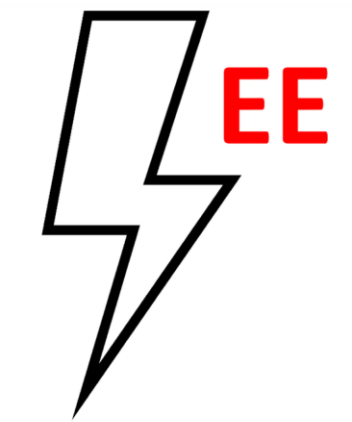
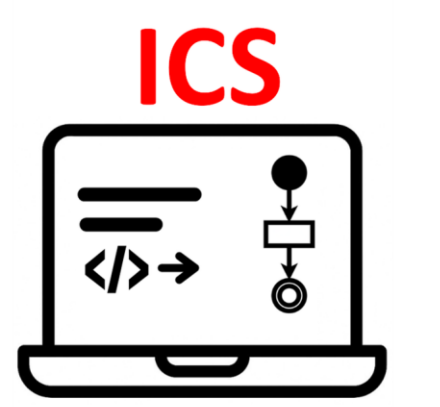


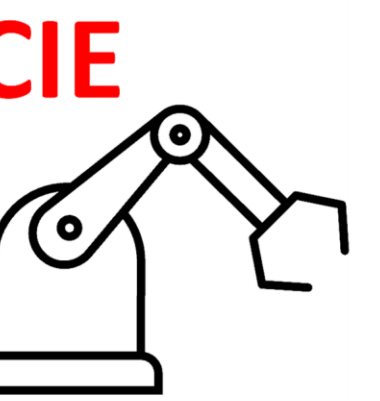
AI-Driven Road Inspection and Quality Reporting System

TEAM
M046

Alhassan Alharbi, Mohammed Al Lail, Hassan Alsalman, Feras Al Hejji, Ridha Alomar, Mohammed AlKadhim
Coach: Dr. Muhammad Emzir



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INTRODUCTION

Road inspection is vital for safe transport, but traditional methods are slow, costly, and error-prone. This project uses AI, LiDAR, cameras, and solar charging for real-time, sustainable road monitoring.

PROBLEM STATEMENT

Current road inspection methods are inefficient, limited, and unsustainable. An autonomous AI system with real-time defect detection and solar charging is needed for continuous operation.

CONSTRAINTS

small outdoor area (B42 Parking)

Fixed structure mobile robot (28.8*20.6*17.7) cm

SQL data storage for queries & labeling

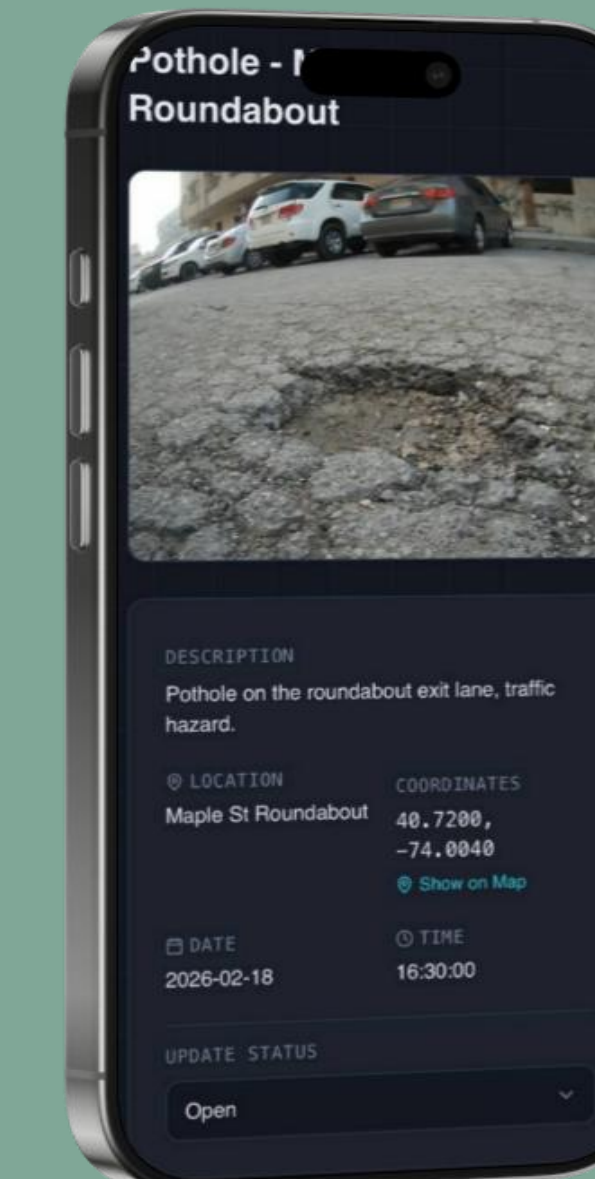
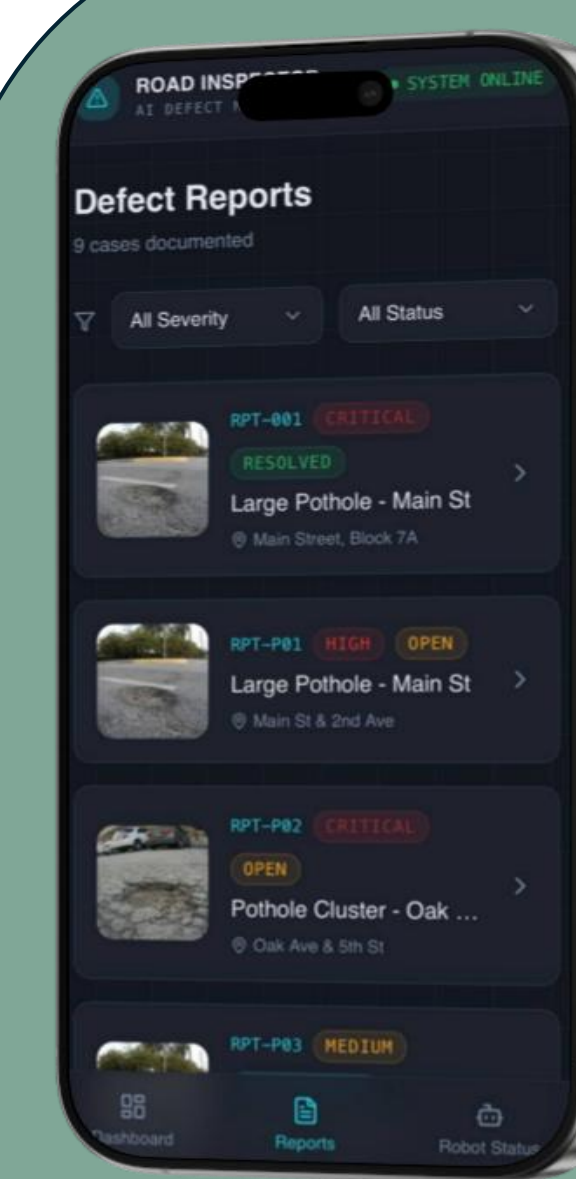
The solar battery system must be able to fully recharge the robot
The AI model must process a single image frame in (< 0.5s).

The docking alignment sensors (camera, IR, or ultrasonic) require clear visibility

SPECIFICATIONS

Defect detection accuracy $\geq 85\%$	Low-battery alert at $< 20\%$
Camera frames processed at ≥ 5 fps	Robot speed limited to 0.3 m/s
Continuous operation ≥ 45 minutes with inspection running	The system shall perform SLAM localization and estimate the robot pose (x, y, θ)

PROTOTYPE



Monitoring System

Mobile Robot



Dock Station



Solar Panel System

TESTING & VALIDATION

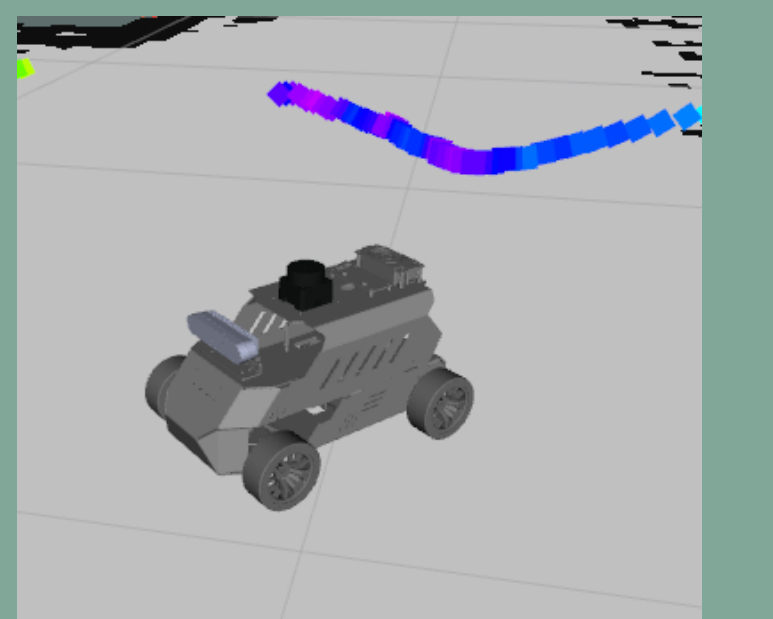
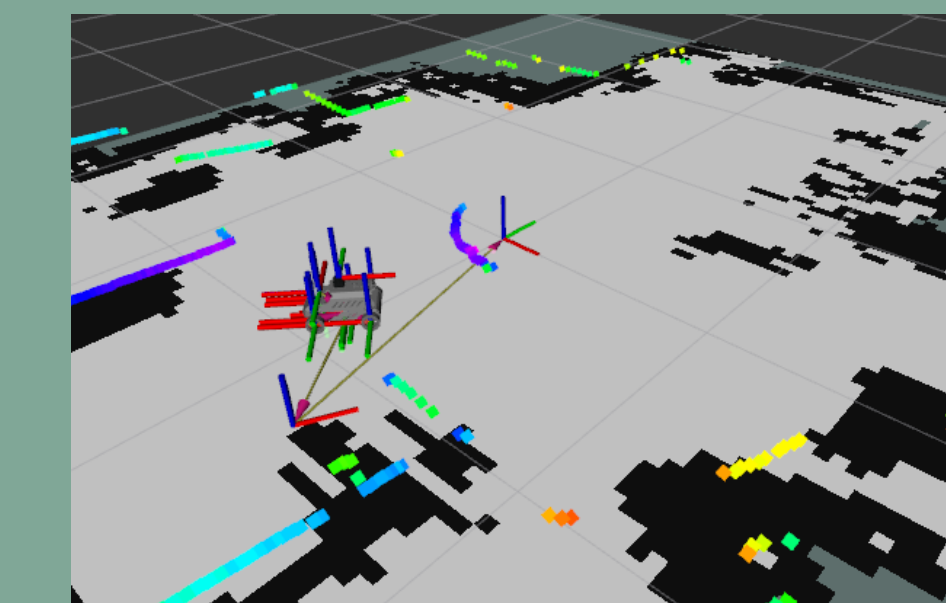
Classification Report:		
	precision	recall
hole	0.84	1.00
no-hole	1.00	0.84
accuracy	0.92	0.92
macro avg	0.92	0.92
weighted avg	0.93	0.91

Accuracy: 91.43%

AI Model Accuracy

Total images: 210
Average time: 64.91 ms
Min time: 49.09 ms
Max time: 264.74 ms
FPS: 15.41
PASS (< 500 ms requirement)

SLAM Localization



CONCLUSION

The System offers a sustainable, autonomous alternative to manual road maintenance. With over 91% real-time defect detection accuracy and precise SLAM-based mapping, this solar-powered prototype shows strong potential to improve modern transportation infrastructure.