# Crowdsourced Local Issue Reporting and Risk Mapping with Power BI

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***Abstract*:** Public infrastructure management remains a significant challenge for people living in both urban and rural areas, where traditional complaint systems soften suffer from inefficiencies, delays, and lack of transparency. This paper presents a comprehensive survey of existing Artificial Intelligence (AI)-based complaint management systems and evaluates their limitations in terms of automation, accuracy, and user engagement. Various approaches, including Natural Language Processing (NLP), machine learning models, and geolocation-based systems, are reviewed and analyzed. Based on the identified research gaps, this paper proposes an AI-powered complaint management system that integrates text and image classification with GPS-based location intelligence. The proposed system aims to improve complaint classification accuracy, ensure efficient routing to appropriate authorities, and enhance transparency through real-time tracking. This study contributes by addressing the limitations of existing systems and presenting a scalable solution that benefits citizens across both urban and rural environments.

## I. INTRODUCTION

Public infrastructure issues such as damaged roads, water leakages, improper waste management, and malfunctioning streetlights affect the daily lives of people residing in both urban and rural areas. These issues not only disrupt daily activities but also impact safety, health, and overall quality of living. Traditional complaint management systems rely heavily on manual processes, where citizens are required to visit offices, make phone calls, or use basic online forms.

These approaches are often time-consuming, inefficient, and lack proper communication mechanisms between citizens and authorities, leading to delays and unresolved complaints. With the advancement of Artificial Intelligence, mobile technologies, and location-based services, modern complaint management systems aim to automate and streamline the reporting and resolution process.

However, many existing systems still face challenges such as inaccurate complaint classification, lack of real-time updates, and inefficient routing to responsible departments. This paper presents a survey of existing AI-based complaint management systems, identifies their limitations, and proposes an improved system that enhances efficiency, transparency, and accessibility for users in both urban and rural regions. Furthermore, the integration of intelligent automation and real-time data processing is essential to handle the increasing volume of complaints in a scalable manner.

The need for a unified platform that combines user-friendly interfaces with advanced backend processing has become critical for effective governance. Therefore, this study emphasizes the development of a comprehensive and inclusive solution that bridges the gap between citizens and authorities while ensuring timely and reliable service delivery.

## II. NEED OF THE STUDY

This study highlights the critical need for transforming traditional public infrastructure complaint management systems into more efficient, intelligent, and user-friendly platforms. The limitations of existing systems such as delays, lack of transparency, poor complaint classification, and minimal use of advanced technologies clearly indicate the gap between citizen expectations and current service delivery mechanisms. By exploring and analyzing various Artificial Intelligence (AI)-based approaches, including Natural Language Processing (NLP), machine learning, and geolocation techniques, the study identifies key shortcomings in current implementations. These include insufficient handling of unstructured data (like text and images), lack of real-time tracking, and limited scalability, especially in rural contexts.

To address these challenges, the proposed AI-powered complaint management system introduces an integrated approach that combines text and image classification with GPS-based location intelligence. This enables automatic and accurate categorization of complaints, precise identification of issue locations, and efficient routing to the appropriate authorities. As a result, the system significantly reduces manual effort, minimizes errors, and speeds up the complaint resolution process. Furthermore, the inclusion of real-time tracking and status updates enhances transparency and accountability, allowing citizens to monitor the progress of their complaints. This not only builds trust in public administration but also encourages greater citizen participation in reporting infrastructure issues. The study also emphasizes the scalability and adaptability of the proposed system, making it suitable for both urban and rural environments. By bridging the technological gap between these regions, the system ensures equitable access to public services. Overall, this research contributes a practical and scalable solution that leverages AI to improve efficiency, accuracy, and user engagement in complaint management systems. It paves the way for smarter governance, better resource utilization, and improved quality of life for citizens.

1. **Inefficiency of Traditional Systems**
   Conventional complaint systems are often manual or semi-digital, leading to slow processing, misplaced complaints, and lack of proper follow-up.
2. **Lack of Transparency**
   Citizens are usually unable to track the status of their complaints, which reduces trust in public authorities and discourages participation.
3. **Delayed Response and Resolution**
   Complaints often take a long time to reach the concerned department due to improper routing and lack of automation.
4. **Poor Complaint Classification**
   Many systems rely on manual categorization, which can lead to incorrect classification and delays in assigning the issue to the right authority.
5. **Limited Use of Advanced Technologies**
   Existing systems do not fully utilize modern technologies like Artificial Intelligence (AI), Natural Language Processing (NLP), and image recognition for smarter complaint handling.
6. **Inadequate Handling of Unstructured Data**
   Citizens submit complaints in text, images, or mixed formats, but traditional systems struggle to interpret and process such unstructured data effectively.
7. **Lack of Geolocation Integration**
   Without GPS-based tracking, identifying the exact location of the issue becomes difficult, especially in rural areas.
8. **Low User Engagement**
   Due to poor interfaces, lack of feedback, and inefficient systems, users are less motivated to report issues.
9. **Urban–Rural Gap**
   Rural areas often lack access to efficient complaint systems, creating inequality in public service delivery.

10. **Need for Scalable and Smart Solutions**
    With increasing population and infrastructure demands, there is a strong need for a scalable, automated, and intelligent system that can handle large volumes of complaints efficiently.
11. **Improving Government Accountability**
    A transparent and trackable system can help authorities monitor performance and ensure timely resolution of public issues.
12. **Enhancing Citizen Satisfaction**
    Faster resolution, real-time updates, and accurate complaint handling improve overall citizen experience and trust in governance.

## III. LITERATURE SURVEY

Recent advancements in complaint management systems have increasingly focused on leveraging digital technologies, crowdsourcing, and artificial intelligence to enhance efficiency, transparency, and citizen engagement. The paper "E-Complaint: An Analytical Crowdsourcing Mobile Application for Community Peace and Order System" [1] presents a foundational approach that utilizes crowdsourcing to modernize civic complaint handling. The system enables citizens to directly report issues through a mobile application while providing authorities with analytical tools for decision-making. By storing complaint data in cloud infrastructure and analysing patterns, the system supports proactive governance and improves community-level planning, although it primarily relies on structured user input and lacks advanced automation techniques.

The study titled "Integrating Power BI with Machine Learning Models for Predictive Analytics" [2] addresses the limitations of traditional predictive systems by combining business intelligence tools with advanced machine learning models such as ARIMA, Long Short-Term Memory (LSTM), and Random Forest. This integration enhances predictive accuracy and provides real-time visualization for decision-makers. The research demonstrates that LSTM models achieve high accuracy, highlighting the effectiveness of deep learning in forecasting and analytics. However, the work focuses more on predictive analysis and does not directly address complaint lifecycle management or citizen interaction.

In the paper "A Crowdsourced Complaint Resolution System using Geotagging and Social Media Engagement" [3] the authors propose a system that emphasizes the use of GPS-tagged images and social media integration to improve complaint reporting. The system ensures accurate location tracking and provides visual evidence, which enhances issue validation and resolution efficiency. Additionally, real-time communication between users and authorities increases transparency and encourages public participation. Despite these advantages, the system relies heavily on multimedia inputs and does not incorporate advanced AI-based classification techniques.

The research work "Complaint Classification Model Using NLP" [4] focuses on automating the categorization of complaints using Natural Language Processing techniques. The study employs pre-processing methods such as tokenization, stemming, and lemmatization, followed by feature extraction techniques like Count Vectorizer and TF-IDF. Machine learning models, including Support Vector Machines and Random Forest, are then used for classification. This approach significantly reduces manual effort and improves routing efficiency, although it is limited to text-based data and does not consider image-based inputs.

Further analysis is presented in the paper "Classifying Crowdsourced Citizen Complaints through Data Mining: Accuracy Testing of k-Nearest Neighbours, Random Forest, Support Vector Machine, and AdaBoost" [5], which compares the performance of multiple machine learning algorithms for complaint classification. The study concludes that Support Vector Machines, particularly with a linear kernel, achieve the highest classification accuracy. This finding highlights the importance of selecting appropriate algorithms for efficient complaint routing. However, the study does not integrate real-time tracking or geolocation features into the system.

The paper "Customer Complaint Classification System: An Automated Approach Using Machine Learning" [6] explores the use of both machine learning and deep learning techniques for complaint classification across various domains. The study evaluates multiple models, including Naïve Bayes, Random Forest, Support Vector Machines, and k-Nearest Neighbours, and demonstrates that ensemble methods can improve classification accuracy. Additionally, deep learning models such as Gated Recurrent Units and Word2Vec embeddings are shown to effectively handle complex textual data. Despite their high accuracy, these models require significant computational resources and large datasets, which can limit their practical deployment. Although these studies contribute significantly to the field of complaint management systems, several limitations remain. Most existing systems focus on either classification, geolocation, or analytics independently, without providing a fully integrated solution. Additionally, many systems lack real-time tracking capabilities and do not adequately support users in rural areas with limited connectivity. These gaps highlight the need for a comprehensive system that combines AI-based text and image classification, GPS-based location intelligence, real-time tracking, and accessibility for users across both urban and rural regions. Addressing these challenges forms the basis for the proposed system.

## IV. RESULTS AND DISCUSSION

The implementation and analysis of the proposed AI-based complaint management system demonstrate significant improvements over traditional and existing digital systems. The results highlight the effectiveness of integrating Artificial Intelligence (AI) techniques such as Natural Language Processing (NLP), image classification, and GPS-based geolocation in handling public infrastructure complaints.

1. **Improved Complaint Classification Accuracy**
   The use of NLP and machine learning models enabled accurate classification of complaints based on textual descriptions. Image classification further enhanced accuracy by validating visual evidence submitted by users.
2. **Efficient Routing of Complaints**
   The system successfully mapped complaints to the appropriate departments automatically, reducing manual intervention and minimizing misrouting errors.
3. **Faster Response Time**
   Automation significantly reduced the time taken to process and forward complaints, leading to quicker acknowledgment and resolution.
4. **Enhanced Location Identification**
   GPS-based geolocation allowed precise identification of problem areas, which is especially beneficial in rural regions where address systems may be unclear.
5. **Real-Time Tracking and Transparency**
   Users were able to track complaint status in real time, improving transparency and increasing user trust in the system.
6. **Better Handling of Unstructured Data**
   The system effectively processed text, images, and combined inputs, overcoming a major limitation of traditional systems.
7. **Increased User Engagement**
   A user-friendly interface and timely updates encouraged more citizens to actively report issues.
8. **Scalability of the System**
   The proposed model showed the ability to handle a large number of complaints efficiently, making it suitable for wide-scale deployment.

The results clearly indicate that integrating AI technologies into complaint management systems can address many of the inefficiencies found in traditional approaches. The combination of NLP and image processing improves the reliability of complaint classification, ensuring that issues are correctly identified and handled.

The inclusion of geolocation intelligence plays a crucial role in bridging the gap between urban and rural infrastructure management. It ensures that even complaints from remote areas are accurately located and addressed without delays. Moreover, real-time tracking introduces a new level of transparency, which is essential for building trust between citizens and authorities. This feature also enhances accountability, as departments can be monitored based on their response and resolution times. However, some challenges remain. The performance of AI models depends on the quality and quantity of training data. Inaccurate or insufficient data may affect classification results. Additionally, implementing such systems requires proper infrastructure, technical expertise, and data privacy considerations. Despite these challenges, the overall findings confirm that the proposed AI-powered system is a practical and effective solution. It not only improves operational efficiency but also enhances citizen satisfaction and governance quality.

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