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Grievassist: AI-Powered Public Grievance Redressal System

G. Raphael Benadit[1], S. Thirumoorthy[2], N.B. Vinoth Kanna[3], Mr.C. Raj Kannan[4]
[1,2,3]UG Scholar,Dept. of IT, Kamaraj College of Engineering and Technology, Madurai, Tamilnadu, India.
[4]Assistant Professor, Dept. of IT, Kamaraj College of Engineering and Technology, Madurai, Tamilnadu, India.
E-mails: *raphaelbenadit52@gmail.com[1], thirus0604@gmail.com[2],vinothkanna2608@gmail.com[3], rajkannanit@kamarajengg.edu.in[4]*

Abstract
Efficient grievance redressal plays a vital role in improving transparency and citizen satisfaction in modern digital governance systems. However, existing public grievance platforms largely depend on manual processing, resulting in delayed responses, improper complaint routing, and lack of prioritization. This paper proposes GrievAssist, an Artificial Intelligence (AI) driven framework designed to automate grievance handling using Natural Language Processing (NLP) and machine learning techniques. The proposed system processes unstructured citizen complaints submitted through a web-based interface and performs automated semantic classification, urgency detection, and intelligent prioritization of reported issues. The framework integrates automated departmental routing, real-time notification services, and role-based administrative dashboards to enable efficient interaction between citizens and government authorities. A scalable AI-supported architecture is employed to ensure reliable data management, continuous system learning, and improved adaptability for handling large volumes of complaints. By analyzing contextual patterns within complaint descriptions, the system assists in identifying relevant service departments and assigning appropriate urgency levels for faster response. Experimental evaluation demonstrates that the proposed approach achieves high classification performance while reducing complaint processing delays compared to conventional manual systems. The results highlight the potential of AI-enabled grievance management platforms in enhancing operational efficiency and supporting transparent, citizen-centric governance in modern smart city environments.

Keywords: *Artificial intelligence; Grievance management; Machine learning; Natural language processing; Smart governance.*

1. Introduction
Public grievance redressal systems play a significant role in maintaining transparency and accountability in modern governance. With the growth of digital public service platforms, citizens increasingly rely on online systems to report civic issues related to infrastructure, sanitation, water supply, traffic management, and public safety. However, many existing grievance platforms still depend on manual processing and departmental routing, which often leads to delays, incorrect complaint categorization, and inefficient handling of urgent issues. As the number of citizen complaints increases, authorities face greater challenges in organizing and prioritizing these grievances effectively.To address these limitations, this study proposes GrievAssist, a digital grievance redressal framework designed to simplify complaint submission and processing. The system allows citizens to report issues using multiple formats such as text descriptions, voice input, photographs, and video uploads. An interactive chatbot assists users in describing problems clearly, while the system analyzes the complaint description to identify the relevant service category and assign an appropriate priority level. By supporting automated complaint categorization and structured grievance tracking, the proposed platform aims to improve the efficiency, transparency, and responsiveness of public grievance management systems[1].

1.1.Background and Motivation
The increasing volume of civic complaints in urban

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environments requires more efficient mechanisms for managing grievance reports. Traditional complaint handling systems often rely on manual categorization and departmental routing, which may lead to delays in identifying the nature and urgency of reported issues. As a result, authorities face challenges in prioritizing critical problems and coordinating responses across different service departments. Improving the accessibility and clarity of complaint submissions can significantly enhance the efficiency of grievance management systems. Allowing citizens to submit grievances using voice input, photographs, and video evidence can provide clearer context for identifying the nature of civic issues and supporting faster administrative response[3].

1.2.Purpose and Scope of the Study

The purpose of this study is to develop a digital grievance management platform that assists both citizens and administrative authorities in handling public complaints more effectively. The proposed system focuses on identifying relevant complaint categories and determining the urgency level of reported issues based on the submitted description.

The scope of the system includes multi-format complaint submission, automated issue categorization, priority identification, and real-time grievance tracking. By providing a structured platform for complaint reporting and monitoring, the system aims to improve communication between citizens and government departments while supporting more efficient grievance resolution[2].

2. Method

The development of the proposed GrievAssist – AI-Powered Public Grievance Redressal System follows a structured software engineering approach to ensure modularity, scalability, and efficient grievance handling. The system is designed as a web-based platform that integrates citizen interaction, intelligent complaint processing, and administrative management within a unified framework. The architecture emphasizes automation and transparency by combining user-friendly interfaces with AI-driven analysis to streamline the grievance redressal process. This structured development approach enables seamless communication between citizens and authorities while minimizing manual intervention.

2.1.System Architecture

The system architecture defines the workflow through which citizen grievances are submitted, processed, and resolved within the GrievAssist platform. Citizens submit complaints through a web interface using text, voice input, images, or video uploads. Each complaint is assigned a unique tracking identifier that allows users to monitor the status of their grievance throughout the resolution process.The submitted information is transferred to the processing layer where the complaint description is analyzed to identify the appropriate service category and urgency level. The processed results are forwarded to the administrative dashboard, where officials review complaints, initiate actions, and update the resolution status. These updates are reflected in the citizen interface through notifications and tracking features, ensuring transparency and continuous communication shown in Figure 1.

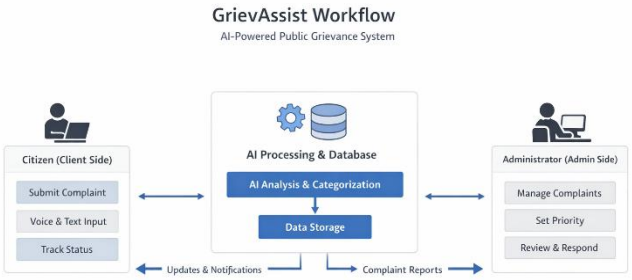

Figure 1 System methodology

2.2.Complaint Submission and Analysis Workflow

The system integrates complaint submission and automated analysis within a single workflow. Citizens provide complaint descriptions through text, voice-to-text conversion, or multimedia evidence such as images and videos. After submission, the complaint text undergoes preprocessing steps including normalization, tokenization, and stop-word removal to convert raw input into structured data.Once the complaint is received, the system automatically forwards the description to the intelligent processing module for analysis and

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categorization. The complaint text undergoes preprocessing operations including normalization, tokenization, stop-word removal, and lemmatization to transform raw input into meaningful structured data. The processed text is then converted into numerical feature vectors using TF–IDF representation, allowing machine learning models to interpret semantic patterns present in citizen complaints. This automated pipeline eliminates manual sorting and ensures consistent classification regardless of complaint volume.

2.3.Dataset Training and Model Evaluation

The system is trained using a dataset containing civic complaint descriptions labeled with service categories and priority levels. Before training, the dataset is cleaned by removing incomplete records and standardizing textual descriptions. The cleaned text is converted into TF–IDF feature vectors to represent important keywords and contextual relationships.A multi-label classification model based on Logistic Regression is used to identify complaint categories, while model performance is evaluated using metrics such as accuracy, precision, recall, and F1-score. The dataset is divided into training and testing sets using an 80:20 split to measure prediction performance on unseen complaints.

Table 1 Complaint Category Distribution in the Dataset

Complaint Category	Number of Samples	Priority Levels Considered
Roads	120	High, Medium
Water Supply	110	Medium, Low
Garbage	105	Medium, Low
Lighting	95	High, Medium, Low
Drainage	115	Medium, Low
Fire	85	High, Medium

Summarizes the distribution of complaint categories included in the dataset used for evaluating the grievance management platform. The dataset consists of multiple civic issue categories such as roads, water supply, garbage management, lighting, drainage, fire-related incidents, and traffic issues. Each complaint record contains a textual description along with labeled category indicators and an associated priority level.

2.4.Priority Detection Mechanism

After category identification, the system determines the urgency level of each complaint. The priority detection mechanism analyzes contextual indicators in the complaint description and assigns a priority level such as High, Medium, or Low.The processed complaint text is converted into TF–IDF features and evaluated by a trained classifier that calculates probability scores for each priority class. The class with the highest probability is selected as the final priority label, enabling the system to highlight urgent grievances and support faster administrative response [4].

3. Results and Discussion

3.1.Results

The performance of the proposed GrievAssist system was evaluated using an 80:20 train–test split on unseen complaint samples. Model effectiveness was assessed using standard evaluation metrics including precision, recall, F1-score, and classification accuracy. Separate evaluations were conducted for the multi-label complaint category classifier and the priority prediction model to measure their individual contributions to the grievance processing workflow[5].

Table 2 Category Classification Performance

Metric	Macro Average	Micro Average
Accuracy (Exact Match)	0.75	—
Precision	0.9530	0.9450
Recall	0.8459	0.8374

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F1-Score	0.8854	0.8879

Table 3 Per-Category Classification Results

Category	Accuracy	Precision	Recall	F1-Score
Roads	0.97	0.8462	0.9167	0.8800
Lighting	0.96	0.7778	1.0000	0.8750
Water	0.94	1.0000	0.5714	0.7273
Garbage	0.98	1.0000	0.8750	0.9333
Traffic	0.97	1.0000	0.8500	0.9189
Fire	1.00	1.0000	1.0000	1.0000
Drainage	0.96	1.0000	0.7647	0.8667
Rainwater	0.96	1.0000	0.7895	0.8824

Table 4 Priority Classification Performance

Metric	Value
Accuracy	0.5600
Precision (Macro Avg)	0.5435
Recall (Macro Avg)	0.5422
F1-Score (Macro Avg)	0.5409

Table 5 Per-Priority Prediction Results

Priority	Precision	Recall	F1-Score	Support
High	0.50	0.42	0.46	31
Low	0.50	0.50	0.50	28
Medium	0.63	0.71	0.67	41

The experimental results indicate that the multi-label complaint classification model achieves strong predictive performance, with high precision and balanced recall across most categories. The model demonstrates excellent capability in identifying safety-related complaints, achieving perfect classification performance for fire-related incidents. In contrast, the priority prediction model exhibits moderate performance due to the subjective nature of urgency labeling, highlighting the need for additional contextual features and larger annotated datasets. Overall, the results validate the effectiveness of the proposed GrievAssist framework for automated grievance categorization and decision support [6].

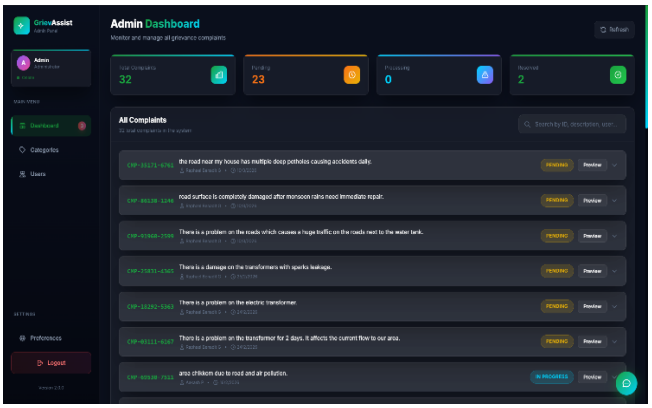

Figure 2 Submitted complaints dashboard

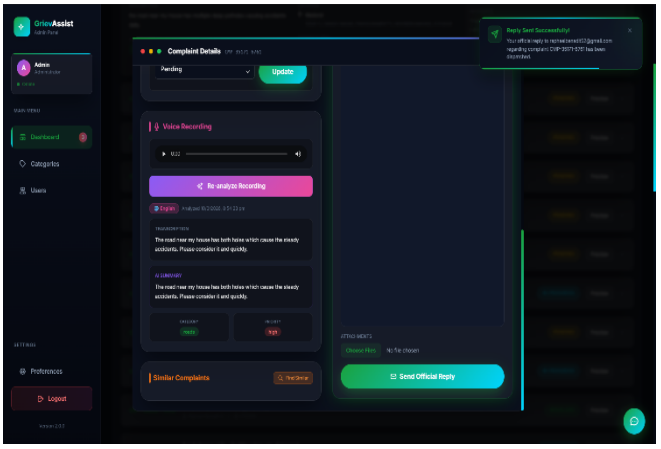

Figure 3 Complaint Analysis Interface

3.2.Discussion

The experimental observations indicate that the proposed grievance management platform can assist in organizing citizen complaints in a structured manner. By interpreting complaint descriptions and identifying the relevant issue category along with an urgency level, the system supports faster identification of civic problems that require

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administrative attention. This capability helps reduce the manual effort involved in reviewing large numbers of complaints and improves the efficiency of grievance handling processes.The integration of multiple complaint submission formats, including voice input, photographs, and video uploads, enhances the clarity of reported issues and provides additional context for decision making. Such features allow authorities to better understand real-world conditions associated with the complaint. Overall, the system demonstrates how structured complaint interpretation and automated prioritization can contribute to improved responsiveness and transparency in public grievance management.

Conclusion

This study presented a digital grievance management platform designed to support efficient reporting and handling of civic issues. The system enables citizens to submit complaints through multiple formats, including text descriptions, voice input, photographs, and video uploads, allowing clearer communication of real-world problems. By interpreting complaint descriptions and identifying the relevant issue category along with an appropriate priority level, the platform assists administrative authorities in organizing complaints and responding to urgent issues more effectively.The results and discussion demonstrate that structured interpretation of complaint information can improve the efficiency of grievance handling processes. The system helps reduce the effort required for manual complaint sorting and supports better prioritization of critical issues. Overall, the proposed platform contributes to improving transparency and responsiveness in public grievance management while enhancing communication between citizens and government authorities.

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