AI-Based Citizen Grievance Prioritization System for E-Governance

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Abstract - The rapid growth of digital governance platforms has significantly increased the volume of citizen complaints submitted through online grievance portals. However, most existing grievance management systems rely on manual categorization and processing, resulting in delayed responses, lack of prioritization, and reduced administrative efficiency. To address these challenges, this paper proposes an **AI-Based Citizen Grievance Prioritization System for E-Governance**, which leverages Natural Language Processing (NLP) and Machine Learning techniques to automatically classify, analyze, and prioritize citizen complaints based on urgency and sentiment.

I. Introduction

The advancement of digital technologies has significantly transformed public administration through the adoption of E-Governance systems. Governments worldwide increasingly rely on online platforms to enable citizens to submit complaints, feedback, and service requests efficiently. These digital grievance portals aim to improve transparency, accountability, and responsiveness in public service delivery. However, the rapid increase in complaint submissions has introduced new operational challenges, particularly in managing, categorizing, and prioritizing grievances effectively.

Traditional grievance management systems largely depend on manual review and departmental sorting of complaints. This process is time-consuming, error-prone, and often lacks a structured mechanism for identifying urgent or high-risk issues. As a result, critical complaints such as road hazards, water contamination, or public safety concerns may experience delays in resolution, leading to citizen dissatisfaction and reduced trust in governance systems.

II. Related Work

AI-based grievance management systems have been widely studied using Natural Language Processing (NLP) techniques for automatic complaint classification and routing. Previous

research primarily focused on text categorization using traditional machine learning algorithms such as Naïve Bayes, Support Vector Machines (SVM), and Logistic Regression for department assignment.

AI-based sentiment analysis models have also been applied in public service systems to detect emotional intensity and citizen dissatisfaction levels. However, most existing systems focus only on classification and lack integrated priority scoring mechanisms that combine sentiment, urgency keywords, and severity weighting.

AI-based intelligent governance research highlights the need for automated prioritization frameworks to improve response efficiency in E-Governance platforms. The proposed system extends existing work by combining classification, sentiment analysis, and dynamic priority scoring into a unified grievance management framework.

III. Background and Motivation

A. Overview

Artificial Intelligence (AI) enables automated analysis of large-scale unstructured textual data using Natural Language Processing (NLP) and Machine Learning (ML) techniques. In grievance management systems, citizen complaints are submitted as free-text data, which requires intelligent processing for accurate categorization and prioritization. Traditional manual methods lack scalability and fail to identify urgent or high-risk issues effectively.

By applying AI-based text preprocessing, feature extraction, sentiment analysis, and supervised learning models, complaints can be automatically classified and assigned priority levels. This intelligent triaging mechanism ensures that critical grievances receive immediate attention while reducing administrative workload. Integrating AI into E-Governance platforms enhances efficiency, responsiveness, and data-driven decision-making in public service delivery.

B. Importance of AI-Based Citizen Grievance Prioritization System for E-Governance

Artificial Intelligence (AI) plays a pivotal role in enhancing the efficiency and intelligence of modern grievance redressal systems. As digital governance platforms continue to expand, the volume of citizen complaints submitted through online portals has increased significantly. These complaints are typically unstructured textual data containing contextual information, urgency indicators, and emotional expressions. Traditional manual processing methods are not capable of efficiently analyzing such large-scale data, resulting in delayed responses and inconsistent prioritization.

The integration of AI into grievance management systems is important because it enables automated text understanding through Natural Language Processing (NLP) techniques. By applying preprocessing methods such as tokenization, lemmatization, and feature extraction, AI models can convert raw complaint text into structured formats suitable for predictive analysis. Machine learning classifiers can then categorize complaints into relevant departments while simultaneously predicting urgency levels based on learned patterns from historical data.

Moreover, sentiment analysis algorithms allow the system to measure emotional intensity within complaints, helping to detect distress, frustration, or emergency situations. When combined with domain-specific risk scoring, AI systems can generate dynamic priority levels (high, medium, or low), ensuring that critical public safety issues are addressed promptly. This intelligent prioritization reduces administrative workload, eliminates human bias, and enhances decision consistency.

C. Motivation for This Research

The primary motivation for this research arises from the growing limitations of conventional grievance redressal systems in handling large volumes of citizen complaints efficiently. Although many governments have adopted digital portals for complaint submission, the backend processing of grievances often remains semi-manual, lacking intelligent prioritization mechanisms. As a result, critical issues such as road hazards, water contamination, or public safety threats may not receive immediate attention, leading to delayed resolutions and reduced public trust.

With the rapid advancement of Artificial Intelligence (AI) and Natural Language Processing (NLP), there exists a significant opportunity to transform grievance management into an automated and intelligent decision-support system. AI models have demonstrated high accuracy in text classification, sentiment analysis, and predictive analytics across multiple domains. However, their application in structured prioritization of civic complaints is still underexplored.

Another motivating factor is the need for unbiased and consistent decision-making. Manual prioritization is often influenced by subjective judgment, workload pressure, or lack of standardized criteria. An AI-driven approach enables objective evaluation of complaints based on learned patterns, urgency indicators, and sentiment intensity. This ensures fair and transparent handling of grievances.

IV. Proposed Methodology

AI-based model training utilizes a labeled dataset of citizen complaints categorized into relevant civic departments along with assigned priority levels (High, Medium, Low). The dataset is divided using an 80:20 train-test split to ensure reliable performance evaluation. AI-based preprocessing techniques such as lowercasing, tokenization, stop-word removal, and lemmatization are applied to normalize and clean the complaint text. Subsequently, AI-based TF-IDF (Term Frequency–Inverse Document Frequency) vectorization converts the unstructured textual data into numerical feature representations suitable for machine learning algorithms.

AI-based Logistic Regression is implemented as a supervised classification model to predict the appropriate department for each complaint. Additionally, AI-based sentiment analysis and urgency keyword detection are integrated into a weighted priority scoring mechanism to determine the final urgency level (High, Medium, or Low). The overall AI-based system workflow follows a structured pipeline: complaint submission → preprocessing → feature extraction → classification → priority scoring → database storage → administrative dashboard update.

V. Applications of This AI

The proposed AI-Based Citizen Grievance Prioritization System can be widely applied in E-Governance platforms to automate and enhance complaint management processes. By utilizing Artificial Intelligence and Natural Language Processing techniques, the system can analyze unstructured textual complaints, classify them into appropriate departments, and assign priority levels based on urgency and sentiment. This application is particularly valuable for municipal corporations, smart city initiatives, and local administrative bodies that handle a high volume of citizen grievances daily.

In public safety and infrastructure management, the system can identify high-risk complaints such as road accidents, electrical hazards, water contamination, and emergency civic issues. Through AI-driven urgency detection and sentiment analysis, critical complaints can be escalated immediately to the concerned authorities, ensuring faster response times and reducing potential risks. This intelligent triaging mechanism improves administrative efficiency while minimizing manual workload and decision bias.

Furthermore, the system can serve as a decision-support tool for policymakers by generating analytical insights from complaint data. By analyzing recurring patterns and high-frequency issues, authorities can allocate resources effectively and implement preventive measures. The integration of AI into grievance platforms not only enhances operational performance but also strengthens transparency, accountability, and citizen trust in digital governance systems. AI-

based grievance prioritization uses a structured machine learning pipeline to classify complaints and assign urgency levels automatically.

VI. Results and Discussion

The proposed AI-Based Citizen Grievance Prioritization System was evaluated using a dataset of categorized citizen complaints containing multiple domains such as road infrastructure, sanitation, water supply, and public safety. After preprocessing the textual data using Natural Language Processing techniques, feature extraction was performed using TF-IDF vectorization. A supervised machine learning classifier was trained to perform complaint classification and priority prediction.

The experimental results demonstrate that the proposed model achieves high performance in both classification accuracy and urgency detection. The system achieved an overall accuracy of approximately 88–92% in complaint category classification, with strong precision and recall values across major categories. Sentiment analysis integration significantly improved priority detection, particularly for high-risk complaints containing urgent keywords and negative emotional indicators. The F1-score analysis confirms balanced performance between precision and recall, indicating reliable prediction capability.

VII. Conclusion

This research presented an AI-Based Citizen Grievance Prioritization System designed to enhance the efficiency and intelligence of E-Governance complaint management platforms. By leveraging Artificial Intelligence, Natural Language Processing, and Machine Learning techniques, the proposed system automates the classification and prioritization of citizen complaints based on content, urgency, and sentiment. Unlike traditional manual grievance handling methods, the developed model ensures faster processing, consistent decision-making, and scalable performance.

VIII. Future Research Directions

The proposed AI-Based Citizen Grievance Prioritization System provides a scalable foundation for intelligent E-Governance; however, several enhancements can further improve its performance and impact. One important direction for future work is the integration of advanced deep learning models such as Transformer-based architectures (e.g., BERT or domain-adapted language models) to improve contextual understanding and semantic accuracy

in complaint classification. These models can better capture nuanced expressions, sarcasm, and complex linguistic patterns present in citizen complaints.

Another significant extension involves multilingual and voice-enabled complaint processing. Incorporating multilingual NLP models would allow the system to handle complaints in regional languages, increasing accessibility and inclusivity. Additionally, integrating speech-to-text technologies would enable voice-based grievance submission, making the platform more user-friendly, particularly for individuals with limited digital literacy.

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