

Smart Event Booking System with Personalized Recommendations

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ABSTRACT:

This study introduces a highly secure, personalized, and scalable event-booking system whose scope is to modernize the idea of event discovery and booking and overall management. On leveraging a support vector machine-based algorithm, personalized suggestions are provided toward events based upon users own booking history with enhanced engagement in addition to consumer satisfaction. The front-end, developed using React, gives a dynamic and interactive interface displaying event details, including name, organizer, venue, time, and pricing. It also enables users to choose seats interactively with real-time updates of pricing and integrates seamlessly into a secure payment process by using Express.js. For event organizers, the system provides an intuitive dashboard that helps manage event attributes such as type, venue, date, and pricing efficiently. To ensure robust security and data privacy, all user information is encrypted using bcrypt.js, while event-related data is securely stored in an PostgreSQL database. The backend, built with Node.js and Express.js, is designed to handle high scalability and efficiency, supporting smooth operations for both attendees and event organizers. The system, through the integration of machine learning-based personalized recommendations and dynamic user interfaces, addresses the key challenges in event management and booking. It streamlines administrative tasks, enhances user experiences, and provides a reliable and comprehensive platform for event organizers and attendees alike.

KEYWORDS :- Event management, Personalized Recommendations, Support Vector Machine (SVM), PostgreSQL database, Secure Payment Processing

1. INTRODUCTION

Event reservation has become a central part of contemporary social and business life, serving concerts, seminars, sporting events, and shows. Such event management systems as they exist, though, are not personalized enough, and as a result, users get too many irrelevant choices. Event organizers also struggle to manage bookings, pricing, and audience interactions efficiently. These constraints point to the necessity for a wiser, more user-oriented approach to event booking. Smart Event Booking System aims to solve these issues by using machine learning to make event suggestions tailored to individual users. With an SVM-based algorithm, the system provides event recommendations based on users' booking history. This not only increases user interaction but also optimizes event exposure for organizers.

The application has an interactive front-end using React for seamless exploration of event information including name,

organizer, location, time, and price. It also has an easy-to-use seat selection process with dynamic pricing updates. The booking process is secured and effortless using Express.js, providing ease of transactions and a smooth user experience. For event planners, the system provides a detailed dashboard that makes it easy to manage event attributes like type, location, date, and price. Security is paramount, with bcrypt.js encryption protecting user information and an SQL database storing event data securely. The scalable backend, developed using Node.js and Express.js, provides high performance and optimal handling of user requests even at high loads.

By combining machine learning-based suggestions, an active user interface, and safe transactions, the Smart Event Booking System offers an improved event booking process. It offers a secure, scalable, and effective solution for event

attendees as well as organizers, closing the gap between event discovery and smooth booking in the digital.

2. LITERATURE REVIEW

This paper explores a mobile application specifically designed to streamline college event management, allowing users to create, edit, and manage events remotely. The application features a user-friendly mobile interface that provides real-time updates on events, ensuring participants and organizers are always informed. Key functionalities include notifications and reminders for event participants, helping them stay on track with schedules and deadlines. While the mobile app excels in providing basic event management tools, it does not offer personalized recommendations or advanced event discovery features, limiting its scope for more complex event needs.[1]

This paper introduces a QR code-based ticket booking system designed for online event management. The system allows users to book tickets in advance and employs QR codes for secure and efficient ticket validation during events. It addresses issues related to ticketing security and minimizes the need for manual checks at event entry points. However, the system's primary limitation lies in its narrow focus—while effective for booking tickets, it does not provide additional functionalities like event discovery, personalization, or management tools. This limits its application to a single aspect of the event lifecycle, which could restrict its usefulness for event organizers.[2]

In this paper, the authors propose an intelligent agent-based system that automates the ticket booking process and personalizes event recommendations for users. By utilizing artificial intelligence, the system adapts to users' preferences and suggests events they may be interested in based on their past activities. The system also features real-time booking, seat availability tracking, and automatic updates. While the system significantly improves the user experience by making ticket booking seamless and personalized, its scalability for large-scale events with high traffic is a concern. For major conferences or concerts, the system may struggle to handle the increased demand and volume of data.[3]

This paper details the development of an AI-driven web application for seamless event management. The application automates various tasks such as event scheduling, attendee management, and resource allocation. By utilizing machine learning and data analytics, the system is able to offer insights into event performance and attendee behavior, helping organizers optimize future events. One limitation is the system's reliance on traditional event management approaches, with a focus on scheduling and logistics but lacking deep learning-based models for more complex decision-making processes. Nevertheless, it offers a practical solution for small to medium-sized events.[4]

The authors present a system for personalized event recommendations based on social network data. By analyzing user behavior, social connections, and interactions on platforms like Facebook and Twitter, the system suggests events that align with a user's interests. While the paper highlights the potential of social networks for personalized event recommendations, the system suffers from outdated models and lacks integration with modern platforms or advanced algorithms that would enhance recommendation accuracy. Moreover, the reliance on social network data can lead to privacy concerns, limiting its adoption among users who value data security.[5]

This paper proposes an intelligent system designed to help users find and manage events based on their preferences, including location, type, and date. By using algorithms to match users with relevant events, the system makes event discovery efficient and personalized. However, the system faces limitations when handling large datasets or integrating with external platforms, as it lacks advanced analytics capabilities. Despite these limitations, the system is useful for individuals looking for localized or smaller-scale events, offering a straightforward and user-friendly interface.[6]

This paper examines how AI can enhance event experiences by automating processes such as event planning, attendee management, and personalization. The authors explore the potential of AI in transforming how events are experienced, particularly in large-scale conferences and expos. While the paper focuses more on theoretical frameworks rather than practical implementations, it highlights the broad possibilities AI offers, such as creating personalized event agendas for attendees and providing real-time event analytics. The main limitation of the paper is its lack of real-world application, with no clear case studies or examples to demonstrate the AI models in action. [7]

The authors propose a web-based event management system specifically designed for colleges. The system allows

administrators to create and manage events while sending notifications to students and staff about upcoming events. Features include event scheduling, participant management, and automated reminders. Although the system is effective for small-scale academic events, it struggles with scalability for larger events, especially in universities with thousands of students. The system also lacks integration with social media platforms for broader reach and engagement, making it primarily suitable for localized college events.[8]

This paper presents a case study of an intelligent event recommendation system designed to suggest events based on user behavior and preferences. By analyzing data such as past event participation, social interactions, and preferences, the system provides personalized event recommendations. Although the study presents valuable insights into the application of machine learning techniques in event management, it lacks a generic solution for widespread adoption. The findings suggest that such recommendation systems can significantly enhance user engagement, but they require careful tuning and evaluation to ensure they meet user expectations in different contexts.[9]

This paper focuses on the design and implementation of BOOKiiIT, a venue booking system that facilitates efficient venue searches and bookings. The system integrates a comprehensive database of venues and provides an easy-to-use interface for users to search, filter, and book venues for events. One major limitation is its lack of integration with external event platforms or additional event management features, such as event promotion or attendee registration. However, its strong point lies in streamlining venue bookings, making it ideal for users whose primary need is finding and reserving event spaces.[10]

This paper discusses a web-based system aimed at helping academic institutions organize events collaboratively. The system includes tools for task delegation, scheduling, and communication between multiple parties involved in event organization. It also supports document sharing and coordination across teams, enhancing collaboration. However, the system's focus on academic events limits its application in other types of event management, such as corporate or social events. Additionally, the system's user interface could benefit from modern design improvements to better meet the expectations of contemporary users.[11]

This paper presents a web-conference management system designed to handle the complexities of organizing virtual academic events. The system supports registration, abstract submission, scheduling, and virtual conference room management. Despite its early adoption of digital event management tools, the system is based on outdated technologies and lacks modern features like real-time collaboration tools, video conferencing integration, and seamless user experiences. It is primarily useful for institutions in the early stages of adopting digital conference management systems but would need significant updates to meet current user needs.[12]

This paper explores the potential of blockchain technology in creating a decentralized and secure event ticketing system. By using blockchain, the system eliminates fraud, duplication, and scalping, ensuring that each ticket is unique and traceable. While the security and transparency benefits are clear, the paper highlights that the system requires technical expertise for implementation and adoption. Blockchain's complexity and the need for specialized knowledge could limit its adoption among smaller event organizers who lack the resources to manage such a system.[13]

This paper discusses a machine learning-based platform designed to help users discover social events. By analyzing data from social networks and user profiles, the system suggests events based on users' interests, past activities, and social interactions. The platform's ability to use machine learning to tailor recommendations based on real-time data is a key strength. However, the system focuses mostly on social events, making it less adaptable for professional or academic events. Additionally, the limited scalability of the algorithm when handling a large number of users poses a challenge for broader implementation.[14]

This paper presents an IoT-based venue booking system that integrates real-time venue data and smart automation to optimize venue selection and booking. The system leverages IoT devices to track venue availability, energy consumption, and other environmental factors, ensuring that events are held in optimal conditions. While the system offers a high level of convenience for organizers and venues, it is limited by the need for IoT-enabled venues, which may not be widely available, especially in traditional venues. Its adoption is also contingent on the cost and complexity of implementing IoT infrastructure.[15]

This paper explores the use of chatbots to improve user engagement in event management. The chatbot-based platform provides users with event information, assists with registration, and answers queries in real-time, offering a personalized experience. While chatbots can significantly enhance user engagement, the paper highlights limitations in handling complex user queries and providing in-depth customer support. As event organizers move toward automation, chatbots will continue to evolve, but for now, they may need to be complemented by human agents for more intricate tasks.[16]

This paper presents a cloud-based event registration system designed to handle large-scale events. The system provides scalability, reliability, and easy access for both organizers and participants, leveraging cloud infrastructure to manage

event data, registrations, and payments. While the cloud system offers great flexibility and scalability, it also has its limitations, such as a dependency on stable internet connections and a lack of offline functionality. The system's reliance on cloud services makes it ideal for large events but may not be suitable for events in locations with limited internet access. [17]

This paper introduces a multi-event management framework that integrates artificial intelligence (AI) for handling concurrent events. The AI system assists with real-time decision-making, resource allocation, and optimization for multiple events happening simultaneously. The framework supports event organizers by automating several administrative tasks, improving efficiency, and enhancing decision-making. However, the paper notes that the system may struggle with decision-making during high traffic or when there is significant variability in event conditions. Despite these limitations, the framework offers a robust solution for managing multiple events simultaneously, making it highly useful for large event organizers. [18]

This paper explores the use of big data tools for event analytics, enabling organizers to gain deep insights into attendee behavior, event performance, and overall engagement. By utilizing big data processing techniques, the system can analyze vast amounts of data collected during events to identify trends, predict outcomes, and optimize future event planning. However, the system is resource-intensive and requires significant computational power, which may be challenging for smaller event organizers. Despite this, the paper emphasizes the potential for big data tools to revolutionize event analytics, providing invaluable insights that can help organizers improve event experiences. [19]

This paper discusses the integration of Augmented Reality (AR) into event management systems to enhance the attendee experience. By incorporating AR, event organizers can offer immersive, interactive experiences, such as virtual tours, 3D displays, and real-time event information overlays. While AR provides a unique and engaging user experience, the paper acknowledges that it requires specialized hardware and may not be compatible with all attendees' devices. Additionally, the limited adoption of AR technology in the event industry means that its full potential has yet to be realized. However, the integration of AR holds significant promise for the future of event management, particularly in creating memorable experiences for attendees. [20]

3. METHODOLOGY

To design a smart, user-friendly, and scalable event booking system, a structured and iterative development process was followed. The methodology encompasses both the traditional aspects of system development and the incorporation of intelligent features through machine learning. Each stage was carefully designed to address key issues in event management such as user engagement, event discovery, system security, and real-time booking functionalities.

3.1 *Framework and Technology Integration*

Feature Modules

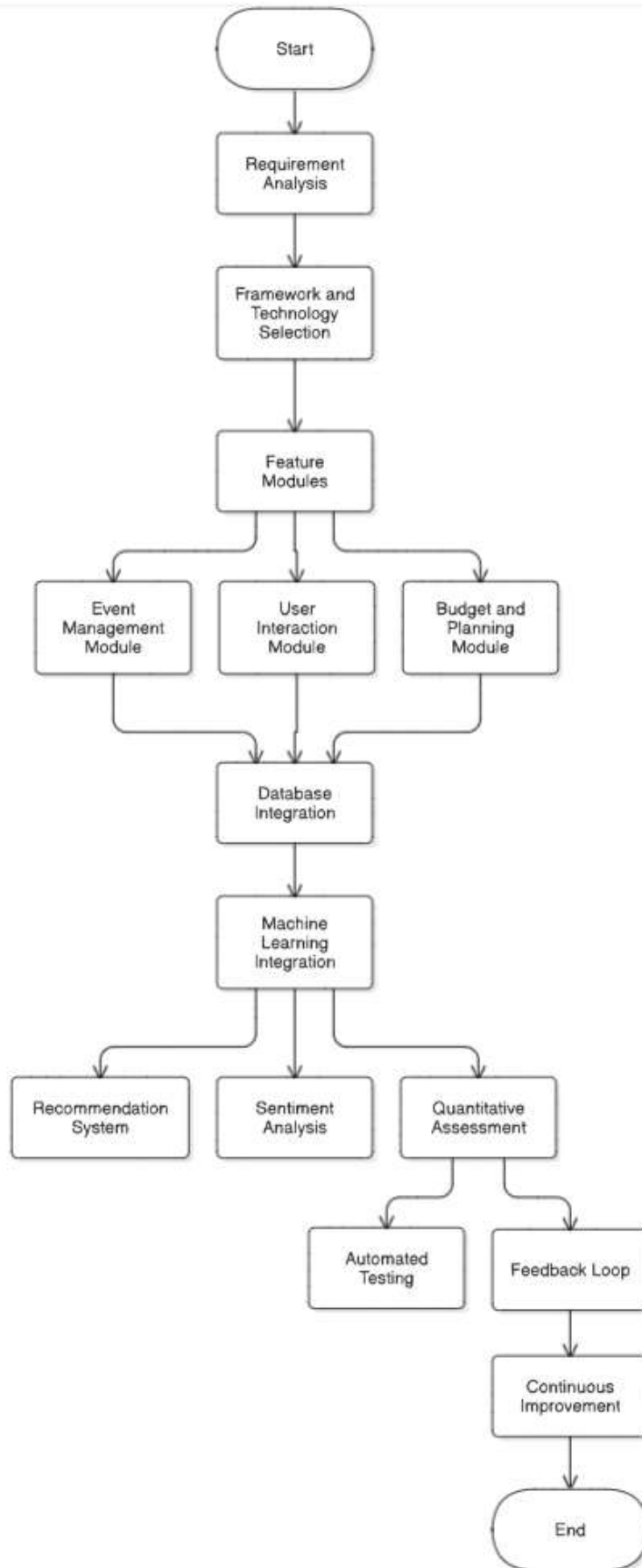
The system is divided into modular components to support core functionalities:

- **Event Management Module:** Enables organizers to create, edit, and manage events, including details like name, type, venue, date, and pricing.
- **User Interaction Module:** Supports user features like registration, live Q&A, polling, and feedback submission.
- **Budget and Planning Module:** Allows event organizers to manage event budgets and planning logistics efficiently.

Machine Learning Implementation

Machine learning techniques are applied to enhance personalization and user experience:

- **Recommendation System:** Utilizes collaborative filtering to suggest events based on user interests and booking history.
- **Sentiment Analysis:** Natural Language Processing (NLP) is used to analyze user feedback and identify areas for improvement.
- **Pattern Recognition (Optional):** Detects user interaction patterns and booking behaviors to improve future recommendations.



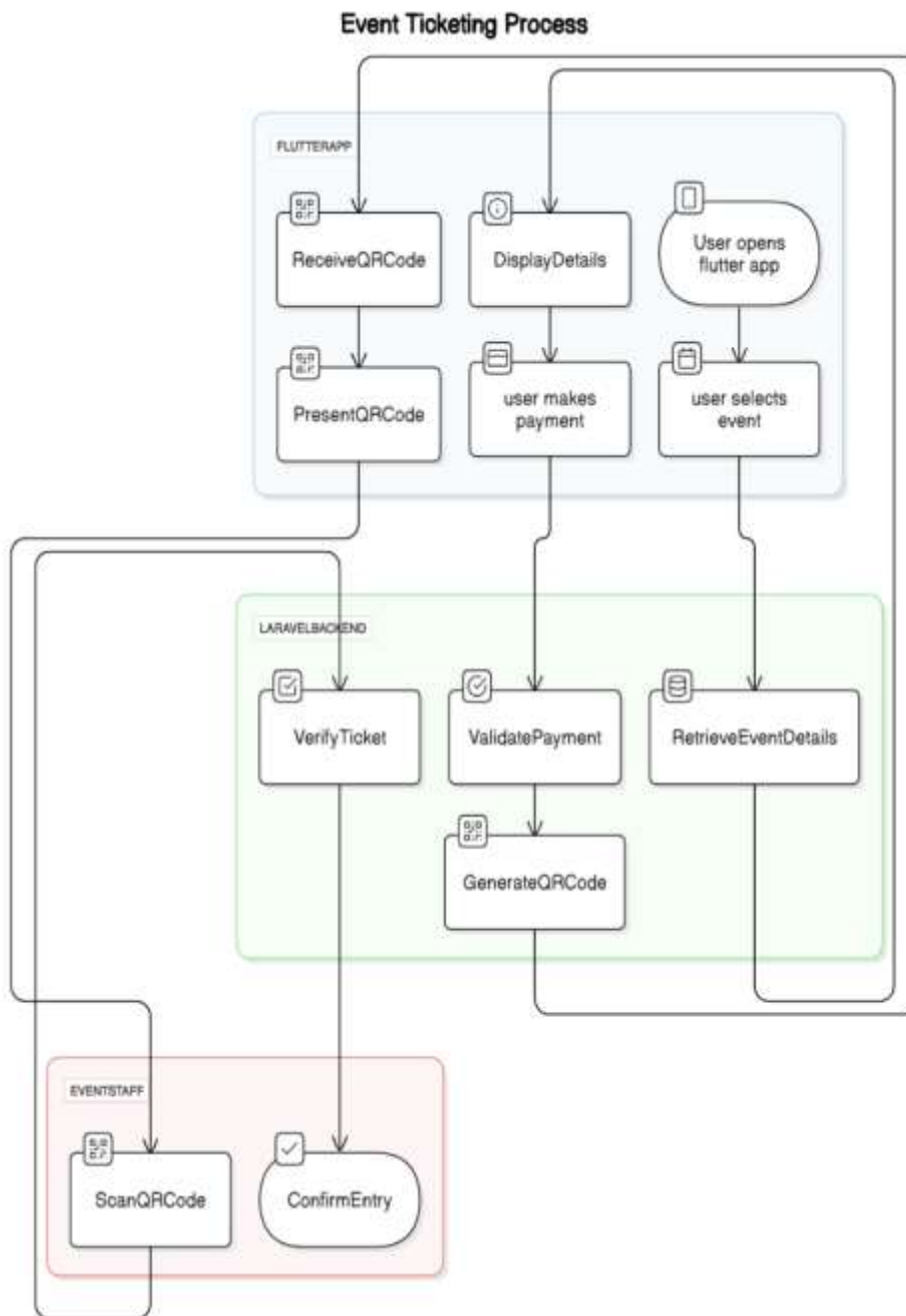
Quantitative Performance Assessment

To ensure reliability and scalability, the system undergoes performance testing and feedback-driven refinement:

- **Baseline Performance:** Metrics like load time, user engagement, and scalability are measured.
- **Automated Testing:** Regular tests are conducted for functionality, security, and cross-device responsiveness.
- **Feedback Loop:** Continuous user feedback is collected to enhance features and improve system performance.

3.2 Technology Stack and Framework Implementation

This system leverages powerful front-end and back-end technologies to ensure efficient development, seamless user interaction, and scalable architecture. The integration of Flutter and Laravel provides a reliable platform for both user-facing applications and server-side logic.



Frontend – Flutter

Flutter, developed by Google, is an open-source UI toolkit used to build natively compiled applications across mobile, web, and desktop from a single codebase.

- **Cross-Platform Development:** Ensures a consistent user experience across devices by using a single codebase for multiple platforms.
- **Hot Reload:** Enables real-time changes during development, improving productivity and allowing instant visual feedback.
- **Rich Widget Library:** Offers customizable and responsive UI elements to design modern and visually appealing interfaces.
- **Dart Programming Language:** Simplifies asynchronous programming and supports reactive architectural patterns for dynamic user interaction.
- **Reactive Architecture:** Utilizes Dart Streams to handle real-time events and data flow efficiently.
- **Rendering Engine (Skia):** Renders fast and smooth graphics for better user experience.

Backend – Laravel

Laravel is a robust and scalable PHP web framework that supports clean code structure and efficient backend logic using the MVC architecture.

- **MVC Architecture:** Separates application logic, UI, and data layers for maintainable and organized code.
- **Routing System:** Makes URL handling and HTTP request management straightforward.
- **Eloquent ORM:** Simplifies database queries with an expressive syntax and easy-to-use model relationships.
- **Blade Templating Engine:** Allows dynamic content rendering with reusable and readable templates.
- **Artisan Console:** Automates common development tasks like migrations, seeding, and testing through command-line tools.
- **Security Features:** Includes built-in support for CSRF protection, encryption, and secure authentication systems.

Additional Functionalities

- **QR Code Integration:** Used for secure, quick, and contactless event ticketing and verification.

Real-time Tracking and Analytics: Allows event organizers to monitor user activity, ticket scans, and engagement metrics, leading to data-driven decision-making.

3.3 *Advanced Technologies in Event Management*

Event management has evolved with the integration of advanced technologies, improving efficiency, security, and user experience. This section explores key technological advancements, their implementation, and their impact on event operations.

3.3.1 **Artificial Intelligence (AI) Systems**

AI systems automate crucial event management tasks, from real-time decision-making to attendee interaction and operational planning.

- **Use Case in Event Management:** AI-driven tools, such as chatbots for attendee support and recommendation engines for personalized experiences, are reshaping how events are planned and executed.
- **Importance:** AI reduces manual workload, identifies trends, and optimizes processes, ensuring streamlined event operations.

Implementation Methodology:

1. **Requirement Analysis:** Identifying areas where AI can improve efficiency, such as registration, engagement, and resource allocation.
2. **Technology Selection:** Choosing AI frameworks like TensorFlow or PyTorch and leveraging AI-powered tools.
3. **Data Collection & Preparation:** Gathering historical and real-time data, followed by preprocessing.
4. **Model Development & Integration:** Training AI models for predictive analytics and embedding them into event platforms.

5. **Testing & Optimization:** Running pilot events to validate AI performance and refine algorithms.
6. **Implementation & Feedback:** Deploying AI solutions, gathering feedback, and improving based on insights.

3.3.2 Data Encryption Technologies

To protect sensitive attendee and operational data, encryption technologies like AES and RSA ensure secure data handling during collection, storage, and transmission.

- **Use Case in Event Management:** Encryption safeguards registration details, payment transactions, and event logistics against cyber threats.
- **Importance:** Protecting sensitive data fosters trust among attendees and ensures compliance with legal standards such as GDPR.

Implementation Methodology:

1. **Encryption Protocol Selection:** Adopting AES-256 for data storage and TLS for secure transmission.
2. **Implementation Plan:** Encrypting personal data at rest and in transit within registration and payment systems.
3. **Compliance & Security Testing:** Conducting audits and penetration tests to ensure compliance with GDPR and CCPA.
4. **Backup & Recovery Strategies:** Using encrypted backups for disaster recovery and ensuring data redundancy.
5. **Continuous Monitoring:** Deploying tools to detect unauthorized access and updating encryption protocols regularly.

3.3.3 AI-Powered Feedback Mechanisms

AI-driven feedback mechanisms collect, analyze, and act on attendee feedback in real time, helping organizers refine event experiences dynamically.

- **Use Case in Event Management:** Digital feedback collection through AI-powered chatbots and sentiment analysis enhances user experience.
- **Importance:** Real-time feedback enables proactive improvements and ensures higher attendee satisfaction.

Implementation Methodology:

1. **Feedback Collection Tools:** Deploying AI-enabled surveys, sentiment analysis software, and chatbot interactions.
2. **Data Aggregation:** Storing structured and unstructured feedback data securely for analysis.
3. **AI Analysis:** Using NLP techniques to analyze text-based feedback and extract actionable insights.
4. **Dashboard Visualization:** Creating real-time dashboards to showcase attendee sentiments and areas for improvement.
5. **Implementation of Improvements:** Acting on feedback-driven insights to enhance event execution.
6. **Post-Event Review:** Summarizing trends and refining AI feedback systems for future events.

3.4 Web-Based Event Management System Using JSP and RNN

This framework incorporates Java Server Pages (JSP) for client-side development, Recurrent Neural Networks (RNN) for individualized event suggestions, and MySQL for database management.

Java Server Pages (JSP)

JSP facilitates dynamic web pages by inserting Java into HTML. It provides real-time updates for events, user registration, and search capabilities. The platform independence is ensured with the integration with Java EE, and reusable elements such as JavaBeans make it easier to maintain.

Recurrent Neural Networks (RNN)

RNNs handle sequential data and are, therefore, perfect for making predictions based on previous user interactions. The recommendation engine looks into user activity and recommends events that are of relevance. For instance, if a user is visiting technology events, they are recommended similar events.

MySQL Database

MySQL stores event information, user preferences, and registrations efficiently. MySQL is capable of real-time updates, which makes data retrieval hassle-free. Security mechanisms such as encryption safeguard sensitive data, and its client-server architecture enables multiple users to use event data concurrently.

Development Approach

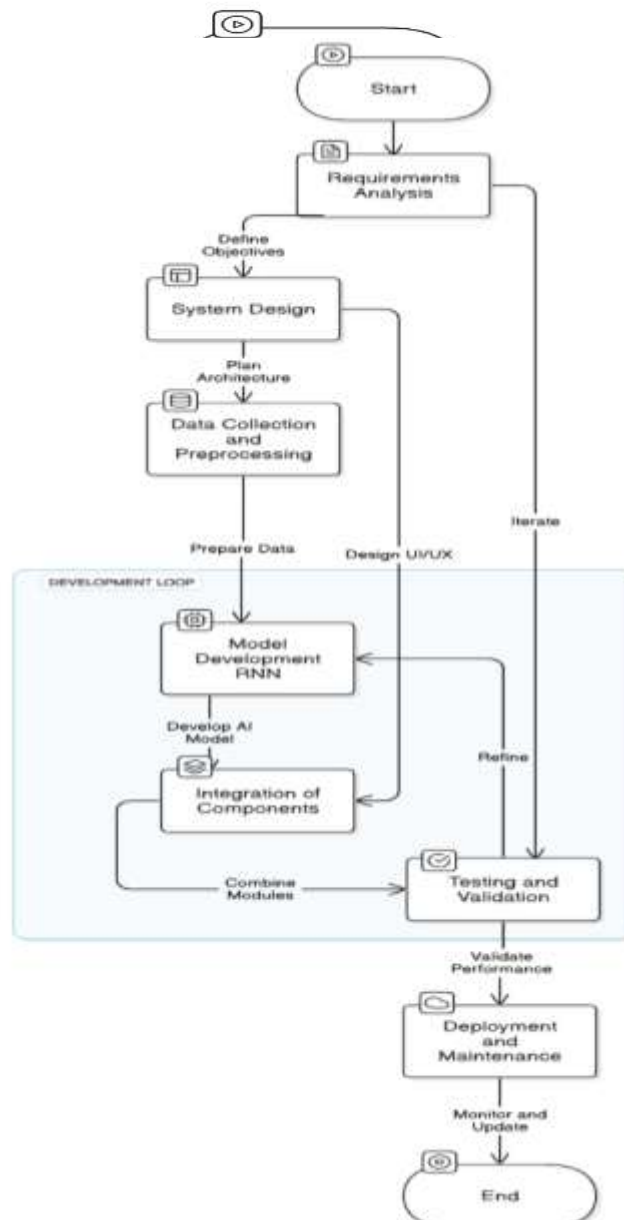
The system adopts a systematic approach:

- Requirement Analysis: Extracts major features such as event search and recommendations.
- System Design: Deploys JSP as the front end, RNN as recommendations, and MySQL as storage.
- Data Preparation: Gathers user interaction data and prepares it for model training.
- Model Development: Trains an RNN to make predictions of user preferences.
- Integration & Testing: Provides smooth data exchange and checks for recommendations.
- Deployment & Maintenance: Deploys the system on a web server and maintains it according to user feedback.

Proposed Methodology

After conducting a comprehensive analysis of current event management platforms and methodologies—such as traditional event booking portals, academic conference systems (e.g., EasyChair, OpenConf), and commercial ticketing services—we identified several pain points. These include limited personalization, inefficient workflows, weak communication between organizers and attendees, and lack of real-time interactions or feedback mechanisms.

To bridge these gaps, we developed a smart Web-Based Event Booking System that not only simplifies the event lifecycle but also enhances the user experience through personalized event recommendations, real-time features, and intelligent



automation. This system is designed to serve both event organizers and event attendees through a unified yet role-based platform.

Technology Stack Used

- **Support Vector Machine (SVM):** For personalized event recommendation and classification based on user behavior and preferences.
- **PostgreSQL:** A powerful, open-source relational database for handling structured data like user credentials, events, seat bookings, and payment records.
- **React.js:** For building a dynamic, component-based frontend that responds efficiently to user interaction.
- **TailwindCSS:** A utility-first CSS framework that ensures a consistent, mobile-responsive, and elegant design.

Overview of the Methodology

Our system adopts a dual-role architecture, providing customized interfaces and functionalities for two main user types:

- Customers (Event Attendees)
- Organizers (Event Creators)

The system architecture follows a structured, modular workflow—right from user authentication and role selection to event creation, seat selection, payment, and real-time booking confirmation. This modularity ensures scalability, maintainability, and ease of integration with future enhancements.

User Role Selection and Authentication

The system initiates with a user type selection screen, allowing users to identify themselves either as *customers* or *organizers*. This distinction ensures that each user group accesses only the relevant features and interfaces. Upon selection, users proceed to the authentication module where they can register or log in.

- Authentication success leads the customer to the event homepage.
- Failure redirects the user to an error-handling screen with relevant prompts.

Customer Workflow

Post-authentication, customers access a personalized homepage, showcasing event recommendations and categorized listings. The personalization engine can be enhanced through Support Vector Machine to suggest relevant events based on past interactions.

Step-by-step process:

1. **Event Discovery:** Browse events by category, date, or personalized suggestions.
2. **View Event Details:** Access detailed information including descriptions, time, venue, speaker/artist info, etc.
3. **Seat Selection and Pricing:** Interactive seat map with real-time availability and pricing that adjusts dynamically based on location, demand, or event popularity.
4. **Secure Payment Gateway:** Users can select preferred payment methods (UPI, cards, net banking, wallets) and are redirected to secure payment gateways.
5. **Confirmation and Ticket Generation:** On successful payment, tickets are generated and sent via email/SMS with a unique QR code for verification.
6. **Payment Failure Handling:** Users are shown clear error messages and offered retry options or customer support assistance.

Organizer Workflow

For organizers, the system offers a comprehensive dashboard post-login. The organizer can:

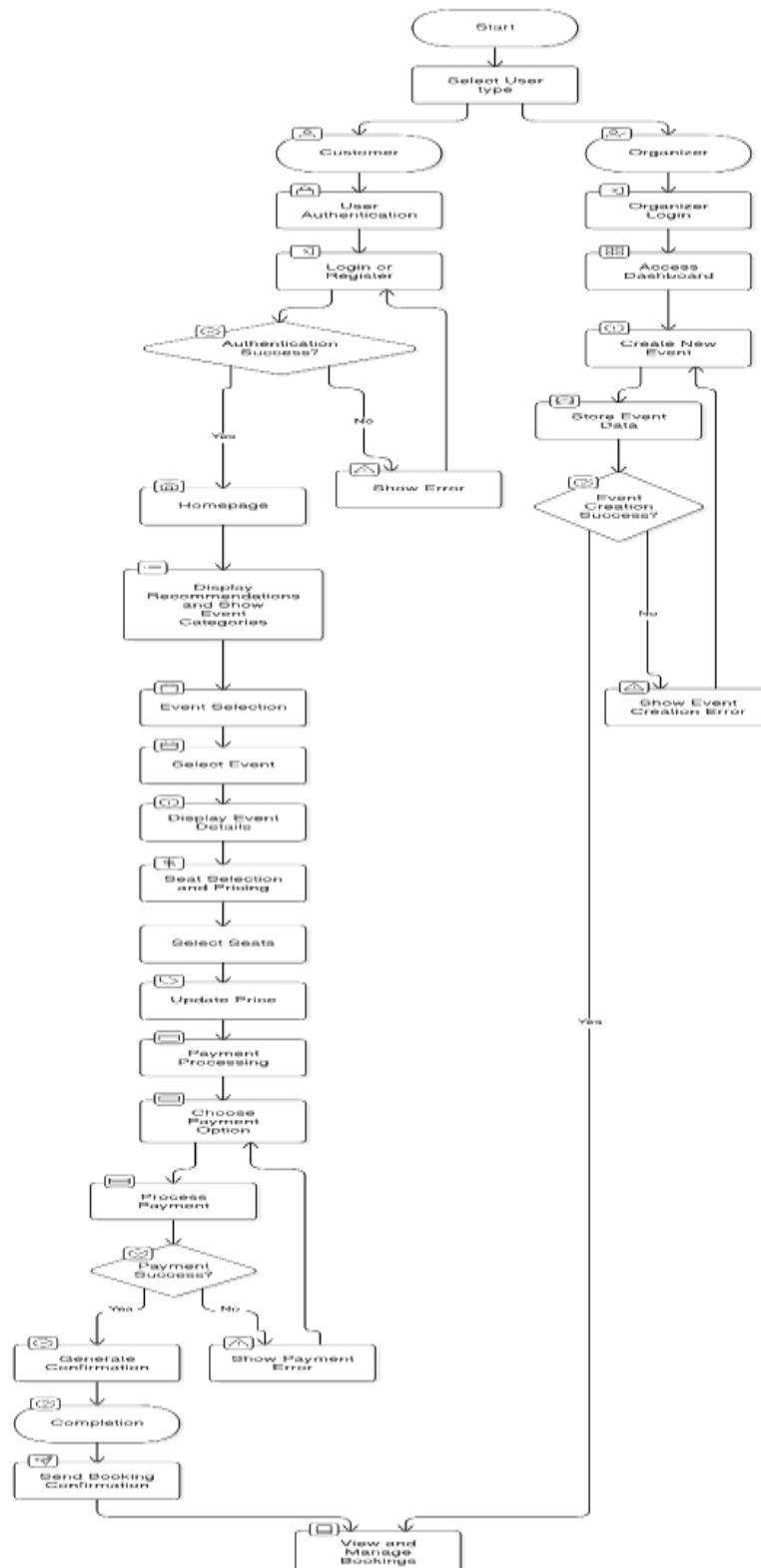
1. **Create New Events:** Input all relevant event data such as title, description, date, time, location, seat structure, and ticket pricing.
2. **Store Event Data:** Once submitted, the data is stored in the backend database.
3. **Check Creation Status:** A success message is shown if event creation is successful, otherwise an error prompt is displayed.

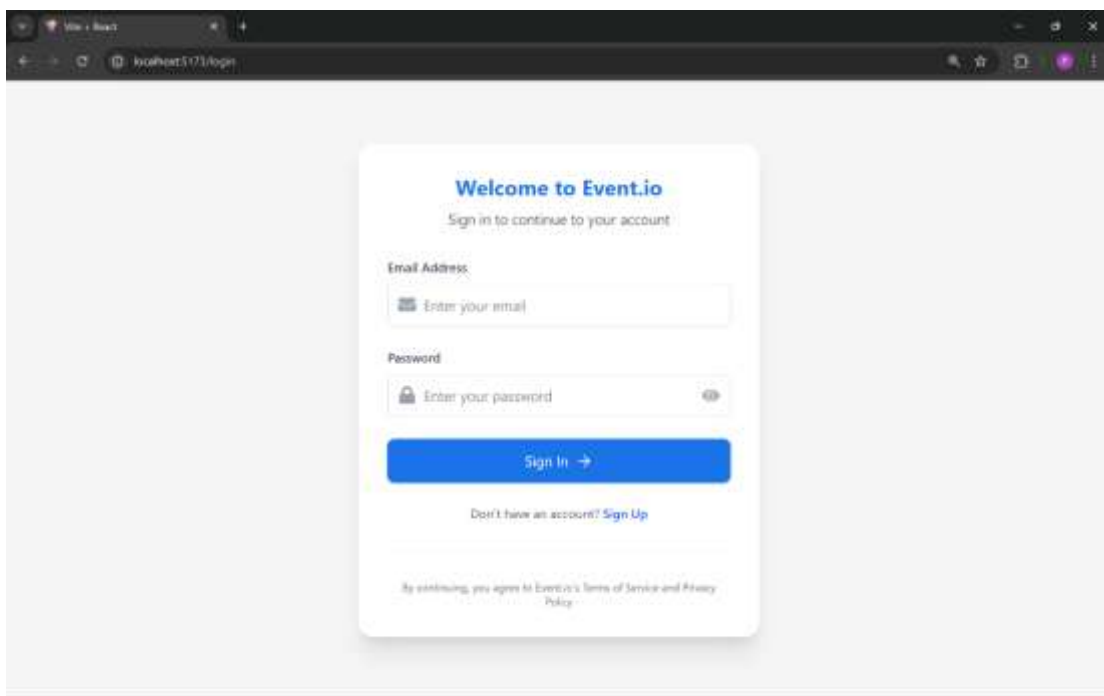
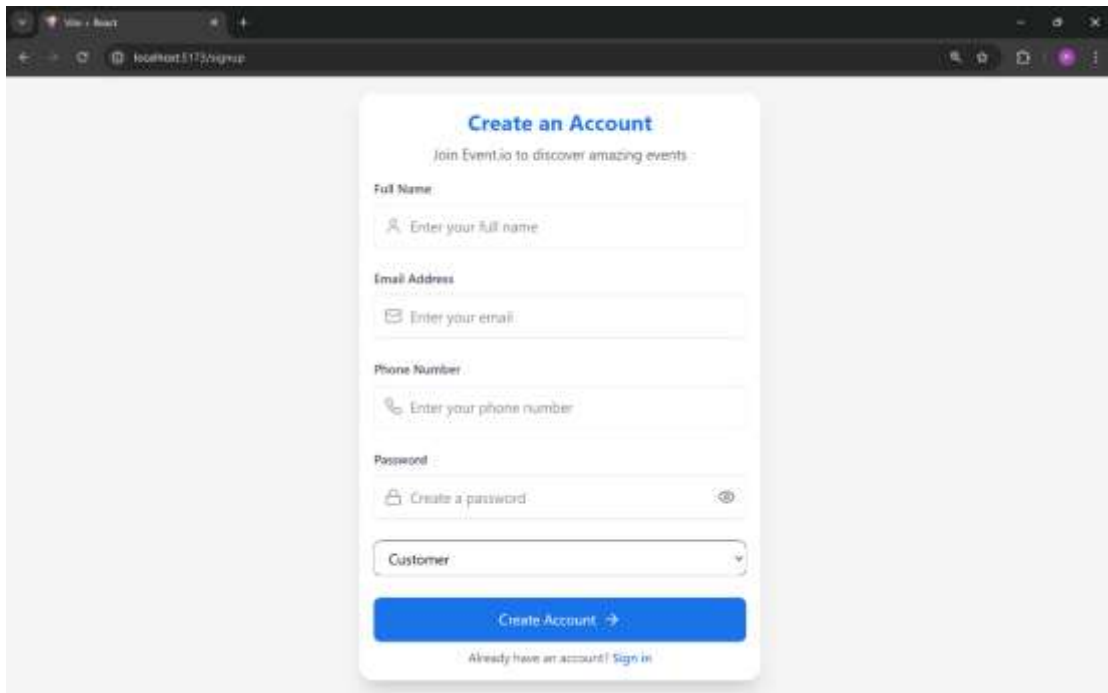
Organizers can also view and manage bookings in real-time, allowing them to track registrations, manage seating capacity, and make adjustments as necessary.

Key Features of the Proposed System

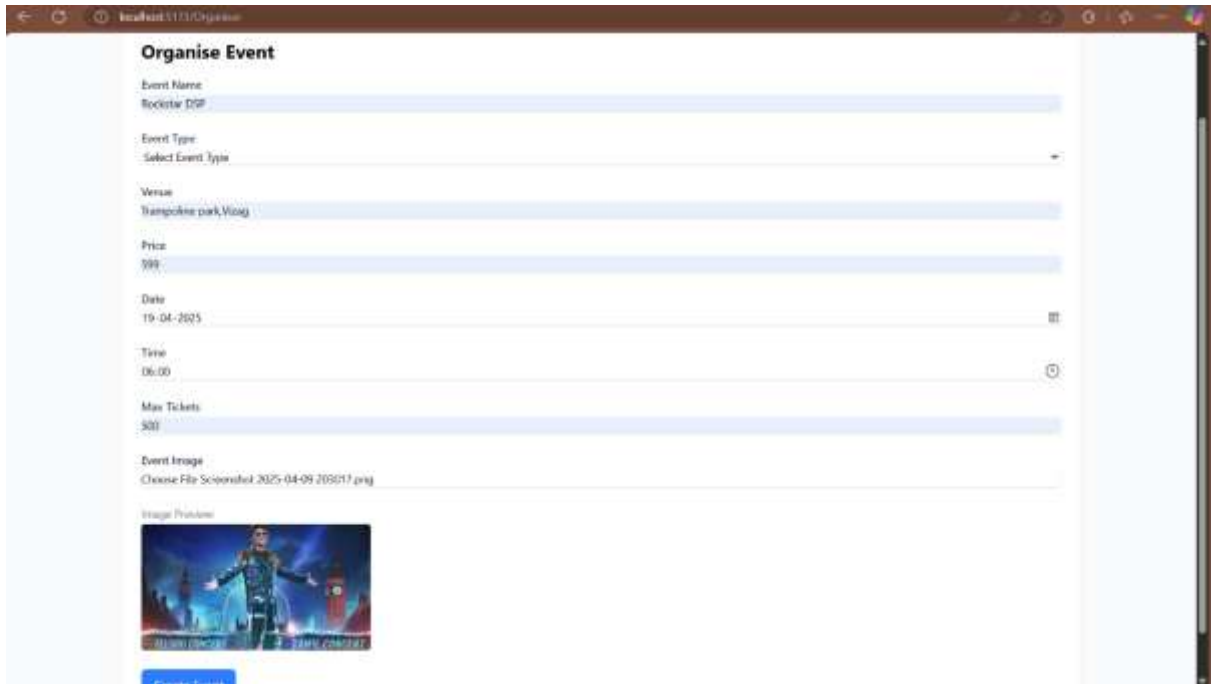
- **Dual Role Architecture:** Clearly separates customer and organizer functionalities.
- **Interactive UI:** Built using PHP and JavaScript for seamless, responsive interaction.

- **Secure Database Integration:** Utilizes MySQL for handling registrations, event data, and transactions.
- **Dynamic Seat Selection & Pricing:** Offers a flexible and transparent booking experience.
- **Real-time Notifications:** Sends automated alerts for bookings, payments, and deadlines.
- **Scalability:** Easily extendable to accommodate multiple events and users simultaneously.
- **Error Handling:** Ensures a smooth experience with appropriate user prompts for all failure points.

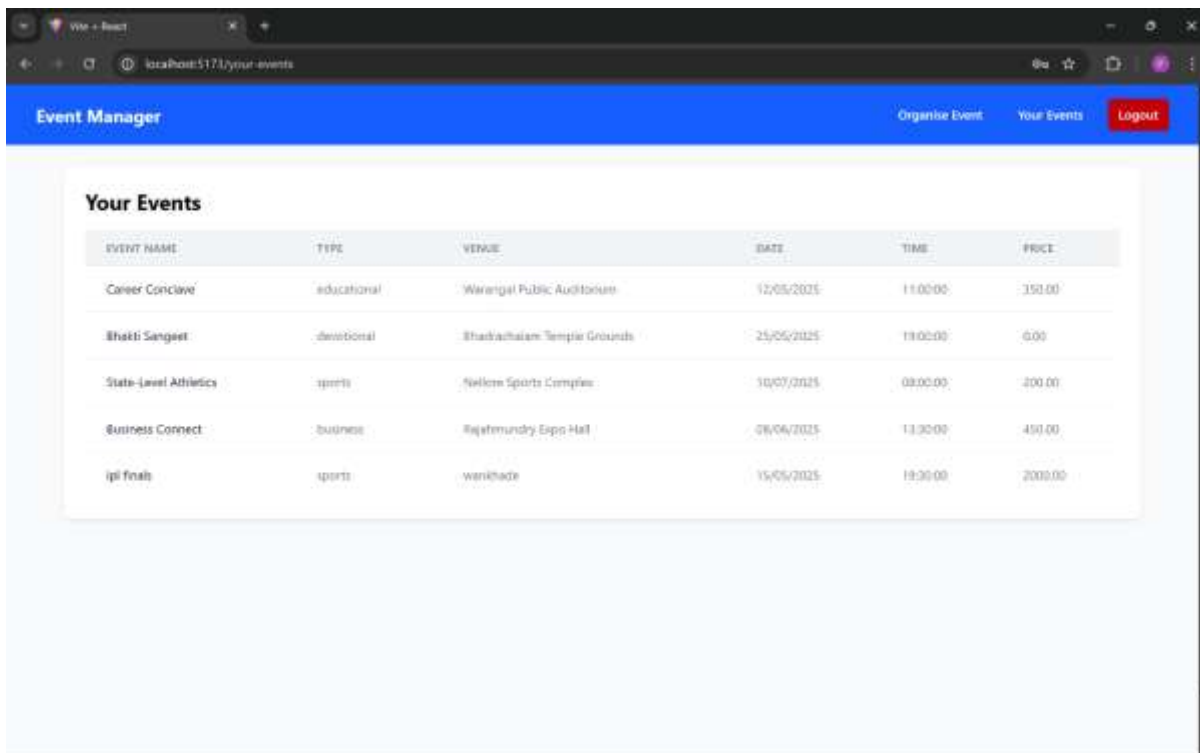




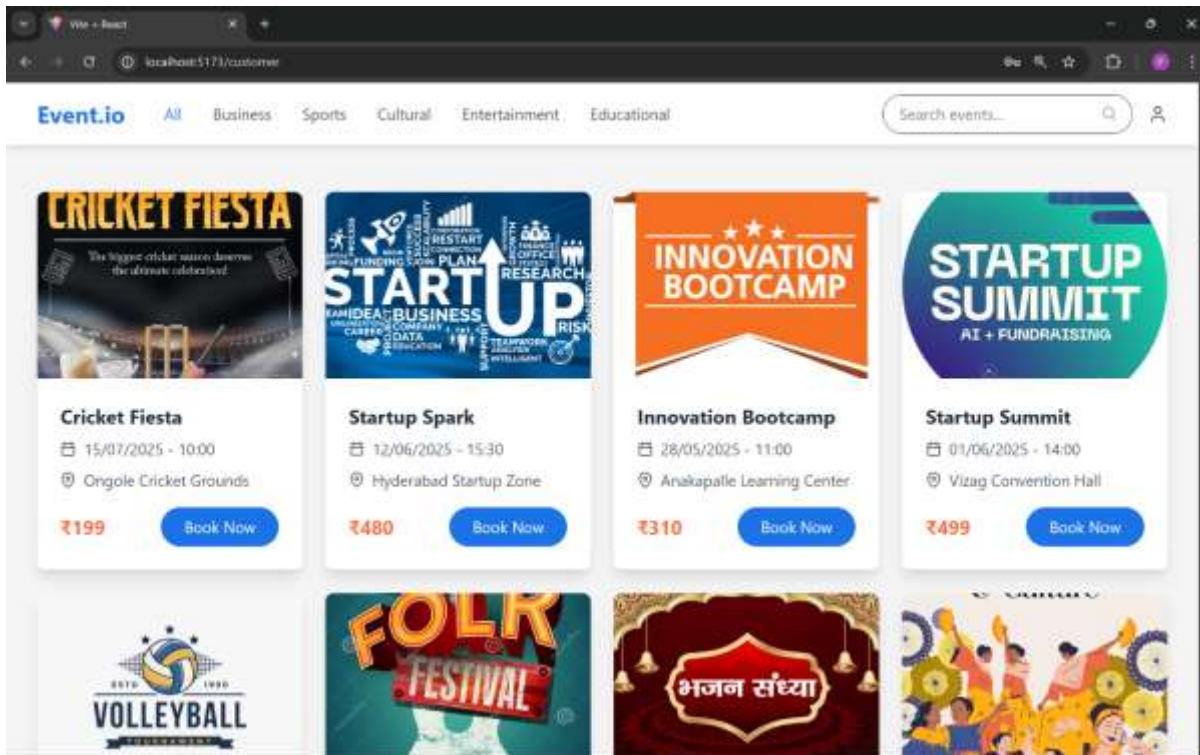
4. RESULTS



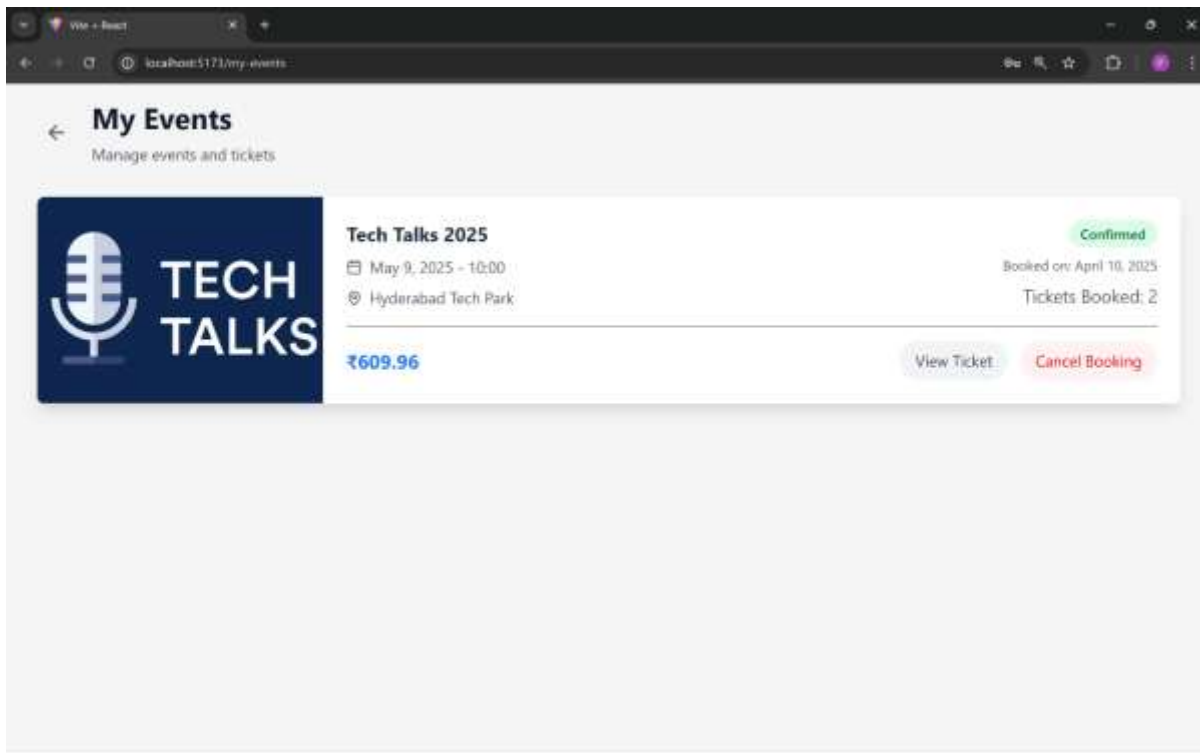
The organiser creates and manages events by filling in important details like event name, event type, venue, price, date, time, maximum tickets, and uploading an event image. After submitting the form, the event is successfully organized and ready for users to view and book tickets.



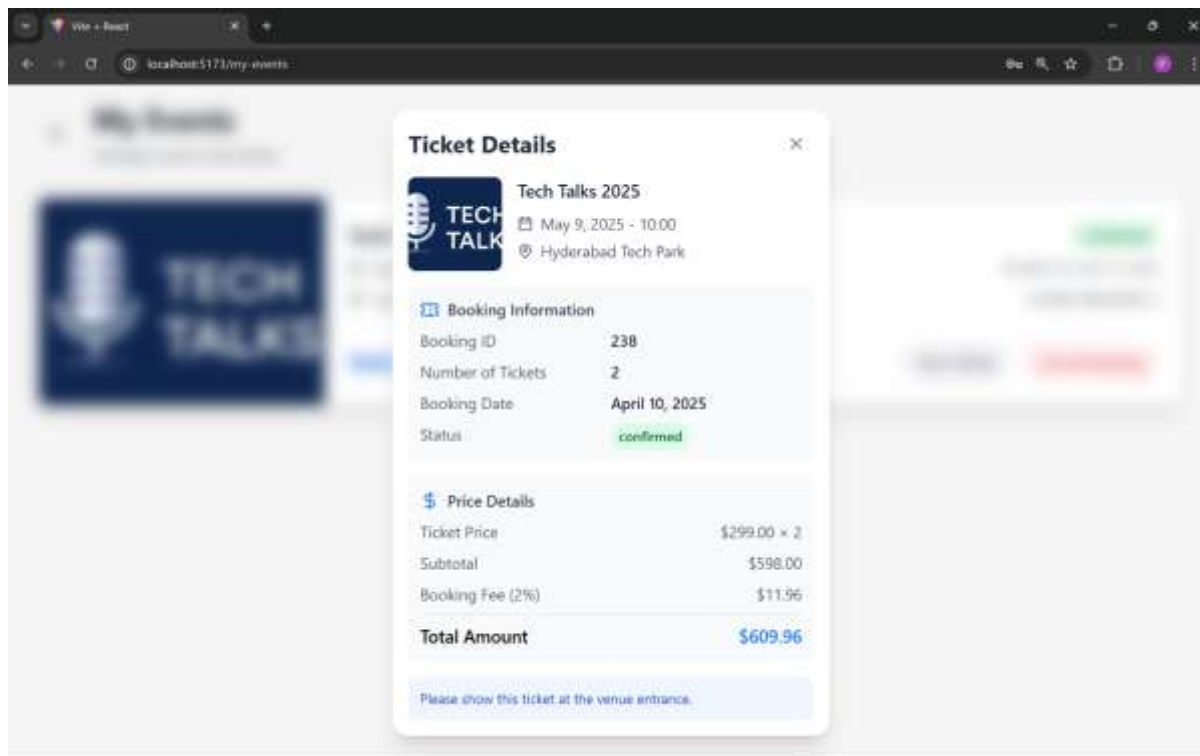
The organiser dashboard displays all the events created by the organiser. It shows the event name, type, venue, date, time, and price in a table format, allowing the organiser to easily view and manage the events they have created.



The customer dashboard displays all available events for customers. It shows the event name, date, time, venue, and price, along with a "Book Now" option, allowing customers to browse and book events easily.



The customer has booked tickets for "Tech Talks 2025." The booking is confirmed, and they can view their tickets or cancel the booking if needed.



The customer has successfully booked tickets for the event "Tech Talks 2025". The booking has been confirmed, and the customer retains the ability to either view their ticket details or cancel the booking if necessary. This provides flexibility and control over their reservation.

5. CONCLUSION

In conclusion, our smart event booking system offers an efficient, user-friendly platform for both event organizers and attendees. By incorporating personalized event recommendations through SVM, utilizing a PostgreSQL backend for secure data management, and designing a responsive interface with React and TailwindCSS, we have created a simple yet effective solution for managing and booking events.

The system streamlines the event lifecycle, from event creation and browsing to seat selection and payment processing, ensuring a seamless experience for all users. This straightforward approach addresses the core needs of event management, offering an intuitive, reliable, and easily scalable platform suitable for various event types.

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