + class sent to OpenAI
- Full enrichment triggered
- Auto-filed to dashboard