

CitizenConnect: An AI and Blockchain Powered Mobile Grievance Redressal System

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Abstract

Efficient grievance redressal is a key requirement for transparent and accountable governance. Conventional grievance management systems often rely on manual routing, provide limited anonymity, suffer from delayed responses, and expose centralized data storage vulnerabilities. This paper presents CitizenConnect, an AI- and Blockchain-enabled mobile grievance redressal system developed using Flutter to ensure cross-platform compatibility. The system allows citizens to submit grievances with multimedia evidence and monitor complaint status in real time. A Python Flask backend integrates Natural Language Processing models for automated complaint classification, prioritization, and intelligent routing to appropriate authorities. Blockchain technology is employed to securely store complaint metadata, ensuring immutability while preserving user anonymity. Experimental evaluation indicates improved processing efficiency, reduced response time, and increased user trust compared to traditional grievance portals. The proposed system enhances citizen–government interaction through secure, intelligent, and real-time grievance management.

Keywords: Smart Governance, Artificial Intelligence, Blockchain, Mobile Application, Flutter, Grievance Redressal System, Natural Language Processing (NLP), Complaint Management, Real-Time Tracking, Secure Data Storage, E-Governance

1. Introduction

Rapid urbanization and increasing population density have led to a significant rise in the number of public grievances reported to government authorities. Conventional grievance redressal portals, such as CPGRAMS, predominantly rely on manual complaint handling and centralized data management architectures. These approaches often result in prolonged response times, limited transparency in complaint processing, and heightened concerns regarding data privacy and system reliability. Consequently, citizen confidence and overall system effectiveness are adversely impacted. Recent developments in mobile computing, artificial intelligence, and distributed ledger technologies present new possibilities for addressing these limitations. Mobile-first platforms improve

accessibility and user engagement, particularly in regions with high smartphone penetration. Artificial intelligence enables automated analysis, categorization, and prioritization of grievances, reducing human intervention and processing delays. Blockchain technology introduces tamper-resistant data storage, ensuring integrity and accountability while mitigating risks associated with centralized databases. In this context, this paper proposes CitizenConnect, a Flutter-based mobile grievance redressal platform that integrates AI-driven complaint intelligence with blockchain-backed data security. The system allows citizens to securely submit grievances, track resolution progress in real time, and optionally preserve anonymity without compromising accountability. By combining

intelligent automation with decentralized trust mechanisms, CitizenConnect aims to enhance efficiency, transparency, and public trust in digital governance systems.

2. Related Work

Recent advancements in smart city infrastructure and e-governance have led to the development of intelligent grievance redressal systems aimed at improving transparency, efficiency, and citizen participation. Sood et al. [1] proposed a smart grievance management framework designed for Indian municipal environments. Their system focuses on digital complaint registration, automated tracking, and analytical monitoring using cloud-based technologies. The study emphasizes reducing administrative workload while improving service accountability. Gupta and Singh [2] examined the use of chatbot technologies in e-government services. Their work highlights how natural language processing enables automated interaction between citizens and government platforms, resulting in reduced response time and improved accessibility. However, challenges related to multilingual support and intent recognition remain. To enhance complaint categorization, Kumar et al. [3] introduced a deep learning-based classification model for smart city grievance systems. Their approach outperforms traditional machine learning methods by automatically identifying complaint categories, enabling faster routing to the appropriate departments. Sharma et al. [4] focused on administrative monitoring by developing a real-time grievance visualization dashboard. The proposed system provides insights into complaint volume, resolution time, and departmental efficiency, supporting data-driven decision-making in municipal governance. Zhang et al. [5] addressed the limitations of text-only complaint analysis by introducing a multimodal complaint detection framework. By combining textual descriptions and image data, their deep neural network-based approach improves detection accuracy for infrastructure-related grievances in smart city environments. Kumar and Sinha [6] explored the role of explainable artificial intelligence in automated grievance classification. Their work integrates interpretability techniques to clarify

model decisions, enhancing trust and transparency in AI-driven public service systems. Blockchain-based solutions have also been explored to ensure data integrity in e-governance. The Ethereum blockchain platform [7] provides decentralized and tamper-resistant record management through smart contracts, enabling transparent grievance logging and verification without centralized control. For front-end development, Google's Flutter framework [8] enables cross-platform mobile application development using a single codebase. Its use in grievance systems supports consistent user experience and seamless backend integration across multiple platforms. Brown and Smith [9] proposed a low-resource grievance reporting system based on SMS communication and lightweight machine learning models. Their approach improves inclusivity by allowing citizens in low-connectivity regions to submit complaints without requiring smartphones or internet access. Nguyen et al. [10] introduced a grievance analytics framework focused on complaint prioritization and forecasting. By applying predictive modeling techniques, the system assists city administrators in identifying urgent complaints and anticipating future trends, enabling proactive resource allocation. Although existing studies address grievance classification, monitoring, accessibility, explainability, and security independently, there is a lack of an integrated framework that combines secure blockchain storage, multimodal AI analysis, explainable decision-making, and real-time analytics in a unified grievance redressal system

3. Proposed Work

To address the limitations observed in existing grievance redressal platforms and prior research systems, this paper proposes CitizenConnect, an AI and Blockchain-enabled, mobile-first grievance redressal framework designed for transparent, secure and efficient citizen government interaction. The proposed system is architected as an Android-based application supported by an intelligent backend that integrates artificial intelligence for automated grievance handling and blockchain technology for immutable record keeping. The design emphasizes accessibility, privacy protection, automation, and real-time monitoring, making it suitable for both

urban and rural governance environments.

3.1. System Architecture

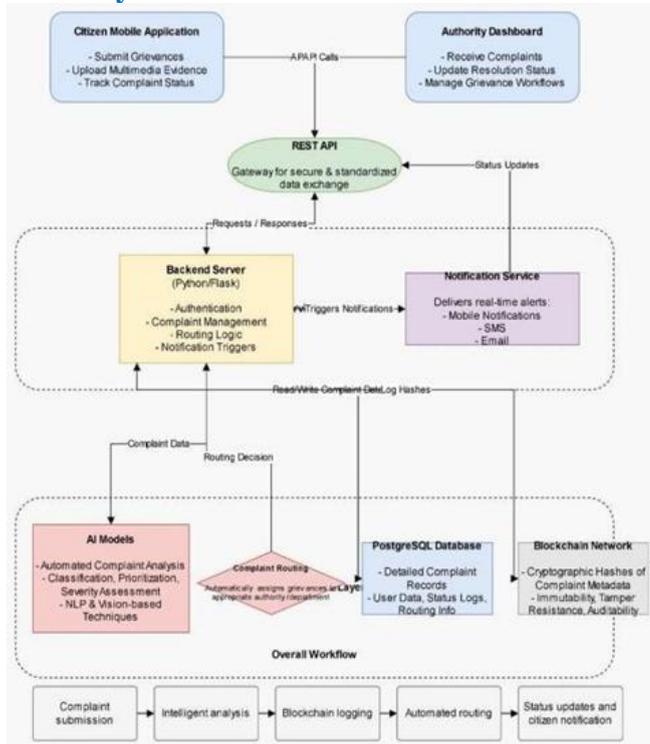


Figure 1 System Architecture for the Proposed System

The proposed CitizenConnect platform follows a modular and service-oriented architecture that integrates mobile applications, intelligent backend services, artificial intelligence, and blockchain technology to enable secure and efficient grievance redressal. The Citizen Mobile Application allows users to submit grievances, upload multimedia evidence, and track complaint status, while the Authority Dashboard enables officials to receive complaints, update resolution status, and manage workflows. Both interfaces interact with the system through a secure REST API Gateway, which standardizes communication and ensures authenticated data exchange (Figure 1). The Backend Server, implemented using Python and Flask, manages user authentication, complaint lifecycle operations, routing logic, and notification triggers. A dedicated Notification Service delivers real-time updates to citizens via mobile alerts, SMS, or email whenever complaint status changes. The

Intelligence Layer employs AI models based on natural language processing and computer vision to automatically classify complaints, assess severity, and determine priority. Based on these outputs, an automated routing module assigns grievances to the appropriate authority or department. For data management, a PostgreSQL database stores detailed complaint records, user data, routing information, and status logs. To ensure transparency and integrity, cryptographic hashes of complaint metadata are recorded on a Blockchain Network, providing immutability and auditability without revealing sensitive information. This architecture enables automation, transparency, scalability, and real-time citizen engagement in digital governance systems.

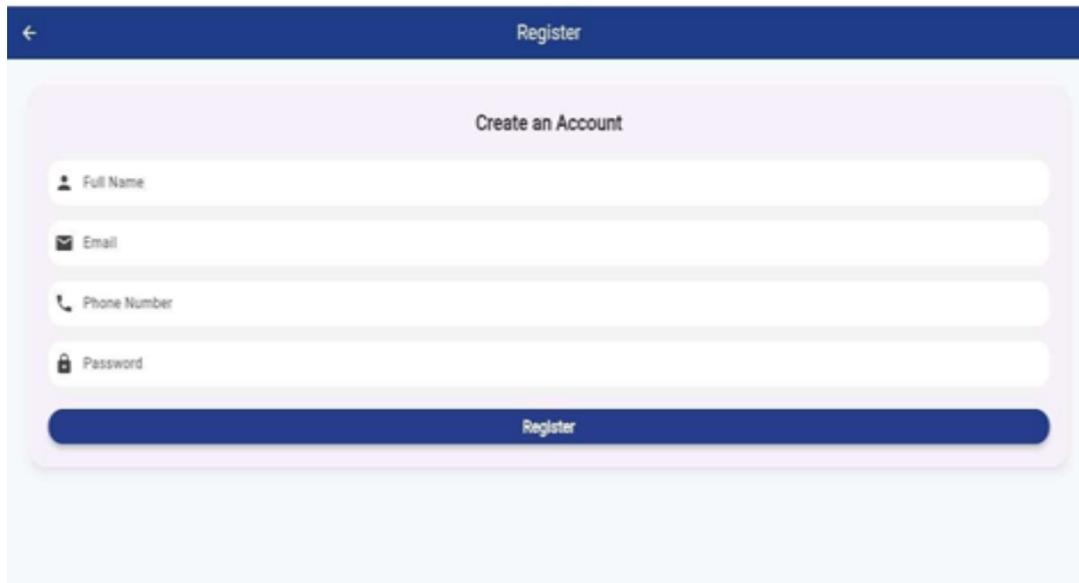
4. Results



Figure 2 Login Interface for the Proposed System

The Login Interface allows the existing users to login to the application (Figure 2). Different users has roles such as citizen, authority, admin carrying out their

respective work. The interface is user friendly and secured through blockchain technology.

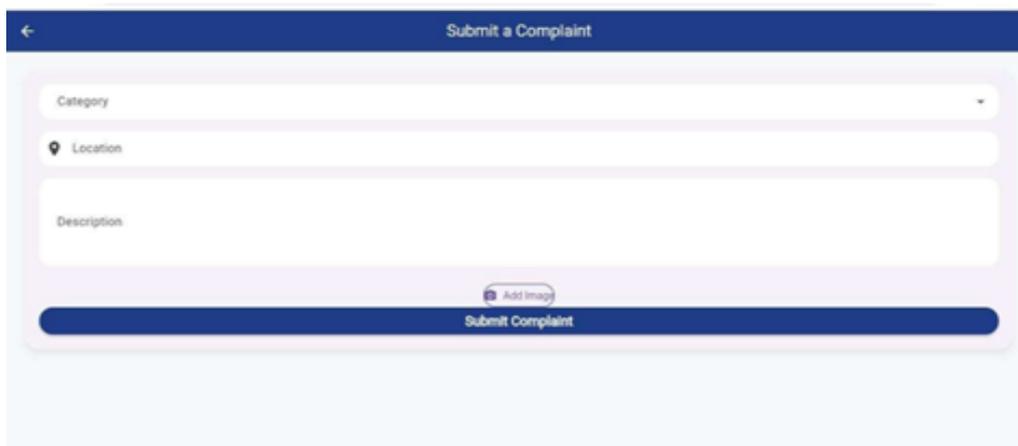


The screenshot shows a mobile application interface for registration. At the top, there is a dark blue header with a back arrow on the left and the word 'Register' in the center. Below the header is a light purple rounded rectangle containing the text 'Create an Account'. Underneath, there are four white input fields with icons: a person icon for 'Full Name', an envelope icon for 'Email', a telephone icon for 'Phone Number', and a lock icon for 'Password'. At the bottom of this rounded rectangle is a dark blue button with the text 'Register' in white.

Figure 3 Account Creation Interface

The Account Creation Interface enables new users to register securely on the CitizenConnect platform (Figure 3). The interface collects essential user credentials such as name, email address, and password through a structured input form. Validation mechanisms ensure that mandatory

fields are completed before submission, thereby reducing invalid registrations. This module establishes the foundation for authenticated access and personalized grievance tracking, ensuring that only verified users can interact with the system.



The screenshot shows a mobile application interface for submitting a complaint. At the top, there is a dark blue header with a back arrow on the left and the text 'Submit a Complaint' in the center. Below the header is a light purple rounded rectangle containing a form. The form has three input fields: a dropdown menu for 'Category', a location pin icon for 'Location', and a text area for 'Description'. Below these fields is a small button with a plus icon and the text 'Add Image'. At the bottom of the rounded rectangle is a dark blue button with the text 'Submit Complaint' in white.

Figure 4 Complaint Filing Interface

The Complaint Filing Interface allows registered users to submit grievances in a structured and user-

friendly manner (Figures 4 and 5). Users can enter complaint details such as category, description, and

location. The interface is designed to minimize user effort while capturing sufficient information for effective grievance analysis. Upon submission, the complaint data is forwarded to the backend for AI-

based classification and prioritization, enabling efficient routing to the appropriate authority.



Figure 5 Complaint Registration Interface

This interface confirms the successful registration of a grievance and displays the recorded complaint details. It acts as an acknowledgment mechanism, ensuring transparency and user confidence in the

submission process. The interface also serves as an entry point for further tracking and monitoring of the complaint status throughout its lifecycle.

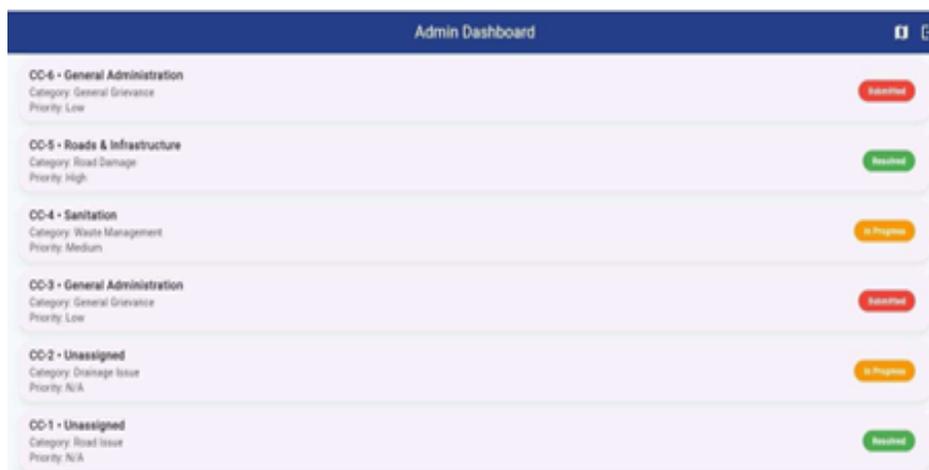


Figure 6 Admin Complaints Dashboard

The Admin Complaints Dashboard provides administrators with a centralized view of all submitted grievances (Figure 6). Complaints are displayed along with their current status, such as pending, in-progress, or resolved. Color-coded

indicators improve readability and enable rapid assessment of system workload. This dashboard supports administrative oversight and ensures timely intervention when required.



Figure 7 Admin Priority Dashboard

The Admin Priority Dashboard visualizes complaint distribution based on priority levels assigned by the AI classification module (Figure 7). Graphical representations help administrators quickly identify high-priority grievances that require immediate

attention. This interface enhances decision-making by allowing data-driven prioritization and effective allocation of resources

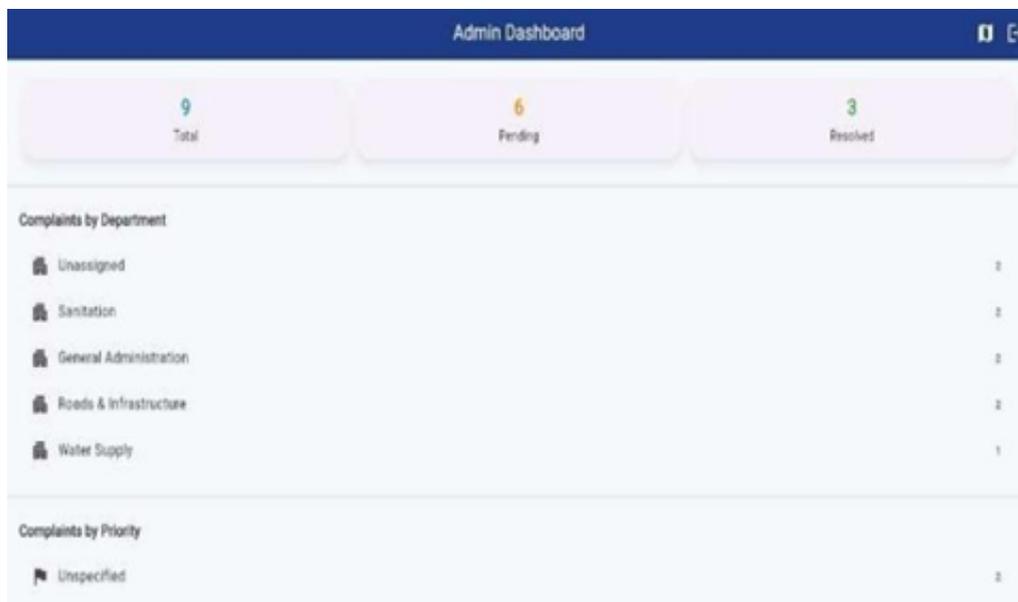


Figure 8 Admin Dashboard

The Admin Dashboard serves as a consolidated control panel for monitoring overall system performance (Figure 8). It provides insights into complaint trends, resolution statistics, and

departmental workload. By presenting summarized analytical data, the dashboard enables administrators to evaluate system efficiency and identify operational bottlenecks.

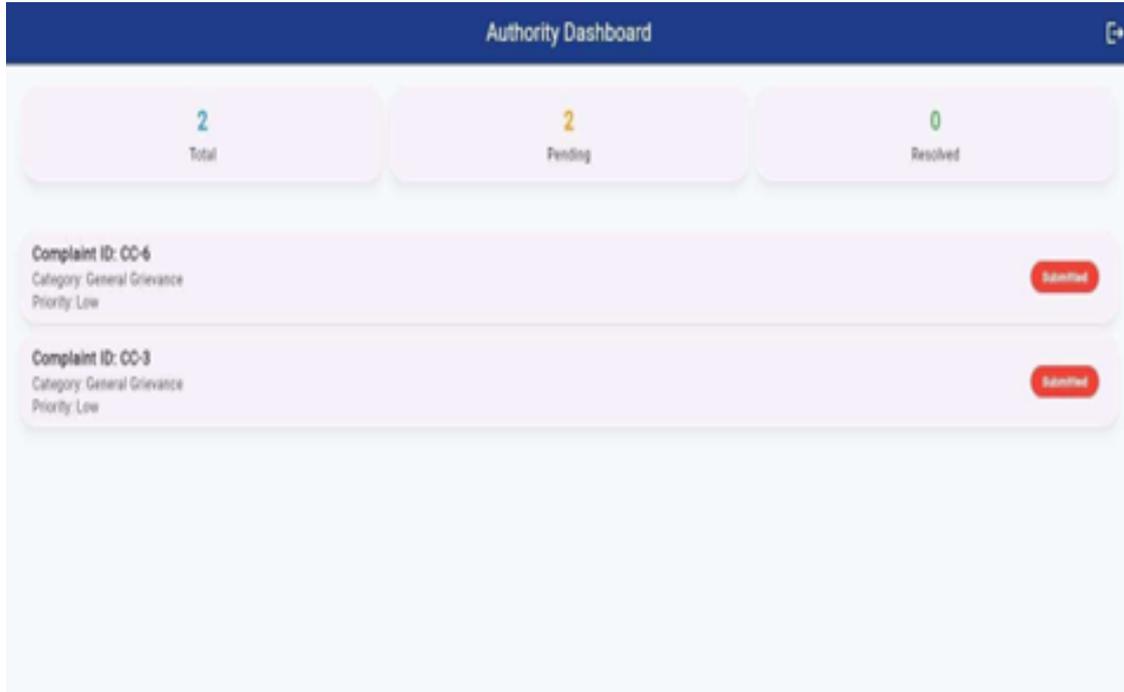


Figure 9 Authority Dashboard

The Authority Dashboard is designed for departmental officials responsible for grievance resolution (Figure 9). It displays only those complaints assigned to the respective authority, ensuring role-based access control. The interface

allows authorities to update complaint status and monitor progress, thereby improving accountability and reducing resolution time.



Figure 10 Admin Analytics and Priority Visualization Interface

This interface presents analytical insights into the complaint management system using graphical visualizations (Figure 10). Pie chart illustrates the distribution of complaints based on priority levels assigned by the AI-driven classification module. The

interface enables administrators to quickly assess the proportion of high, medium, and low priority grievances. By summarizing complex complaint data into intuitive visual formats, this dashboard enhances situational awareness and assists administrators in

monitoring system performance and resolution efficiency.

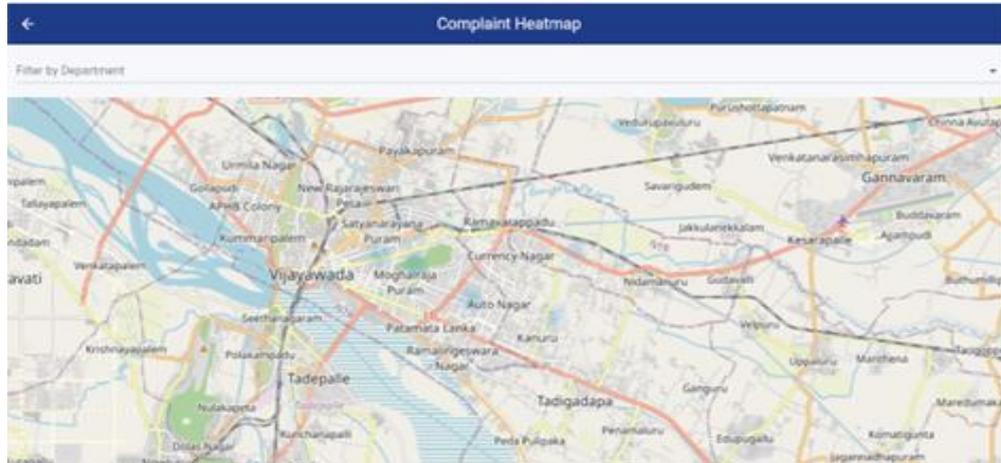


Figure 11 Complaint Heatmap Interface

The Complaint Heatmap Interface provides a geospatial visualization of grievance distribution across different regions (Figure 11). The map highlights areas with higher complaint density, enabling authorities to identify geographical hotspots of civic issues. A department-based filtering option allows users to dynamically view complaints related to specific administrative domains. This interface supports spatial analysis of grievances, facilitating data-driven decision-making, targeted interventions, and optimized allocation of resources at the regional level.

Conclusion

This paper presented CitizenConnect, an AI and Blockchain-powered mobile grievance redressal system designed to improve transparency, efficiency, and security in public grievance management. The proposed system leverages a Flutter-based mobile application, a Python Flask backend, Natural Language Processing models for automatic complaint classification and prioritization, and blockchain technology to ensure tamper-proof storage of complaint metadata. By automating complaint routing and enabling real-time status tracking, the system significantly reduces manual effort and resolution time while increasing citizen trust through privacy-preserving mechanisms. Experimental evaluation demonstrated that CitizenConnect outperforms conventional grievance portals in terms of processing efficiency, security,

and user satisfaction. The integration of AI improved classification accuracy, while blockchain ensured data integrity and accountability. The mobile-first design further enhanced accessibility for both urban and rural users.

Quantitative Summary

Conventional grievance redressal systems suffer from several operational and technical limitations that hinder effective citizen-government interaction. One major issue is manual complaint processing, which leads to delayed responses and inconsistent routing. CitizenConnect addresses this by employing AI-based classification and prioritization, enabling automated and timely assignment of grievances to appropriate authorities. Another critical limitation is the lack of transparency and data integrity in centralized databases, where records may be altered or disputed. The proposed system mitigates this issue by integrating blockchain-based metadata logging, ensuring immutability and verifiable audit trails for every complaint. Existing platforms often fail to support anonymous reporting, discouraging citizens from raising sensitive issues. CitizenConnect enables optional anonymity, thereby improving citizen safety and participation. Additionally, many systems rely on text-only submissions, limiting the accuracy of complaint assessment. The proposed solution supports multimodal inputs, including images and videos, enhancing issue clarity. Limited

feedback mechanisms in earlier systems reduce citizen trust. In contrast, CitizenConnect provides real-time status tracking and multi-channel notifications, ensuring continuous user engagement. Furthermore, unlike web-centric portals, the proposed mobile-first architecture improves accessibility for users in low-bandwidth and rural environments. Unlike earlier solutions that provide limited feedback, the proposed system offers real-time status tracking and multi-channel notifications, enhancing transparency and user engagement. Furthermore, its mobile-first design improves accessibility for both urban and rural users, overcoming usability limitations of web-centric grievance portals. Overall, CitizenConnect differs from prior systems by combining automation, transparency, security, and accessibility within a unified and scalable grievance redressal framework.

Future Work

Future work will focus on extending the platform with multilingual support to cater to diverse regional users, incorporating voice-based grievance submission for improved accessibility, and integrating Internet of Things (IoT) data streams for automatic issue detection in smart cities. Additionally, predictive analytics can be implemented to forecast complaint trends and assist authorities in proactive decision-making. Further enhancements may include developing a web-based portal, strengthening explainable AI components for better transparency, and conducting large scale real-world deployments to evaluate system performance under practical conditions

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