AI-Powered Citizen Reporting and Smart Municipal Response System

Abdulla Nishal[1], Muhammed Mikdad[2], Fatheen Yusuf[3], Shreya Shetty[4]
[1,2,3]*Students, Department of Computer Science and Engineering, Srinivas Institute of Technology (S.I.T), Mangalore, Karnataka, India*
[4]*Assistant Professor, Department of Computer Science and Engineering, Srinivas Institute of Technology (S.I.T), Mangalore, Karnataka, India*
doi.org/10.64643/IJIRTV12I12-206809-459

***Abstract*—This paper presents Urban Eyes AI, a cloud-native smart city platform designed to modernize the identification and resolution of urban infrastructure issues. Traditional municipal grievance methods rely on fragmented manual reporting, 311 calls, and human-only triage, leading to delayed responses and a lack of public transparency. To overcome these challenges, this system is developed using Next.js, Supabase, and Google Generative AI, providing a centralized platform for capturing geolocated media, automating issue classification, and mapping civic hazards. The portal allows citizens to easily report issues while an AI engine instantly validates the image, calculates a severity score, and filters out fraudulent submissions. It simplifies municipal dispatch activities, enables real-time public map updates, and supports data-driven decision-making for city officials. Overall, the system enhances the efficiency of urban governance and fosters community trust.**

***Index Terms*—Smart City, Artificial Intelligence, Computer Vision, Geospatial Mapping, Workflow Automation, Next.js, Municipal Governance, Citizen Science.**

I. INTRODUCTION

In modern urban environments, the rapid detection and repair of infrastructure defects such as potholes, broken streetlights, and severe waterlogging play an important role in public safety and city development. However, many municipal bodies still depend on manual or outdated legacy systems to manage civic grievances, which often leads to unorganized data, massive administrative backlogs, and difficulty in prioritizing critical hazards. This lack of an automated triage system makes it challenging for city officials to deploy field crews efficiently and provide timely updates to the public. To overcome these issues, this project introduces Urban Eyes AI, an AI-powered citizen reporting and smart response system developed using modern cloud and machine learning technologies.

The system offers a centralized and user-friendly platform where citizens can submit photographic evidence of urban decay. By integrating Google Gemini AI, the system autonomously classifies the issue, determines its severity, and verifies its authenticity. With role-based access control and real-time geospatial mapping using Mapbox, the portal improves municipal response times, ensures data security, and makes the urban maintenance process highly efficient and structured.

II. PROPOSED SYSTEM

The proposed system is a comprehensive, cloud-based smart city platform developed using Next.js, Supabase, and Google Generative AI. It provides a centralized ecosystem where citizens can report infrastructure issues using their mobile devices, while the AI backend instantly processes the unstructured media to extract actionable insights.
The system supports role-based access for citizens, municipal operators, and field crews, ensuring secure and organized data handling.

It automates the traditional bureaucratic routing of tasks, enabling real-time map updates, improving civic communication, and making the municipal repair pipeline entirely transparent and automated.

III. METHODOLOGY

A. Data Ingestion and Geolocation

The system collects unstructured data in the form of images and text descriptions submitted by citizens through the web or mobile interface. During ingestion, the application extracts EXIF metadata to capture raw GPS coordinates and timestamps. This data is securely stored using Supabase Storage and PostgreSQL. Proper validation is applied, including reverse-geocoding, to ensure the accuracy and completeness of the location data. This step helps in maintaining a highly reliable spatial database, which is essential for the smooth functioning of the dispatch system.

B. AI-Driven Triage and Classification

The processed media data is sent to the Google Gemini 3.1 Pro AI model via secure backend API routes. The AI analyzes the image to classify the specific infrastructure defect (e.g., pothole, garbage overflow) and assigns a severity score (1-10) based on public safety risks. Crucially, the AI evaluates the validity of the image, filtering out irrelevant or fake submissions (e.g., selfies, memes). This automated triage ensures that only verified, actionable data reaches the municipal operators, significantly reducing administrative overhead.

C. Automated Workflow Routing

The system processes the AI-enriched data to automate municipal workflows. Using N8N orchestration and webhooks, the system evaluates the AI's classification and routes the task to the specific departmental database (e.g., routing waterlogging to the Drainage Department). It enables operators to monitor automated dispatches, while citizens receive real-time notifications regarding the status of their reports.

D. Geospatial Visualization

The results are displayed through highly interactive, user-friendly interfaces using React and Mapbox GL. The system plots verified infrastructure issues on a public transparency map using color-coded severity markers. Real-time dashboards help municipal administrators easily understand hotspot trends and SLA (Service Level Agreement) compliance, improving overall usability and strategic planning.

IV. SYSTEM DESIG

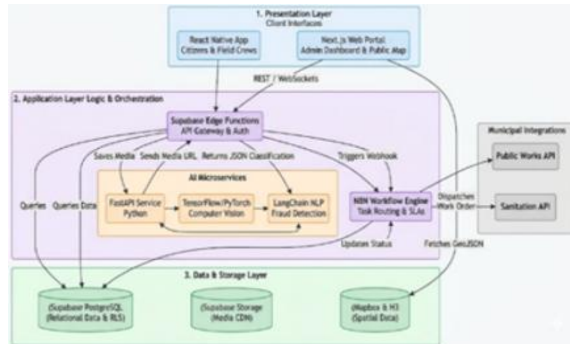

Fig. 1: System Architecture of Urban eyes Ai

Fig. 1 illustrates the overall system architecture of the Urban Eyes AI platform. The process starts with user interaction, where citizens capture and upload geolocated media. The data is processed through the Next.js backend, where the image buffer is securely passed to the Google Generative AI API. The AI calculates a severity score, validates the image, and classifies the hazard. The results are securely saved in Supa base. The system manages spatial coordinates, severity metrics, and resolution statuses through different modules. Operators can track automated dispatches and override AI decisions, if necessary, while citizens can view the public map and track their community rewards. This architecture ensures highly scalable data management, secure access, and automated municipal communication.

V. RESULTS

The developed system successfully implements an AI-Powered Citizen Reporting Portal that simplifies urban maintenance through a centralized, intelligent platform. Users log in based on their roles: citizens can view their reporting history and the public map, while municipal operators can monitor incoming AI-validated reports and manage field crews. The integration of Google Gemini flawlessly filters out fake reports and dynamically scores the severity of legitimate hazards. The portal presents complex geospatial data in a clear, clustered manner, helping city planners understand infrastructure decay effectively. With real-time updates and user-friendly dashboards, the system enhances civic trust, improves resource allocation, and makes the municipal repair process highly transparent.

Fig 2: Landing Page

Fig. 2 shows the home interface and login system. The interface provides an overview of the platform's mission and seamless authentication via Supabase Auth, ensuring secure, role-based entry for both citizens and administrators. improving overall user experience.

Fig 3: Citizen Reporting Interface

Fig. 3 displays the report submission page. Citizens upload images of infrastructure issues, and the system automatically extracts GPS coordinates. The interface is optimized for rapid, frictionless mobile usage to encourage maximum civic participation.

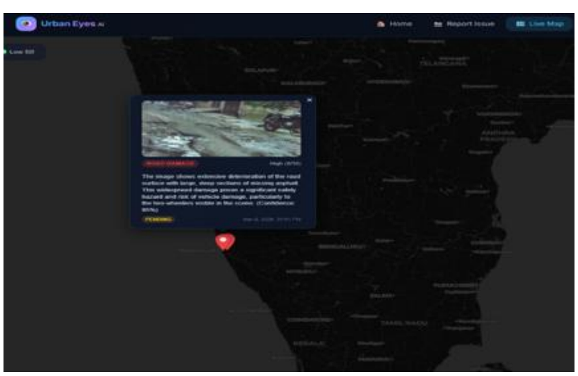

Fig 4: AI Analysis Output

Fig. 4 shows the backend JSON response generated by the AI module. It highlights the system successfully identifying an issue (e.g., "Pothole"), assigning a high severity score due to its location on a main road, and confirming the report's validity, thereby bypassing the need for manual human verification.

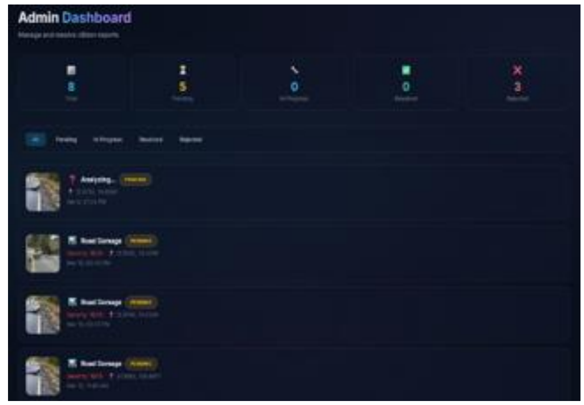

Fig 5: Municipal Admin Dashboard

Fig. 5 shows the municipal operator dashboard, which provides a complete overview of active hazards within the city. Through this dashboard, officials can review the AI's confidence scores, manually override categorizations if require, monitor field crew dispatch statuses, and analyze long-term infrastructure trends.

VI. CONCLUSION

The UrbanEyes AI platform demonstrates a highly effective solution for modernizing urban infrastructure management and civic reporting. The system successfully provides a centralized, cloud-native platform to capture citizen reports, autonomously triage them using advanced Artificial Intelligence, and map them geospatially. It completely removes the manual bottlenecks associated with traditional 311 call centers and legacy grievance systems. The developed portal is user-friendly, highly scalable, and supports strict role-based access control. It enhances communication between the government and the public, filters out fraudulent data, and helps city officials deploy resources rapidly to high-severity hazards. Overall, the system contributes to safer city streets, data-driven municipal budget allocation, and a more transparent, responsive smart-city ecosystem.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to their project guide, [Guide's Name], for their valuable guidance, continuous support, and encouragement throughout the project. We also extend our thanks to the Head of the Department and all faculty members of the Computer Science and Engineering department at Srinivas Institute of Technology for their support and assistance during the completion of this work.

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