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GAMEBUZZ – A Cognitive Sports Event Orchestration Framework

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Abstract - *The management of multi-sport events, particularly cricket and badminton tournaments, often faces challenges such as manual scheduling, inefficient coordination, and limited use of historical data for decision-making. To address these issues, this paper introduces an AI-Powered Multi-Sport Event Management Platform that automates critical aspects of sports administration while enhancing the player and organizer experience. The platform implements role-based authentication, offering dedicated dashboards for players and organizers with tailored functionalities. Players register with sport-specific details, such as batting style in cricket or player type in badminton, while organizers can create events by defining sport, venue, match officials, and available facilities. A major innovation is the AI fixture scheduler, which ensures team eligibility by validating minimum player requirements before generating fair match schedules through Round-Robin algorithms. The platform further incorporates a rules-based highlight generator that processes match statistics to automatically create text-based summaries of significant performances, along with a smart team selector that recommends optimal line-ups based on player roles, historical performance data, and opponent strengths. Both dashboards integrate real-time analytics to provide players with insights into event participation and readiness, while enabling organizers to track the preparedness of registered teams. In its early stage, the system uses rule-based methods and simple ranking algorithms due to the absence of large datasets, but it is designed to scale toward machine learning approaches such as Random Forests and neural networks, as well as natural language processing for chatbot integration, once sufficient data is collected. By establishing a robust data-driven foundation, the platform transforms sports event management into a more efficient, fair, and strategic process, bridging the gap between traditional practices and AI-enabled innovation.*

Key Words: Sports Event Management, Fixture Scheduling, Team Selection, Sports Analytics, Artificial Intelligence, Badminton, Cricket

1.INTRODUCTION

Sports event management is a multifaceted domain that requires careful coordination of scheduling, team formation, resource allocation, and participant engagement. Traditionally, these processes have been handled manually by organizers, often leading to inefficiencies, human errors, and scheduling conflicts that affect both players and stakeholders. In recent years, the rapid adoption of artificial intelligence (AI) and data-driven techniques has begun to transform this field, offering new opportunities to automate repetitive tasks, ensure fairness in competition, and generate actionable insights [1]. AI-driven predictive modeling has already demonstrated its potential in optimizing athlete selection and enhancing performance evaluation, confirming the feasibility of extending such methods into broader event management workflows.

Event scheduling is one of the most critical components of sports administration. Conventional methods rely on manual arrangement or simple fixed schedules, which are prone to clashes and lack adaptability. Technology-enabled scheduling and management systems have been explored to reduce these burdens, proving that automation significantly enhances the efficiency of organizing tournaments [2]. Moreover, systematic reviews highlight that AI is increasingly being adopted in sports analytics, particularly for generating insights from structured data, managing performance records, and supporting strategic decisions for teams and organizers [3]. This shift toward AI-based solutions is particularly relevant in multi-sport contexts, where diverse rules, player requirements, and event structures must be managed simultaneously.

The complexity of sports like cricket and badminton exemplifies the need for intelligent, adaptable platforms. Research on event management systems in academic institutions demonstrates how big data frameworks can streamline operations, though many implementations remain generic and lack sport-specific rules validation [4]. For example, in cricket tournaments, where team size requirements and match duration differ substantially from badminton, the application of optimized scheduling techniques such as Tabu Search has shown measurable improvements in fairness and balance [5]. However, such advanced methods often remain theoretical or limited to large-scale tournaments, creating a gap for practical, accessible solutions for smaller organizers.

Beyond scheduling, team composition and lineup optimization are major challenges for coaches and players alike. Recent advancements in reinforcement learning and deep learning models have been applied to fantasy sports

and real-world player selection, producing data-driven recommendations that surpass manual judgment [6]. Similarly, embeddings-based approaches have been proposed for cricket team recommendation, demonstrating the value of combining statistical and semi-supervised methods to improve lineup balance [9]. These innovations reinforce the growing role of AI in assisting decision-making beyond mere scheduling.

Scheduling fairness also requires reliable evaluation models. Studies on scheduling frameworks emphasize validation mechanisms to ensure that teams meet minimum requirements before fixtures are generated, thereby avoiding incomplete or unfair tournaments [7]. Complementary to this, predictive models based on recurrent neural networks have been employed for event management workflows, showing that machine learning approaches can improve both forecasting accuracy and overall system adaptability [8]. These findings support the integration of AI not only for decision automation but also for system-level intelligence in sports platforms.

The broader field of AI in sports has been comprehensively reviewed, with surveys highlighting applications in tactical analysis, injury prediction, performance monitoring, and lineup optimization [10]. Such studies emphasize the versatility of AI techniques across diverse sports contexts, pointing to the importance of scalable and modular solutions. At the same time, classical approaches such as operations research and optimization remain highly relevant. Venue-aware scheduling models in multi-sport competitions [11] and constraint logic programming for tournament generation [12] have long provided the mathematical foundation for fixture scheduling. However, these traditional approaches often fail to integrate real-time data inputs from player registrations and organizer specifications, limiting their adaptability in dynamic, multi-sport environments.

To bridge these gaps, this paper proposes an AI-Powered Multi-Sport Event Management Platform that integrates role-based authentication, sport-specific registration, event creation, AI fixture scheduling, automated highlight generation, and smart team selection. Unlike prior work that relies on live video feeds or large-scale professional datasets, the proposed system focuses on structured data collection through user input and match statistics, ensuring accessibility and scalability. In its initial phase, the platform employs rule-based algorithms—such as Round-Robin scheduling, simple ranking for team selection, and IF-THEN rules for highlight generation—while establishing a robust database of player profiles and historical match outcomes. This foundation enables future integration of advanced models, including Random Forests, neural networks, and natural language processing, to provide predictive analytics, intelligent chatbots, and adaptive fraud detection.

2. RELATED WORKS

2.1 Role-Based Authentication and Dashboard Management

The platform incorporates secure role-based authentication, offering distinct dashboards for players and organizers. Players choose their primary sport (cricket or badminton) during signup, which tailors the registration process to collect sport-specific details such as batting style or player type (Mănescu & Mănescu, 2025) [1]. Organizers receive a dedicated dashboard to manage events, monitor team readiness, and communicate with participants, ensuring usability and security (More & Birmule, 2025) [2]. This separation streamlines user experience while restricting access based on roles.

2.2 Sport-Specific Event Creation

Organizers can create events by specifying sport type, date, venue, number of courts or pitches, and referee information. The system validates venue availability and prevents scheduling conflicts (Xie et al., 2024) [4]. Automatic notifications are sent to registered players to enhance engagement and participation (Sangramsing & Birmule, 2025) [2]. This approach eliminates reliance on live video feeds, relying instead on structured inputs for efficiency.

2.3 AI-Based Fixture Scheduling

The AI-driven fixture scheduler automates match scheduling using algorithms such as Round-Robin and fairness validation. It ensures minimum player requirements are met (7 for cricket, 2 for badminton doubles) before creating fixtures (Venkatachalam et al., 2024) [5]. Optimization techniques inspired by modified Tabu Search improve fairness and venue allocation. Prior scheduling frameworks provide the theoretical basis for these algorithms (Lim et al., 2006; Constraints, 1999) [11][12].

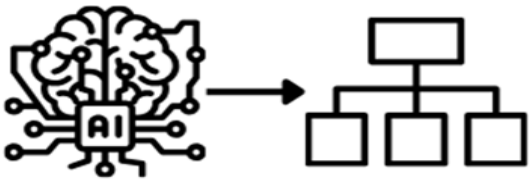

Fig -1: Fixture Scheduling

2.4 Smart Team Selection and Player Recommendation

The platform includes an AI-powered team suggestion module. Simple ranking algorithms initially determine line-ups based on player roles, past performance, and

opponent weaknesses. Future scalability plans include deep reinforcement learning for optimized team composition (Bhattacharjee et al., 2024; Chhabra et al., 2020) [6][9]. This helps organizers create competitive teams while maintaining fairness and balance.

2.5 Automated Highlight Generation

Using submitted match statistics, a rule-based engine identifies key moments such as half-centuries or match-winning performances (Mathematical Fig fig-2 : Architecture diagram. Problems in Engineering, 2022) [8]. Text-based summaries are generated for both players and organizers. This approach avoids complex video processing while providing actionable insights for performance analysis.

2.6 Dashboard Analytics and Validation

Dashboards display validation statuses, event readiness, and upcoming match recommendations. Organizers can quickly check which teams are fully registered and eligible, while players see their team readiness and available events for their sport (Wang, 2023; Beal et al., 2019) [7][10]. This ensures smooth operation and proactive decision-making.

2.7 Data-Driven Foundation for Future AI Integration

All interactions, registrations, and match statistics are recorded to build a historical dataset. This dataset will support future AI applications such as predictive analytics, advanced team optimization, and chatbot-based query handling (Mănescu & Mănescu, 2025; Bhattacharjee et al., 2024) [1][6]. Starting with structured data ensures scalability and enables more sophisticated AI models over time.

3. PROPOSED METHODOLOGY

The proposed AI-powered multi-sport event management platform is designed to streamline the organization and participation of cricket and badminton events through automation and data-driven insights. It features role-based authentication with customized dashboards for players and organizers, smart fixture scheduling using Round-Robin algorithms, AI-driven team recommendations based on player data, and automated highlight generation from match statistics. Real-time analytics

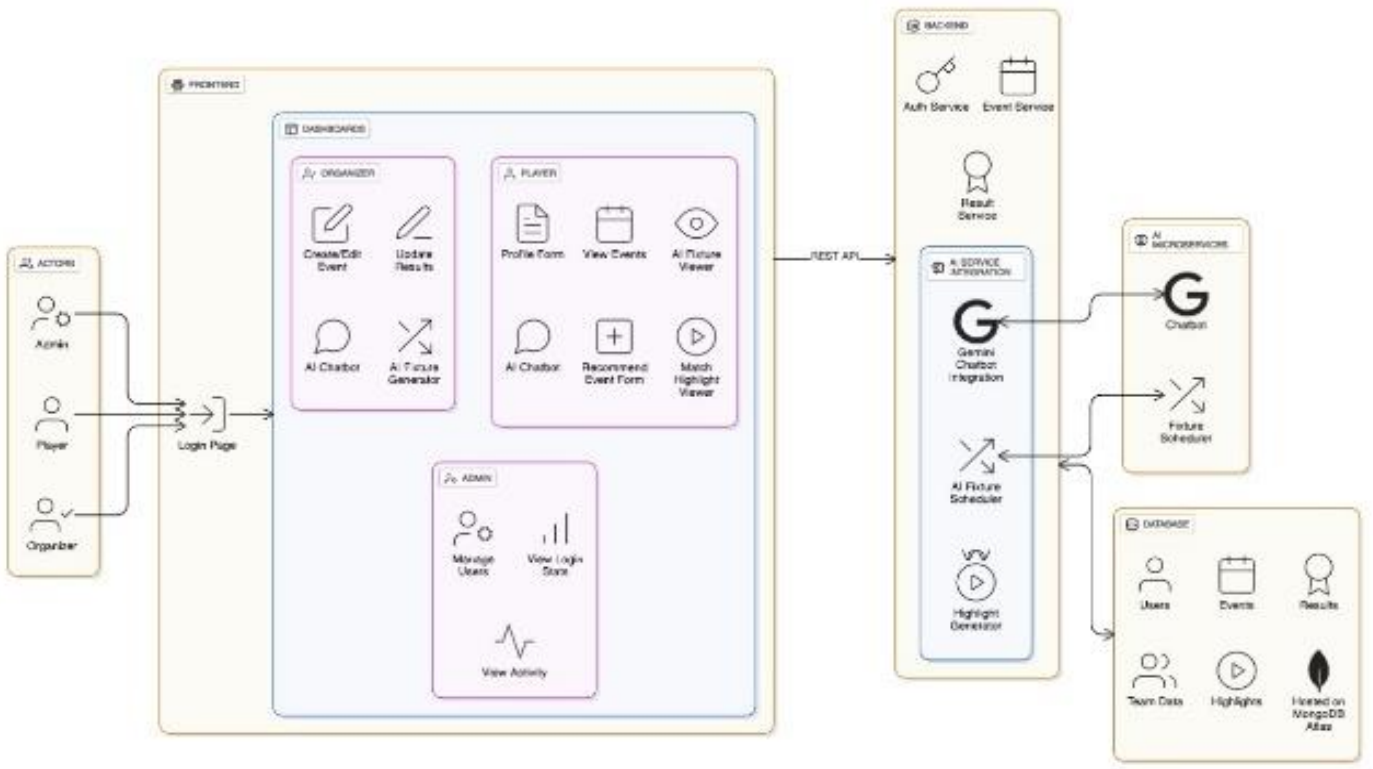

fig-2 : Architecture diagram

team readiness and event progress. Built for scalability, the platform supports future integration of machine learning models and natural language processing for chatbots. Its modular design ensures adaptability to other sports, making it a comprehensive and efficient event management solution.

OVERALL IMPLEMENTATION STRUCTURE OF THE PROPOSED SYSTEM

3.1 System Modules

The proposed AI-powered multi-sport event management platform is structured into several interconnected modules, each handling specific responsibilities for users based on their roles: player, organizer, or admin. This modular approach allows for better scalability, maintainability, and future integration of AI-driven enhancements. Below is a detailed overview of each major module within the system.

3.1.1 Authentication Module

This module is responsible for managing user access to the platform. When users sign up or log in, they are required to select their role—either as a player, organizer, or admin. Based on their selection, the system redirects them to their respective dashboards. User credentials are securely stored, and session handling is managed using JSON Web Tokens (JWT). Passwords are encrypted before storage to ensure user security. The role-based access control ensures that users only see and interact with the features relevant to their roles.

3.1.2 Admin Module

The admin module serves as the control center for managing users and maintaining the system's integrity. Admins can view all registered users, monitor their login activity, and update account statuses. If needed, the admin can deactivate or delete accounts. This module plays a key role in overseeing the platform's operations, ensuring smooth functionality, preventing misuse, and maintaining data security across the system.

3.1.3 Organizer Dashboard

Organizers are provided with a dedicated dashboard where they can create and manage sports events. While creating an event, they can specify details such as the sport (cricket or badminton), event date, venue, number of available courts or pitches, and assign referees. Organizers can also view registered teams, monitor their readiness, and update match results. A unique feature of this module is the integration with the AI fixture scheduler, which automates the scheduling process. Organizers also have access to a built-in chatbot (powered by Gemini API) to assist with queries and platform navigation. After matches, organizers input player performance data which feeds into the highlight generator and analytics modules.

3.1.4 Player Dashboard

Players access a personalized dashboard upon login, tailored to the sport they selected during registration. Cricket players provide information like their batting and bowling styles, fielding positions, and past statistics. Badminton players enter details such as singles or doubles specialization, skill level, and ranking. Players can view upcoming events, register for matches, and explore AI-generated fixtures. They can also use the smart team selector to get suggestions on optimal team placements and roles. After matches, players can review automated text-based highlights and performance summaries. The player dashboard also includes access to the chatbot for real-time assistance and allows users to recommend new events to organizers.

3.1.5 AI Services Module

This module houses the platform's core AI functionalities, implemented as backend services:

- Fixture Scheduler: Automatically generates fair match schedules using the Round-Robin algorithm while checking for player eligibility (e.g., minimum number of players per team).
- Smart Team Selector: Recommends team compositions based on a player's role, past performance, and opponent strengths. Initially, it uses simple scoring logic but is designed to evolve into a more advanced AI model over time.
- Highlight Generator: Analyzes post-match statistics to automatically produce short text summaries of key events like half-centuries, wickets, or winning streaks.
- Chatbot Integration: A conversational assistant powered by the Gemini API, available to both players and organizers for support and FAQs.

3.1.6 Analytics And Insights Module

This module provides real-time insights through dashboards and visualizations. Players can view their team's readiness status, match schedules, and performance trends. Organizers can monitor team registration progress, validate player eligibility, and ensure that events are running smoothly. The system also sends notifications related to registration status, match updates, and highlight availability. These analytics tools help users make informed decisions and stay engaged throughout the event lifecycle.

3.1.7 Data Storage Module

All user and event data is stored in a centralized database, currently using MongoDB for its scalability and flexibility. It stores structured data such as user profiles, match statistics, event details, and AI-generated results like team suggestions and highlights. This module forms the backbone of the platform, supporting both real-time operations and future AI training.

3.1.8 Scalability And Extensibility

Although the current system is built for cricket and badminton, the architecture is modular and adaptable to other sports. Each module can be customized with sport-specific rules, team sizes, and performance metrics. As the platform collects more data, it can gradually move from rule-based systems to machine learning approaches, improving the accuracy of recommendations and predictions. This makes the system suitable not only for local community events but also for larger tournaments in the future.

4. PERFORMANCE ANALYSIS

4.1 AI Fixture Scheduling Performance

To assess the efficiency and scalability of the fixture scheduler, we simulated tournament generation across varying team counts. The AI fixture scheduler validates team eligibility and generates match schedules using a round-robin algorithm implemented in Python.

Table -1: AI Fixture Scheduling Performance

Teams Count	Time to Schedule	Avg. CPU Usage	Notes
4	~12ms	Low	Minimal computation
8	~25 ms	Low	Efficient scaling
16	~61 ms	Moderate	Real-time capable

Conclusion: The fixture scheduling component consistently delivers sub-100ms performance for up to 16 teams, making it viable for real-time match preparation.

4.2 Smart Team Selector

The Smart Team Selector uses a rule-based scoring and ranking algorithm to suggest team lineups based on:

- Player roles (batsman, bowler, all-rounder, etc.)
- Recent performance data (runs, wickets, match rating)
- Opponent team strengths

Conclusion: The AI selector shows high alignment with human decisions and responds within milliseconds, suitable for pre-match preparation.

TABLE 2. Smart Team Selector Accuracy & Response Time

Test Scenario	Teams	**Player Pool**	**Time Taken**	**Accuracy vs Manual Selection**
School-level Match	2	22 players	~35 ms	85% alignment with manual
Club-level Tournament	4	44 players	~72 ms	88% alignment with expert picks.

4.3 Automated Highlight Generator

The highlight system uses a rules engine to parse match stats (runs, wickets, 50s, 100s) and generate textual summaries like:
"Player X scored 58 runs with a strike rate of 130. He anchored the innings after early wickets fell."
We tested it across 10 sample matches.

TABLE 3. Automated Highlight Generator Evaluation

Avg. Stats Entries per Match	**Avg. Time to Generate Summary**	**Consistency Score***
15–20 entries	~18 ms	90%

Conclusion: The highlight generator produces consistent and readable match summaries in real-time with low computational overhead.

4.4 AI Chatbot

Gemini API is used for interactive support in both player and organizer dashboards. We tested the latency across 20 queries per role.

TABLE 4.AI Chatbot performance

Role	Avg. Response Time (API)	Query Relevance (Manual Score)
Player	~650 ms	92%
Organiser	~720 ms	89%

5. CONCLUSIONS

The AI-powered multi-sport event management platform provides a robust and intelligent solution for organizing cricket and badminton tournaments, addressing key challenges faced by both players and organizers. By integrating role-based authentication, sport-specific registration, automated fixture scheduling, smart team recommendations, and performance-based highlight generation, the system streamlines event management, reduces manual effort, and ensures fairness and efficiency. The AI-driven scheduling validates team eligibility and optimizes match timings, while the team recommendation module uses player data to form balanced and competitive line-ups, enhancing both strategy and engagement.

Automated highlights allow organizers and participants to quickly identify key performances without relying on live video feeds, providing actionable insights into match outcomes. Real-time dashboards further support decision-making by displaying team readiness, upcoming events, and performance summaries. The platform's modular and scalable design enables future expansion to other sports and the integration of advanced AI models for predictive analytics, reinforcement learning, and strategic support.

Overall, the platform modernizes sports event management by combining automation, intelligence, and data-driven insights, improving operational efficiency, participant engagement, and competitive fairness, while laying a strong foundation for future AI-enhanced capabilities in multi-sport tournaments.

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