

CITIZEN CENTRIC COMPLAINT PLATFORM

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Abstract

In today's digital era, efficient grievance management plays a crucial role in enhancing communication between citizens and government authorities. The proposed Citizen-Centric Complaint Platform provides an intelligent, automated, and transparent system for registering, classifying, and tracking public complaints. The system leverages Natural Language Processing (NLP) and a Bidirectional Long Short-Term Memory (BiLSTM) model to analyze complaint text and automatically categorize it into relevant departments while assessing urgency and sentiment. The input text is pre-processed through tokenization, lemmatization, and stopword removal, followed by word embedding using GloVe to capture semantic meaning. The BiLSTM layer, with tanh and sigmoid activation functions, processes the contextual information in both forward and backward directions, ensuring better understanding of complaint context. The output vector is passed through Dense and Softmax layers to predict the most probable department and urgency level. The system architecture integrates FastAPI for backend processing, React.js for front-end interaction, and MySQL for data storage. Additionally, APIs such as Google Maps.

Keywords: Centric Complaint Platform, Natural Language Processing, Bidirectional Long Short-Term Memory, GloVe Embedding, Text Classification, Sentiment Analysis, Department Classification, Urgency Detection, Tokenization, Lemmatization, Stopword Removal, Softmax Activation, Tanh Activation, Sigmoid Activation.

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I. Introduction

In today's digital era, urban and rural citizens expect quick and transparent solutions to civic problems such as uncollected garbage, broken streetlights, water supply issues, and poor road conditions. However, traditional complaint systems are often manual, time-consuming, and inefficient, leading to delays in issue resolution and reduced citizen satisfaction. To overcome these challenges, there is a growing need for an intelligent and automated complaint management platform that can efficiently handle and categorize citizen grievances.

The Citizen-Centric Complaint Platform aims to streamline this process by leveraging Natural Language Processing (NLP) and Deep Learning techniques. The system allows citizens to submit complaints in simple natural language, which are then automatically analyzed and classified into

appropriate departments using a Bidirectional Long Short-Term Memory (BiLSTM) model. This enables government authorities to receive well-structured and prioritized complaints, ensuring faster responses and improved public service management.

The project integrates GloVe word embeddings with the BiLSTM model to understand the semantic meaning of complaint text. The GloVe model converts words into numerical vectors that capture contextual relationships between terms, while the BiLSTM processes the complaint in both forward and backward directions to capture complete contextual information. The model then predicts the relevant department (e.g., Sanitation, Water Supply, Roads) and determines the urgency level based on the sentiment and context of the complaint. This automation reduces manual intervention and enhances the accuracy of complaint routing.

The platform is developed using React.js for the frontend, FastAPI (Python) for backend processing, and MySQL for database management. The NLP model operates at the backend, where preprocessing steps such as tokenization, stopword removal, and lemmatization are performed before classification. The frontend provides an intuitive interface for citizens to submit and track complaints, while administrators can monitor and manage grievances through a centralized dashboard. Additionally, the system integrates APIs such as Google Maps for location-based complaint routing.

Overall, this project demonstrates the potential of AI-driven governance by combining deep learning, NLP, and modern web technologies to create a citizen-focused complaint management system. The use of BiLSTM ensures improved context understanding, enhances classification accuracy, and makes the system scalable for real-world implementation in smart city and e-governance environments.

II. Importance of Technology

2.1 Enhanced Efficiency in Complaint Handling

Technology automates the end-to-end complaint management process, including submission, categorization, routing, and status tracking. This automation minimizes manual intervention, reduces delays, and ensures that citizen grievances are resolved quickly and systematically. The integration of NLP and Deep Learning further enhances accuracy in understanding and classifying complaints.

2.2 Centralized Grievance Data Management

By integrating all citizen complaints, departmental responses, and resolution updates into a single digital platform, technology enables local authorities to manage grievance data securely and efficiently. This centralized system ensures transparency, prevents data duplication, and allows administrators to access complaint histories for better decision-making and accountability.

2.3 Intelligent Complaint Classification

The use of Natural Language Processing (NLP) and Bidirectional Long Short-Term Memory (BiLSTM) algorithms allows the system to intelligently analyze complaint text. Through GloVe embeddings, words are converted into numerical vectors, helping the model understand context and meaning. This enables automatic routing of complaints to the correct department, ensuring faster and more accurate redressal.

2.4 Data Transparency and Accountability

Digital complaint systems maintain an auditable trail of all grievances, actions taken, and responses provided. This ensures that every complaint is traceable and accountable, discouraging negligence or misuse of authority. Administrators can also generate analytical reports to monitor departmental performance and identify bottlenecks.

2.5 Accessibility and User Convenience

The platform allows citizens to register complaints from any device—desktop or mobile—without visiting government offices. Features such as automatic location detection, image uploads, and prefilled personal details enhance user experience and make the system accessible to all citizens, including those in rural or remote areas.

2.6 Data-Driven Governance

The integration of analytics enables authorities to visualize complaint trends, identify recurring civic issues, and allocate resources more effectively. For example, if multiple complaints arise from a particular area, predictive insights can help authorities take preventive action before problems escalate.

2.7 Scalability and Future Readiness

A technology-driven system can easily scale to handle complaints from multiple cities or states with minimal configuration. The architecture supports integration with AI chatbots, multilingual interfaces, and mobile applications, making it adaptable for future smart governance initiatives.

2.8 Security and Reliability

Technology ensures that all complaint data and user information are stored securely using encryption and authentication mechanisms. Role-based access control ensures that only authorized personnel can modify complaint records, maintaining data integrity and system reliability.

2.9 Digital Awareness and Empowerment

By introducing citizens to AI-based complaint management systems, this technology increases digital literacy and encourages community participation. It empowers citizens to voice their issues through modern digital platforms, contributing to the vision of a transparent and responsive governance system.

III. Literature Survey

Yaran Jiao et al. [1] explored the role of online citizen complaints in improving environmental management using spatio-temporal and sentiment analysis. Their research analyzed 7,657 environmental complaints from Guangzhou City, revealing that most complaints carried negative sentiments and varied across time and location. The study demonstrated how text mining and sentiment analysis can help governments refine complaint-handling mechanisms, improve transparency, and design targeted environmental interventions.

Nikhil Zade et al. [2] presented an NLP-based automated text summarization and translation system integrating graphical user interface (GUI) design and secure document management. The system leverages NLP for efficient information extraction and summarization, achieving accuracy between 91%–95%. This approach illustrates how NLP techniques can enhance citizen complaint analysis by automatically summarizing and categorizing textual reports, thereby improving processing speed and classification accuracy.

Trang Thi Uyen Nguyen et al. [3] investigated the impact of citizen relationship quality and involvement on e-government adoption using the SocioCitizenry theory. The study found that trust, satisfaction, and relational bonds (financial, social, and structural) are key drivers of citizen engagement. It emphasized that strengthening citizen relationships through interactive e-government platforms significantly increases transparency, trust, and proactive civic behavior.

Li Jia et al. [4] developed a Tibetan text classification method using a Bidirectional Long Short-Term Memory (BiLSTM) model integrating Word2Vec and TF-IDF for text representation. Although focused on Tibetan language processing, this research demonstrates the effectiveness of

deep learning techniques in classifying and analyzing large volumes of textual data, which is directly applicable to automated complaint categorization and citizen feedback analysis systems. Vinay Kumar and Mamata Jenamani [5] introduced a framework for identifying and prioritizing urban issues using Smart City data. Their model applies Aspect-Based Sentiment Analysis (ABSA) to extract sentiments and issues from citizen feedback collected through e-governance portals. By analyzing user-generated content, the system prioritizes urban concerns such as sanitation, healthcare, and pollution, supporting informed decision-making for responsive governance. Diah Ayu Cahya Ningrum et al. [6] proposed a web-based citizen complaint system to enhance community participation in village development. The study emphasized the transition from manual grievance handling to a digital platform that improves transparency, accountability, and efficiency in complaint resolution. Implemented in Jekulo Village, the system demonstrated improved trust between citizens and local government through real-time complaint tracking and structured data management.

Overall, the reviewed literature suggests that integrating automation, natural language processing, sentiment analysis, and predictive analytics can significantly improve grievance management systems. These studies collectively highlight the importance of intelligent classification, prioritization, and data-driven governance in building transparent and responsive citizen-centric platforms.

Research Gap

Although various digital and AI-based solutions have been proposed for managing residential societies, there remains a lack of a comprehensive grievance redressal system specifically designed for residential societies that aims to provide transparency, prioritized issue resolution, and ease of use. Existing solutions either lack comprehensiveness in functionality or require complex infrastructure, making them less suitable for implementation in small- to medium-scale residential environments.

Table 1: Comparative Analysis of Existing Systems and Proposed System

Study	Complaint Mgmt	Priority Handling	Transparency	Society-Specific
Bolake et al. [1]	Yes	No	Partial	Yes
Acharya et al. [3]	Yes	No	Partial	Yes
Bhavar et al. [4]	Yes	No	Partial	No
Proposed System	Yes	Yes	Yes	Yes

IV. Related Work

In addition to the previously discussed studies, several researchers have explored the role of cloud-based architectures and automation tools in improving data accessibility and reducing manual intervention in grievance management systems. Some works also highlight the benefits of integrating mobile notifications and AI-based analytics to enhance responsiveness and system efficiency [1].

Parallel to residential and administrative systems, a significant body of research exists in the public-facing civic technology (Civic Tech) domain. Platforms such as SeeClickFix and

FixMyStreet have demonstrated the effectiveness of web and mobile-based solutions for non-emergency public grievance reporting [2]. These systems emphasize usability, citizen engagement, and precise geospatial localization to route issues such as potholes, graffiti, and non-functional streetlights to the appropriate municipal authority [3].

On a national scale, government-led initiatives such as India's Centralized Public Grievance Redress and Monitoring System (CPGRAMS) represent comprehensive portals designed to manage grievances across multiple government departments. However, such systems often focus more on procedural workflow completion than on real-time, data-driven analytics and intelligent automation [4].

To address the challenges associated with processing large volumes of public feedback, recent research has increasingly focused on the application of Natural Language Processing (NLP) and machine learning techniques. Studies have demonstrated the successful use of text classification models to automatically categorize unstructured citizen complaints, ensuring they are routed to the appropriate department (e.g., Sanitation, Water Supply, Roads) without manual intervention [5]. Furthermore, sentiment analysis and urgency detection models have been developed to triage incoming reports, enabling administrators to prioritize high-risk or time-sensitive issues efficiently [6]. These advancements provide a strong foundation for implementing intelligent, scalable, and data-driven citizen grievance management platforms.

V. Methodology

The development of the proposed Citizen-Centric Complaint Platform (CCCP) follows a structured and modular approach. The methodology includes requirement analysis, architectural design, database modeling, integration of Natural Language Processing (NLP) and deep learning models, implementation, testing, and deployment. The objective is to design a secure, scalable, and intelligent web-based system that enables citizens to register complaints and ensures automatic routing to the appropriate municipal department for faster resolution.

I. Requirement Analysis

The initial phase involves identifying both functional and non-functional requirements from the perspectives of citizens, administrators, and municipal officers. Functional requirements include user authentication, complaint submission with image and location upload, automatic department detection using NLP and BiLSTM, sentiment-based urgency classification, and complaint status tracking. Non-functional requirements focus on system performance, scalability, reliability, security, and user-friendly interface design. This phase ensures alignment between system capabilities and stakeholder expectations.

II. System Architecture Design

The system follows a three-tier architecture consisting of the presentation layer, application layer, and database layer. The presentation layer is implemented using React.js, providing an interactive and responsive web interface. The application layer is developed using FastAPI and Python, handling business logic, NLP preprocessing, BiLSTM-based classification, and authentication mechanisms. The database layer utilizes MySQL to store structured data such as user details, complaint records, department information, and municipality data. This layered architecture ensures modularity, scalability, and secure communication between components.

III. Role-Based Access Control (RBAC)

To ensure data security and operational transparency, Role-Based Access Control (RBAC) is implemented. Citizens are permitted to submit complaints and track their status. Administrators oversee all complaints and assign them to respective departments. Department officials can view

and update complaints related only to their domain, such as sanitation, water supply, or road maintenance. This approach prevents unauthorized access and enhances accountability across all system users.

IV. Database Design

A relational database schema is designed to maintain structured and interconnected data. The primary tables include Users, Complaints, Departments, and Local Bodies. The Users table stores authentication credentials and role information. The Complaints table contains title, description, image URL, geographic coordinates, predicted department, sentiment score, and complaint status. The Departments table maintains department identifiers, while the Local Bodies table includes municipality and panchayat information with LGD codes. Primary and foreign key constraints ensure data integrity and consistency.

V. Module Development

The system is divided into multiple functional modules:

- **Authentication Module:** Implements secure login using JWT tokens and bcrypt password hashing.
- **Complaint Registration Module:** Allows users to submit complaints with descriptive text and images.
- **Location Detection Module:** Uses Google Maps API to capture latitude and longitude for identifying the correct municipal body.
- **NLP and BiLSTM Module:** Performs text preprocessing including tokenization, lemmatization, and stopword removal before classification.
- **Sentiment Analysis Module:** Determines urgency level (High, Normal, Low) based on emotional tone.
- **Admin Dashboard Module:** Displays categorized complaints based on status (Pending, In Progress, Resolved).

VI. Automation and AI Integration

Artificial Intelligence forms the core of the system. The NLP module extracts semantic features from complaint text using word embeddings such as GloVe. The BiLSTM model processes contextual information bidirectionally and classifies the complaint into the appropriate department. Sentiment analysis determines urgency level, enabling automatic prioritization. The system then forwards complaints to the relevant municipal authority. Analytical reports generated from stored data help administrators monitor complaint trends, resolution rates, and departmental efficiency.

VII. System Implementation

The frontend is developed using React.js to provide a responsive and dynamic user interface. The backend is implemented using FastAPI and Python, integrating AI models and authentication services. MySQL is used for structured data storage and efficient querying. Google Maps API supports geolocation detection. Security mechanisms include JWT authentication, bcrypt password hashing, HTTPS communication, and secure database configuration. Modular programming principles are followed to ensure maintainability and extensibility.

VIII. Testing

Comprehensive testing is conducted to validate functionality and performance. Unit testing verifies individual modules such as complaint submission and NLP classification. Integration testing ensures proper communication between modules and the database. System testing validates the end-to-end workflow from complaint registration to resolution. User Acceptance Testing

(UAT) is performed to evaluate usability and real-world performance. These testing procedures ensure system reliability, accuracy, and security prior to deployment.

IX. Deployment and Maintenance

The platform is deployed on a secure web server with SSL encryption to ensure secure communication. Continuous monitoring mechanisms maintain system availability and detect potential issues. Version control tools such as Git are used for managing updates and enhancements. Future improvements include multilingual complaint support, real-time chat integration using AI assistants, and advanced analytics for performance evaluation. Regular maintenance ensures scalability and adaptability to evolving technological requirements.

X. Sample Data and Implementation Results

To ensure rigorous quality assurance, sample records were processed to replicate real-world municipal grievance operations within a controlled web-based environment. The dataset included dummy citizen profiles, sample civic complaints of varying text lengths, and geographic coordinates mapped using the Google Maps API.

Integration and system testing verified that the BiLSTM classification module accurately categorized high-confidence complaints and successfully executed automatic department routing without manual intervention. Complaints containing ambiguous or low-context textual information were appropriately flagged for manual review and triage by administrators.

Performance evaluation indicated a significant reduction in departmental routing time compared to traditional manual processing methods. The automated classification and sentiment-based prioritization mechanisms improved overall system efficiency and operational transparency. These results demonstrate that the Citizen-Centric Complaint Platform (CCCP) effectively fulfills its functional requirements while maintaining scalability, reliability, and intelligent decision support capabilities.

VI. Implementation

The Citizen-Centric Complaint Platform (CCCP) is implemented as a modular, AI-enabled web-based system integrating Natural Language Processing (NLP) and deep learning techniques for automated complaint classification and routing. The system enhances transparency, improves response time, and ensures that complaints reach the appropriate authority without manual intervention. The architecture consists of frontend, backend, and database components working together to provide a secure and user-friendly environment.

System Setup

The frontend is developed using React.js along with HTML, CSS, and JavaScript to provide a dynamic and responsive interface for citizens and administrators. The backend is implemented using FastAPI (Python), which manages authentication, complaint processing, AI model integration, and API communication. A MySQL relational database is used to store user information, complaint records, department details, local body data, and sentiment results.

The system integrates the Google Maps API for geolocation detection and reverse geocoding. For text classification, GloVe word embeddings are combined with a Bidirectional Long Short-Term Memory (BiLSTM) model. The platform is deployed on a secure cloud server with SSL encryption to ensure data confidentiality and integrity.

Role-Based Access Control (RBAC)

Role-Based Access Control (RBAC) is implemented to maintain data security and operational transparency. Citizens are allowed to register complaints, upload images, view complaint history, and track grievance status. Administrators can monitor all complaints, assign them to departments,

and over- see resolution progress. Department officials can access and update complaints relevant to their domain.

During login, the system verifies user credentials and as- signs dashboard access according to the registered role. This structured access model prevents unauthorized operations and strengthens platform security.

System Modules

The platform is divided into interconnected modules to ensure modularity and maintainability:

- **User Authentication Module:** Handles user reg- istration and login using JWT-based authentication and bcrypt password hashing.
- **Complaint Management Module:** Allows citizens to submit complaints with textual descriptions and optional images.
- **Location Detection Module:** Uses Google Maps API to capture latitude and longitude and determine the appropriate municipal body.
- **NLP and Classification Module:** Processes com- plaint text using preprocessing techniques and BiL- STM classification.
- **Sentiment Analysis Module:** Determines urgency level (High, Normal, Low) using sentiment polarity analysis.
- **Admin Dashboard Module:** Provides filtering, monitoring, and status updates for complaints.
- **Notification Module:** Sends automated alerts re- garding complaint submission, status changes, and resolutions.

Automation and Notification Mechanism

Automation is a key feature of the system. When a com- plaint is submitted, the AI module automatically processes the text, predicts the appropriate department, determines urgency level, and forwards it to the respective authority. Notifications are generated for both administrators and citizens whenever there is a status update.

This automation reduces manual workload and ensures that complaints are handled efficiently and transparently.

Algorithms Used in Implementation

Complaint Department Classification

The department classification process uses GloVe embed- dings combined with a BiLSTM model.

Input: Complaint text (title and description)

Processing Steps:

- 1) Convert text to lowercase and perform tokenization.
- 2) Remove stopwords and apply lemmatization.
- 3) Convert tokens into GloVe embedding vectors.
- 4) Pass the sequence of vectors into a BiLSTM net- work.
- 5) Concatenate forward and backward hidden states.
- 6) Apply a Dense layer with ReLU activation.
- 7) Use Softmax activation for multi-class department prediction.

Output: Predicted department ID with confidence score.

Sentiment and Urgency Detection

This module determines complaint priority based on senti- ment polarity.

Input: Complaint text

Processing Steps:

- 1) Calculate sentiment polarity using TextBlob.
- 2) If polarity is negative, assign High urgency.

- 3) If polarity is neutral, assign Normal urgency.
- 4) If polarity is positive, assign Low urgency.
- 5) Store urgency level in the complaint record.

Output: Urgency label (High / Normal / Low)

Location Detection and Mapping

This module maps GPS coordinates to the correct municipal body.

Input: Latitude and Longitude from Google Maps API

Processing Steps:

- 1) Perform reverse geocoding to extract locality information.
- 2) Retrieve taluka, district, and state details.
- 3) Compare extracted location with local body database records.
- 4) Fetch the corresponding local_body_id.

Output: Local Body ID and address details.

Complaint Status Tracking

This process manages complaint lifecycle updates.

Input: Complaint ID and updated status

Processing Steps:

- 1) Retrieve complaint record from the database.
- 2) Update status (Pending → In Progress → Resolved → Closed).
- 3) Record timestamp in complaint history table.
- 4) Trigger notification to inform the citizen.

Output: Updated complaint status with timestamp.

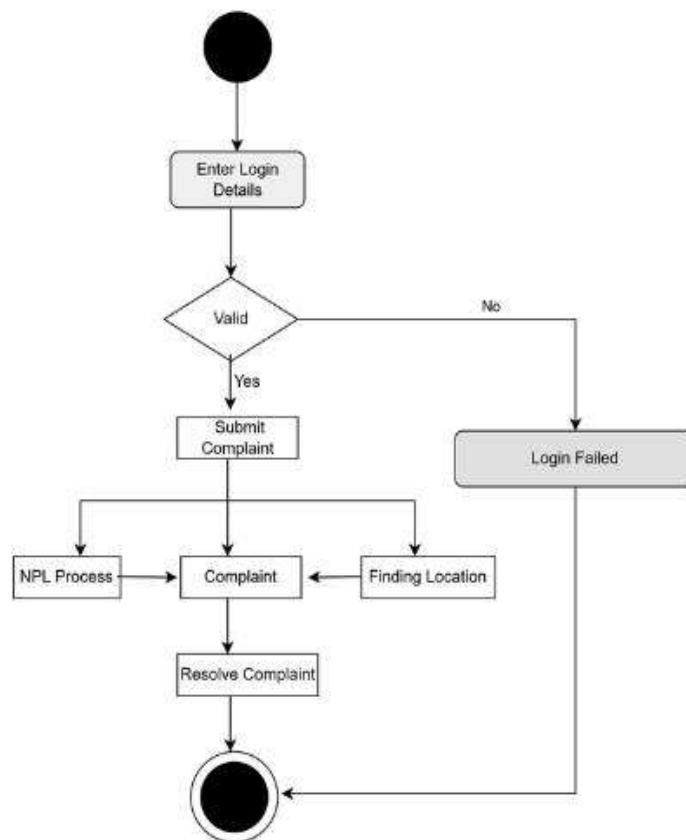


Figure 1: Activity Diagram

VII. Findings and Discussion

Current Trends in Citizen Complaint Management Platforms

Recent studies and practical implementations indicate a significant increase in the adoption of AI-driven Citizen Complaint Management Platforms (CCCP) across municipal and government institutions. Digital grievance redressal systems are becoming essential components of smart-city initiatives, enabling efficient management of public issues such as sanitation, water supply disruptions, and infrastructure maintenance.

A major emerging trend is the integration of Natural Language Processing (NLP) and deep learning models, including Bidirectional Long Short-Term Memory (BiLSTM), for automated complaint classification and routing. These intelligent systems reduce manual intervention and improve routing accuracy. Additionally, cloud-based dashboards and geolocation services provide real-time monitoring of complaint progress and departmental performance. Such technological advancements enhance transparency, accountability, and responsiveness in public administration.

Data Analysis and Operational Efficiency

The effectiveness of a Citizen Complaint Platform depends on its ability to analyze complaint-related data efficiently. The system processes structured data such as complaint descriptions, sentiment polarity, urgency levels, and resolution timelines. Text preprocessing techniques including tokenization, lemmatization, and stopword removal prepare the input data for deep learning models.

The BiLSTM model, supported by GloVe word embeddings, captures contextual relationships within complaint text and predicts the appropriate department. This automated analysis helps identify recurring civic issues such as sanitation delays, water leakage zones, or streetlight failures. Administrative dashboards generate visual analytics related to complaint frequency, average resolution time, and departmental efficiency.

By transforming traditional manual complaint handling into a data-driven process, the system improves operational efficiency and supports proactive municipal decision-making.

Module Integration and System Scalability

The Citizen-Centric Complaint Platform consists of multiple interconnected modules, including User Authentication, Complaint Registration, Department Classification, Sentiment Analysis, Location Mapping, and Administrative Monitoring. Each module performs a specific function while interacting through a centralized relational database.

For example, the Complaint Registration module collects complaint details, the NLP and BiLSTM module classifies department categories, and the Sentiment Analysis module determines urgency level. The Location Mapping module identifies the appropriate municipal body using geographic coordinates, while the Admin Dashboard provides real-time tracking and reporting capabilities.

This modular architecture ensures scalability and flexibility, enabling future integration of additional civic departments, multilingual processing, AI-based chatbots, or advanced analytics tools. Experimental observations suggest that such integration reduces response time, enhances coordination between departments, and improves citizen satisfaction.

Opportunities and Challenges

Despite the advantages of AI-based grievance systems, several challenges must be addressed. Data privacy and security are primary concerns, as the platform handles sensitive information including personal details and geolocation data. Strong encryption mechanisms, secure APIs,

HTTPS communication, and Role-Based Access Control (RBAC) are essential to safeguard system integrity.

Another challenge involves ensuring algorithmic fairness and minimizing bias in classification and prioritization decisions. Additionally, technical limitations such as internet connectivity issues, inaccurate geolocation mapping, or server downtime may temporarily affect system availability. However, significant opportunities exist for future enhancement. Transformer-based models such as BERT can improve classification accuracy. Integration with Internet of Things (IoT) sensors, such as smart waste bins or water monitoring systems, can enable proactive complaint detection. Cloud-based deployment ensures scalability across multiple municipalities, while predictive analytics can help authorities anticipate recurring civic issues.

These findings demonstrate that AI-powered citizen complaint platforms have strong potential to modernize governance by promoting transparency, accountability, and intelligent public service delivery.

Table 2: Performance Comparison of Complaint Management Systems

Parameter	Manual	Proposed
Routing Time	3–5 Days	Instant
Triage Effort	Moderate	High
Record Retrieval	High	Reduced
Transparency	Slow	Fast
	Low	High

The Citizen-Centric Complaint Platform consists of multiple interconnected modules, including User Authentication, Complaint Registration, Department Classification, Sentiment Analysis, Location Mapping, and Administrative Monitoring. Each module performs a specific function while interacting through a centralized relational database.

For example, the Complaint Registration module collects complaint details, the NLP and BiLSTM module classifies department categories, and the Sentiment Analysis module determines urgency level. The Location Mapping module identifies the appropriate municipal body using geographic coordinates, while the Admin Dashboard provides real-time tracking and reporting capabilities. This modular architecture ensures scalability and flexibility, enabling future integration of additional civic departments, multilingual processing, AI-based chatbots, or advanced analytics tools. Experimental observations suggest that such integration reduces response time, enhances coordination between departments, and improves citizen satisfaction.

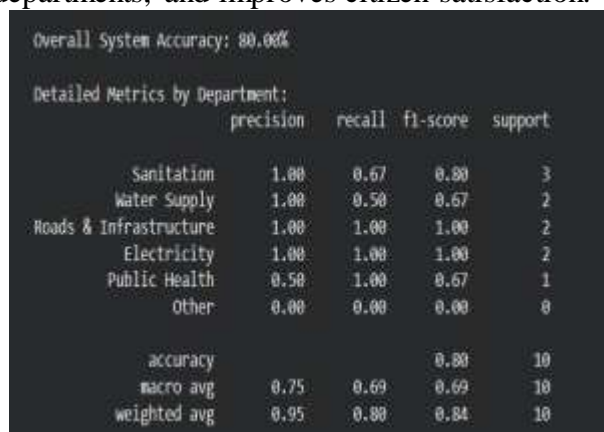


FIGURE 2: Performance Metrics

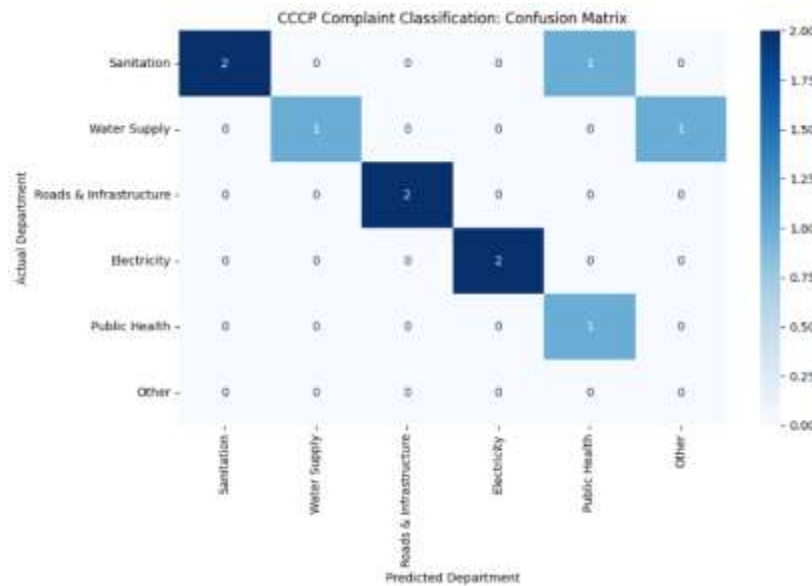


FIGURE 3: Confusion Matrix for complaint Classification Model

VIII. Conclusion

The proposed Citizen-Centric Complaint Platform (CCCPC) presents a comprehensive, AI-enabled web-based grievance redressal system designed to modernize municipal complaint handling. By integrating Natural Language Processing (NLP), deep learning models such as BiLSTM, and automated routing mechanisms, the platform enhances efficiency, transparency, and responsiveness in public service delivery.

As the system continuously collects and analyzes complaint data, its classification accuracy and predictive capabilities are expected to improve over time. Monitoring complaint trends, sentiment patterns, and resolution timelines enables the platform to identify recurring civic issues, predict potential complaint surges, and prioritize urgent cases effectively.

With periodic retraining of AI models and system updates, the platform can dynamically adapt to evolving governance requirements and manage large-scale municipal operations efficiently.

The transition from traditional manual grievance systems to intelligent, data-driven platforms reflects the broader movement toward smart governance and digital transformation. Automation reduces delays, prevents complaint misrouting, and enhances citizen satisfaction through real-time tracking and automated notifications. However, the deployment of AI-based systems also introduces challenges related to data privacy, cybersecurity, and algorithmic fairness. Implementing strong encryption standards, secure APIs, HTTPS communication, and Role-Based Access Control (RBAC) is essential to ensure ethical and secure system operation.

Experimental evaluations and pilot implementations indicate improvements in administrative efficiency, faster resolution times, and enhanced coordination among government departments. Therefore, the implementation of the proposed Citizen-Centric Complaint Platform represents a significant step toward transparent, accountable, and intelligent governance.

Future work may include integration of multilingual complaint processing, transformer-based models such as BERT for improved classification accuracy, IoT-enabled automated complaint detection, and predictive analytics for proactive civic management. These advancements will

further strengthen the platform's capability to evolve into a scalable, adaptive, and truly citizen-centric governance solution.

IX. Future Work

Although the proposed Citizen-Centric Complaint Platform demonstrates improved efficiency and transparency, several areas remain open for future enhancement. Further research can refine the model by incorporating multilingual support to serve diverse demographic groups and by upgrading to advanced Transformer-based architectures such as BERT for improved text classification accuracy.

The system can also be extended through the integration of Internet of Things (IoT) devices, such as automated waste-level sensors and smart water monitoring systems, which can automatically generate complaints without requiring direct human intervention. This proactive approach would enhance real-time monitoring and preventive governance.

Additionally, expanding the platform to a scalable cloud-based deployment architecture will ensure higher availability, fault tolerance, and performance optimization. Such enhancements will enable grievance redressal systems to evolve into more intelligent, adaptive, and data-driven platforms, supporting the next generation of smart urban governance.

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