



SMART COMPLAINT MANAGEMENT SYSTEM WITH AI-POWERED PRIORITIZATION AND ESCALATION

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ABSTRACT: Efficient complaint management is essential in educational institutions to promptly resolve issues raised by students and faculty across multiple departments. Traditional manual systems often lack timely prioritization and routing, causing delays and dissatisfaction. This paper presents a smart complaint management system integrating artificial intelligence techniques such as natural language processing and sentiment analysis for automated complaint classification, urgency detection, and priority assignment. The system features AI-powered escalation of unresolved or critical complaints and provides real-time dashboards for transparent tracking by administrators and users. Drawing insights from authoritative journal research on AI-powered feedback management and comprehensive surveys of complaint management systems, this college-tailored solution significantly improves responsiveness, accountability, and operational efficiency. The approach offers scalable benefits for similar institutional complaint handling frameworks, aiming to harness AI-driven automation for enhanced service delivery.

Keywords-Complaint Management, Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), Prioritization, Escalation, Sentiment Analysis, Real-Time Tracking, Automation, User Satisfaction

I. INTRODUCTION

In today's fast-paced and service-driven environment, effective complaint management is essential for maintaining user trust and organizational efficiency. Traditional complaint handling systems often struggle with delayed responses, improper prioritization, and inefficient escalation processes. These challenges can lead to unresolved issues, decreased customer satisfaction, and reputational damage. To address these problems, this project introduces a Smart Complaint Management System that integrates Artificial Intelligence (AI) to automate and enhance the complaint resolution workflow. By leveraging Machine Learning (ML) and Natural Language Processing (NLP), the system intelligently analyzes the content of complaints, determines their urgency, and prioritizes them accordingly. It also features an automated escalation mechanism, ensuring that high-priority or unresolved complaints are promptly forwarded to the appropriate authorities or departments. The system not only reduces manual intervention but also improves response time, transparency, and user engagement. It is designed to be scalable and adaptable, making it

suitable for various sectors such as government services, education, healthcare, and corporate environments.

Efficient complaint management plays a crucial role in ensuring the quality of services provided by organizations across various sectors, including government agencies, educational institutions, healthcare facilities, and private enterprises. A well-structured complaint system enables users to report issues, provide feedback, and seek resolutions, ultimately contributing to higher satisfaction and better service delivery. However, many existing systems still rely on manual processes or outdated technologies, resulting in delayed responses, mismanagement, and a lack of transparency. Traditional complaint systems face several challenges such as inconsistent complaint categorization, lack of urgency detection, ineffective tracking, and inefficient escalation mechanisms. These shortcomings often lead to unresolved complaints, increased user frustration, and administrative burden. In many cases, critical issues may go unnoticed due to poor prioritization or lack of timely intervention, negatively impacting the reputation and performance of the organization.

II. LITERATURE REVIEW

[1] Gokce, Tajvidi, and Hajli (2024) present a comprehensive study where Artificial Intelligence (AI) and machine learning (ML) are central to refining management responses to negative feedback in organizational settings. Their research demonstrates that precise, tailored responses—like admitting mistakes, providing direct contact details, and clear action-taking—measurably improve customer satisfaction and loyalty. Leveraging large-scale datasets, their AI-driven framework predicts customer sentiment and informs strategies for automated complaint handling, making response personalization a central aspect of effective engagement.

[2] Task prioritization through reinforcement learning has also been advanced by Li et al. (2025), who introduced a Nash Q-learning framework for optimizing dynamic decisions in multi-agent environments. Their work focuses on prioritizing and allocating resources for tasks according to urgency, system state, and available capacity, resulting in reduced latency and increased adaptability. Although applying primarily to resource scheduling and technical environments, the methodology can be adapted to intelligent complaint management systems needing dynamic prioritization.

[3] Sarafis and Karamitsios (2024) survey the progression of citizen complaint management systems from manual methods to advanced, AI-enabled digital platforms. Their review details how integrated case tracking, automated routing, and natural language processing (NLP) have led to the adoption of transparent, scalable systems. The use of AI in complaint classification and prioritization streamlines the process and paves the way for the adoption of intelligent chatbots, real-time feedback, and predictive analytics in public and e-government applications.

Earlier systems primarily employed static rules and manual triage, resulting in delays and limited scalability. Recent advances, notably through NLP models such as BERT and LSTM, have empowered systems to automatically detect urgency and intent from unstructured input, improving triaging efficiency. However, most platforms remain reactive, intervening only after SLA violations or customer dissatisfaction, with limited predictive monitoring or unified dashboards.

The application of Artificial Intelligence (AI) in complaint and task management systems has been extensively explored to enhance operational efficiency and service quality. Many studies emphasize the integration of machine learning (ML), natural language processing (NLP), and automation to optimize complaint prioritization and resolution processes. Despite these advancements, existing systems still face critical challenges related to scalability, adaptability, and real-time escalation handling.

Recent systems harness NLP and ML algorithms for complaint analysis, classification, and routing. For instance, Vasanthavelan et al. (2025) developed an AI-powered petition analysis system that categorizes grievances according to urgency and type, utilizing sentiment analysis and automated dashboards for administrative monitoring. However, many models rely on heuristic-based sentiment analysis and lack comprehensive evaluations of model accuracy.

Reinforcement learning has been employed for dynamic task prioritization, as demonstrated by Li et al. (2025), who used Nash Q-learning to optimize resource allocation under changing system loads. Such frameworks support scalable complaint management but are mostly domain-specific, with limited adaptation to public complaint systems requiring real-time escalation and transparency.

The deployment of AI chatbots, NLP-based classifiers, and data analytics has shown promising results in transforming reactive complaint handling into proactive, predictive processes. Foundry authors (2025) proposed a civic complaint platform that integrates generative AI to automatically recognize issues, generate complaint texts, and assign cases to relevant departments, leading to a 30% reduction in backlog and improved user satisfaction.

Industry forecasts reveal rapid growth in the AI complaint management market, expected to reach USD 28.92 billion by 2033 at a CAGR of 21.1%, driven by the need for faster, more personalized, and multi-channel support.

While these studies highlight the potential of AI to improve complaint management, common limitations persist. Many systems lack end-to-end integration, predictive escalation capabilities, and transparency in decision-making. Additionally, concerns such as algorithmic bias, depersonalization, and the need for continuous model training remain significant hurdles.

Summary: Existing literature underscores a significant shift from manual procedures to AI-enabled, automated solutions. However, most frameworks are domain-specific, reactive, and lack comprehensive end-to-end implementations with features like real-time analytics, predictive escalation, and explainability. The proposed Smart Complaint Management System aims to bridge these gaps by integrating NLP-based analysis, dynamic prioritization, rule-based escalation, and user-friendly dashboards within a unified platform, paving the way for more intelligent and transparent complaint handling.

III. PROPOSED WORK

The proposed Smart Complaint Management System with AI-Powered Prioritization and Escalation aims to develop a centralized, automated, and intelligent platform for efficient complaint handling across various sectors, including government, utilities, healthcare, and corporate organizations. The system is designed to streamline the entire complaint lifecycle—from submission and classification to prioritization, routing, and resolution—through Artificial Intelligence (AI)-based automation and predictive analytics. The system addresses the limitations of traditional complaint management systems, which often rely on manual sorting and static priority levels, leading to delays and inefficient escalation handling. By integrating AI modules such as Natural Language Processing (NLP), sentiment analysis, and machine learning-based prioritization, the proposed system ensures timely and intelligent complaint resolution while maintaining transparency and accountability.

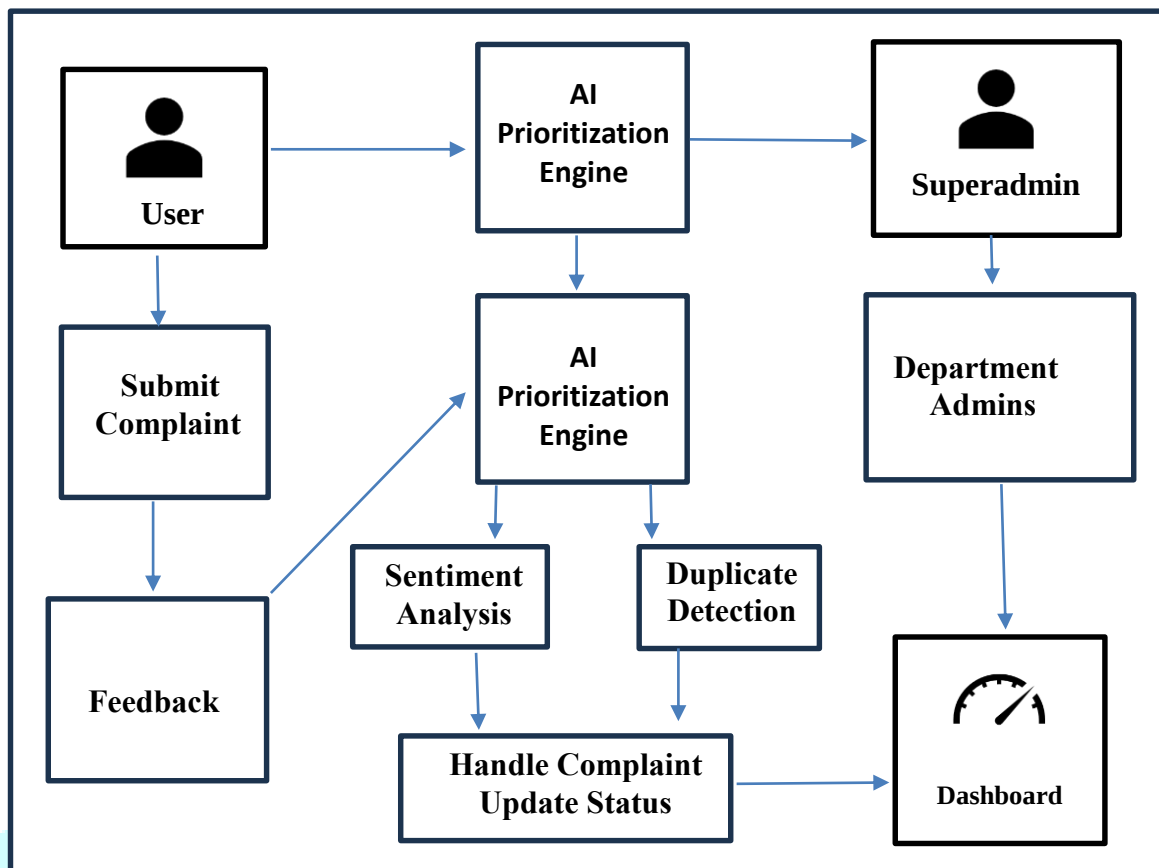


Fig. Proposed System

The architecture of the proposed system follows a three-tier design, consisting of the presentation layer, application layer, and database layer. The presentation layer provides an intuitive web and mobile interface through which users can register complaints, track their status, and receive real-time updates.

The application layer performs the core business logic, including complaint categorization, AI-based priority scoring, SLA (Service Level Agreement) tracking, and automatic escalation. It also handles authentication, authorization, and secure communication between components. The database layer securely stores all information, including user details, complaint data, priority scores, assignment logs, and escalation histories, using a relational database such as MySQL or PostgreSQL. The AI-based prioritization module analyzes complaint text and metadata to determine the severity, urgency, and impact level. This dynamic scoring helps allocate resources efficiently and ensures that critical issues are addressed first. The escalation engine monitors the SLA deadlines and automatically triggers alerts or reassigns cases to higher authorities when resolution delays are predicted. Integration with communication APIs enables instant notifications via email or SMS for both users and administrators.

The system also includes administrative dashboards that offer data visualization tools for monitoring performance indicators such as average response time, open complaint count, and SLA compliance rate. Managers can identify recurring issues, analyze trends, and make data-driven decisions to improve service delivery. The key goal of the proposed system is to provide a reliable, scalable, and user-friendly complaint management platform that reduces manual workload, enhances response efficiency, and ensures timely resolution. The system can be deployed across different devices—desktops, tablets, and smartphones—allowing universal access and real-time monitoring for all stakeholders.

IV. PROBLEM STATEMENT

[1] Efficient complaint management plays a vital role in maintaining transparency, accountability, and trust in organizations, especially in sectors such as government services, education, healthcare, utilities, and corporate enterprises. However, in most existing systems, the process of receiving, analyzing, prioritizing, and resolving complaints is highly manual and time-consuming. Users often face delays in response, lack of feedback, and limited visibility into the status of their complaints. On the administrative side, authorities struggle to handle the growing volume of grievances, leading to inefficiency, duplication of efforts, and

decreased satisfaction among stakeholders. Traditional complaint management platforms generally operate as simple ticketing systems that store complaints without intelligent classification or prioritization. Each complaint is treated equally regardless of its urgency or impact, which leads to resource mismanagement. For example, a critical infrastructure failure and a minor service inconvenience may both receive the same level of attention. This lack of differentiation slows down response times for serious issues and creates frustration among users expecting timely action.

[2] Another challenge lies in the manual nature of prioritization and escalation. Human operators are responsible for reading and categorizing complaints, which is not only labor-intensive but also prone to bias and error. Since most complaints are text-based and written in natural language, they contain hidden cues such as emotion, sentiment, and urgency. Without Artificial Intelligence (AI) and Natural Language Processing (NLP), it is extremely difficult for traditional systems to extract these insights automatically. As a result, administrators are unable to make informed decisions about which complaints require immediate attention. Existing systems also lack dynamic escalation mechanisms. Typically, if a complaint is not addressed within a specific time frame, it must be manually forwarded to higher authorities. This rigid, non-adaptive process fails to consider the real-time workload, complaint category, or severity level. Consequently, many complaints remain unresolved for long periods, leading to inefficiency and decreased public trust. Furthermore, there is often no feedback loop to analyze historical complaint data and generate meaningful insights for process improvement.

[3] The absence of an intelligent analytical dashboard further limits the ability of organizations to monitor performance and identify recurring issues. Without metrics such as response time, complaint trends, and departmental efficiency, authorities cannot evaluate or optimize their grievance redressal strategies. Moreover, data stored across multiple, unlinked databases results in redundancy and inconsistency, making it difficult to track progress or ensure accountability.

Considering these limitations, there is a pressing need for a Smart Complaint Management System that can utilize Artificial Intelligence (AI) for automatic categorization, prioritization, and escalation of complaints. The proposed system should employ NLP and Machine Learning (ML) models to interpret complaint text, determine sentiment polarity, and classify urgency levels. It should also integrate an automated escalation workflow that triggers notifications to higher officials when unresolved issues exceed predefined thresholds. Real-time dashboards and analytics will provide transparency to both users and administrators, enabling data-driven decision-making. The core problem lies in the inefficiency, lack of intelligence, and absence of automation in traditional complaint management processes. The proposed AI-powered solution aims to overcome these challenges by delivering a responsive, transparent, and data-driven complaint management ecosystem that ensures timely redressal, improved user satisfaction, and enhanced operational efficiency across multiple domains.

V. OBJECTIVE

- ❖ Implement AI-based classification and sentiment analysis.
- ❖ Enable priority assignment and auto-routing to relevant departments.
- ❖ Create an automated escalation engine for time or sentiment-based escalation.
- ❖ Improve user experience, reduce complaint resolution time.
- ❖ Provide an admin dashboard for live tracking, updates, and reports.
- ❖ Develop a user-friendly platform for lodging complaints

VI. CONSLUSION

The Smart Complaint Management System with AI-Powered Prioritization and Escalation represents a transformative approach to managing customer grievances in a fast, efficient, and transparent manner. By integrating advanced AI techniques like natural language processing and machine learning, the system can accurately analyze complaint content, automatically categorize issues, and intelligently prioritize cases based on urgency and impact. This ensures that critical complaints are escalated promptly, significantly reducing resolution times and preventing customer dissatisfaction.

The automation of complaint workflows minimizes manual intervention, reducing human error and operational costs while enhancing the overall productivity of support teams. Real-time tracking and notification mechanisms keep both customers and administrators informed, fostering trust and accountability. The system's robust reporting and analytics capabilities empower organizations to identify recurring problems, monitor service-level agreements (SLAs), and make data-driven decisions for continual improvement. Incorporating security and compliance measures further ensures that sensitive customer data is protected, maintaining confidentiality and adherence to regulatory standards. Overall, this intelligent complaint management solution not only optimizes operational efficiency but also strengthens customer relationships and supports business growth by addressing issues proactively and effectively.

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