

College Hall Reservation System With Chatbot Support For Intelligent Campus Administration

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Abstract- We propose an intelligent, automated seminar hall booking system integrated with a chatbot assistant to streamline scheduling on campus. The system's objective is to replace manual reservation processes—spreadsheets, emails, and walk-ins—with a unified platform that handles booking requests, conflict detection, and user queries. Technically, we employ a three-tier stack: a Python-based backend for booking logic and NLP processing, a Java component for system integration and performance-critical tasks, and HTML/CSS (with JavaScript) for the responsive web interface. The chatbot uses NLP techniques to understand natural-language requests (e.g. “Book a hall for 50 people next Tuesday”) and guides users through available slots. Automatic conflict checking against the database ensures no double-bookings, and the calendar interface provides real-time availability. By leveraging automation and AI, the system is expected to significantly reduce scheduling conflicts and administrative workload, while improving user satisfaction through 24/7 conversational support. In a “smart campus” context, this integrated approach enhances resource utilization and transparency: notifications keep students and staff informed, and logged data can inform future campus planning. Early tests and user feedback suggest the solution makes hall reservation faster, more accurate, and more user-friendly.

Keywords- Hall Booking, Chatbot, Smart Campus, NLP, Automation, Educational Technology.

I. INTRODUCTION

Educational institutions increasingly require efficient management of shared spaces (seminar halls, auditoriums, etc.). Traditionally, hall reservations have been handled manually—via paper records, spreadsheets, or fragmented email requests—which often leads to double bookings, scheduling conflicts, and delays. Such inefficiencies burden both students and administrators, as each booking must be manually checked and coordinated. Moreover, users cannot easily see real-time availability, leading to repeated follow-ups.

The concept of a smart campus applies digital technologies to optimize campus operations. Recent advances show that smart scheduling systems, often using IoT sensors and analytics, can detect real-time occupancy and thus reduce conflicts and wasted space. In parallel, chatbots leveraging natural language processing (NLP) have emerged as effective campus assistants. For example, custom campus chatbots can answer FAQs and guide students through administrative tasks without human intervention. By combining these trends, we address campus scheduling needs: our system offers a conversational interface alongside traditional booking features, embodying a smart campus assistant tailored for hall reservations.

In this work, we develop a College Hall Booking System enhanced with a chatbot assistant. Users can interact via a web or chat interface (text messages) to book halls. The chatbot, implemented with NLP, interprets queries and suggests available slots in natural language, while the backend (Python/Java) enforces booking rules. This system aims to eliminate double-booking and manual bottlenecks, improving transparency and user satisfaction. In the following sections, we review related systems, detail our implementation and its benefits, and present example dialogue, concluding with future work.

II. LITERATURE REVIEW

1. Seminar Hall Booking with Integrated Chatbot (Deepesha et al. [1])

Deepesha et al. developed a seminar hall booking system that integrates a chatbot interface, offering users an interactive calendar to select date and time slots. The system is built using HTML/CSS/JavaScript for the frontend and PHP/MySQL for the backend. When a conflict is detected, the system notifies users and suggests alternative available slots. This design significantly improves scheduling transparency and reduces manual effort [1]. Our system builds on this concept by introducing a Python-based backend for better NLP handling and a Java layer for robust backend logic, providing more advanced AI-driven features than PHP-based implementations.

2. Library Hall Booking and Management (Karthika et al. [2])

Karthika et al. proposed a web-based booking platform for managing college library halls using the MERN (MongoDB, Express.js, React, Node.js) stack. The system features role-based authentication, dynamic hall allocation, and admin approvals. If the selected hall is unavailable, it automatically suggests alternatives. The authors report that their system "minimizes booking conflicts and enhances transparency" [2]. Our project takes inspiration from this model but differs in its use of NLP chatbot technology, allowing users to book halls via natural language rather than navigating menus or forms.

3. CAMPUSOPEDIA Smart Assistant Platform (Tete et al. [3])

Tete et al. introduced CAMPUSOPEDIA, a smart campus platform developed with JavaScript that integrates services like timetables, attendance tracking, and bookstore access. The chatbot is central to the system's architecture, providing students with natural-language access to various campus functions. This research highlights the chatbot's importance in simplifying campus navigation and making digital systems more approachable [3]. We adapt this principle to the specific domain of hall reservations, using NLP to interpret booking requests and confirm slots via conversation.

4. Educational Chatbots for University Systems (Ramakrishnan et al. [4])

Ramakrishnan et al. studied NLP-powered chatbots in academic environments, demonstrating how AI assistants improve campus engagement and information retrieval. They emphasize the value of conversational interfaces for common student tasks like class scheduling and event updates. Their findings show that chatbot use leads to higher user satisfaction and reduced administrative workload [4]. Our system applies these findings directly by implementing a hall booking chatbot capable of both answering queries and processing transactions.

5. AI-Driven Banquet Hall Chatbot (Fathima and Deepesha [5])

Fathima and Deepesha presented a chatbot tailored for booking banquet halls, which handles queries about hall capacity and availability. While this system does not offer full scheduling functionality, it illustrates how chatbots can automate customer engagement and improve response times [5]. We extend this approach by not only answering availability queries but also processing bookings in real time,

managing scheduling conflicts, and integrating an administrative backend.

III. FINDINGS

The implemented system comprises a web interface, a chatbot service, and a backend database and scheduler. The frontend UI (HTML/CSS/JavaScript) provides an interactive calendar and forms for manual booking. Users can also launch a chat window or messaging app to converse with the chatbot. The backend uses Python (e.g. a Flask or Django server) to process bookings and run NLP modules (using libraries like spaCy or Rasa). Java components handle efficient scheduling logic and any additional services (e.g. an Android app or integration APIs). All booking data is stored securely (e.g. in PostgreSQL or MySQL), with schemas for users, halls, and reservations.

Key features and benefits include:

- Automated conflict detection: When a user attempts a booking, the system checks for overlapping reservations and only confirms if the slot is free, as in prior work [1]. If a conflict exists, it suggests alternatives, eliminating double-booking.
- NLP chatbot interface: The chatbot understands intents such as booking requests, availability queries, and cancellations. For example, a user can say "Book a hall for 50 people next Monday," and the bot will parse the date, duration, and headcount. This natural-language interface makes the system accessible [4].
- 24/7 availability and user satisfaction: Unlike office hours, the automated system is always online. Students no longer wait for staff responses. Similar systems report improved user satisfaction when instant, conversational help is available [4].
- Administrative control and transparency: Administrators have a dashboard to approve or review bookings and can override if needed. Users receive real-time notifications of approval status [2].
- Data-driven insights: Every interaction is logged. The system can generate reports on hall usage patterns, helping planners optimize space.

Overall, the system greatly reduces manual effort. Conflict-checking that took minutes with spreadsheets now happens instantaneously. By combining a familiar web calendar with AI assistance, the booking experience is both efficient and user-friendly. Early deployment in a campus pilot showed a notable drop in scheduling errors and positive feedback: users appreciated that the chatbot answered

questions immediately and processed bookings without email chains.

Sample Conversation

Below is a representative dialogue between a student and the chatbot:

User: “Hello, I’d like to book a hall next Tuesday at 3 PM for two hours.”

Chatbot: “Sure! For how many people?”

User: “About 50 attendees.”

Chatbot: “I see. The Medium Hall (capacity 100) is free next Tuesday from 3 PM to 5 PM. Should I go ahead and reserve it?”

User: “Yes, please confirm the booking.”

Chatbot: “Your booking is confirmed. The Medium Hall is reserved on Tue 13-May-2025 from 3:00 PM to 5:00 PM for 50 people. A confirmation email has been sent. Anything else I can help you with?”

User: “No, thank you.”

Chatbot: “You’re welcome! Feel free to ask if you need any further assistance.”

IV. CONCLUSION

We have presented a Smart Campus Hall Booking System that integrates automated scheduling with an NLP-powered chatbot assistant. By uniting these components, the solution addresses common pitfalls of traditional reservation processes: it eliminates double bookings, reduces manual workload, and provides a user-friendly interface for students and staff. The technology stack (Python, Java, HTML/CSS) supports a robust implementation: Python’s libraries enable natural language understanding, Java ensures scalability, and the web front-end makes the service accessible across devices. In line with smart campus objectives, the system offers real-time updates and potential data analytics to improve space utilization.

Future work will extend this foundation. We plan to integrate calendar APIs or IoT sensors (e.g., room-occupancy detectors) for even smarter scheduling. The chatbot could be enhanced with advanced AI (e.g. a transformer model) to handle more complex queries and multiple languages. We also foresee developing mobile and voice interfaces so bookings can be done via smartphone or smart speaker. Finally, systematic user studies and performance evaluation will quantify the benefits observed anecdotally. Overall, this work demonstrates that combining automation with conversational AI can significantly enhance campus resource management, moving toward truly intelligent campus operations.

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