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Smart Campus Event Hub: AI-Based Recommendations with Timetable-Aware Notifications

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Abstract: ***"The Smart Campus Event Hub is designed to enhance student involvement in campus activities through intelligent event management and user-specific recommendations." The system combines user profiles, event data, and timetable analysis to suggest events that align with both individual interests and available time slots. By considering schedule constraints, the platform minimizes conflicts and ensures that recommended events are practically feasible for students to attend. An integrated recommendation module analyzes user preferences and past interactions to deliver relevant suggestions, while an automated notification system provides timely alerts through both in-app messages and email. These notifications are tailored to each user's free time, increasing the likelihood of participation. The platform is developed using Flask, SQLAlchemy, and supporting AI components, ensuring efficient performance and scalability. Evaluation of the system indicates improved event discovery, better utilization of free time, and higher user engagement compared to traditional event management approaches. The proposed solution demonstrates how combining personalization with schedule awareness can significantly enhance the overall campus experience.***

Keywords: Smart Campus, Event Recommendation, Artificial Intelligence, Timetable Analysis, Personalization, Notification System

I. INTRODUCTION

Educational institutions regularly host a wide range of academic, technical, and cultural events that contribute to student learning beyond the classroom. Despite the availability of these opportunities, many students struggle to identify events that are both relevant to their interests and compatible with their schedules. Most existing event platforms simply display lists of upcoming activities, requiring users to manually search and filter information, which can be time-consuming and inefficient. As a result, students often miss valuable events that could support their personal and professional development.

Another key limitation of current systems is the lack of integration with student timetables. Without awareness of academic schedules, event platforms may suggest activities that conflict with classes or other commitments. "This mismatch discourages student from attending events even when they are relevant." In addition, notification systems are typically generic and do not consider user preferences or availability, further limiting their effectiveness.

To address these issues, this work introduces a Smart Campus Event Hub that combines personalization with schedule awareness. The system analyzes user interests, past interactions, and timetable data to generate event recommendations that are both relevant and feasible to attend. By identifying free time slots and aligning them with suitable events, the platform helps students make better use of their available time. The proposed system also incorporates automated notifications and engagement features to keep users informed and motivated. Personalized alerts, along with elements such as rewards and recognition, encourage consistent participation. By bridging the gap between event availability and student accessibility, the system aims to create a more efficient and engaging campus environment.

II. EXISTING SYSTEM

Current campus event management platforms generally provide a basic interface where events are displayed as a simple list without any form of personalization. Students are expected to browse through multiple entries and identify relevant events on their own, often relying on limited filters such as date, category, or location." This makes event discovery slow and less effective for users".

These systems do not take into account individual user preferences, previous participation, or behavioral patterns. As a result, the events shown to users may not align with their interests, reducing the likelihood of engagement.

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Another major limitation is the absence of integration with academic schedules. Since student timetables are not considered, users may encounter frequent clashes between events and their classes, discouraging them from registering.

In addition, notification mechanisms in such systems are either minimal or not tailored to individual users. Alerts are typically generic and lack contextual relevance, which reduces their effectiveness in capturing user attention. Overall, these limitations lead to lower participation rates, inefficient event discovery, and a less engaging user experience.

A. Disadvantages

1) No personalized event suggestions
2) Lack of timetable or schedule awareness
3) High probability of scheduling conflicts
4) Generic or ineffective notification systems
5) Time-consuming manual event exploration

III. PROPOSED SYSTEM (UPDATED WITH AI EMAIL NOTIFICATION)

The Smart Campus Event Hub introduces an intelligent platform that focuses on delivering relevant and timely event recommendations by combining user preferences with schedule awareness. The system begins with a user profile module where students register and provide details such as interests, academic information, and activity preferences. This data serves as the foundation for generating personalized recommendations. A recommendation engine processes user data along with event information to identify activities that match individual interests. Instead of presenting a generic list, the system prioritizes events that are more likely to appeal to each user, reducing the effort required for discovery and improving relevance. A key component of the system is the timetable analysis module. Students can upload their academic schedules, which are analyzed to determine available free time slots throughout the week. The system then compares these free periods with event timings to ensure compatibility. This approach helps in avoiding scheduling conflicts and ensures that suggested events can be realistically attended without interfering with academic responsibilities. The recommendation system uses a content-based filtering approach. It analyzes user interests, preferences, and past interactions to suggest relevant events. The system matches event categories with user profiles and filters them based on available time slots obtained from timetable analysis. This ensures that recommendations are both relevant and feasible. To enhance communication, the platform incorporates an automated notification mechanism. Personalized email alerts are generated by considering both user preferences and identified free time slots. These notifications include event details such as timing, venue, and the corresponding available slot, enabling users to make quick and informed decisions. In addition to email communication, in-app notifications and reminders are provided to keep users updated about upcoming events. The system also integrates gamification features to encourage active participation. Users can earn points, unlock badges, and track their performance on leaderboards based on their involvement in events. This adds a motivational aspect to the platform and encourages regular user activity. Overall, the proposed system combines personalization, timetable awareness, and automated communication to create a more efficient and user-focused event management solution, significantly improving participation and usability compared to conventional approaches.

IV. SYSTEM ARCHITECTURE

The Smart Campus Event Hub is designed using a modular architecture that integrates frontend, backend, database, and intelligent processing components. This structure ensures scalability, efficient data handling, and smooth interaction between system modules.

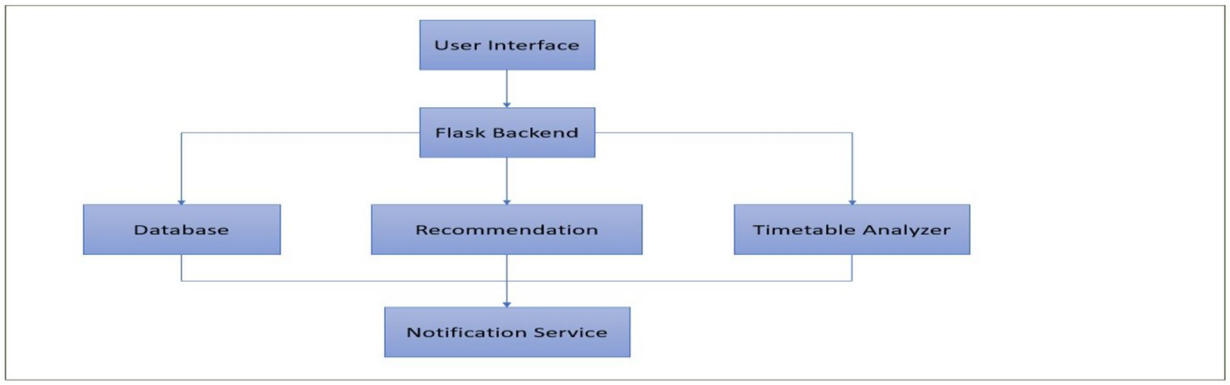

Fig. 1: - System architecture

As illustrated in Fig. 1, the overall architecture consists of four main layers: the user interface, application server, database, and AI-based processing modules. The frontend provides an interactive interface where users can register, view events, upload timetables, and receive recommendations. The backend, implemented using Flask, handles user requests, processes data, and coordinates communication between different components of the system.

The database, managed using SQLAlchemy, stores user profiles, event details, participation records, and timetable data. This structured storage enables efficient retrieval and updating of information required for personalization and scheduling analysis.

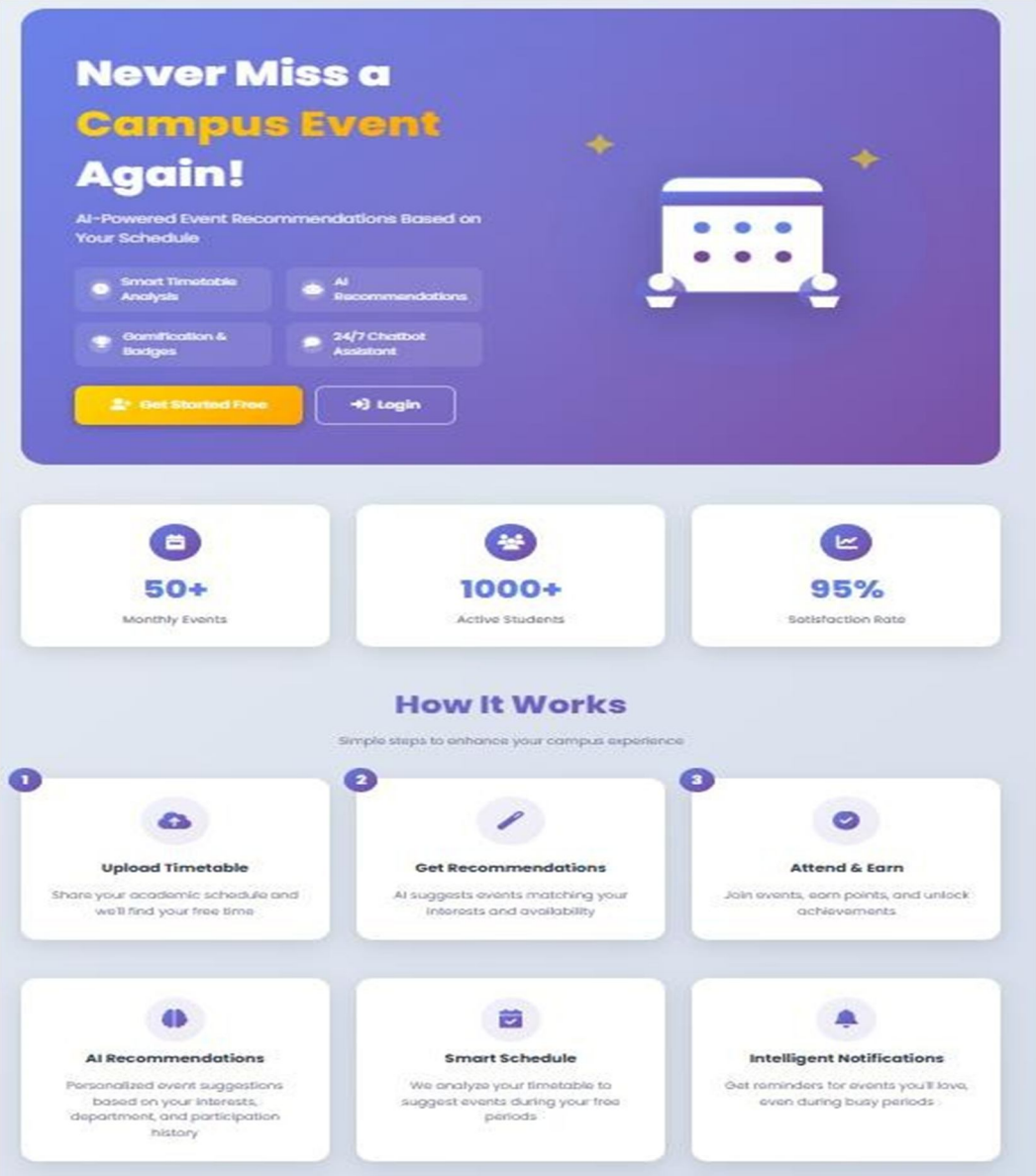

Fig. 2: – User interface page

The AI and logic layer is responsible for generating personalized recommendations and analyzing timetables. It processes user preferences along with event metadata to identify suitable matches. At the same time, the timetable analyzer extracts free time slots from uploaded schedules and verifies whether a user is available during a given event. This combined processing ensures that recommendations are both relevant and feasible.

Fig. 2 shows the user interface of the system, which is designed to be simple and userfriendly. It allows students to easily navigate through event listings, manage their profiles, and view personalized suggestions. The interface plays a key role in enhancing usability and ensuring smooth interaction with the platform.

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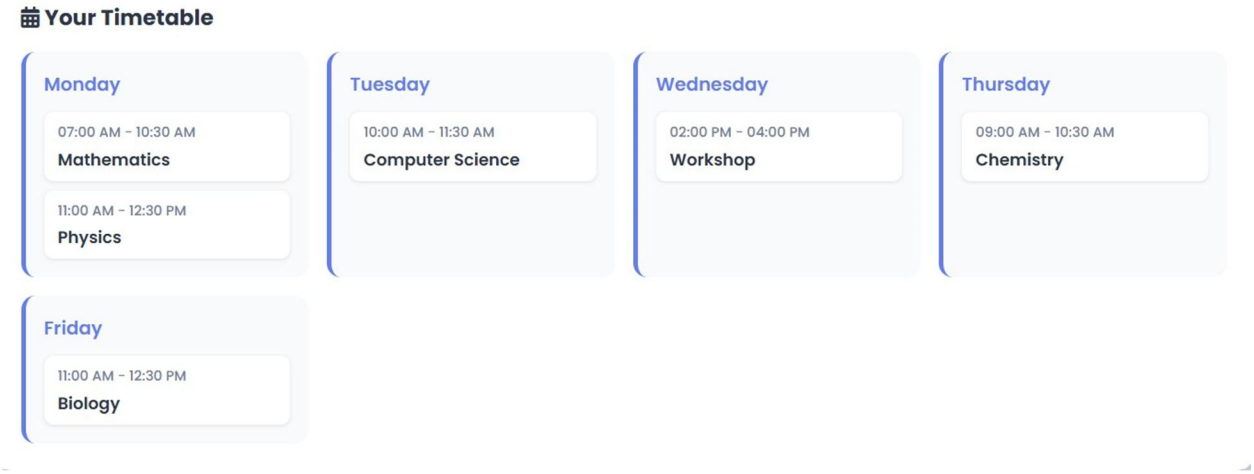

Fig. 3: - Time table analyzer page

Fig. 3 presents the timetable analyzer module, where users can upload or input their schedules. The system processes this data to identify free periods and visually represent availability. This module is essential for avoiding scheduling conflicts and improving the accuracy of event recommendations.

Overall, the architecture enables seamless integration of user data, event information, and intelligent processing, resulting in a responsive and efficient system that enhances both usability and performance.

V. RESULTS AND ANALYSIS

The performance of the Smart Campus Event Hub was evaluated in terms of system efficiency, usability, and its impact on student engagement. The results indicate that the system provides faster and more effective event discovery compared to conventional platforms. By using personalized recommendations, users can easily find relevant events with minimal effort. The integration of timetable analysis helps avoid scheduling conflicts, allowing students to participate without affecting their academic activities.

Operation	Average Response Time
Page loading	~ 20 ms
Registration and login	~ 145 ms
Time table analyzer	~ 150 ms
Recommendation	~200 ms
Email Notification	~100 ms

Table I System Response Times

The system's operational performance was measured by analyzing the response time of key functionalities, as presented in **Table I**. The results show that most core operations, including page loading, user authentication, timetable processing, and recommendation generation, are executed within a few milliseconds. This demonstrates that the system is capable of handling realtime interactions efficiently. Table I highlights that page loading requires approximately 20 ms, while registration and login operations take around 145 ms. The timetable analyzer processes schedules in nearly 150 ms, and the recommendation engine generates results in about 200 ms. Email notifications are delivered in approximately 100 ms, ensuring timely communication with users. These response times indicate that the system maintains a smooth and responsive user experience even during multiple concurrent operations.

The system improves user interaction by delivering timely and relevant event updates. The inclusion of gamification Furthermore, the notification mechanism contributed significantly to increased user elements, such as points and badges, encouraged repeated participation and sustained engagement over time. Compared to traditional systems, the proposed solution demonstrated improved usability, reduced event conflicts, and higher participation rates.

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Overall, the experimental evaluation confirms that the Smart Campus Event Hub effectively combines personalization, schedule awareness, and automation to enhance both system performance and user satisfaction.

VI. CONCLUSION

The Smart Campus Event Hub successfully addresses the limitations of traditional event management systems by integrating artificial intelligence, timetable analysis, and personalized notifications. The system enhances event participation, improves time management, and provides a user-centric experience. By aligning event recommendations with user interests and availability, the platform ensures higher relevance and usability.

Future work can focus on incorporating advanced machine learning models, real-time analytics, and mobile application support to further enhance system capabilities. The proposed solution demonstrates the potential of intelligent systems in transforming campus event management into a more efficient and engaging process.

VII. FUTURE SCOPE

The Smart Campus Event Hub can be further enhanced by integrating more advanced technologies and expanding its functionality to improve user experience and system intelligence. One potential improvement is the adoption of advanced machine learning models such as collaborative filtering and deep learning techniques to generate more accurate and adaptive recommendations based on evolving user behavior. These models can continuously learn from user interactions, feedback, and participation patterns to refine suggestion quality over time. Another important extension is the development of a dedicated mobile application to provide seamless access and real-time notifications. Mobile integration would allow users to receive instant alerts, RSVP to events quickly, and interact with the platform more frequently, thereby increasing overall engagement. The system can also be enhanced by incorporating real-time data processing and analytics. This would enable dynamic updates of event recommendations based on last-minute schedule changes, newly added events, or cancellations. Additionally, integrating calendar synchronization with platforms such as Google Calendar or institutional scheduling systems would further improve timetable accuracy and usability.

Social and collaborative features can be introduced to make the platform more interactive. For instance, users could view events their peers are attending, share recommendations, form groups, or provide ratings and reviews. This would create a communitydriven ecosystem that encourages participation through peer influence.

Furthermore, the inclusion of a feedback-driven recommendation mechanism can help the system understand user satisfaction levels. By collecting explicit feedback (likes, ratings) and implicit behavior (clicks, attendance), the system can continuously optimize its recommendation strategy.

Security and scalability can also be strengthened by implementing cloud-based deployment and advanced authentication mechanisms. This would ensure data protection, system reliability, and the ability to handle a large number of users efficiently.

Overall, these enhancements would transform the Smart Campus Event Hub into a more intelligent, scalable, and user-centric platform capable of delivering a highly personalized and engaging campus experience.

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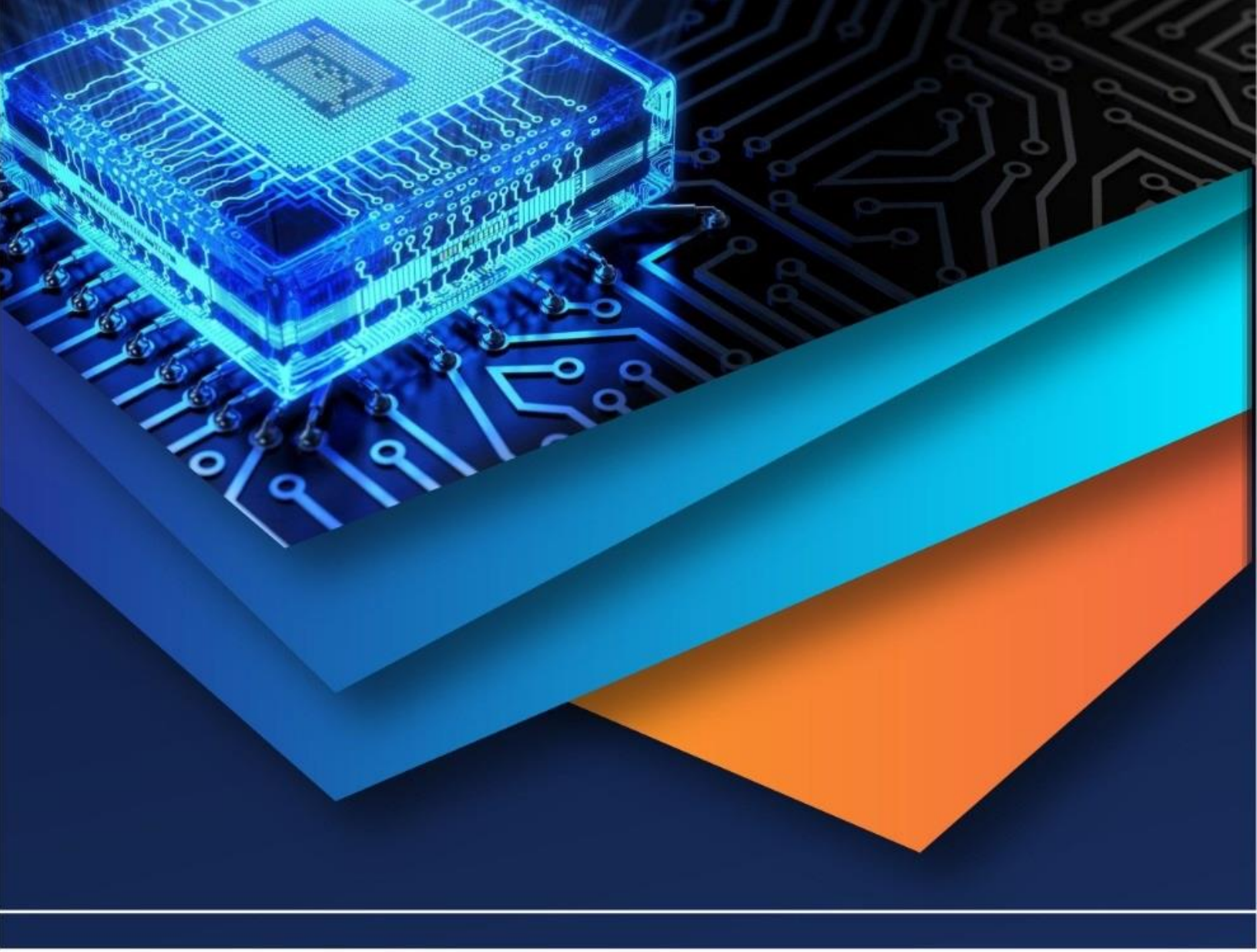

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