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Integrated Citizen Grivence System - Nagarik Connect

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ABSTRACT
Effective grievance management forms the bedrock for establishing open, responsible, and responsive governance. Traditional complaint-handling mechanisms tend to be slow and unstructured. They also involve a lack of coordinated feedback exchange between citizens and the authorities, thereby causing unresolved issues and reduced civic trust. To address this challenge, ICGS is designed as an integrated digital platform. It facilitates the seamless registration, tracking, and resolution of civic complaints.The system offers a multilingual and user-friendly interface, which enables the citizens to report issues with public services such as sanitation, water supply, road maintenance, and electricity. Complaints go automatically to the corresponding department, reducing manual involvement and delaying processes. The administrators of each department are able to assign tasks to the workers, track their progress in real time, and update their status for review by the citizens. Further features include automated notification, feedback collection, resolution history, and enhancement of transparency and accountability among departments.ICGS links citizens, authorities, and field workers into one digital ecosystem for easier grievance redressal. The platform cuts down response time, ensures proper tracking of service requests, and improves service delivery by informed decision-making. The system supports smarter and more responsive urban administration by closing the communication gap and thereby encouraging participatory governance.

Keywords: Integrated Citizen Grievance System, Nagarik Connect, E-Governance, Artificial Intelligence (AI), Natural Language Processing (NLP), BERT-based Classification, Automated Complaint Routing, Smart City Governance, Multilingual Support, Real-time Grievance Tracking.

1. INTRODUCTION

In modern urban environments, the quality of civic services and the responsiveness of government institutions play a crucial role in shaping public trust. As cities expand and populations grow, the number of service-related issues—such as damaged roads, water leakage, waste mismanagement, and electricity disruptions—continues to rise. Although many administrative bodies have mechanisms for addressing citizen grievances, most conventional systems still rely on fragmented, manual processes that are slow, inconsistent, and lack transparency. Citizens often struggle to submit complaints, track

progress, or communicate with concerned departments, while administrators face difficulties in sorting, prioritizing, and resolving issues efficiently.To address these challenges, there is an increasing need for intelligent and technology-driven grievance redressal models that streamline communication between citizens and authorities. *Nagarik Connect – Integrated Citizen Grievance System (ICGS)* has been developed with this objective in mind. It provides a unified digital platform that simplifies the entire complaint lifecycle—from submission and classification to assignment, tracking, and resolution. The system allows citizens to report issues through a user-friendly interface, enriched with descriptions, images, and GPS-based location details for accurate problem identification.A key component of the platform is its AI-powered complaint categorization system, which uses a BERT-based Natural Language Processing (NLP) model to automatically determine the appropriate municipal department for each grievance. This reduces manual workload, minimizes misrouting errors, and ensures faster redirection of complaints. The platform also supports role-based dashboards for citizens, administrators, and field workers, enabling each stakeholder to access relevant tools, manage tasks effectively, and monitor progress in real time.In addition to automation, the system promotes inclusivity through multilingual support, offering citizens the ability to interact in their preferred language. Features such as feedback collection, status updates, resolution history, and digital notifications further enhance accountability and ensure transparent communication throughout the process.By integrating modern technologies with public-service workflows, Nagarik Connect transforms the conventional grievance redressal model into an efficient, citizen-centric, and data-driven ecosystem. The platform not only improves service delivery but also strengthens collaborative governance and encourages active civic participation.

2. LITERATURE REVIEW

Research on digital grievance redressal systems has gradually evolved in response to the growing need for efficient and citizen-focused public services. Initial studies relied on traditional machine-learning techniques for classifying complaint text, which worked well for structured data but showed limitations in understanding contextual meaning. Subsequent research addressed unstructured and informal complaint sources, such as social-media data, using NLP-based feature extraction and neural models to identify complaint intent. With the emergence of deep-learning approaches, multi-issue grievance classification became possible through models capable of capturing sequential and semantic relationships, although these methods often demanded high computational resources and large labeled datasets. To balance accuracy and practical deployment, later studies incorporated contextual language models and workflow automation to improve complaint routing efficiency. Recent work expanded system accessibility through speech-based complaint submission and demonstrated that lightweight classifiers can still perform effectively in structured governance environments. Additionally, anomaly detection techniques have been applied to identify fraudulent or repetitive grievances, ensuring data reliability. Despite these advancements, existing research commonly lacks comprehensive multilingual support, end-to-end system integration, and multimodal input handling. Addressing these gaps, the Integrated Citizen Grievance System (Nagarik Connect) proposes a unified AI-enabled platform that combines automated complaint classification, multilingual access, real-time tracking, and analytical dashboards to improve transparency, efficiency, and responsiveness in civic grievance management.

3. METHODOLOGY

The methodology adopted for the development of *Nagarik Connect – Integrated Citizen Grievance System (ICGS)* follows a systematic and goal-oriented approach to design a transparent, intelligent, and citizen-focused grievance redressal platform. The initial phase involved an in-depth requirement analysis with key stakeholders, including citizens, municipal administrators, and field-level workers. This phase identified essential functional requirements such as simple grievance submission, role-based complaint handling, and real-time status tracking, along with non-functional requirements like system scalability, data security, multilingual accessibility, and cross-device responsiveness. These requirements guided the overall system design to ensure that the platform remains practical and adaptable for real-world governance environments.

Based on the identified requirements, a modular and layered system architecture was developed to support efficient data flow and automation. The architecture consists of a user interface layer for collecting complaints, images, and geolocation data; a backend application layer responsible for authentication, complaint validation, workflow management, and API communication; an AI-driven classification layer; and a database layer for secure data storage and retrieval. This separation of concerns enhances system maintainability and scalability while allowing smooth interaction between components. The backend ensures role-based routing of complaints, enabling administrators and field workers to access only relevant modules, thereby improving operational efficiency and accountability.

A core feature of the methodology is the integration of a BERT-based Natural Language Processing model to automate complaint classification and departmental assignment. By leveraging contextual embeddings and self-attention mechanisms, the model accurately interprets complaint descriptions and reduces the need for manual intervention. The backend, implemented using Python Flask, supports secure authentication, file uploads, and access control, while SQLite/MySQL handles structured data efficiently. The frontend, built with HTML, CSS, Bootstrap, and JavaScript, provides an intuitive and responsive user experience with multilingual support enabled through Flask-Babel. Additional features such as geolocation using Google Maps API, image-based evidence submission, continuous testing, model refinement, and analytical dashboards contribute to reliable performance and informed decision-making. Overall, this methodology delivers a scalable, AI-enabled, end-to-end grievance redressal ecosystem that enhances efficiency, transparency, and responsiveness in civic complaint management.

In addition, an iterative development and evaluation strategy was followed to ensure continuous improvement of the system. Each module was developed, tested, and refined through regular feedback from users and administrators, allowing usability issues and performance gaps to be addressed early. Security measures such as data validation, access control, and secure authentication were emphasized throughout development to protect sensitive citizen information. Performance monitoring and analytics were also incorporated to assess system responsiveness, classification accuracy, and complaint resolution timelines, ensuring that Nagarik Connect remains reliable, adaptable, and effective for long-term municipal governance use.

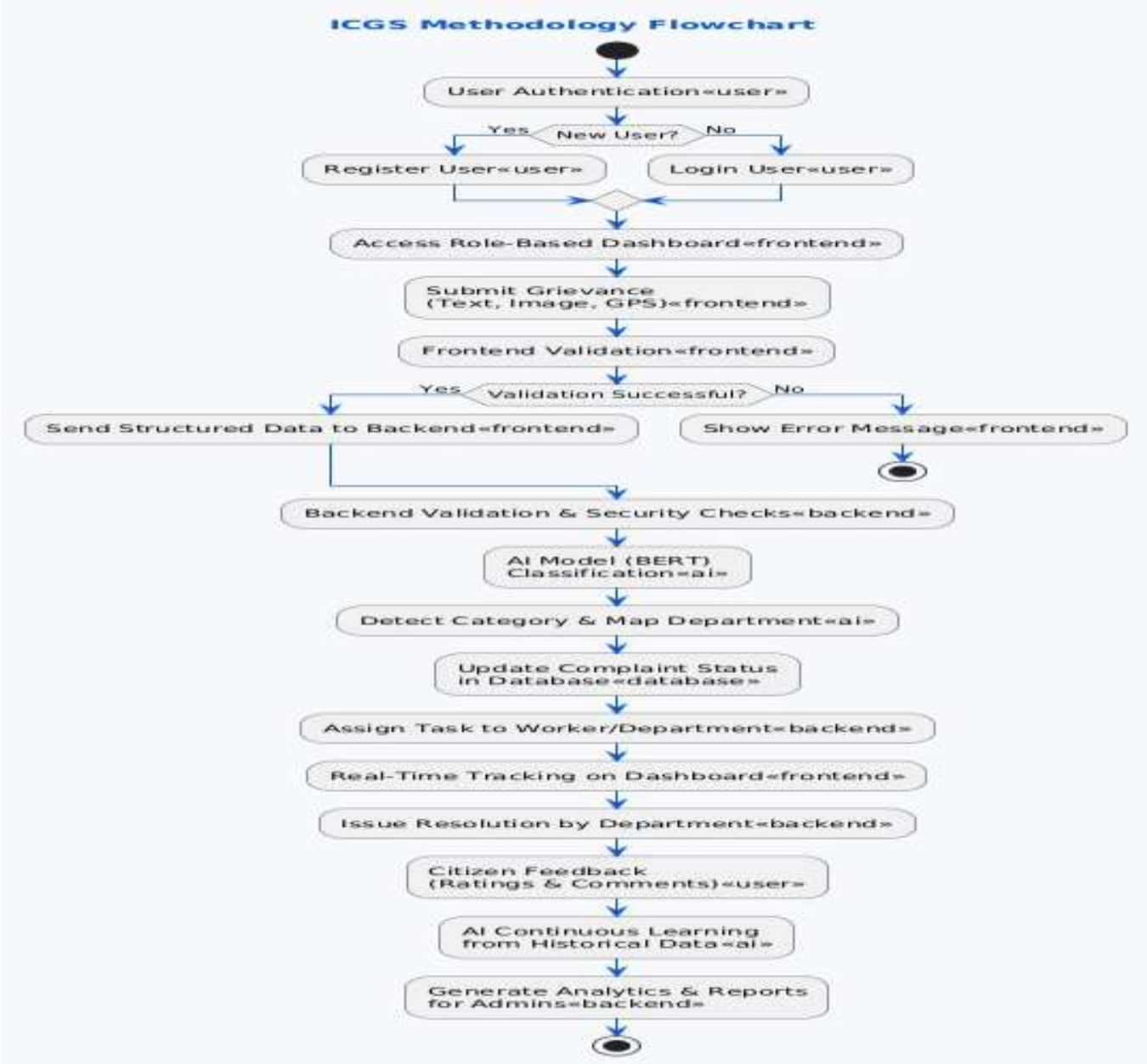

Figure 3.1: Methodology Diagram

4. MODELING AND ANALYSIS

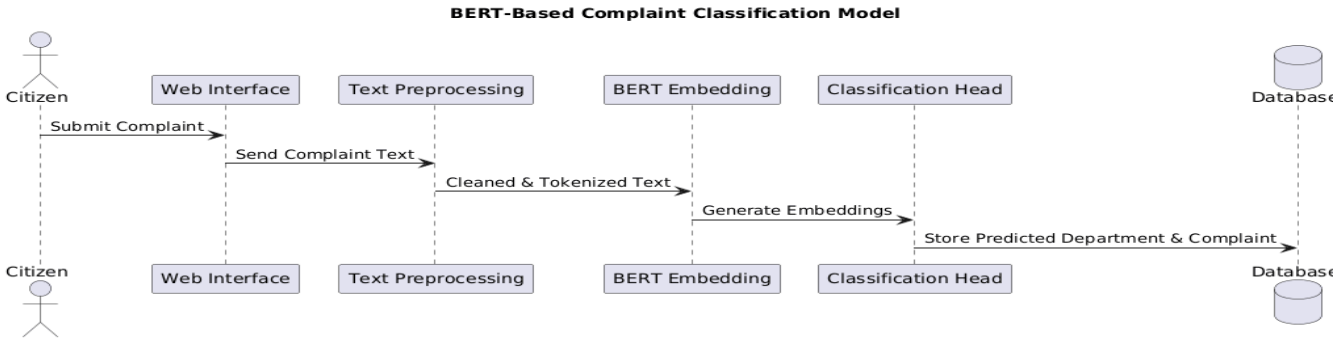

Figure 4.1: Bert-Based Complaint Classification

As illustrated in **Figure 4.1**, Nagarik Connect uses a fine-tuned BERT-based AI model to understand contextual complaint text, automatically route grievances to relevant departments, and provide analytical insights that support efficient and data-driven civic administration.

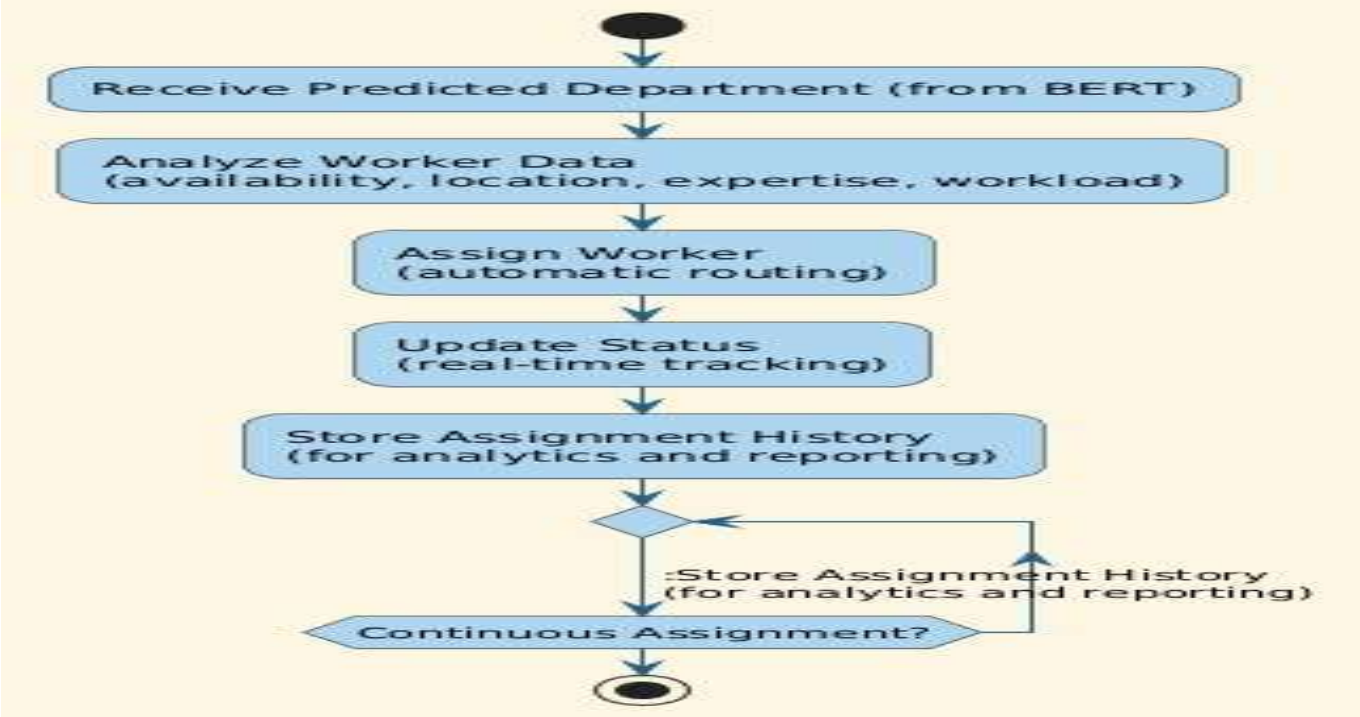

Figure 4.2 : Worker Assignment Model

Figure 4.3:Analytics and Dashboard Model

The analytics layer is built using lightweight visualization technologies such as Chart.js and custom data-handling scripts that transform raw database entries into meaningful graphs, charts, and statistical summaries. The system does not merely display counts but interprets the data to help authorities detect patterns. For instance, if the dashboard reveals a sudden rise in complaints related to water scarcity in a particular region, administrators can instantly investigate further or redirect additional resources. Similarly, if a department consistently demonstrates slower response times, the analytics reveal this trend, encouraging process improvements or manpower adjustments. Citizen satisfaction scores, collected through the feedback module, are also included in the analytics dashboard, enabling the administration to evaluate performance not only through numbers but also through user experience.

5. RESULTS AND DISCUSSION

The Nagarik Connect – Integrated Citizen Grievance System was developed to provide a seamless and intelligent platform for citizens, administrators, and field workers to manage civic complaints efficiently. The following section presents the results of the implemented system and discusses how each component functions in real-world interactions. Each figure illustrates a specific stage or interface of the system, and the descriptions below analyze their purpose, usability, and contribution to the overall workflow. All figures referenced here correspond to those in the submitted report.

Figure 5.1: Home Page

The Home Page, shown in *Figure 5.1*, acts as the central entry point to the system, welcoming users with a clean and structured layout.

Figure 5.2: Language Selection

Figure 5.2 illustrates the Language Selection interface, which allows users to choose their preferred language before exploring the system. This feature is crucial for inclusivity, as users come from diverse linguistics.

Figure 5.3: Account Creation Page

As shown in **Figure 5.3**, the account creation interface enables users to securely register with validated personal details, establishing a unique identity that supports personalized access, complaint tracking, and reliable system communication.

Figure 5.4 : User Login Page

Figure 5.4 illustrates the User Login interface that securely verifies registered users through password authentication, offers password recovery support, and provides quick, user-friendly access to personalized dashboards while protecting sensitive information.

Figure 5.5 : User Dashboard

In *Figure 5.5*, the User Dashboard is displayed, offering a personalized space where citizens can view their submitted complaints, register new grievances, access notifications, and check status updates.

Figure 5.6 : Complaint Registration Page

Figure 5.6 depicts the Complaint Registration interface, one of the core features of the system. Here, users can describe their issue, upload images, and select or auto-detect the location through GPS.

Figure 5.7 : Submitted Complaint Page

Shown in *Figure 5.7*, this page displays all previously registered complaints along with their status, timestamps, and administrative responses.

Figure 5.8 : Admin Page

The Admin Login interface shown in *Figure 5.8* serves as the secure entry point for system administrators. This level of authentication ensures that only authorized personnel can view, assign, or modify complaints

Figure 5.9 : Admin Home Page

Figure 5.9 shows the Admin Home Page that summarizes active, pending, and resolved complaints, using clear visuals to highlight priorities, support quick decisions, and improve administrative efficiency.

Figure 5.10 : Department Admin Login Page

The Department Admin Login interface shown in *Figure 5.10* allows department-specific officials to access their respective modules.

Figure 5.11 : Department Dashboard

Figure 5.11 depicts the Department Dashboard that lists department-wise complaints with sorting and real-time status updates, enabling effective resource management and improved administrative accountability.

Figure 5.12 : Department Complaints List

In *Figure 5.12*, a detailed list of complaints routed to the particular department is shown. Each entry includes the complaint description, location, evidence files, user details, and current status. This layout helps department officials quickly understand the nature of the issue and assign it to the appropriate field worker. The clear structuring supports efficient complaint management and avoids miscommunication during task allocation.

Figure 5.13: Add Worker page

Figure 5.13 displays the Add Worker interface, which allows department administrators to register new field workers into the system.

Figure 5.14 : Feedback Submission Page

The Feedback Submission page shown in *Figure 5.14* enables citizens to rate the quality of service after their complaint has been resolved.

Figure 5.15 : Feedback Dashboard

Figure 5.15 shows the Feedback Dashboard that visually summarizes user ratings and comments, helping administrators assess satisfaction, track trends, and improve service quality with transparency.

6. CONCLUSION

Nagarik Connect is an integrated citizen grievance platform that transforms traditional complaint management into a transparent, efficient, and citizen-focused system. By combining web technologies, automated complaint routing, role-based dashboards, real-time tracking, feedback collection, and analytics, the platform simplifies how grievances are submitted, monitored, and resolved. The inclusion of a BERT-based NLP model enables accurate understanding and classification of complaints, reducing manual effort and administrative delays while supporting multilingual access. The platform enhances accountability through structured dashboards for citizens, departments, and field workers, ensuring clear communication and task ownership at every stage. Analytics provide valuable insights into complaint trends, department performance, and citizen satisfaction, supporting data-driven decision-making. Overall, Nagarik Connect strengthens public trust, improves service delivery, and offers a scalable foundation for future intelligent and inclusive urban governance solutions.

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