

Research Paper

Rail Smart GPT: AI-Powered Virtual Assistant for Railway Information Retrieval, Ticket Booking, and Real-Time Passenger Support

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ABSTRACT- Rail Smart GPT is an AI-powered virtual assistant that uses a conversational interface to make booking tickets and train information easier. The intricacy and latency of conventional railway inquiry systems are the primary issues discussed. The goal is to use AI technology to deliver quick, precise, and automated railway services. To comprehend user inquiries and provide intelligent answers, it employs Natural Language Processing. Real-time responses and seamless user interaction are made possible by generative AI. Python and Flask are used in the system's development for backend processing. The front-end interface uses HTML, CSS, and JavaScript. For safe reservations, alerts, and real-time train updates, databases and APIs are combined.

KEYWORDS:

Rail Smart GPT, Artificial Intelligence, Natural Language Processing, Ticket Booking Automation, Real-time Railway Information, Conversational Interface, Web Technologies.

I. INTRODUCTION

In today's digitally connected era, passengers expect instant, accurate, and personalized access to railway information and services. While existing railway enquiry

systems and mobile applications provide basic functionality, they often suffer from complex interfaces, fragmented information sources, and limited real-time support, making the user experience inefficient and time-consuming. RailSmartGPT addresses these challenges by introducing an AI-powered virtual assistant that leverages natural language processing and conversational intelligence to deliver seamless railway information retrieval, ticket booking assistance, and real-time passenger support. The primary objective of this project is to simplify railway interactions by enabling users to communicate in natural language, receive accurate and context-aware responses, and access critical travel-related services through a unified intelligent platform. By integrating real-time data handling with AI-driven reasoning, RailSmartGPT enhances passenger convenience, operational efficiency, and overall travel experience

II. RELATED WORK

The application of AI and chatbots in railroad and public transportation systems has been the subject of numerous studies. S. Karthikeyan et al.'s study "A Survey on Railway Reservation System Using Chatbot" describes how NLP-based chatbots

automate railway inquiries and raise user satisfaction. A. Priyanka et al.'s "Intelligent Chatbot for Railway Ticket Booking System" focuses on real-time communication and AI-driven ticket booking to streamline passenger services. Another work that emphasizes the use of generative AI for real-time decision-making and passenger support is "AI-Based Conversational Agent for Public Transportation Systems" by Luca Fantin et al. These studies demonstrate how AI and NLP greatly increase productivity, lessen manual labor, and enhance user experience. Building on these ideas, RailSmartGPT incorporates automation, conversational AI, and real-time data handling to deliver a smart and reliable railway assistance system. Railway information systems have evolved significantly with the integration of artificial intelligence, natural language processing, and real-time data services to improve passenger experience and operational efficiency. Traditional railway enquiry platforms and mobile applications primarily rely on menu-driven interfaces and static databases, which often require users to navigate multiple steps to retrieve information such as schedules, fares, or seat availability. Several studies have proposed virtual assistants for transportation systems that focus on timetable retrieval, ticket booking assistance, and service alerts. While these solutions improved accessibility and response speed, many lacked real-time integration with railway databases and offered limited contextual understanding of passenger needs. Some systems focused mainly on information retrieval without supporting end-to-end services such as booking assistance or personalized travel guidance. Others provided real-time updates but lacked conversational depth and multi-turn dialogue handling.

III. EXISTING SYSTEM

The existing method by Kumar and Mehta (2023) in "AI-Based Railway Enquiry and Passenger Assistance System" introduced a rule-based and NLP-assisted platform to provide train schedules, fare details, and basic ticket booking guidance through a conversational interface. While the system improved passenger interaction compared to traditional menu-driven applications, it had several limitations. It relied on predefined intents and keyword matching, which restricted its ability to handle complex or multi-turn passenger queries. The system supported limited real-time data integration, resulting in delayed or incomplete updates on train status and platform changes. Additionally, it focused mainly on information retrieval rather than end-to-end passenger support, such as personalized travel assistance or disruption handling. These drawbacks indicate the need for a more intelligent railway assistant capable of real-time data integration, context understanding, and comprehensive passenger support.



IV. PROPOSED SYSTEM

RailSmartGPT is a conversational AI-powered technology that aims to modernize railway services by offering quick, precise, and easy access to train information and ticket buying. Reducing manual dependency and eliminating delays brought on by conventional railway inquiry systems are the main goals of the approach. Through the integration of Natural Language Processing and Artificial Intelligence, the system

comprehends user inquiries and provides intelligent real-time responses. By facilitating human-like dialogue and contextual support, generative AI improves engagement. Python and Flask are used in the project's backend development to provide scalability and effective request handling. APIs facilitate smooth data interchange, notifications, and real-time train updates. By automating repetitive operations and reducing human intervention, the system increases operational efficiency.

V.SYSTEM ARCHITECTURE:

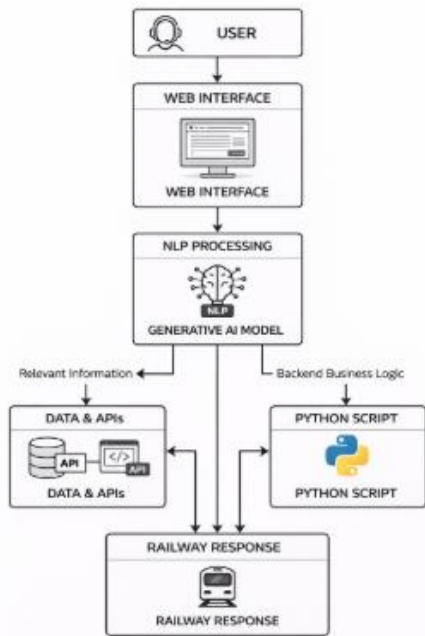


Fig.1: Architecture of RailSmartGpt

VI. IMPLEMENTATION AND RESULTS

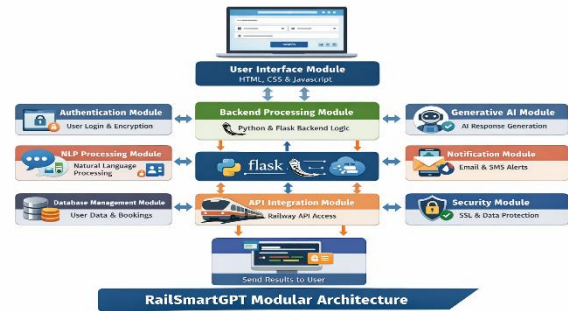
User: The user initiates the interaction by entering a query related to train schedules, ticket booking, or railway services. This acts as the starting point of the system workflow.

Web Interface:The web interface captures user input and provides a simple, interactive platform for communication. It forwards the request securely to the backend for processing.

NLP Processing:Natural Language Processing analyses the user’s query to identify intent, keywords, and context. This ensures accurate understanding of user requirements.

Generative AI Model:The generative AI model processes the interpreted query and generates intelligent, human-like responses. It supports decision-making and contextual reply generation.

Data & APIs:This layer fetches real-time train data, booking information, and availability using external APIs and databases. It ensures accurate and updated information delivery.



Python Script:The Python backend handles business logic, integrates APIs, processes data, and manages system flow. It acts as the core controller of the application.

Railway Response:The final processed information is returned to the user as ticket details, confirmations, or alerts. This completes the interaction with a fast and reliable response.

VII. RESULTS AND DISCUSSION:

The home page of RailSmartGPT features a clean, modern, and user-friendly interface designed to support both first-time users and experienced travellers. Clear navigation options such as **Railway Information**, **Ticket Booking**, and **Passenger Support** allow users to quickly access essential services without any technical complexity. The layout ensures smooth interaction, enabling users to find train details, book tickets, and get assistance effortlessly. With intuitive design elements and responsive

controls, the platform delivers a seamless and efficient user experience for all users.

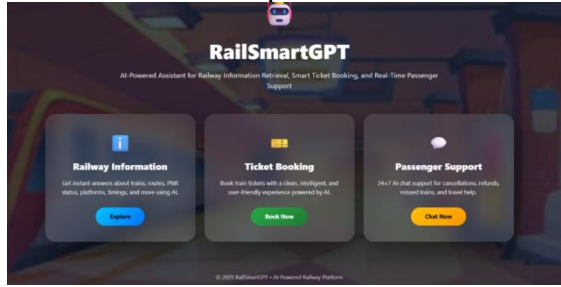


Fig.2: Application Home Page

This screen shows the Ticket Services section of RailSmartGPT, offering quick access to Ticket Booking and Ticket Cancellation options. The clean layout and clear buttons make navigation simple and efficient. Users can easily manage their bookings while using the back and logout options for smooth and secure navigation.

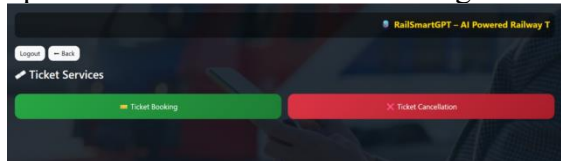


Fig.3 Ticket Service

The Ticket Booking interface of the RailSmartGPT system. It allows users to enter passenger details, select the journey route (From-To), choose the travel date, and specify the quota type for booking. The clean and structured layout ensures easy data entry and reduces user errors. The Check Trains button initiates the search for available trains based on the provided details. Overall, this interface simplifies the booking process and ensures a smooth, user-friendly experience.

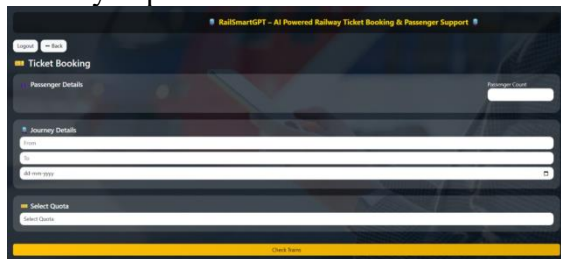


Fig4: Ticket Booking

The Ticket Booking Summary in the RailSmartGPT system, presenting complete

travel and passenger details in a clear format. It displays information such as train name and number, route, journey date, class, coach, seat number, and travel duration. Passenger details, including age and gender, are also listed along with the total fare.

Users can choose a preferred payment method such as UPI, card, or net banking to complete the booking. Once payment is successful, a confirmation message appears with options to book another ticket or cancel the current booking. This page ensures clarity, secure payment, and a smooth booking experience for users.

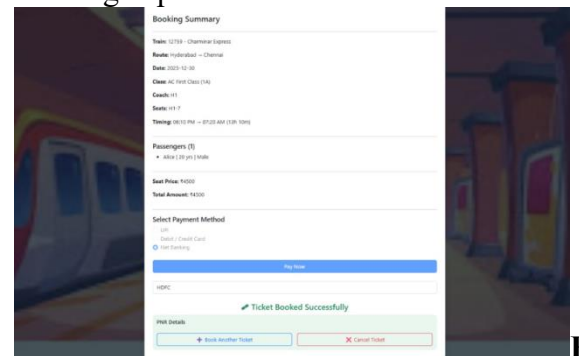


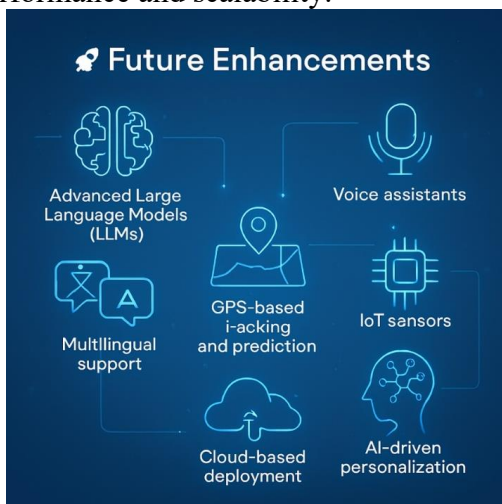
Fig.5 Ticket Booked Successfully

VIII CONCLUSION AND FUTURE ENHANCEMENT:



RailSmartGPT effectively transforms railway services using AI and NLP to deliver fast, accurate, and user-friendly assistance. The system improves efficiency, reduces manual effort, and enhances overall user experience. In the future,

RailSmartGPT can be enhanced using advanced Large Language Models (LLMs), voice assistants, and multilingual support for wider accessibility. Integration with IOT sensors and real-time GPS tracking can improve train monitoring and prediction accuracy. Cloud-based deployment and AI-driven personalization can further optimize performance and scalability.



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