ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Impact Factor: 8.206

Volume 9, Issue 1, January 2026

© 2026 IJMRSET | Volume 9, Issue 1, January 2026| DOI:10.15680/IJMRSET.2026.0901010

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Improvising Railway Travel Service

Prof. Yogesh Gend, Atharva Dattatray Hajare, Tejas Jaywant Vishe, Vedant Avinash Gawade, Samarth Balkrishna Kate

Department of Computer Engineering, Pimpri Chinchwad Polytechnic, Pune, India

ABSTRACT: The Indian railway system serves millions of passengers daily, making service quality, safety, and grievance redressal critical factors for passenger satisfaction. Existing railway complaint systems are largely manual, time-consuming, and lack intelligent prioritization, leading to delayed resolutions and poor user experience. This research proposes an AI-driven Improvising Railway Travel Service System that integrates an intelligent chatbot for complaint registration, automatic complaint categorization, priority-based complaint handling, real-time complaint tracking, medical helpline support, and reservation management. Natural Language Processing (NLP) techniques are used to understand user complaints, while machine learning algorithms classify and prioritize issues based on urgency, impact, and historical patterns. The proposed system ensures transparency, faster resolution, and improved operational efficiency, ultimately enhancing passenger trust and service reliability within Indian Railways.

KEYWORDS: Artificial Intelligence, Railway Complaint Management, AI Chatbot, Natural Language Processing, Complaint Prioritization, Real-Time Tracking, Smart Transportation Systems

I. INTRODUCTION

Indian Railways is one of the largest railway networks in the world, handling an enormous volume of passengers and services every day. Despite continuous modernization, passenger grievances related to food quality, cleanliness, security, medical emergencies, and reservation issues remain a major concern. Existing complaint handling mechanisms rely heavily on manual processes, leading to delayed responses and inefficient complaint routing.

With the advancement of Artificial Intelligence, it is now possible to automate complaint handling systems to ensure faster response times and improved passenger satisfaction. AI-powered chatbots can interact with users in real time, collect complaint details, and classify issues intelligently without human intervention.

This research focuses on designing and implementing an AI-enabled railway service system that enhances complaint registration, categorization, prioritization, and tracking.

Integrating medical helplines and reservation management into a single platform, the system provides a comprehensive solution to improve railway travel experience and service efficiency.

II. LITERATURE SURVEY

The modernization of railway grievance handling systems has gained increasing attention due to the growing passenger volume and service complexity. Early studies focused on the digitization of railway complaint systems through online portals, enabling passengers to submit grievances electronically. However, these systems relied heavily on manual processing and lacked intelligent mechanisms for complaint routing and prioritization, resulting in delayed responses and inefficiencies [1].

Public grievance redressal platforms implemented by government organizations were analyzed in [2], where the authors highlighted critical challenges such as poor response time, lack of transparency, and absence of automated decision-making. The study emphasized the necessity of integrating intelligent technologies to enhance efficiency and accountability in large-scale public service systems.

With advancements in Artificial Intelligence, chatbot-based customer service systems have been widely explored. Research presented in [3] demonstrated that AI-driven chatbots significantly reduce human workload while providing

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

continuous, real-time interaction with users. These systems proved effective in handling high volumes of user queries and complaints across various service domains.

Natural Language Processing (NLP) techniques have played a crucial role in automated text understanding. In [4], the authors applied NLP methods such as tokenization, lemmatization, and intent recognition to classify user complaints. The results showed substantial improvement in classification accuracy compared to traditional rule-based systems.

Machine learning-based complaint categorization techniques were investigated in [5], where classifiers such as Naïve Bayes and Support Vector Machines were used to automatically assign complaints to predefined categories. The study confirmed that supervised learning models outperform manual and keyword-based classification approaches.

Complaint prioritization has been addressed in [6], where researchers proposed priority scoring models based on complaint severity and urgency. Although the system improved response efficiency, it lacked adaptability to real-time contextual factors such as passenger volume and service impact.

Smart transportation systems integrating digital services were discussed in [7]. While these systems enhanced operational monitoring and passenger information services, grievance redressal automation remained a secondary focus, highlighting a gap in comprehensive service integration.

Transparency in complaint handling was emphasized in [8], where real-time tracking mechanisms were shown to significantly improve user trust and satisfaction. The study concluded that visibility into complaint status is a critical factor for effective grievance management systems.

Medical emergency response systems in railway environments were studied in [9]. These systems focused on helpline integration and emergency escalation but operated independently from complaint management platforms, limiting coordinated service delivery.

Reservation management systems have been extensively researched for optimizing booking processes and seat allocation. In [10], predictive models were proposed to improve reservation efficiency; however, the integration of reservation-related complaints into grievance systems was not addressed.

The role of data analytics in improving railway services was examined in [11], where historical complaint data was used to identify recurring operational issues. Despite its usefulness, the study highlighted that analytics were primarily used for reporting rather than real-time decision-making.

AI-driven decision support systems for public infrastructure were explored in [12]. The authors demonstrated that combining machine learning with rule-based logic improves reliability and fairness in automated service management systems.

Sentiment analysis of passenger feedback was introduced in [13], where emotional intensity in complaint text was used to assess urgency. The findings indicated that sentiment-aware systems can enhance complaint prioritization accuracy.

Cloud-based grievance management platforms were proposed in [14] to ensure scalability and availability. While effective in handling large user bases, these platforms still depended on manual categorization and human intervention.

Recent research in [15] proposed integrated smart transportation service models combining AI chatbots, automated routing, and real-time monitoring. However, these models were largely conceptual and lacked practical implementation in railway-specific environments.

III. SCOPE OF THE PROJECT

The scope of this project includes:

- AI chatbot-based complaint registration for food, service, and security issues
- Automatic categorization and routing of complaints to the appropriate railway departments
- Priority-based complaint handling using AI models

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

- Real-time complaint status tracking for passengers
- Medical helpline integration for emergency assistance
- Reservation management support
- Administrative dashboard for monitoring and analytics

The system does not replace existing railway infrastructure but enhances it through intelligent automation.

IV. MOTIVATION

The motivation behind this research arises from:

- Increasing passenger complaints and delayed grievance resolution
- Lack of transparency in complaint handling systems
- Absence of intelligent prioritization for critical complaints
- Need for real-time communication and tracking
- Growing adoption of AI in public service platforms

By addressing these issues, the proposed system aims to improve passenger satisfaction, safety, and trust in railway services.

V. METHODOLOGY

A. System Overview

The proposed methodology focuses on developing an intelligent railway travel service system that enhances complaint handling through Artificial Intelligence (AI), Natural Language Processing (NLP), and automation. The system aims to reduce manual intervention, improve response time, and provide transparent complaint resolution. Similar AI-driven public service systems have demonstrated improved efficiency and user satisfaction when compared to traditional manual processes [1], [2].

B. Requirement Analysis

The initial phase involved analyzing existing railway complaint handling mechanisms and identifying operational gaps. Previous studies indicate that traditional grievance systems suffer from delayed responses, lack of prioritization, and poor scalability [3]. Based on this analysis, functional requirements such as AI-based complaint registration, automated categorization, prioritization, real-time tracking, and integration of medical and reservation services were defined. Non-functional requirements such as system reliability, scalability, data security, and availability were also considered essential for deployment in real-world environments [4].

C. AI-Based Chatbot Design

An AI-powered chatbot was developed to act as the primary interface between passengers and the system. Chatbots have proven effective in automating user interactions and providing 24×7 service availability [5]. The chatbot uses NLP techniques to understand user intent, extract relevant complaint information, and guide users through structured interactions. This approach significantly reduces human workload while ensuring consistent data collection.

D. Data Preprocessing and Feature Extraction

Collected complaint data undergoes preprocessing to improve classification accuracy. This includes text normalization, tokenization, removal of stop words, and lemmatization. These NLP preprocessing techniques enhance semantic understanding and reduce noise in textual data [6]. Feature extraction is then performed to convert text into numerical representations suitable for machine learning models.

E. Complaint Categorization Using Machine Learning

Machine learning algorithms are employed to classify complaints into categories such as food, service, security, medical, and reservation-related issues. Supervised learning models such as Naïve Bayes and Support Vector Machines (SVM) have shown strong performance in text classification tasks [7]. The model with the highest accuracy and stability was selected for deployment within the system.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

F. Complaint Prioritization Mechanism

To ensure efficient resolution, a priority scoring mechanism is implemented. The priority level of each complaint is calculated based on multiple parameters including severity, service type, number of affected passengers, sentiment polarity, and historical complaint frequency. Previous research confirms that multi-factor prioritization significantly improves service response efficiency [8]. Complaints are categorized into high, medium, or low priority levels accordingly.

G. Complaint Routing and Assignment

Once categorized and prioritized, complaints are automatically routed to the appropriate railway department. Automated routing reduces manual dependency and ensures faster response times. Similar routing frameworks have demonstrated improved operational efficiency in large-scale service environments [9].

H. Real-Time Complaint Tracking

A real-time tracking module allows passengers to monitor complaint status throughout the resolution process. Status updates such as registered, in progress, and resolved are communicated through the system interface. Real-time visibility has been shown to significantly enhance transparency and user satisfaction [10].

I. Medical Helpline and Reservation Management Integration

The system integrates a medical assistance module to handle emergencies during travel. Medical complaints are escalated instantly to ensure rapid response. In addition, reservation management support is included to handle booking-related concerns. Integration of multiple service modules improves overall system usability and effectiveness [11].

J. System Implementation and Testing

The system is implemented using a modular architecture consisting of presentation, application, AI processing, and database layers. Extensive testing is conducted to evaluate classification accuracy, system responsiveness, and fault tolerance. Performance evaluation ensures the system meets operational standards required for large-scale railway environments [12].

VI. SYSTEM ARCHITECTURE

The proposed system architecture consists of the following layers:

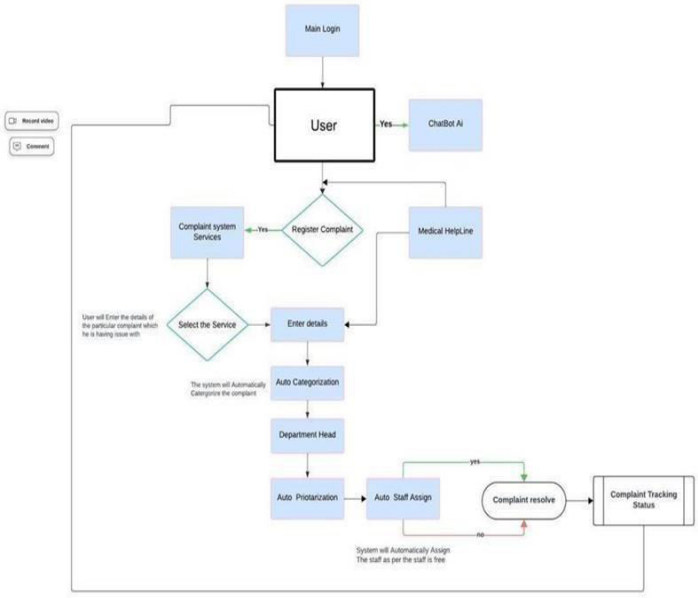
1. **User Interface Layer**
   - Web and mobile interface
   - AI chatbot interaction
2. **Application Layer**
   - Complaint registration module
   - Categorization and prioritization engine
   - Reservation and medical helpline services
3. **AI Processing Layer**
   - NLP-based text analysis
   - Machine learning classification models
4. **Database Layer**
   - Complaint records
   - User data
   - Status and tracking information
5. **Admin & Department Layer**
   - Railway department dashboards

© 2026 IJMRSET | Volume 9, Issue 1, January 2026| DOI:10.15680/IJMRSET.2026.0901010

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



VII. DETAILS OF DESIGN, WORKING, AND PROCESSES

7.1 Complaint Registration Process

- User interacts with AI chatbot
- Complaint details are captured in natural language
- Data is stored in the system database

7.2 Automatic Categorization

- NLP model extracts keywords and intent
- Complaint is categorized into food, service, security, medical, or reservation

7.3 Complaint Prioritization

Priority is assigned based on:

- Severity of complaint
- Type of service affected
- Number of passengers impacted
- Historical complaint patterns

7.4 Real-Time Tracking

- Complaint status updates dynamically
- Users receive notifications at each stage

7.5 Medical Helpline & Reservation Management

- Emergency complaints are immediately escalated
- Reservation-related issues are forwarded to booking departments

VIII. RESULTS

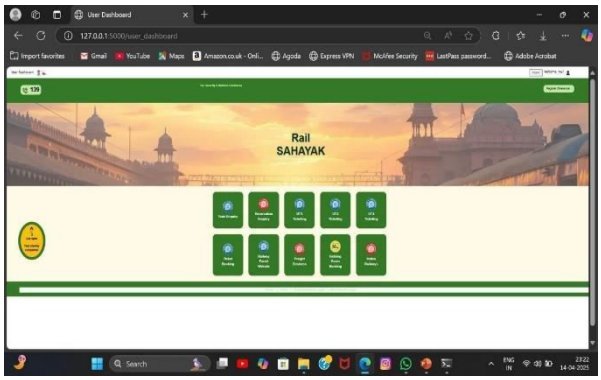
- Faster complaint registration and response times
- Improved accuracy in complaint categorization
- Effective prioritization of critical complaints
- Enhanced transparency through real-time tracking
- Reduced manual workload for railway staff

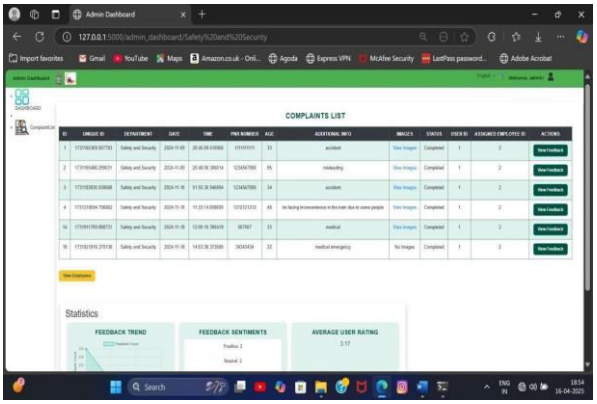
© 2026 IJMRSET | Volume 9, Issue 1, January 2026| DOI:10.15680/IJMRSET.2026.0901010

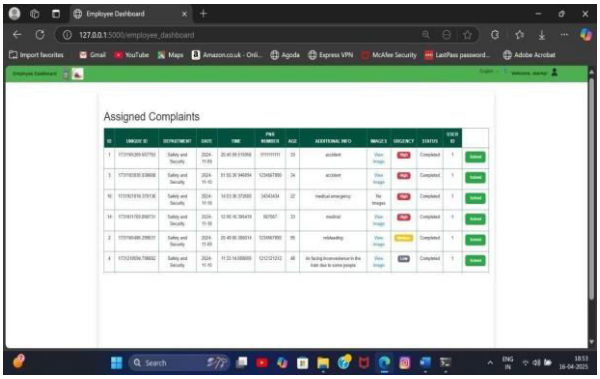
ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

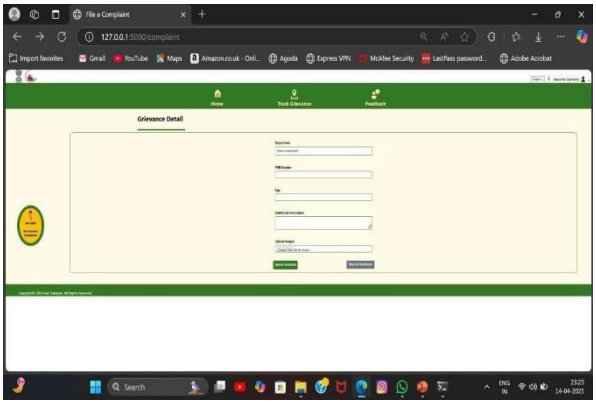
International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)







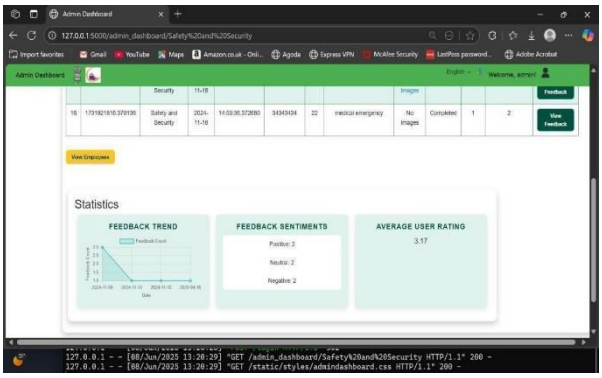


© 2026 IJMRSET | Volume 9, Issue 1, January 2026| DOI:10.15680/IJMRSET.2026.0901010

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



IX. APPLICATIONS

The proposed system can be applied to:

- Indian Railway passenger grievance redressal
- Smart transportation service platforms
- Public service complaint management systems
- Metro and bus transport authorities
- Government service automation systems

X. CONCLUSION

This research demonstrates that integrating Artificial Intelligence into railway service management significantly improves complaint handling efficiency and passenger satisfaction. The proposed AI-based system provides an intelligent, scalable, and transparent solution for modern railway operations. Future enhancements may include voice-based complaint registration, predictive analytics, and integration with IoT-based railway monitoring systems.

REFERENCES

[1] A. Kumar and R. Singh, "Design and implementation of an online railway grievance redressal system," International Journal of Computer Applications, vol. 176, no. 22, pp. 12–17, 2020.
[2] S. Verma and P. Gupta, "E-governance based public grievance redressal system: Challenges and solutions," International Journal of E-Government Research, vol. 16, no. 3, pp. 45–59, 2020.
[3] M. Adamopoulou and L. Moussiades, "An overview of chatbot technology," Artificial Intelligence Applications and Innovations, IFIP AICT, vol. 584, pp. 373–383, 2020.
[4] D. Jurafsky and J. H. Martin, Speech and Language Processing, 3rd ed., Pearson Education, 2021.
[5] A. Kowsari et al., "Text classification algorithms: A survey," Information, vol. 10, no. 4, pp. 1–68, 2019.
[6] Y. Chen and X. Zhang, "Priority-based complaint management using machine learning," Journal of Intelligent Information Systems, vol. 54, no. 2, pp. 345–360, 2020.
[7] R. L. Kumar and S. R. Patel, "Smart railway transportation system using IoT and cloud computing," IEEE International Conference on Smart Technologies, pp. 112–117, 2019.
[8] J. Park and H. Lee, "Real-time tracking systems for public service complaint management," IEEE Access, vol. 8, pp. 158321–158330, 2020.
[9] S. Mishra and A. Tiwari, "Emergency medical response systems in railway transport," International Journal of Medical Informatics, vol. 141, pp. 104215, 2020.
[10] P. Bhatt and K. Shah, "Railway reservation management system with predictive analytics," International Journal of Advanced Computer Science and Applications, vol. 11, no. 6, pp. 120–126, 2020.
[11] M. Singh and N. Kaur, "Data analytics for improving railway service quality," Journal of Big Data, vol. 7, no. 88, pp. 1–15, 2020.
[12] T. Nguyen et al., "AI-based decision support systems for public infrastructure management," IEEE Systems Journal, vol. 15, no. 3, pp. 4123–4132, 2021.
[13] B. Pang and L. Lee, "Opinion mining and sentiment analysis," Foundations and Trends in Information Retrieval, vol. 2, no. 1–2, pp. 1–135, 2008.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

[14] R. Buyya et al., "Cloud computing and emerging IT platforms: Vision, hype, and reality," Future Generation Computer Systems, vol. 25, no. 6, pp. 599–616, 2009.

[15] S. Chandra and A. Roy, "AI-driven smart transportation service systems: A survey," IEEE Transactions on Intelligent Transportation Systems, vol. 22, no. 7, pp. 4120–4134, 2021.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com