



TechSprint



Leveraging the power of AI



Team Details

- a. **Team name:** Team-PHS
- b. **Team leader name:** Harshitha Reddy Gutha
- c. **Statement:** Open Innovation

Problem Statement : Poor road conditions and potholes are a major cause of accidents, vehicle damage, traffic congestion, and increased maintenance costs. Currently, pothole identification and reporting are mostly manual, time-consuming, and unreliable.

Authorities often depend on public complaints or periodic inspections, which leads to delayed repairs and unsafe roads. There is a lack of a real-time, automated system to accurately detect potholes and provide precise location data for quick action.

Proposed Solution & Working : The proposed system uses vehicles or smartphones to continuously capture road images while traveling. These images are processed using an AI model built on Google Cloud AI to automatically detect potholes. Once a pothole is identified, its GPS coordinates are extracted and stored in Firebase along with image data and severity details. The collected information is then visualized on a Google Maps-based dashboard, where authorities can monitor pothole locations in real time, analyze road conditions, and prioritize maintenance efficiently. This automated approach improves road safety, reduces inspection effort, and enables faster road repairs.

Opportunities

A. HOW DIFFERENT IS IT FROM ANY OF THE OTHER EXISTING IDEAS?

- **AI-Driven Automation** : Automatically detects potholes using AI without manual reporting, reducing delays and human effort.
- **Low-Cost & Scalable Setup** : Uses smartphones or vehicle-mounted cameras instead of expensive, specialized hardware.
- **Real-Time GPS Mapping** : Potholes are instantly GPS-tagged and updated live on the dashboard for accurate tracking.
- **Interactive Map Dashboard** : Integrates Google Maps and Firebase to provide a clear, real-time visual view for authorities.
- **Severity-Based Repair Priority** : Classifies potholes by severity to help maintenance teams fix critical issues first.
- **Smart City Ready Architecture** : Cloud-based design allows easy scaling from small areas to large smart-city deployments.
- **Data-Driven Maintenance Insights** : Historical data enables analytics and predictive planning to prevent future road damage.

Opportunities

B. HOW WILL IT BE ABLE TO SOLVE THE PROBLEM?

- **Automated Road Monitoring :** AI continuously detects potholes from road images, removing the need for manual inspections.
- **Early & Accurate Detection :** Potholes are identified at an early stage, preventing accidents and further road damage.
- **Precise GPS Location Tracking :** Each pothole is GPS-tagged, enabling maintenance teams to locate and repair issues quickly.
- **Centralized Live Dashboard :** All detected potholes are shown on a single map interface for efficient area-wide monitoring.
- **Faster Repair & Prioritization :** Severity-based data helps authorities prioritize urgent repairs and reduce response time.
- **Cost & Effort Reduction :** Automation reduces manpower requirements and lowers operational expenses.
- **Enhanced Road Safety :** Timely repairs minimize vehicle damage, traffic disruptions, and accident risks.
- **Data-Driven Maintenance Planning :** Stored historical data supports analysis and preventive maintenance strategies.

Google Technologies used :

Frontend (User Interface & Interaction) : These technologies handle how users see, interact, and send data to the AI agent.

1. Google Maps API :

- Displays locations, routes, or detected objects (e.g., potholes) on an interactive map
- Supports markers, heatmaps, and real-time updates
- Used to visualize AI results geographically

2. Firebase Hosting :

- Hosts the web application securely and scalably
- Fast global content delivery using Google's CDN

3. Flutter (by Google) :

- Used to build cross-platform apps (Web, Android, iOS)
- Provides smooth UI and easy integration with Firebase and APIs

4. Firebase Authentication :

- Handles user login using Google Sign-In, email/password, or phone number
- Ensures secure access to the AI agent dashboard

5. Web Technologies (HTML, CSS, JavaScript) :

- Create responsive dashboards and controls
- Communicate with backend APIs to send images, videos, or user commands

Google Technologies used :

Backend (AI Processing & Data Management)

These technologies power the AI logic, data storage, and decision-making.

1. Google Cloud AI / Vertex AI

- Trains and deploys machine learning models
- Used for image recognition, object detection, NLP, and AI agents
- Provides scalable and managed AI services

2. TensorFlow :

- Google's open-source ML framework
- Used to build and train AI models (e.g., pothole detection)
- Easily integrated with Vertex AI

3. Firebase Firestore / Realtime Database :

- Stores detected data, AI results, GPS coordinates, and user actions
- Supports real-time updates to the frontend

4. Google Cloud Functions :

- Serverless backend logic
- Automatically triggers AI processing when data is uploaded
- Reduces server management overhead

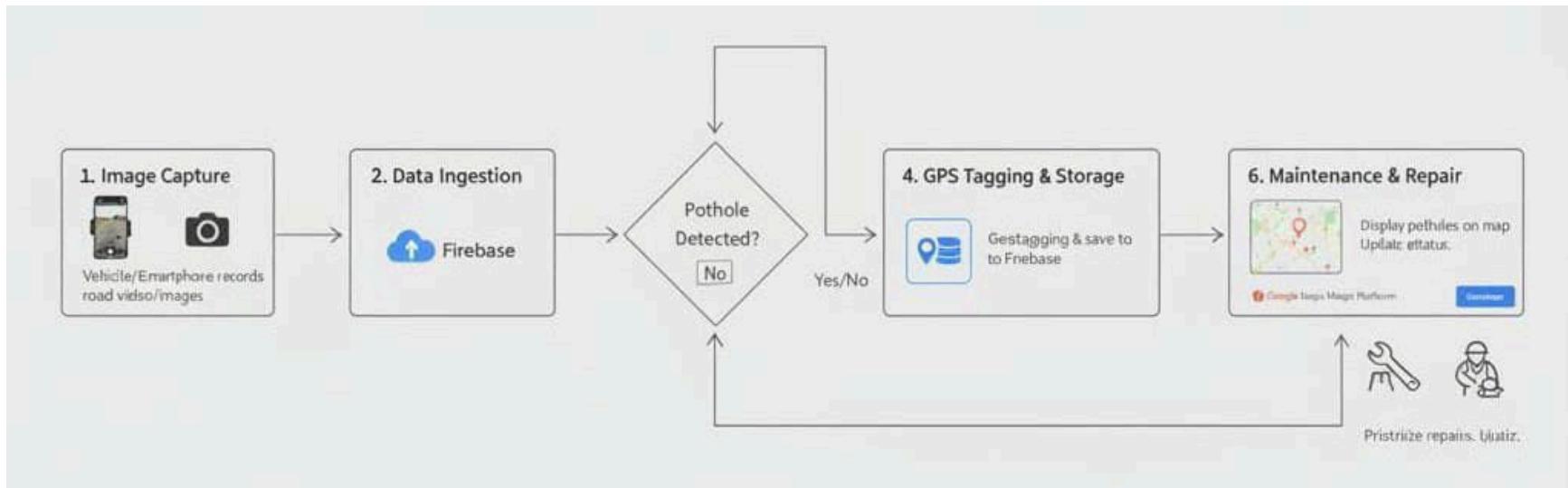
5. Google Cloud Storage :

- Stores large files like images, videos, and model outputs
- Secure and highly scalable

6. Dialogflow (for AI Agents & Chatbots) :

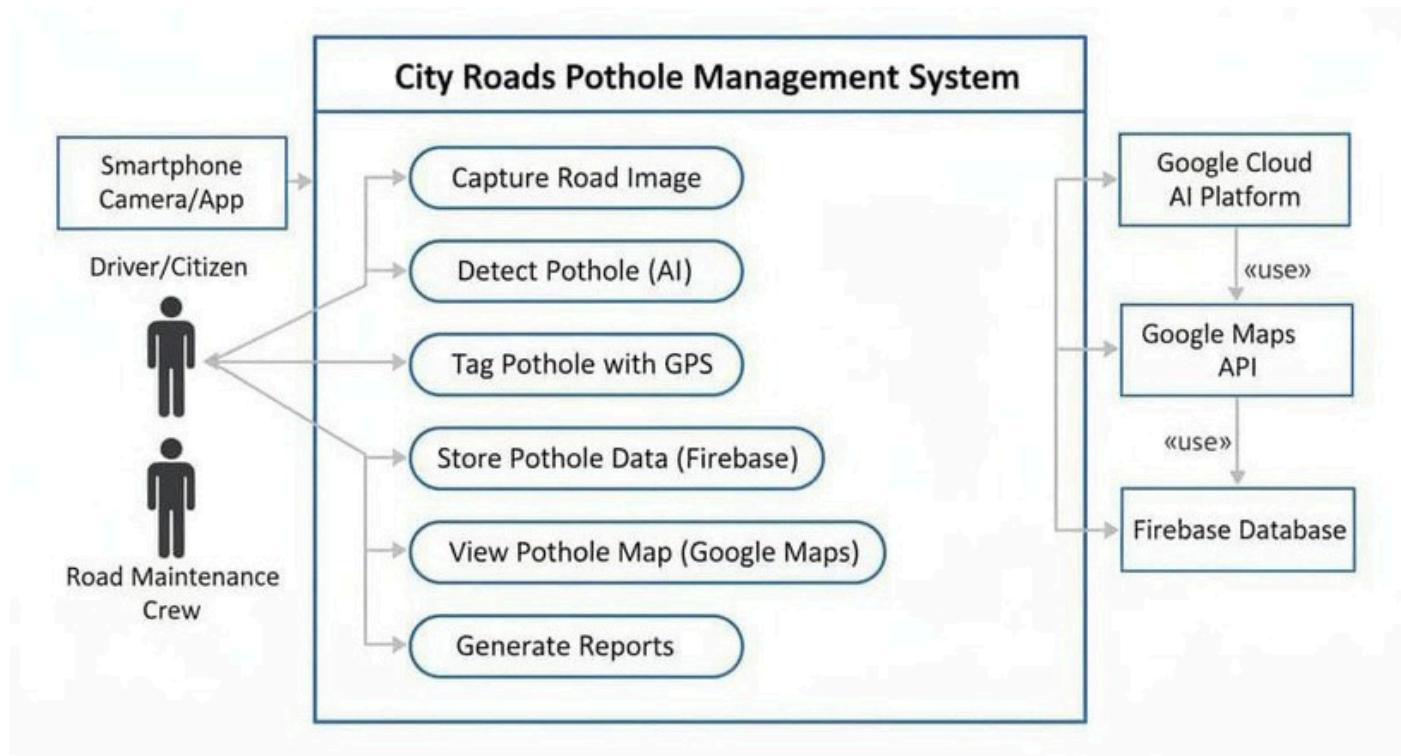
- Builds conversational AI agents Handles user queries using NLP Integrates with Google Assistant and web apps

Process flow diagram or Use-case diagram

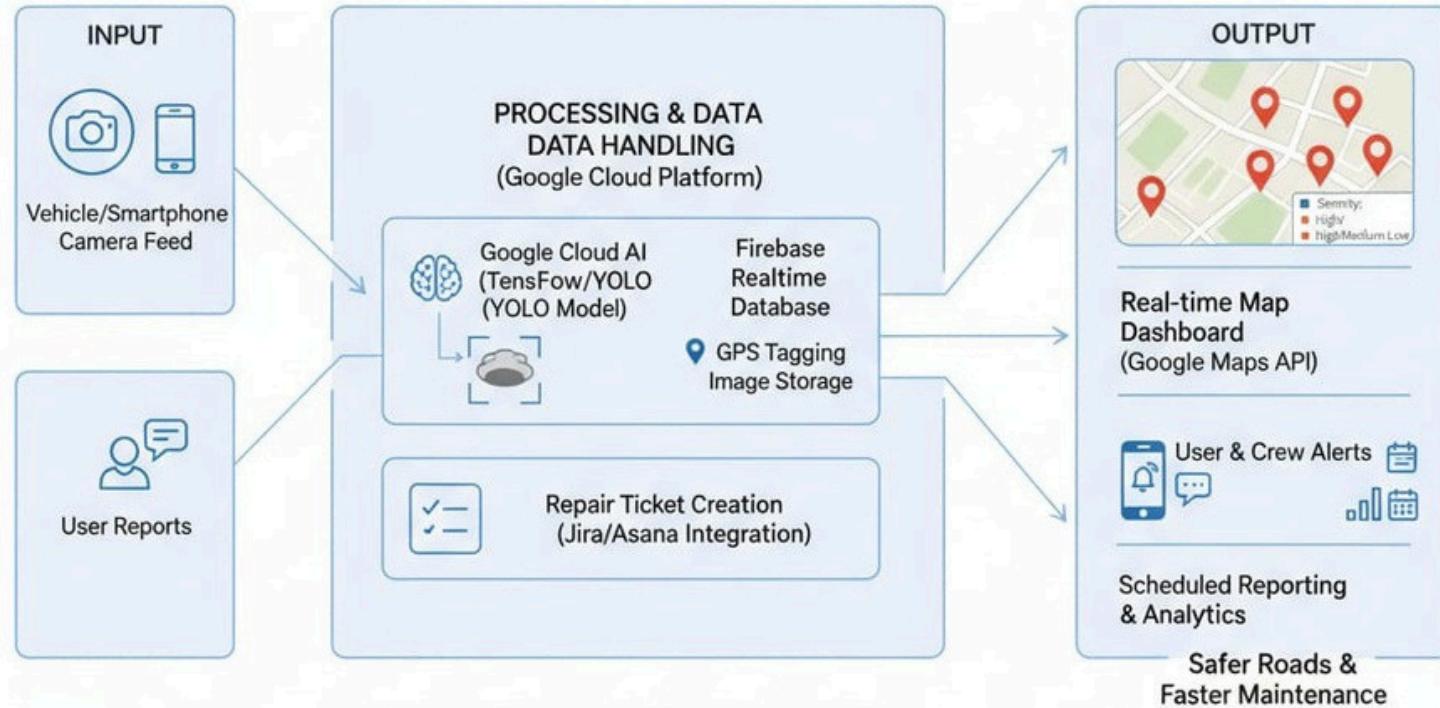




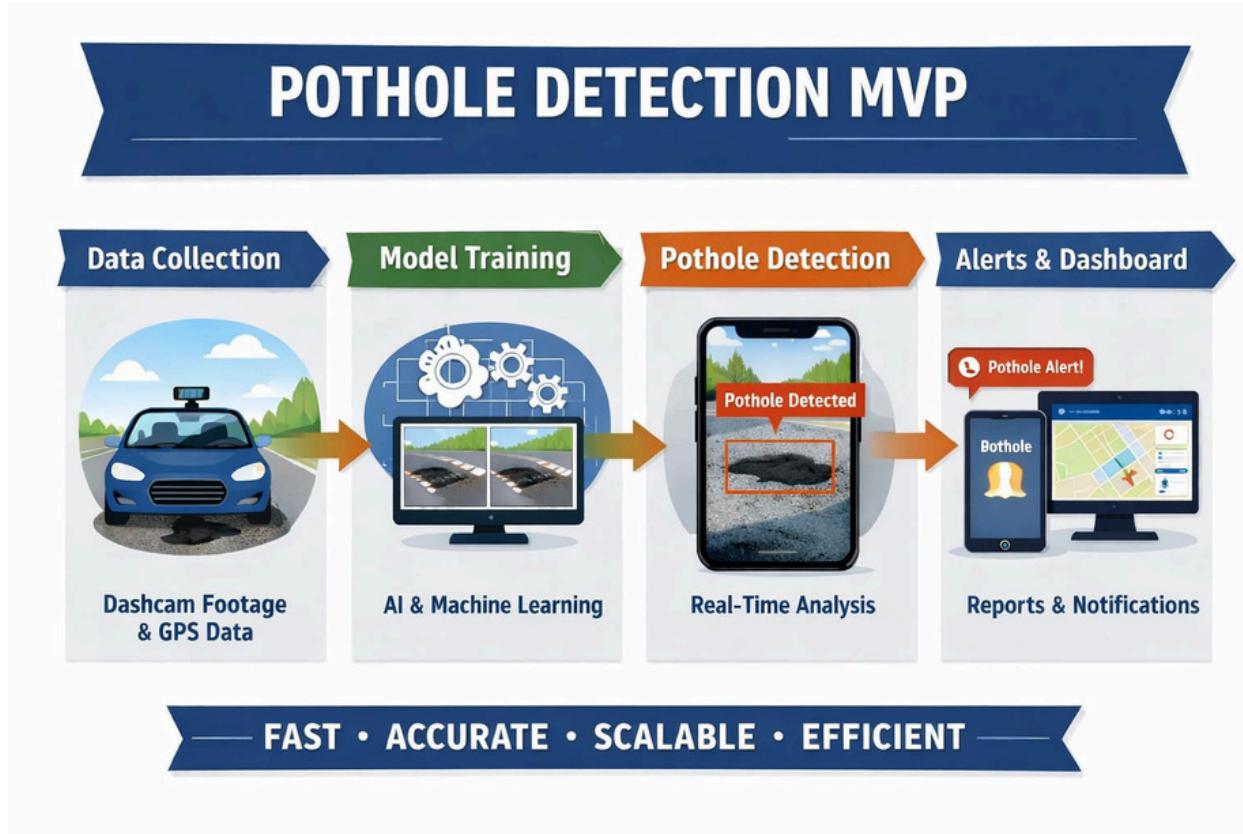
Wireframes/Mock diagrams :



Architecture diagram of the proposed solution



Snapshots of the MVP



Additional Details/Future Development (if any)

- **Predictive Pothole Formation :**

Use historical data and weather patterns to predict roads likely to develop potholes.

- **Real-Time Driver Alerts :**

Notify drivers about nearby potholes to reduce accidents and vehicle damage.

- **Expanded Road Defect Detection :**

Extend AI to detect cracks, uneven surfaces, waterlogging, and faded road markings.

- **Crowdsourced Reporting Integration :**

Allow citizens to contribute images through a mobile app to increase coverage.

- **Automated Maintenance Workflow :**

Integrate with government systems to auto-generate repair tickets and track progress.

- **Severity-Based Budget Planning :**

Use analytics to optimize maintenance budgets and resource allocation.

- **Smart City Integration :**

Integrate with traffic control, IoT sensors, and urban planning systems.

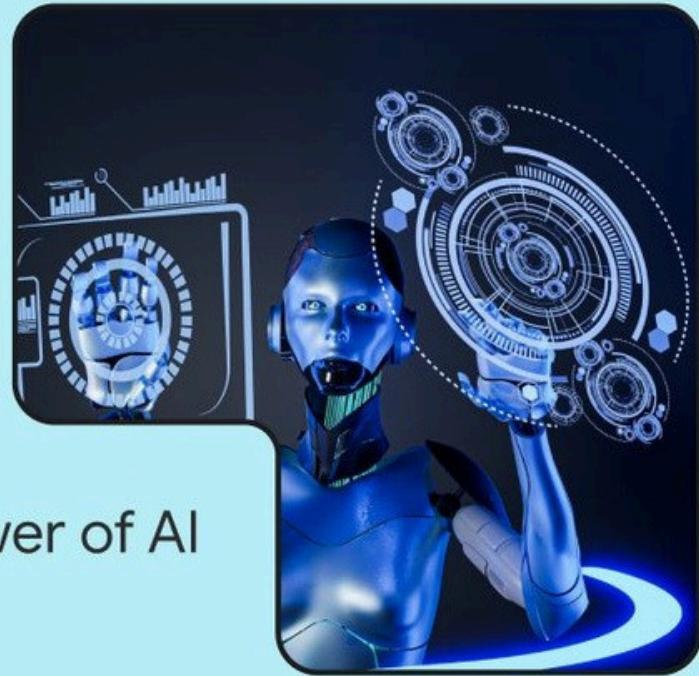


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Thank you!