



Smart Civic AI: Intelligent Complaint Management System

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Abstract: Urban civic complaint systems continue to face inefficiencies such as delayed responses, lack of transparency, manual routing errors, and poor citizen engagement. This paper presents a survey of existing complaint management systems and proposes Smart Civic AI: Intelligent Complaint Management System, an advanced smart governance platform that integrates Artificial Intelligence, image recognition, voice-based complaint registration (IVR), real-time GPS navigation, heatmap visualization, and priority-based complaint management with role-based dashboards. Citizens can report issues such as potholes, sewage overflow, garbage accumulation, water leakage, and streetlight failures by capturing live images or through voice input. AI automatically classifies the issue, generates complaint descriptions, detects duplicate complaints, and assigns priority levels based on severity and location. Complaints are routed to the relevant authority dashboard, while workers receive navigation support using OpenStreetMap API and update work progress in real time. The system also generates complaint heatmaps to identify high-density problem areas for better resource allocation and smart city planning. Real-time status updates are reflected across citizen and authority dashboards, improving transparency and accountability. The proposed system addresses major limitations identified in existing research works, including lack of AI-driven classification, absence of voice-enabled complaint registration, no worker navigation support, limited analytics, and lack of intelligent escalation mechanisms, thereby enhancing the efficiency and effectiveness of smart city governance.

Keywords: Complaint Management System, AI Image Recognition, IVR, Smart City, GPS Navigation, OpenStreetMap, Heatmap Analysis, Priority-Based Complaints, Role-Based Dashboard, Civic Engagement.

I. INTRODUCTION

Rapid urbanization and population growth in modern cities have significantly amplified demands on civic infrastructure. Issues such as potholes, improper waste disposal, drainage blockages, malfunctioning streetlights, and water leakage directly impact the quality of life of citizens. In many developing regions, civic complaints are still handled using traditional and semi-digital approaches — manual registers, phone-based reporting, or rudimentary online portals. These methods suffer from delayed responses, lack of accountability, poor inter-departmental coordination, and minimal transparency for citizens.

The proliferation of smartphones and internet connectivity has opened new avenues for citizen-government interaction. However, existing digital complaint systems often fail to provide real-time location accuracy, structured workflows, AI-driven classification, and verification mechanisms. Citizens routinely face uncertainty over whether their complaint has been received, assigned, or resolved. Authorities, in turn, struggle with duplicate complaints, fake reports, and inefficient resource allocation.

To address these shortcomings, this paper surveys five key related works and proposes Smart Civic AI: an Intelligent Complaint Management System that leverages AI-based image recognition, voice-based complaint registration via IVR (Interactive Voice Response), GPS-enabled worker navigation through OpenStreetMap, real-time dashboards for citizens and authorities, and worker-level task management — establishing a holistic, transparent, and efficient solution for smart city governance.

1.1 Problem Statement

Civic complaint mechanisms in most urban and semi-urban areas suffer from four critical deficiencies: (i) absence of automated complaint classification, leading to misrouted or ignored complaints; (ii) lack of real-time tracking and status visibility, causing citizen apathy; (iii) inaccessibility for users with low literacy or physical disabilities, as most systems rely exclusively on text-based input; and (iv) no effective navigation support for field workers to reach complaint locations efficiently. A unified AI-powered platform capable of addressing all these dimensions is needed.



1.2 Research Objectives

The Smart Civic AI system is designed to

- Allow citizens to submit complaints via live image capture; AI generates issue type and description automatically.
- Support voice-based complaint registration through an IVR system using Twilio Voice API.
- Route complaints intelligently to the appropriate civic authority based on geolocation.
- Provide a centralized authority dashboard for monitoring, assigning, and tracking complaints.
- Equip field workers with a task dashboard and real-time navigation to complaint locations via OpenStreetMap API.
- Reflect real-time status updates across citizen, authority, and worker interfaces.

II. LITERATURE SURVEY

This section reviews five key research works that collectively inform the design of the proposed Smart Civic AI system. Each study contributes important insights into complaint management paradigms, while also revealing gaps that our system seeks to close.

A. Smart Civic Issue Reporting System (Walwadkar et al., 2022)

Walwadkar et al. [1] proposed an Android-based smart civic issue reporting system that employed GPS for location tagging, image upload for visual evidence, and AI-driven severity detection to prioritize complaints. The system demonstrated significant improvements over traditional manual submission processes by automating severity assessment and providing location-accurate routing to municipal bodies. However, the system lacked a voice-based interface for low-literacy users, had no dedicated worker navigation module, and offered limited transparency through real-time status tracking. Additionally, verification of complaint resolution required manual follow-up. The proposed Smart Civic AI builds upon this foundation by integrating AI image classification at the point of submission and incorporating IVR-based complaint entry.

B. Online Complaint Management System using Image Recognition (Balakrishnan et al., 2023)

Balakrishnan et al. [2] presented a web-based complaint management platform in which citizens upload photographs of civic issues. The system leverages the YOLO (You Only Look Once) v4 object detection algorithm to automatically identify and classify the type of problem — such as potholes, garbage overflow, or road damage — without requiring manual textual input. Google Maps API was used for automatic GPS-based location detection, eliminating the need for users to enter address details. Workers are required to upload a completion snapshot upon resolving the issue, and a credit/warning scoring mechanism incentivizes timely resolution. Despite its strengths, the system is web-only and not optimized for mobile, lacks voice accessibility, and does not offer a dedicated worker navigation feature. Our proposed system adopts a similar AI-image classification approach but extends it with mobile-first UX, IVR support, and OpenStreetMap navigation for field workers.

C. Next-Step: A Mobile-Based Platform for Community-Driven Issue Reporting (Nidarshan et al., 2024)

Nidarshan et al. [3] introduced Next-Step, a React Native mobile application backed by Supabase, enabling citizens (reporters) and volunteers to collaborate on civic issue resolution. The platform features GPS-based complaint routing, real-time notifications, a gamified reward system with leaderboards and badges, role-based dashboards for reporters, volunteers, and administrators, and volunteer-driven task assignment. The reward system demonstrated measurable improvements in user engagement and long-term platform retention. However, Next-Step does not include AI-based image recognition for automatic issue classification, lacks voice or IVR-based complaint submission, and has no dedicated navigation API for workers reaching complaint sites. Media upload was planned but not yet implemented at the time of publication. The proposed Smart Civic AI retains Next-Step's role-based and gamification philosophies while adding AI classification and IVR capabilities.

D. Resolvio: A Voice-Enabled Complaint Management System (Abirami et al., 2025)

Abirami et al. [4] proposed Resolvio, a voice-enabled public complaint management system designed for accessibility and inclusivity. The system employs Google Speech-to-Text to transcribe voice complaints, followed by AI-based classification and automated routing to the appropriate department. Firebase Cloud Messaging provides real-time notifications, and face authentication ensures secure login. Evaluation demonstrated an average citizen satisfaction score of 4.57 out of 5 for voice interaction ease, and service provider satisfaction above 4.1. The system compared favourably against traditional e-complaint websites, paper forms, and call centres across metrics such as complaint tracking (95%), classification accuracy (92%), and duplicate avoidance (88%). Despite these achievements, Resolvio did not incorporate



image recognition for automated issue detection and lacked a dedicated navigation interface for workers. The Smart Civic AI system adapts Resolvio's IVR concept by integrating Twilio Voice API alongside AI image processing.

E. FixMyCity: A Geo-Based Smart Civic Complaint Management System (Franklin et al., 2026)

Franklin and Savitha [5] proposed FixMyCity, a Progressive Web Application (PWA)-based civic complaint system featuring geo-based routing, duplicate complaint detection, before-and-after image evidence, and a public transparency map showing resolved complaints. The system supports role-based workflows across citizens, employees, sub-administrators, and main administrators. GPS location capture and automatic zone-based routing ensure accurate assignment of complaints, while a public map displaying resolved issues with photographic proof enhances citizen trust. The study demonstrated a noticeable reduction in complaint response time and improved user trust through transparency. Key gaps include the absence of voice/IVR accessibility, no AI-based image classification at submission, and no real-time worker navigation. The Smart Civic AI system extends FixMyCity's geo-based routing with AI image recognition and IVR complaint submission.

Table I. Comparative Analysis of Related Works

Feature	Walwadkar [1]	Balakrishnan [2]	Nidarshan [3]	Abirami [4]	Franklin [5]	Proposed System
AI Image Classification	Partial	Yes (YOLO)	No	No	No	Yes (CNN/YOLO)
IVR / Voice Input	No	No	No	Yes	No	Yes (Twilio)
GPS / Geo-Routing	Yes	Yes	Yes	Yes	Yes	Yes
Real-time Tracking	No	No	Yes	Yes	Yes	Yes
Worker Navigation	No	No	No	No	No	Yes (OSM)
Authority Dashboard	Partial	Yes	Yes	Yes	Yes	Yes
Reward / Gamification	No	Partial	Yes	No	No	Planned
Duplicate Detection	No	No	No	Yes	Yes	Yes
Accessibility (Low Literacy)	No	No	No	Yes	No	Yes
Before/After Proof	No	Yes	No	No	Yes	Yes

III. PROPOSED SYSTEM – SMART CIVIC AI

A. AI-Based Image Classification

Management System is a multi-role, AI-powered web and voice platform designed to streamline the lifecycle of civic complaint registration, routing, resolution, and verification. The system addresses the combined gaps identified across the five reviewed studies.

B. System Architecture

The architecture follows a three-tier model: a citizen-facing web portal and IVR channel at the presentation layer; a Flask (Python) backend with REST API endpoints at the application layer; and a MySQL database at the data layer. The backend integrates a machine learning module for image classification, Twilio Voice API for IVR processing, and the OpenStreetMap/Leaflet API for map navigation.

C. Citizen Interface and Complaint Submission

Citizens register on the platform and can submit complaints through two channels. Via the web portal, users capture a live photograph of the civic issue; the AI classification module analyses the image and automatically generates the issue type (e.g., pothole, garbage overflow, sewage leakage) and a descriptive text summary. The citizen can review and submit with GPS-tagged location data. Via the IVR channel (powered by Twilio), citizens dial a designated number, listen to prompts in their preferred language, and verbally describe the issue; speech-to-text conversion and NLP classification



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D. AI-Based Image Classification

The core intelligence of the system resides in its image recognition module, which employs a convolutional neural network (CNN) — pre-trained on a civic issue dataset including categories such as road damage, waste accumulation, water leakage, streetlight failure, and sewage overflow. Upon image upload, the model predicts the issue category with confidence scoring, and generates a natural language description. This eliminates manual categorization effort and reduces misrouting significantly. The YOLO based approach demonstrated in Balakrishnan et al. [2] serves as a technical precedent, extended here with a domain specific training corpus.

E. Authority Dashboard

The authority dashboard provides civic officers with a real-time view of all incoming complaints, organized by category, priority, geographic zone, and status. Authorities can assign complaints to field workers, update priority levels, escalate unresolved issues, and view before-and-after photographic evidence upon resolution. Analytics panels display complaint volume trends, response time metrics, and zone-level heat maps to aid resource planning.

F. Worker Dashboard and Navigation

A key differentiator of the proposed system is the dedicated worker interface. Field workers log in to a streamlined dashboard displaying complaints assigned to them, complete with issue type, description, priority, and location. Workers can click a navigation button that launches OpenStreetMap with turn-by-turn directions to the complaint site. Upon reaching and resolving the issue, workers upload a completion photograph and mark the complaint resolved. This update is immediately reflected on both the authority and citizen dashboards. neural network (CNN) — pre-trained on a civic issue dataset including categories such as road damage, waste accumulation, water leakage, streetlight failure, and sewage overflow. Upon image upload, the model predicts the issue category with confidence scoring, and generates a natural language description. This eliminates manual categorization effort and reduces misrouting significantly. The YOLO-based approach demonstrated in Balakrishnan et al. [2] serves as a technical precedent, extended here with a domain-specific training corpus.

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I. Real-Time Status Tracking

Every state change in the complaint lifecycle — Submitted, Assigned, In Progress, Resolved — triggers real time notifications to the citizen via the web portal. Citizens can view a complaint timeline showing timestamps for each state transition, ensuring full transparency. Escalation flags are raised automatically if a complaint remains unresolved beyond a configurable threshold, notifying higher-level authorities.

J. Dataset and Technology Stack

The system dataset records key attributes including Complaint ID, User ID, Issue Type, Description, Latitude, Longitude, Location Area, Image Path, Priority, Status, Assigned Worker, Created/Opened/Resolved timestamps, Duplicate Flag, Escalation Flag, and Response Time. The technology stack comprises HTML/CSS/JavaScript for the frontend, Flask (Python) for the backend, MySQL for data storage, Scikit-learn/TensorFlow for the ML pipeline, OpenStreetMap with Leaflet for mapping, and Twilio for IVR



IV. RESULT ANALYSIS AND DISCUSSION

The proposed Smart Civic AI system offers measurable improvements over existing systems across five dimensions: complaint classification accuracy, accessibility, worker efficiency, system transparency, and citizen engagement.

AI-based image classification eliminates the manual categorization step required in systems like Next- Step [3] and FixMyCity [5], reducing misrouting errors. By adding IVR support alongside image-based submission, the system achieves a level of accessibility comparable to Resolvio [4] while extending it with visual complaint evidence — a combination no single reviewed system offers.

The worker navigation feature via OpenStreetMap is a unique contribution absent from all five reviewed works. In field trials conducted during system prototyping, workers equipped with turn-by-turn navigation reached complaint sites faster than those relying on manual address lookup, yielding significant time savings on each resolution cycle.

Duplicate detection and escalation mechanisms, drawing on approaches from Resolvio [4] and FixMyCity [5], reduce redundant administrative workload and ensure timely resolution of critical issues. Real-time dashboard synchronization ensures all stakeholders — citizens, authorities, and workers — maintain a consistent view of complaint status.

V. CONCLUSION AND FUTURE SCOPE

This paper surveyed five prominent civic complaint management systems and identified four cross-development (IJSRED), vol. 9, no. 1, Jan–Feb 2026 cutting gaps: the absence of AI-driven image classification at submission, lack of voice/IVR accessibility, no dedicated worker navigation support, and limited real-time transparency across all stakeholder interfaces. The proposed Smart Civic AI: Intelligent Complaint Management System addresses all four gaps in a unified platform by integrating CNN-based image recognition, Twilio IVR, OpenStreetMap worker navigation, role-based dashboards, and escalation-aware real-time tracking.

Future enhancements include multilingual IVR support to serve linguistically diverse communities, predictive hotspot analytics to proactively deploy resources in high-complaint zones, gamification features such as citizen reward points and leaderboards to sustain long-term engagement, and integration of large language models (LLMs) for richer natural language complaint generation from voice inputs. The modular architecture ensures these capabilities can be incrementally added without disrupting existing functionality.

Smart Civic AI represents a significant step towards intelligent, inclusive, and transparent urban governance — empowering citizens to participate actively in their community's development while equipping authorities and field workers with the tools needed for efficient, accountable service delivery.

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