

AI IN SPORTS

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AI is used widely in sports. In refereeing, AI increases transparency and fan trust by providing data-driven evidence for each call, helping to explain the reasoning behind every decision and making the process clearer for everyone. It is also used for referees' training and development. AI isn't just useful during games. It can also transform how referees are trained. By analyzing thousands of game scenarios, AI can help officials review their performance, identify improvement areas, and simulate difficult game situations. This targeted training can lead to better officiating and fewer mistakes on the field. Additionally, they use enhanced VAR video assistant referees. Fans, players, and coaches often feel frustrated by long delays that disrupt the game flow. AI has the potential to streamline this process by automatically highlighting key moments for review and providing instant recommendations to VAR officials.¹ For instance, AI can flag potential fouls, handballs, or offside situations by analyzing video feeds in real-time, allowing VAR teams to focus only on the most critical footage. This reduces the time spent on reviews and helps maintain the rhythm of the game. Also, it can help with the analysis of the game. AI systems provide comprehensive game analytics, helping referees understand game dynamics better.²

The National Basketball Association (NBA) uses AI to help with players' health and injury prevention. Injury prevention and players' health management are critical applications of AI in basketball. The Los Angeles Lakers use predictive analytics to anticipate potential injuries. By analyzing player data such as training intensity, game workload, and even sleep patterns. AI systems can flag possible injury risks, enabling teams to manage player health proactively. In scouting and recruitment, Philadelphia, known for its data-centric approach, uses AI to analyze potential recruits. By evaluating players across various leagues and competitions. AI helps in identifying talent that might be overlooked through traditional scouting methods. Teams like the Golden State Warriors and the Toronto Raptors have been pioneers of using AI in data analytics- using complex algorithms to analyze game footage and player statistics. This data-driven approach enables a deeper understanding of player strengths, weaknesses, and how they mesh as a team. For instance, the Toronto Raptors partnered with IBM (International Business Machines) to use its Watson AI to analyze tons of data points, ranging from player shooting percentages to their effectiveness in specific game situations.³ This level of analysis helps coaches make informed decisions on player rotations and game strategies. Also, beyond the court, in fan engagement, AI is changing how fans interact with the game. The NBA app, from the NBA, showed off a new generative AI tool, Gen AI, that promises to personalize the live game-viewing experience for fans watching on digital platforms and offers personalized content, including highlights, player statistics, and even predicting game outcomes. NB-AI is a voice-activated assistant that analyzes live video in real time to answer fan questions or to transform footage into something entirely new by interpreting user commands.⁴ NB-AI can create something entirely new

¹ Jones, Andrew. "Transforming VAR and Refereeing with AI: The Next Evolution in Sports Officiating." *LinkedIn*, 12 Nov. 2024, www.linkedin.com/pulse/transforming-var-refereeing-ai-next-evolution-sports-officiating-qyptc. Accessed 27 Feb. 2025.

² "The Use of AI in Sports and Refereeing." *REFR Sports*, 28 Jan. 2024 www.refrsports.com/blog/ai-used-as-sports-referees. Accessed 27 Feb. 2025.

³ "How AI Is Revolutionizing the Game of Basketball." *Forbes*, www.forbes.com/. Accessed 27 Feb. 2025.

⁴ Mccaskill, Steve. "NBA Shows off 'NB-AI' Generative AI Tool at 2024 All-Star Game." *SportsPro*, 19 Feb. 2024, www.sportspro.com/news/nba-nb-ai-generative-ai-tech-all-star-game/. Accessed 27 Feb. 2025

rather than just analyzing already available data to respond to queries or make predictions, which makes it an example of Gen AI rather than conventional AI. This level of personalization enhances the fan experience, making them feel more connected to their favorite teams and players. On the team side, the Sacramento Kings, renowned for their innovative use of technology, employed AI to enhance fan experiences in their state-of-the-art Golden 1 Center, offering a glimpse into the future of live sports entertainment. In marketing, on the business front, AI is instrumental in optimizing marketing strategies and ticket sales. Teams use AI algorithms to analyze fan behavior and preferences, allowing them to tailor marketing campaigns and enhance fan engagement. But the most exciting aspect of AI in basketball is the synergy between humans and machines. Coaches and players are not being replaced, they're being augmented. AI provides them with insights and recommendations. However, the final decision still lies in the hands of human experts.

Major League Baseball (MLB) uses AI in injury predictions and prevention. Injuries, especially to pitchers, can be costly for teams. With AI, medical staff and coaches can assess patterns that might signal injury risks, such as changes in release point, declining velocity, or shoulder strain. If a pitcher shows signs of fatigue or stress, coaches can modify his schedule or even adjust his pitch repertoire. In customized training programs, AI-driven wearable technology tracks player metrics, from heart rate variability to muscle recovery times, providing personalized insights for optimizing training and recovery. For instance, Whoop, a popular wearable among athletes, tracks sleep quality, strain, and recovery, helping players and trainers build data-informed routines. This real-time monitoring enhances game readiness, ensuring players are at their peak on game day. In AI analytics, AI models analyze opposing batters' tendencies, predicting the types of pitches they struggle with based on factors such as swing path, plate coverage, and historical performance against similar pitches. Coaches use these insights to call pitches that maximize strikeout potential while minimizing hit probability. And defensive shifts, where fielders position themselves based on a batter's tendencies, have become routine. AI-driven analytics can reveal a batter's likelihood to hit to specific areas of the field, allowing managers to position players for optimal defensive coverage. In decision support, AI platforms can process and interpret game data in real-time, allowing coaches to make data-informed decisions mid-game. Real-time decision support helps managers react quickly to unfolding game situations. In addition, AI is utilized in biomechanical analysis, where advanced models assess player movements and biomechanics, monitoring every aspect of a pitcher's throw or a batter's swing. Systems like KinaTrax use computer vision to track each player's body in 3D, identifying subtle motions that can reveal inefficiencies or risks of injury.⁵ Teams use this data to refine player mechanics, enhancing performance while minimizing strain on muscles and joints. Virtual and augmented reality is used in MLB. MLB is experimenting with virtual and augmented reality experiences that allow fans to "attend" games from anywhere or relive famous plays. With VR headsets, fans can experience live-action simulations, complete with real-time AI-driven data overlays, putting them at the center of the action.

In performance analysis, Sportlogia, an Israeli tech firm, introduced an AI-powered tool capable of analyzing player actions in real-time. The software utilizes computer vision and machine learning to understand and predict in-game scenarios. In a recent Premier League season, the software helped teams increase their goal-scoring by an average of 15%, a striking testament to the power of AI-enabled analysis. Firms such as WSC Sports have pioneered the development of AI algorithms capable of efficiently navigating through vast datasets to provide in-depth analyses of game tactics

⁵ Gibson, E.D. "AI is Transforming Major League Baseball" *Medium*, Nov. 2024, deconch30.medium.com/ai-is-transforming-major-league-baseball-1161f96ab16d. Accessed 27 Feb. 2025.

and player capabilities. A recent report from Deloitte in 2023 highlights that AI's utilization in football's big data analytics has surged by more than 30% within the last five years. Also, Second Spectrum, which develops a gaming machine learning software to revolutionize sports through AI, uses AI for NBA teams such as the Golden State Warriors and the Cleveland Cavaliers to analyze the quality of shots and the biomechanics behind in-game movements.

In fan engagements, SuperSport Schools, powered by Pixellot's streaming platform, has revolutionized sports school content in South Africa, making it accessible to fans across the Country. AI allowed cameras to be operated remotely and commentary added if needed for schools with multiple AI cameras being able to stitch together video content. In 2022, the OTT App broadcasts 28,000 school rugby matches and created broadcast-quality automated graphics and highlights packages. Also, Satisfi Labs, a provider of conversational AI solutions, partnering with NFL teams like the Tampa Bay Buccaneers, highlights how AI can strengthen fan-team connections. Their AI chat system offers customizable features such as welcome messages, branded colors, avatars, mascots, and pop-up buttons, all while providing valuable insights into user interactions. The FIFA+ App introduced by FIFA for the 2022 Qatar World Cup used AI technologies to enable fans to scan the pitch whilst watching games, with AR technology being able to display in-depth statistics of individual players through their phone screens. The stadium experience feature of the app included features such as top speed and the players' heatmap and offered spectators a unique opportunity to engage in sports like never before.

In marketing and sponsorships, Nike has employed AI to identify and collaborate with micro-influencers in the fitness and sports industry. They use AI to find individuals who genuinely resonate with their brand and have engaged followings.⁶ Micro-influencers produce content on all social media channels, however, Instagram, YouTube, and TikTok have proved most popular. An example of one of Nike's influencers is @Laurenschrammfit, a global Nike trainer, breath work, and ice bath coach with a little over 5000 followers on Instagram. GumGum Sports uses AI-powered predictive analytics to help sports organizations assess the return on investment of sponsorships. By analyzing historical data and market trends, the company can predict the impact of different sponsorship deals, allowing organizations to make data-driven decisions on sponsorships. GumGum Sports manages over 260 billion SAR Specific Absorption Rate in media buying globally across TV, digital, and out-of-home advertising each year. Also, FC Barcelona has achieved remarkable success in its marketing strategy by embracing AI through its collaboration with Adsmurai. This transformative partnership focused on three key areas: 'always on' campaigns, automated bidding, and awareness-building efforts. AI enabled an 'always on' approach with broad matching algorithms, reducing the need for frequent updates. Automated bidding using Smart Bidding strategies improved profitability with lower investments. Moreover, FC Barcelona's awareness campaigns on platforms like YouTube and Google Display Network led to impressive results, including a 190% increase in conversions, a 192% growth in revenue, and a 31% decrease in cost per acquisition.

In athlete recruitment, Brentford FC is renowned for its innovative use of data and AI in recruitment. They employ a statistical "Moneyball" model, analyzing player statistics and performance metrics to identify undervalued talents and make cost-effective signings. This approach has helped the team discover promising players who fit their playing style and budget. And Brighton

⁶ "How Sporting Organisations Can Benefit from AI." *LinkedIn*,

5 Sept. 2023, www.linkedin.com/pulse/how-sporting-organisations-can-benefit-from-ai-global-13-1e. Accessed 27 Feb. 2025.

FC, on the other hand, has utilized AI algorithms to scout players globally, considering factors such as performance data, fitness levels, and injury risks. These approaches enable both clubs to make data-driven recruitment decisions, uncover hidden gems, and optimize their squads. Brighton has made 1.7 billion SAR in player sales over the last two seasons, generating a profit of 777 million SAR. Also, the Golden State Warriors collaboration with Google Cloud utilizes AI for athlete recruitment. They harness Google Cloud's AI and machine learning capabilities to analyze player data comprehensively. This data-driven approach helps identify prospects that align with the team's playing style and team requirements, streamlining the recruitment process and aiding in more informed player selections.

In stadium operations, Hard Rock Stadium in Miami teamed up with Dell Technologies to implement a crowd management AI system that uses cameras and sensors to monitor fan behavior. This system helps optimize traffic flow, security deployments, and concession stand staffing. The Miami Dolphins estimated that the change has generated over 5.6 million SAR in savings. The Tottenham Hotspur Stadium uses AI technology for energy efficiency. The building management system adjusts lighting, heating, and cooling based on occupancy and weather conditions, reducing energy consumption and costs. Also, Mercedes-Benz Stadium in Atlanta implemented IBM Watson-powered AI chatbots, known as "Ask Arthur". These chatbots provide fans with personalized information, directions, and services during games and events, such as locating concessions, parking areas, and toilets.

In-game officials and refereeing, AI-powered technology was used at the FIFA 2022 Qatar World Cup, halving the time it took to make VAR offside decisions. Semi-automated offside technology (SAOT) was used to overhaul the system used to judge positional offsides. The system was devised in collaboration with several universities, including the Massachusetts Institute of Technology. Tennis and Cricket employ Hawkeye's AI-driven ball tracking system, which assists officials on match events using ball tracking that uses high-speed cameras and AI to make instantaneous, highly accurate decisions. Also, Golf incorporates ShotLink, an AI platform, to track player statistics and ball movements in real-time. This data assists golf officials and referees in assessing penalties and making informed rulings during tournaments.

The use of AI in sports, however, also contains many serious risks, which especially international sports organizations and federations should deal with much more actively than has been the case so far. One of the biggest risks is data protection and security for the individual athlete. The implementation of artificial intelligence in sports involves the collection and analysis of a range of personal information about the individual athlete. This data mustn't be misused about the individual athletes' privacy and security. Indeed, sports organizations and federations must comply with strict data protection regulations and implement robust cybersecurity measures to protect this sensitive information from unauthorized access or breach. AI technologies in sports entail several ethical considerations, especially about fair play and "equal competition terms" for all athletes. Resourceful nations and global commercial companies can gain several unfair advantages through the use of artificial intelligence, just as there will be great risks of manipulation of results. There is a great need for international federations to establish clear and transparent guidelines to preserve the integrity of individual sports and ensure that AI is used ethically and according to the sporting regulations in individual sports. If this does not happen, athletes and teams from strong sporting nations such as the US, China, Japan, Russia, the UK, France, Australia, and the Netherlands will achieve significant comparative competitive advantages in many sports. Implementing AI technologies in sports may face

technical limitations and implementation issues. It requires significant financial resources, sophisticated algorithms, and reliable data sources. Sports organizations and federations must invest in the necessary infrastructure, expertise, and resources to ensure the responsible and effective use of artificial intelligence in sports.⁷ If this does not happen, the use of artificial intelligence in the coming years may have far greater negative consequences than medical doping has had for international sports over the past decades.

⁷ "Artificial Intelligence in Sports: Potentials and Risks." *MA57consulting*, 4 Apr. 2024, ma57.dk/en/artificial-intelligence-in-sports-potentials-and-risks/. Accessed 27 Feb. 2025.