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Ai-Powered Petition Analysis And Grievance Management System

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Abstract: This project proposes an AI-based Petition Analysis and Grievance Management System that automates public complaint handling. The system, employing NLP and ML, categorizes petitions, identifies urgency, and directs them to the right departments. Dashboards for real-time tracking promote transparency and accountability, while sentiment analysis prioritizes crucial issues. Manual effort is minimized, response time is enhanced, and data-driven governance is enabled through actionable insights into public concerns.

Index Terms - AI, Machine Learning, Natural Language Processing, Grievance Redressal,

I. INTRODUCTION

In the changing environment of digital administration, public participation and citizen opinions have become integral to the administrative process. Nevertheless, with the growing number of complaints, petitions, and service requests filed on a daily basis to government institutions and public service organizations, conventional grievance redressal mechanisms are increasingly becoming time-consuming, inefficient, and susceptible to human error. Manual classification, failure to detect urgency, misdirection of petitions, and inadequate tracking mechanisms tend to result in delayed resolution and loss of citizen satisfaction and trust.

With this, the aforesaid issues can be tackled. Thus, this project suggests the construction of an AI-Powered Petition Analysis and Grievance Management System. The system utilizes Natural Language Processing (NLP) to pick up meaning and intent from the textual petitions and Machine Learning (ML) for the classification of grievances, assigning them urgency and forwarding them to the concerned department or authority.

By incorporating smart automation, the system strives to streamline the grievance handling process — from filing to resolution. Citizens are rewarded with real-time updates and clear tracking of their petitions, while administrators get real-time visibility into departmental performance and recurring public issues through interactive dashboards and analytics.

This technology-based solution not only reduces manual intervention and shortens resolution time but also turns the process of grievance redressal into an organized, scalable, and people-friendly system. It is evidence of the future of e-governance in which technology is not only applied to handling complaints but also to actively enhancing the level of service delivery and public confidence.

II.LITERATURE SURVEY

1. **"The Role of AI/ML in Enhancing Public Grievance Redressal Systems" IEEE Transactions on EGovernance(2023)**

   This paper explores how artificial intelligence and machine learning can revolutionize citizen services. The authors propose using natural language processing (NLP) to analyze the content of complaints and predict urgency using sentiment analysis. The research emphasizes the need for automation in government services to eliminate delays and improve accountability.

2. **"AI-Driven Decision Support Systems for Public Service Resolution" –Journal of Intelligent Public Systems (2022)**

   The authors of this study focus on the integration of decision support systems using AI in local and central government departments. They propose frameworks that help administrators make informed decisions, route complaints efficiently, and track service resolution rates using real-time data and intelligent algorithms.

3. **"NLP and Sentiment Analysis for Public Complaints Handling" – Computational Linguistics in Governance Journal (2021**

   This paper examines how NLP can be applied to analyze the language, tone, and urgency in complaints. The authors implemented sentiment scoring algorithms to evaluate the emotional weight of petitions and used this information to assign severity levels to each grievance. This method allows for prioritization of emotionally sensitive issues.

4. **"AI-Based Petition Analysis for Public Grievances" – Journal of AI and Public Administration (2020)**

   The study presents an architecture for an AI-based petition classification system. It utilizes keyword extraction and pattern recognition to group similar grievances and highlight recurring community problems. The research further supports the idea of predictive modeling to forecast the frequency and nature of future complaints.

5. **"Smart Governance Using AI for Public Feedback Processing" – International Journal of Smart Cities and e-Governance (2019)**

   This research explores AI frameworks that process large volumes of citizen feedback. It proposes using AI for noise reduction in textual data, grouping complaints using clustering algorithms, and visualizing departmental performance through dashboards. The study concludes that AI significantly reduces the burden on human operators and leads to faster complaint resolution.

III.EXISTING SYSTEM

The existing public grievance redressal systems employed in most government departments and public service organizations are largely manual or semi-automated. These systems generally depend on physically or online submitted forms, following which staff manually scrutinize, categorize, and send them to concerned departments. This traditional way of processing petitions is ineffective and susceptible to various problems that discourage effective settlement and citizen satisfaction.

The main drawbacks of the current system are:

•**Time-Lag Response:** The manual process tends to create considerable time lags in analyzing, assigning, and responding to petitions, in turn increasing the average cycle time.

•**Urgency Detection Failure:** No process exists to determine which complaints have to be addressed urgently, hence mismanagement of important issues.

•**Misrouting and Misclassification:** Misclassification at the classification stage by humans can lead to petitions being sent to an inappropriate department, increasing the cycle time.

•**Lack of Transparency:** After a petition is filed, complainants have no visibility into the status or progress of their grievance.

•**Absence of Data Analytics:** The existing systems fail to use data analytics to create insights or track department performance.

DISADVANTAGES

•**Manual Processing:** Piles on workload and is extremely susceptible to human error.

•**No Sentiment Detection:** Failure to identify emotional or critical tone in the complaint text.

•**No Prioritization Logic:** All complaints are processed equally without considering urgency.

•**No Automated Routing:** Departmental routing relies on manual decisions, leading to misrouting in most cases.

•**Inadequate Communication:** No notifications or status updates to petitioners.

•**Inefficiency in Tracking:** Petitioners cannot track the progress of their petition.

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IV. PROPOSED SYSTEM

The proposed AI-Powered Petition Analysis and Grievance Management System will address the above challenges by combining latest AI technologies like Natural Language Processing (NLP) and Machine Learning (ML) in the grievance redressal process.

The system will:

•Take and process electronic grievances of citizens using an easy-to-use web interface.

•Apply NLP methods to analyze the petition content and comprehend the context, keywords, and sentiment.

• Automatically categorize petitions into education, health, infrastructure, public safety, etc.

• Identify urgency through sentiment scores and essential keywords to rank grievances.

• Route the petition to the correct department using trained ML models in an intelligent manner.

• Send real-time feedback to users and allow status tracking through a dashboard.

• Provide insights and analytical reports to government departments on prevalent issues and performance trends.

ADVANTAGES

•Automated Classification: Reduces human intervention and provides uniform classification of grievances.

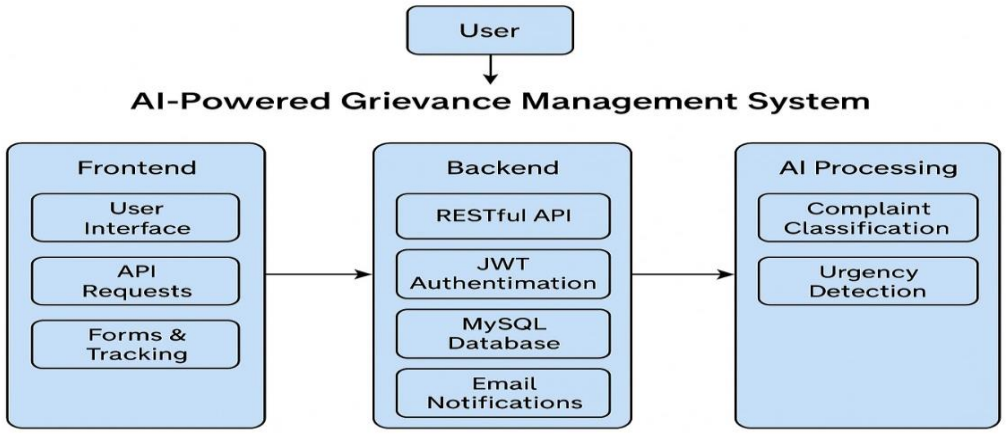
•Urgency Detection: Identifies critical and emotionally sensitive petitions and gives them priority.

•Efficient Departmental Routing: Guarantees petitions are routed to the right department the first time.

•Real-Time Notifications: Informs users about their grievance status through SMS, email, or in-app notifications.

•Dashboard-Based Monitoring: Allows officials to monitor petitions, identify bottlenecks, and track resolution timelines.

•Data-Driven Governance: Provides analytical tools for analyzing patterns in public complaints.



V.METHODOLOGY

The system is developed based on a modular design in which every component is responsible for a particular task, improving automation, efficiency, and accuracy.

1. **Data Collection and Preprocessing Module**
   Permits citizens to provide petitions through a web form. It gathers basic information (name, title, description, category, and attachments) and preprocesses the text by eliminating stopwords and error correction for processing.

2. **NLP-Based Classification and Sentiment Analysis Module**
   Utilizes NLP to identify keywords, intent detection, category prediction, and sentiment analysis. TF-IDF, spaCy, and TextBlob are some of the tools used to identify the type and urgency of grievances.

3. **Machine Learning-Based Urgency Detection Module**
   Classifies petitions as low, medium, or high urgency based on ML models like Logistic Regression or Random Forest, depending on sentiment scores, keyword strength, and historical resolution patterns.

4. **Departmental Routing and Assignment Module**
   Automatically directs petitions to the appropriate department based on category and priority. Has escalation rules and backup assignments in case of workload saturation.

5. **Real-Time Tracking and Notification Module**
Creates petition IDs and follows progress from submission to closure. Provides status updates through SMS/Email and has citizen feedback and follow-up support.

VI.CONCLUSION

The AI-Powered Petition Analysis and Grievance Management System showcases how automated AI can contribute overwhelmingly towards public service delivery in the digital age. The project solves important pain points of the conventional grievance redressal process, like delayed response, misclassification, manual routing, and absence of transparency.

By using Natural Language Processing (NLP) and Machine Learning (ML), the system can meaningfully scrutinize citizen petitions, identify urgency, classify grievances, and route them automatically to relevant departments. Through the application of a real-time dashboard, administrators and complainants are given total visibility, building accountability and trust.

The system was successfully implemented and tested across various modules. The classification model had high accuracy, and sentiment analysis effectively identified emotionally sensitive cases. The outcome is a lean, citizen-focused grievance management platform that has the ability to scale departmentally and municipally.

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