



TrackNFix

Pothole Detection & Tracking System

Team :

AlexVision



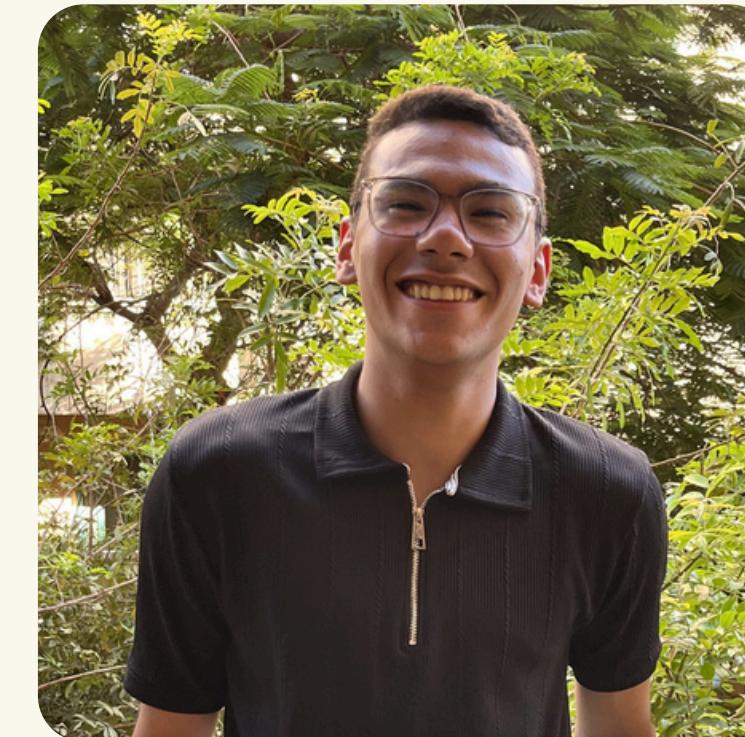
Shehab Magdy

Embedded Engineering



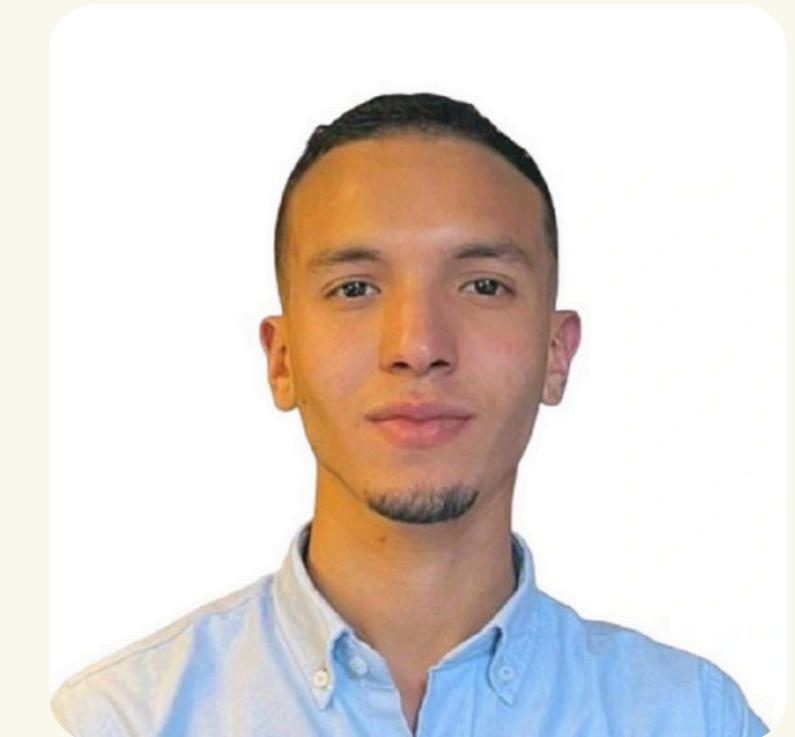
**Abdelrahman
Mohammed**

Machine Learning



Abdelrahman Saied

Backend



Seif Khaled

Frontend

Team member #1



- Embedded System Coding
- Hardware Assembling
- Data Pipelining
- UML
- Presentation

Shehab Magdy

(Team leader)

Team member #2



- Data Collection
- Machine Learning Model Development
- Evaluation & Testing
- Model Deployment
- UML

Abdelrahman Mohammed

Team member #3



- Flask Server API Development
- Database Design
- Automation & Scheduling
- Presentation

Abdelrahman Saied

Team member #4



- UI/UX Design
- Frontend Development
- User Interaction Features
- Data Visualization

Seif Khaled

PROBLEM STATEMENT

The Pothole Problem

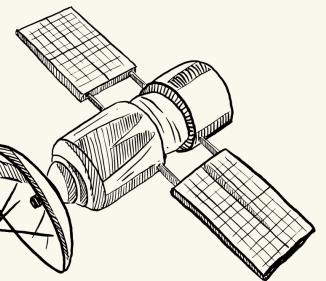
- Potholes cause road accidents and vehicle damage
- Repair costs run into millions annually
- Current reporting methods are manual, slow, and unreliable
- Lack of real-time, large-scale monitoring systems.
- In Egypt, road conditions contribute to 5% of traffic accidents



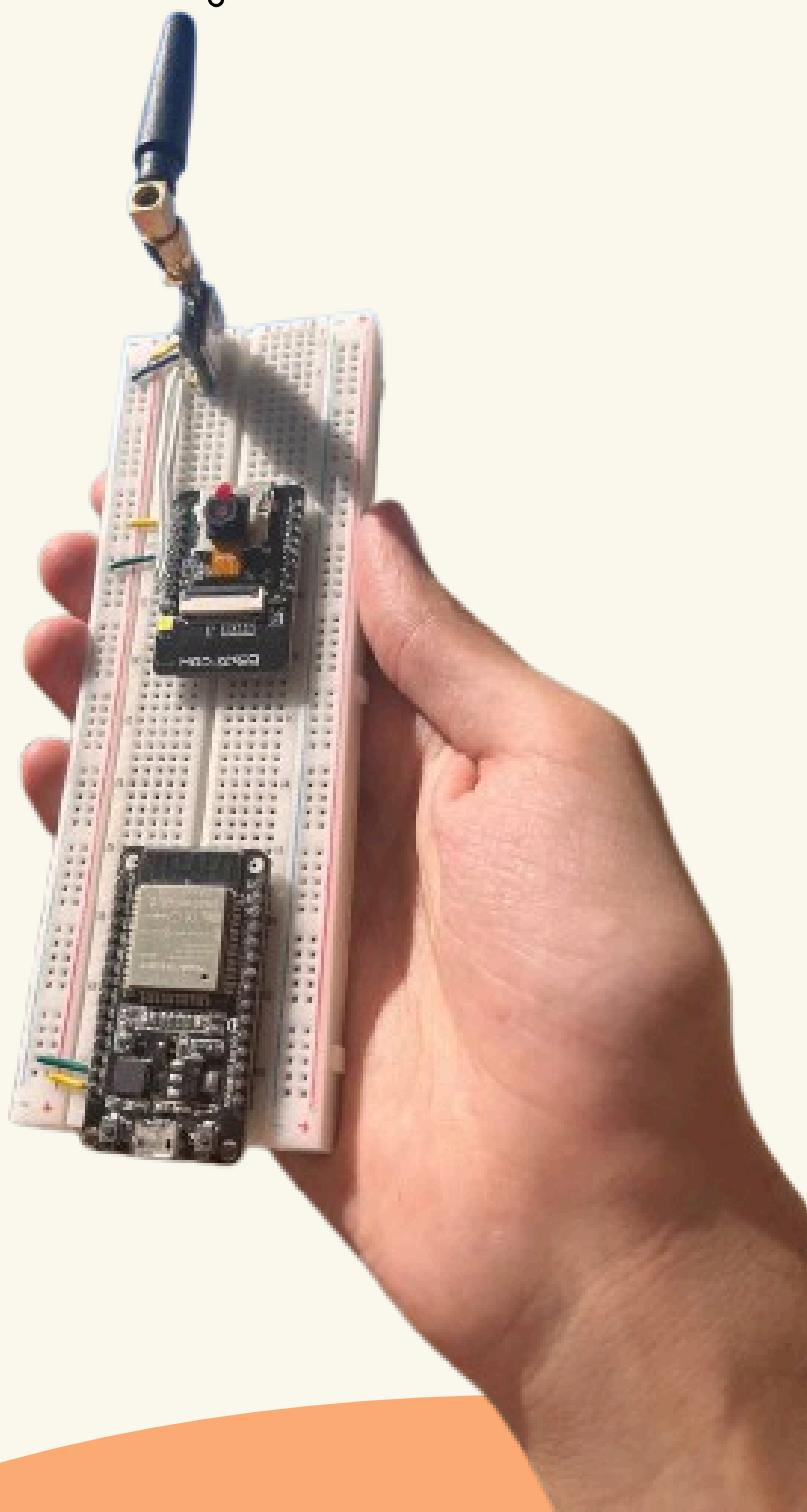
PROPOSED SOLUTION



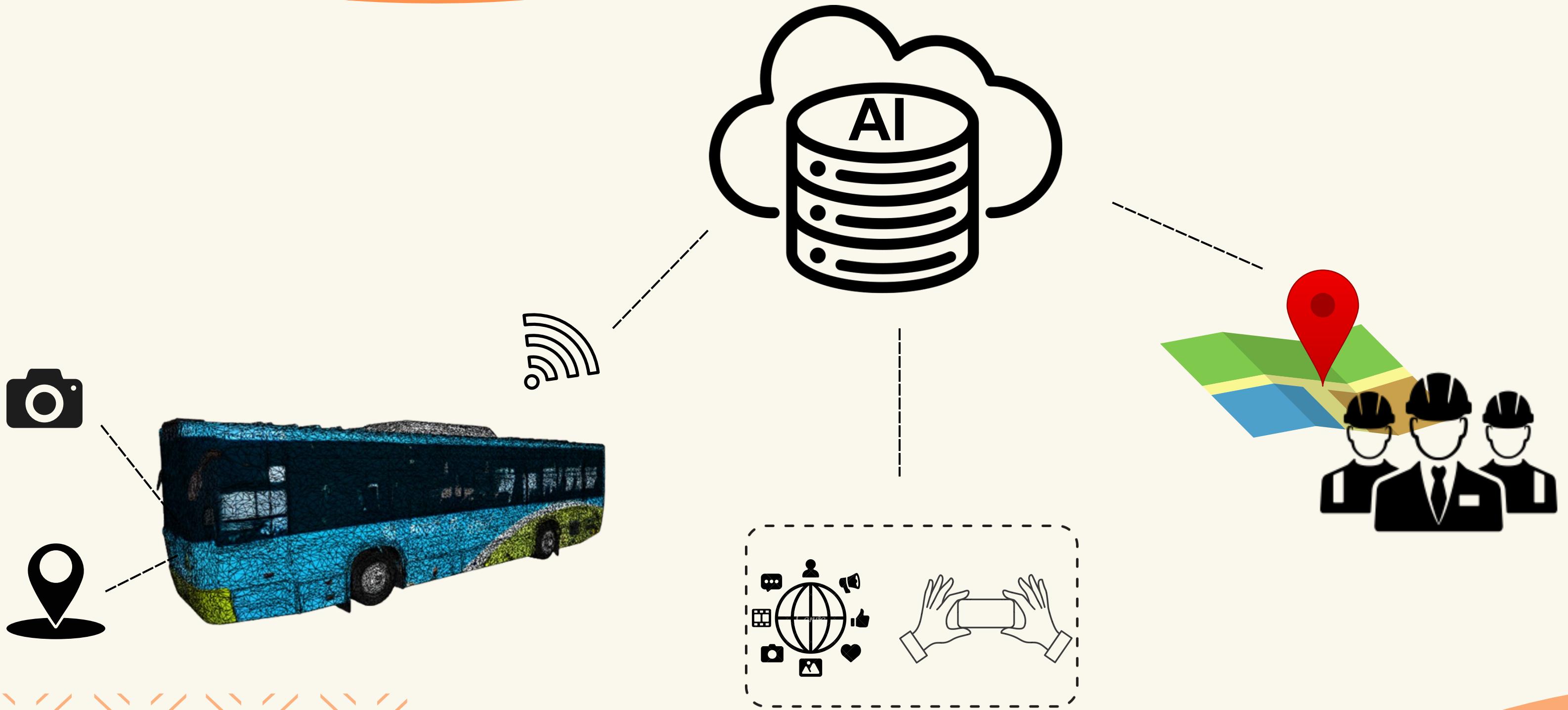
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- Automatic Pothole Detection using IoT (Internet of Things)
- GPS & Camera to record pothole location and evidence.
- Utilizing AI model to detect potholes with 87% Accuracy
- Web app for users to view potholes and track repairs
- Embedded system in Public Transportation ensuring continuous Detection
- Dashboard & analytics to support authorities in prioritizing repairs.



PROPOSED SOLUTION

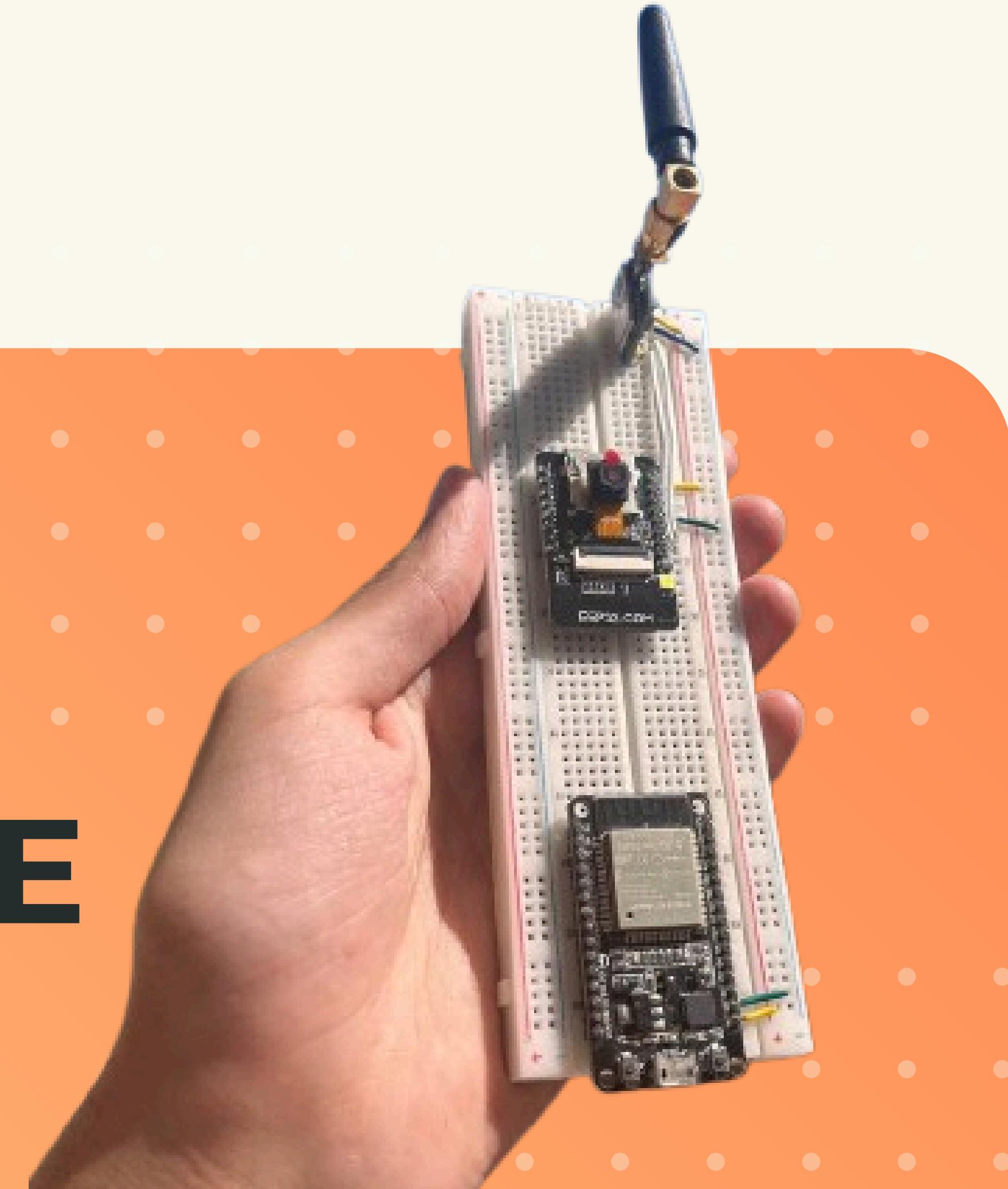




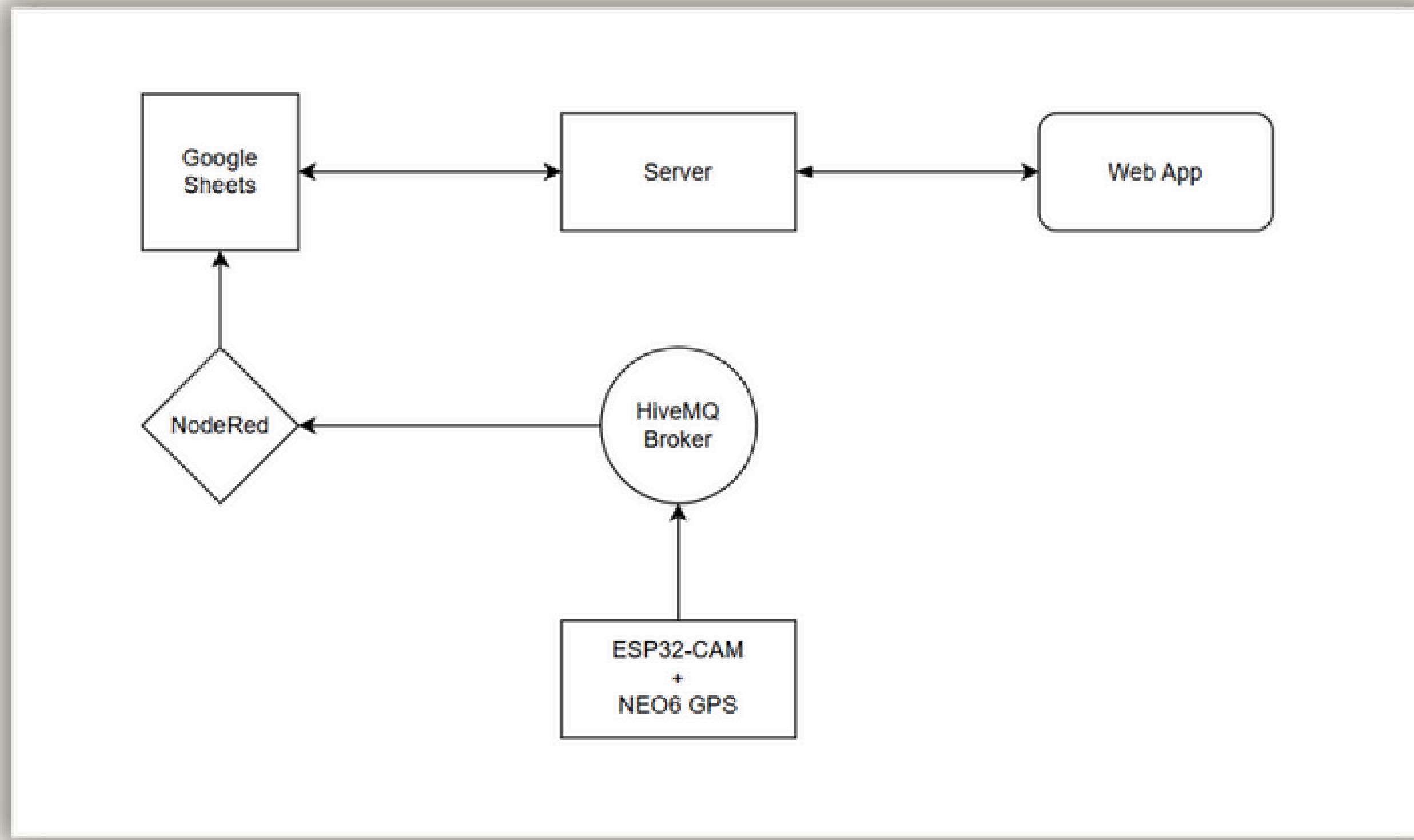
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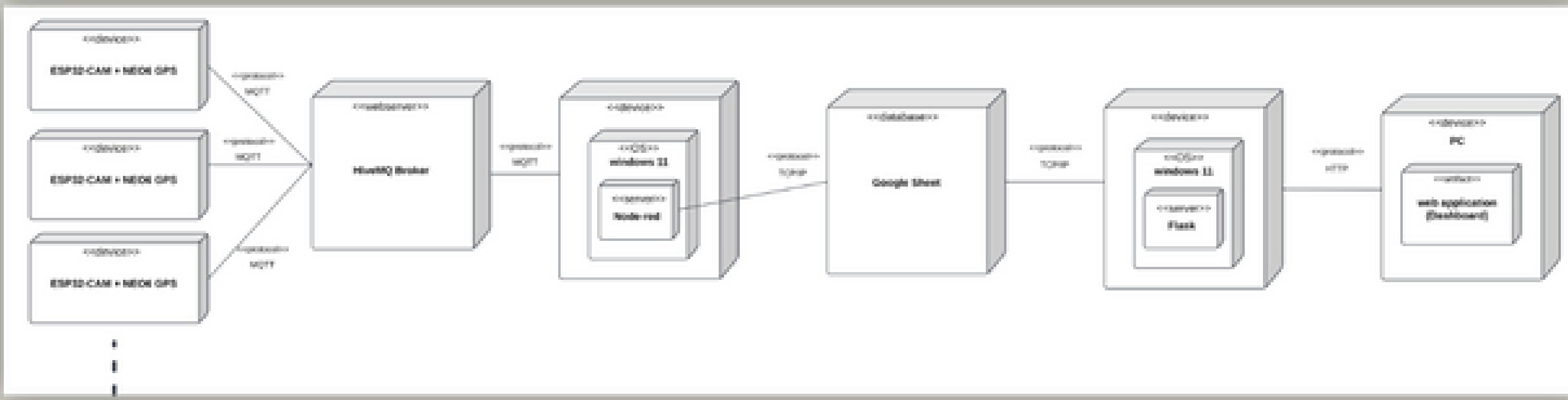
SYSTEM ARCHITECTURE



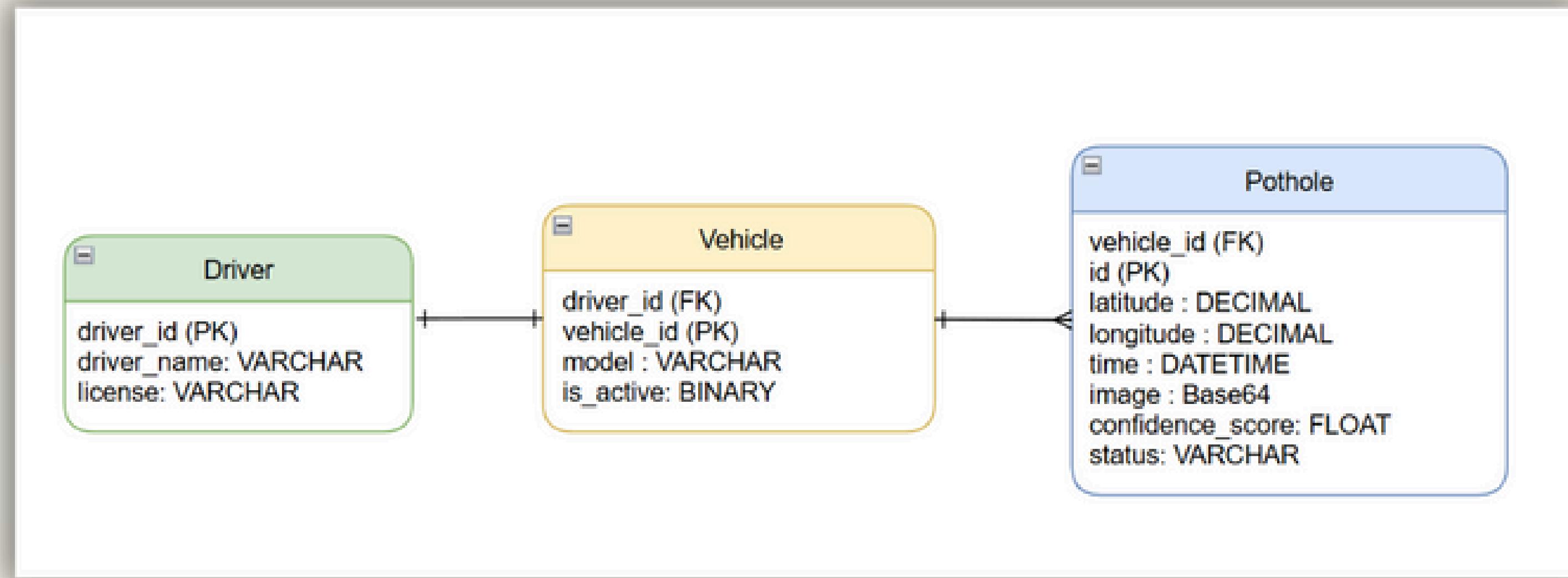
SYSTEM ARCHITECTURE



DEPLOYMENT DIAGRAM



CLASS DIAGRAM



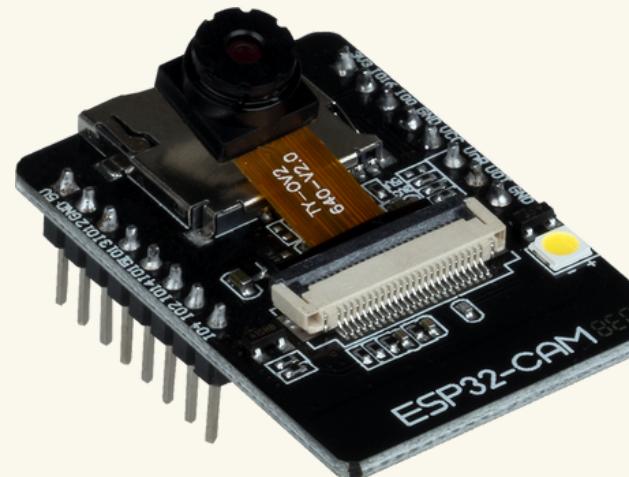


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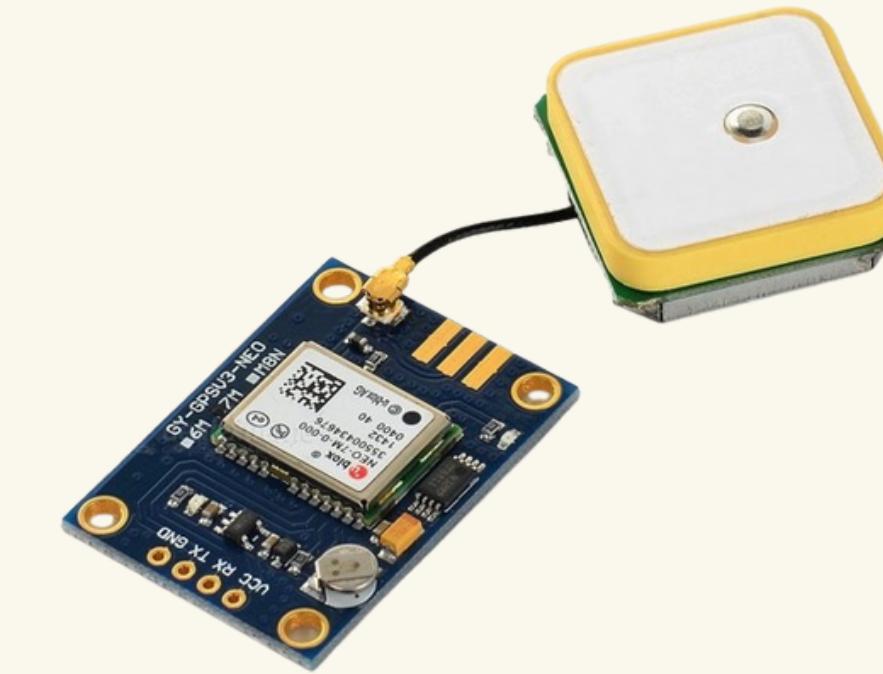
HARDWARE SETUP



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ESP32-CAM



Ublox NEO-6M GPS

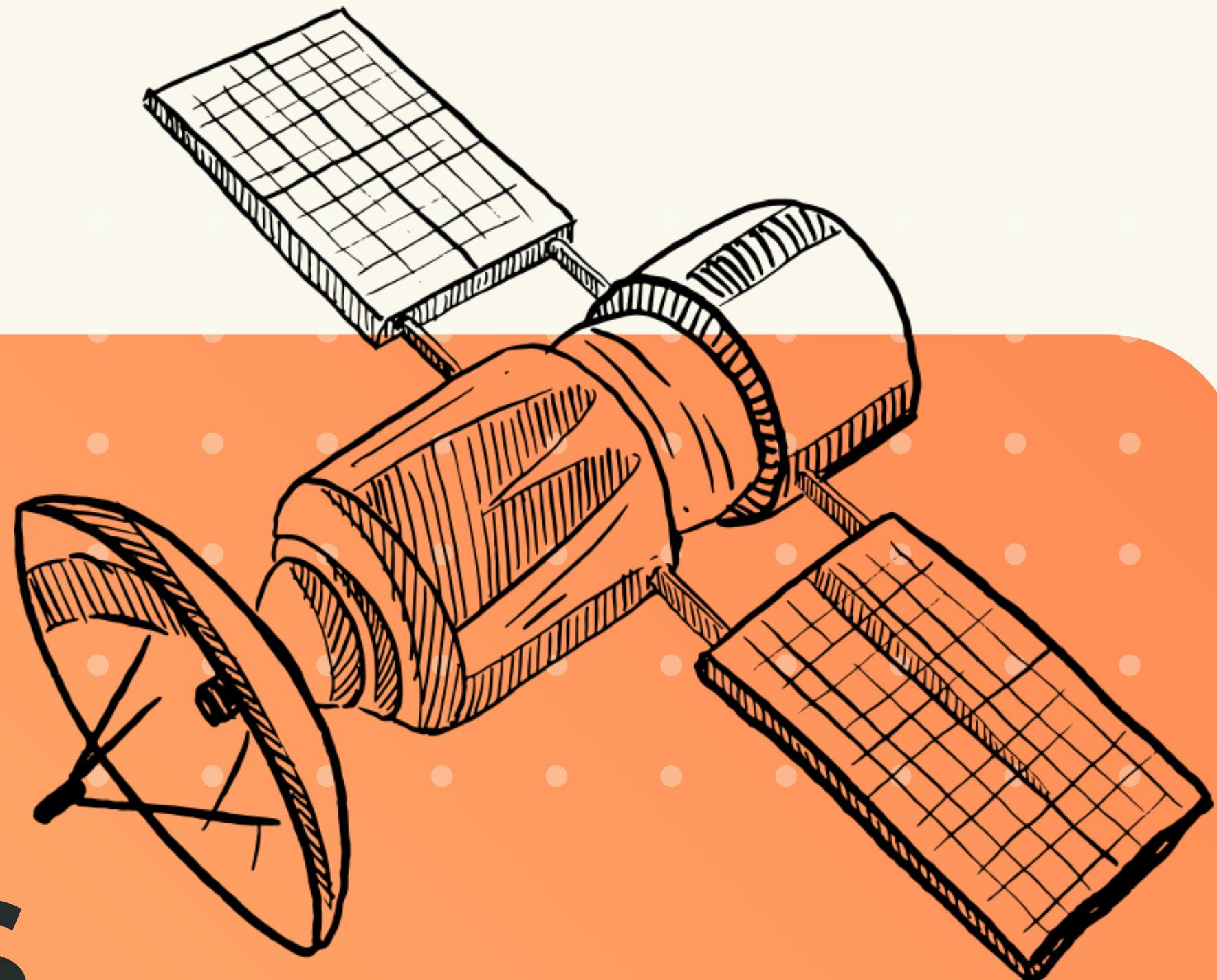
- ESP32-CAM for capturing images
- NEO-6 GPS module for location tracking
- 5V Power Supply from rechargeable battery or vehicle power
- Compact & durable design as a weatherproof and vibration-resistant housing.



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SOFTWARE COMPONENTS





1



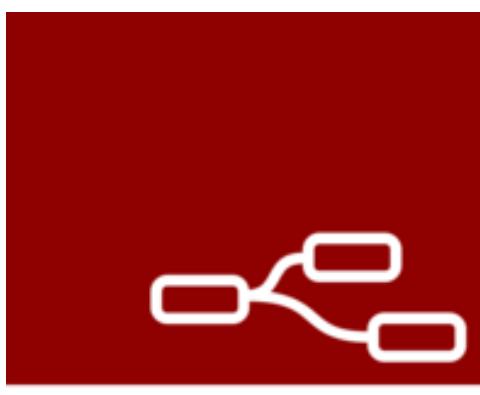
Visual Studio Code as the main development environment for writing, debugging, and managing the project's codebase

2



Used for programming, testing, and uploading code to the ESP32-CAM and GPS modules, enabling sensor integration and real-time data collection.

3



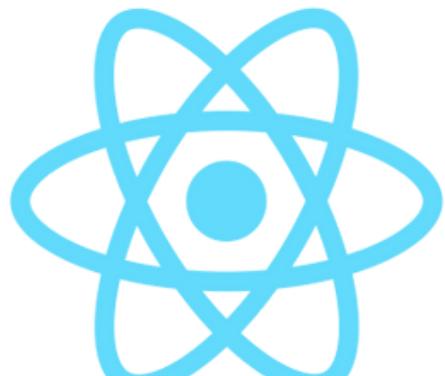
Used as a flow-based tool to automate logging the IoT Streaming data from the ESP32 to the Google sheet

4



Used as the MQTT broker to reliably handle real-time communication between the ESP32 device and the backend, ensuring pothole data is transmitted seamlessly.

5



React JS

Used to build the web application's frontend, providing an interactive interface where users and authorities can view pothole locations on the map, and track repair progress.

6



Google Sheets

Used as a lightweight data warehouse to store pothole reports, enabling easy access, analysis, and integration with dashboards for visualization.

7



Used to develop the backend API, handling communication between the IoT devices, database, and web application, while managing image processing, classification and data flow.

8



Used for developing and training the pothole detection YOLO AI model in a cloud-based environment with free GPU support, enabling efficient experimentation and testing.

DATASET

| vehicle_id | pothole_id | latitude | longitude | time | image | label | confidence | status |
|------------|------------|-----------|-----------|----------------|----------------|-------|------------|---------|
| 1 | 1 | 31.083525 | 29.743272 | 2025-09-23T06: | /9j/4AAQSkZJRg | yes | 0.5524 | pending |
| 1 | 2 | 31.094221 | 29.75971 | 2025-09-23T06: | /9j/4AAQSkZJRg | yes | 0.4417 | pending |
| 1 | 3 | 31.093741 | 29.763823 | 2025-09-23T06: | /9j/4AAQSkZJRg | yes | 0.6470 | pending |
| 1 | 4 | 31.095614 | 29.758211 | 2025-09-23T06: | /9j/4AAQSkZJRg | yes | 0.5381 | pending |
| 1 | 5 | 31.089774 | 29.766917 | 2025-09-23T06: | /9j/4AAQSkZJRg | yes | 0.7598 | pending |
| 1 | 6 | 31.094436 | 29.765422 | 2025-09-23T06: | /9j/4AAQSkZJRg | yes | 0.4341 | pending |
| 1 | 7 | 31.094655 | 29.766086 | 2025-09-23T06: | /9j/4AAQSkZJRg | yes | 0.5441 | pending |
| 1 | 9 | 31.09688 | 29.769234 | 2025-09-23T07: | /9j/4AAQSkZJRg | yes | 0.5488 | pending |



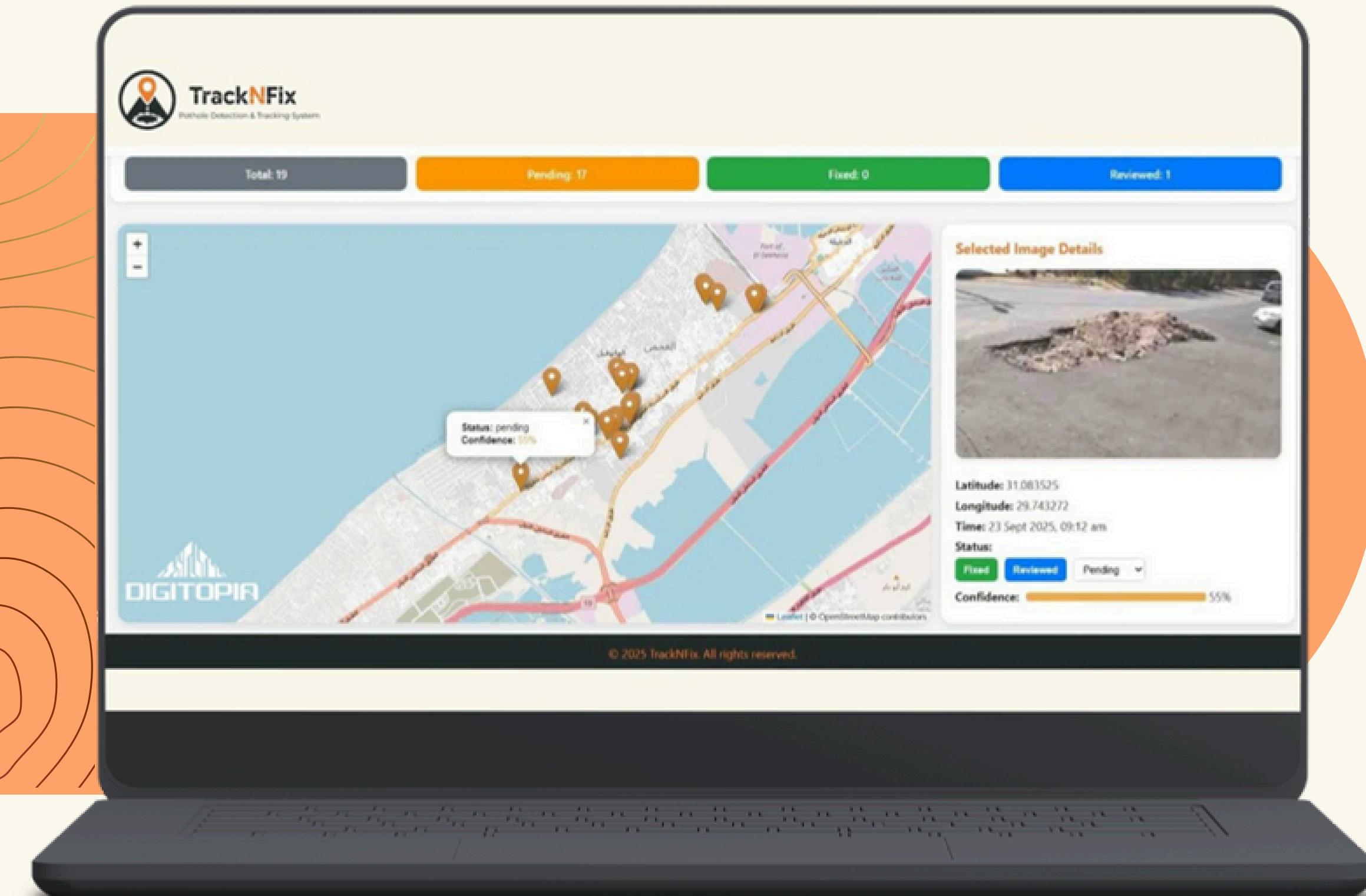
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WEB APPLICATION



LIVE DASHBOARD



IMPACT



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THANK YOU