

Impact of Artificial Intelligence in World of Sports: Trends Lifting the Events

Dr. Jaya John Chackuparambil¹

¹Assistant Professor, R. S. Bidkar College Hinganghat

Abstract

AI has permeated nearly every sector, and the sports industry is no exception. Technologies such as virtual reality systems, AI-driven performance analytics, smart training equipment, and AI-assisted strategy development are becoming increasingly common. However, the integration of AI also introduces several concerns, including diminished spectator engagement, the erosion of strategic depth in certain sports, and threats to employment within the industry. While some fear that AI could have lasting negative impacts on competitive sports, this research—drawing upon current news, academic sources, online surveys, and interviews with professionals—aims to demonstrate otherwise. Findings reveal that AI is a transformative force, with its benefits greatly outweighing the drawbacks. Moreover, the issues it presents can be effectively managed through appropriate human oversight. Overall, AI is expected to play an increasingly vital role in advancing the future of competitive sports.

INTRODUCTION

As AI technology progresses, its influence has expanded across numerous industries, such as autonomous driving and large-scale data analytics. Within the sports sector, AI and data science are playing an increasingly pivotal role. Since most aspects of the physical world can be quantified—and anything quantifiable can be predicted or optimized using AI and data analysis—sports, with its abundance of measurable variables, presents an ideal domain for AI implementation. Artificial intelligence (AI) is an advanced interdisciplinary field that has evolved from the integration of various disciplines, including computer science, cybernetics, information theory, systems science, and philosophy.

Through smart wearable devices, athletes can obtain precise data on metrics like heart rate, speed, and cadence. These devices, in conjunction with intelligent data analysis systems, help athletes understand their physical condition and formulate scientifically grounded training plans. AI is increasingly integrated into professional training environments, utilizing computing technology to assess athletes' physical characteristics and muscle development at the genetic and metabolic levels. Genetic testing, along with the continuous monitoring of variables such as heart rate and acceleration, enables a comprehensive analysis of how aerobic training correlates with performance and technique. This approach allows for the creation of detailed physical profiles, customized training regimens, standardized exercise movements, injury prevention, and real-time performance assessments based on data-driven indicators.

A key aspect of the research also involves identifying and addressing the risks and challenges AI poses to the sports industry—such as potential disruptions to the roles and livelihoods of sports professionals. Developing strategies to mitigate these risks and resolve associated issues forms another essential goal of this project.

Role of AI

As technology continues to evolve, it is expected that such systems will be adopted across a broader range of sports.

In sports like football, volleyball, and badminton, where determining whether the ball is in or out can be challenging due to its high speed, AI-powered digital detection systems have proven especially valuable. These systems use real-time optical motion capture to record the exact spatial position of the ball throughout its movement. By continuously calculating the ball's three-dimensional coordinates (X, Y, Z), the system identifies the exact moment the ball approaches the ground (when the Z-value is at its lowest). It then compares the X and Y coordinates with the official boundaries to determine whether the ball has landed in or out of bounds, thereby significantly increasing the accuracy and scientific validity of such decisions.

Artificial intelligence significantly enhances the objectivity and viewer engagement in competitive sports. A notable example is the Hawk-Eye system, widely utilized in sports such as tennis and cricket. This system leverages high-speed imaging and machine learning to track the trajectory of the ball in real time. Typically employing eight to ten high-speed cameras, the system maps the three-dimensional space of the playing area down to millimeter-level precision. By capturing the ball's flight path from various angles, it

reconstructs the motion using advanced algorithms to generate a 3D visual, which is then instantly displayed on screens. The entire process is completed within ten seconds and boasts an impressive accuracy rate of approximately 99%. By eliminating the limitations of human perception, including blind spots and subjective error, the Hawk-Eye system ensures that decisions made during the game are fair, transparent, and impartial.

Artificial Intelligence as a Tactical Assistant in Competitive Sports

This advanced analysis equips coaches with a comprehensive understanding of both team and opponent performance, enabling more effective game preparation and adaptive in-game strategy. Perhaps more significantly, AI is also capable of simulating and predicting the likelihood of success for various tactical scenarios. For instance, some rugby coaches are now leveraging AI systems to instantly evaluate the most effective strategies during high-pressure situations, accelerating decision-making with statistical support.

AI systems continuously analyze data and offer actionable recommendations, allowing coaches to refine their strategies in highly competitive environments. By integrating data from wearable sensors and high-speed motion-tracking cameras, AI platforms are capable of accurately capturing variables such as object speed, spin, and positioning in sports like tennis, hockey, and cricket. Furthermore, they meticulously monitor player movements and assess how each action impacts the dynamics of the game.

METHODOLOGY

To support this research, an online survey was conducted via WeChat, gathering data from 40 participants over the course of one week. This survey formed a foundational part of the data collection process for the thesis, providing firsthand insights into perceptions and experiences related to AI in sports.

AI in Competitive Sports

These include AlphaGo's groundbreaking victory against the world champion in Go, which highlighted AI's capacity to outperform human intelligence in strategic games. Another case examines how AI-assisted analytics contributed to the Golden State Warriors' success in the NBA, showcasing how performance data can refine gameplay and training regimens. Additionally, Google's AI achievements in the real-time strategy game StarCraft II illustrate how machine learning can master complex, fast-paced environments. These case studies are supplemented by data from online surveys and interviews with industry professionals and spectators, offering a broader perspective on how AI is perceived and applied in various competitive sports sectors.

AI-powered tools and smart equipment played a significant role in optimizing player performance and maintaining peak physical condition throughout the grueling NBA seasons.

One example of this technological integration is the use of specialized sleep pods designed to combat jet lag, helping players recover more efficiently during frequent travel. Additionally, players wore advanced wearable devices capable of monitoring physical metrics such as heart rate and leg strength, which allowed coaching staff and medical teams to evaluate fatigue levels and make data-driven decisions about rest and training.

After a successful trial in the NBA Development League, the Warriors adopted the Athos pressure-sensing training suits. These garments, embedded with AI-integrated sensors, track critical physiological indicators—muscle engagement, heart activity, and nervous system responses—during workouts, giving trainers a detailed understanding of each athlete's physical condition and workload.

In 2016, the Warriors further enhanced their training environment by installing the PlaySight SmartCourt system in their California practice facility. This AI-powered system uses nine high-definition cameras to capture, analyze, and transmit real-time video footage of player training sessions. The insights generated from this visual data help coaches review performance with greater accuracy and tailor strategies based on empirical evidence.

Through the combination of AI technology and athletic excellence, the Warriors exemplify how cutting-edge tools can offer a competitive edge in professional sports.

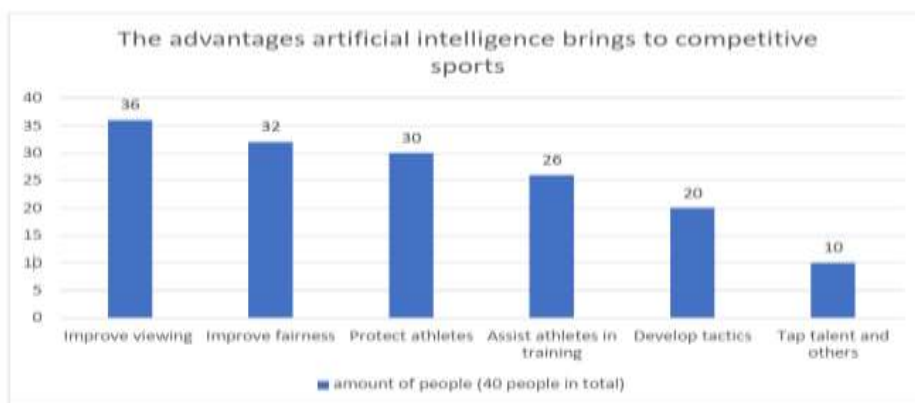


Figure 1. The advantages artificial intelligence brings to competitive sports

DISCUSSION & RESULTS

Tools such as automated replay systems and motion tracking provide highly accurate insights, minimizing human error and enhancing officiating transparency. Additionally, AI contributes to the entertainment value of sports, particularly in disciplines like fencing, martial arts, and others where rapid, complex movements can now be captured and replayed with clarity—making the games more engaging for spectators.

While AI shows promise in tactical planning, there are limitations. Strategy, by nature, often relies on unpredictability and adaptability—traits that current AI systems, which operate on data-driven patterns, struggle to emulate. Because similar AI algorithms may produce identical outputs, teams using the same systems could arrive at comparable strategies, reducing the competitive advantage. Moreover, real-time decision-making, such as calling timeouts or adjusting player formations on the fly, still demands human intuition and situational awareness, which AI has not yet mastered.

Based on news reports, scholarly literature, survey data, and expert interviews, this study concludes that artificial intelligence offers multiple benefits to the world of competitive sports. Technologies such as VR and advanced tracking systems not only improve fairness but also enhance the overall experience for players and fans alike. Off the field, AI enables athletes to create more tailored and efficient training plans, monitor their physical condition through smart devices, and reduce the risk of injuries. Furthermore, AI supports coaches and analysts by efficiently processing game data, enabling more informed decisions regarding player performance and team strategy.

CONCLUSION

As AI technology continues to evolve alongside the expansion of the Internet, its integration into competitive sports will only deepen. This ongoing advancement implies that the industry will encounter increasingly complex situations and emerging issues. To navigate this changing landscape, athletes, coaches, and other stakeholders must continuously enhance both their professional expertise and their understanding of information technology. Staying informed and adaptable will be essential to fully leverage the benefits of AI while effectively managing its associated risks.

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