ARTIFICIAL INTELLIGENCE AND ITS USE IN SPORTS

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ABSTRACT

The application of machine learning in sports has become a common arena in the last few years. And keeping in view the productive impact brought by the accuracy of technology into sports, there is not an iota of doubt that it will continue to prosper in this domain. In this paper, we discuss the areas where Artificial intelligence has become a part of our daily lives, from voice identification systems to direction-finding applications. However, scientists are increasingly using machine learning in other science and technology fields, such as sports. Artificial intelligence provides benefits in many areas of sports, such as improving athletes' performance and health, preparing training and diet plans, analyzing games and developing strategies, refereeing, scouting and recruiting players, predicting matches, selling tickets, and even sports journalism. In this paper, machine learning in sports is used and the way it is used in various sports. AI has remarkably influenced the level of audience involvement, creating a policy for games, and the way they are played today. We see that data processing and machine learning are being used in sports in a essential amount. We will give some examples of the applications of artificial machine learning in sports and examine how this technology contributes to the sport industry and research and how it will shape the future of sports. Machine learning in sports is used and the way it is used in various sports is different,

INTRODUCTION

Sport is an activity that people do to maintain their physical and mental health, socialize, have fun, and compete. Sport is also a large industry and a cultural phenomenon. The development and change of sports are influenced by the advances in science and technology. One of these advances is artificial intelligence. With the help of machine learning athletes will efficiently understand cadence, heart rate, speed and other information by wearing smart wearable devices, intelligently inspect the data obtained from device inspection during exercise to understand their personal physique, and use professional and analytical methods to rationally apply exercise Plan to improve physical fitness. Intelligence is more widely used in professional athletes' sports training. It relies on computer technology to inspect the characteristics of athletes' physique and muscle training from the point of view of genes and energy metabolism, obtains athletes body data through genetic testing, and obtains daily training athletes' heart rate and acceleration through scientific and technological means. Inspect the relationship between athletes' aerobic training, sports performance and sports technology, generate athlete's physical fitness data, completely understand the athlete's physical health and relative training intensity, establish athletes' physical fitness files, modify reasonable sports training plans for athletes, and standardize featured training movements , avoiding physical injury caused by improper training, and inspect whether the athlete has the conditions to play on the court through various data indicators.

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is a branch of computer science that focuses on creating intelligent machines that can perform tasks that require human intelligence. These tasks include reasoning, discovering meaning, generalizing, and learning from past experiences. AI applications range from advanced web search engines and recommendation systems to autonomous driving cars and strategic games (Copeland, 2023; Schroer, 2023; Wikipedia, 2023).

The term AI was coined in 1956 and has become more popular today thanks to the advances in science and technology such as the increase in data volume and the development of algorithms and computations. In its early stages, AI testing was associated with topics such as problem-solving and finding various solution methods. In later stages, AI developed with neural network, today can perform processes such as identifying speech, images and data, making future predictions. Deep learning enables AI to continue to evolve (Coşkun & Gülleroğlu, 2021). AI and machine learning are not the same thing. AI is a broad field that includes many sub-fields, including Machine Learning. Machine learning is a subdivision of AI that is an application of AI that enables the machine or system to learn and enhance

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USE OF ARTIFICIAL INTELLIGENCE

AI is used in many fields such as medicine, health, education, military, agriculture, mining, media, banking and many different business areas (Boucher, 2020; Chan, et al. 2022; Burrows, 2021; Leeming, 2021). For example, in the field of medicine, the diagnosis and treatment processes of diseases can be completed almost flawlessly with AI technology. In addition, AI technology is used in areas such as medical imaging, drug production and management, robotic surgery. In addition, AI technology is used in the banking sector for customer service and fraud prevention purposes.AI technology has made great developments in the sports industry in the last 5 years. The machine learning applications used in today's sports world are categorized into four main categories: chatbots, computer vision, automatic journalism and wearable technology or connected gadgets.

Chatbots are used and exercised in the sports field to answer fan questions on a wholesome range of topics, including live game information, team statistics, gym and stadium information (Kumba, 2019). They can also help athletes track their daily calorie in- take, suggest meal plans, and remind them to stay hydrated and take the necessary supplements. They can also teach athletes the importance of nutrition in recovery (Weber et al., 2023).

Computer Vision is an AI field that focuses on enabling computers to interpret, understand and analyze the visual world. It involves developing algorithms and techniques along with methods that allow computers to recognize and interpret images and videos. This is an interdisciplinary scientific field that is interested in gaining a high-level understanding and automation of what the human visual system can do. Computer Vision can process image data from different sources such as cameras, sensors and other devices (Krotkov, 1988; Shin, Hong, & Elmqvist, 2023; Stockman & Shapiro, 2001). Computer Vision is used in many different areas in the sports world. For example, it is used to perform detailed and complex analyses in sports such as football, basketball, cricket, and badminton. This technology is used for tasks such as detecting and classifying players, tracking records of players or balls, predicting trajectories of players or balls, recognizing team strategies and categorizing various events in sports (Naik, Hashmi, & Bokde, 2022). Computer Vision is also used to help referee decisions (Boesch, 2023).

Robot Journalism is a term used to describe the use of automated mechanized soft- ware programs to create news and different articles. It is sometimes also called "automated journalism" or "algorithmic journalism" (Linden, 2017; Uçak, 2018). In the sports world, automated journalism is a method that media outlets use to reach their customers interested in sports and increase their revenues by using AI-focused automation (Graefe, 2016). This way, sports news can be produced faster and more efficiently.

Wearable Technology is the common name of technological devices that can be used by humans and are loaded with smart sensors that track body movements (Godfrey et al., 2018). Examples of wearable technology in the sports world include accelerometers, pedometers, and GPSs that can be used to measure an athlete's energy expenditure and movement pattern. Wearable technology is usually used to monitor a user's health (Wikipedia, 2023). The most common smart products used in sports wearable technology products are athlete bracelets, watches, and bracelets (Serçek & Korkmaz, 2023). It has been shown that smartphone ap- plications and activity trackers increase physical activity in adults (Laranjo et al., 2021), and are effective intervention of tools/strategies for reducing body weight and BMI in individuals with overweight/obesity and chronic comorbidities and deformities (McDon- ough, Su, & Gao, 2021). Machine learning can be used in sports training to optimize and improve the performance of athletes and teams. AI-based technologies can help coaches monitor athletes' progress, analyze data, and provide actionable insights (Gülen, 2022). One of the most important benefits of using AI in sports training is the ability to analyze data more accurately and quickly. AI systems can analyze data obtained from matches and training sessions and help coaches make better decisions. In addition, AI can also help coaches create personalized training programs for individual athletes. AI can help teams develop successful strategies (Gautam, 2023).

AI and sports analytics play an important role in upgrading and improving the performance and accuracy of athletes and teams. AI algorithms can process large amounts of data quickly and reveal patterns, relationships and statistical information. This way, teams and athletes can inspect their performance, identify weaknesses and create strategies to improvise them. AI covers many different areas in sports analytics. The first one is player performance analytics. AI can analyze the statistical data of an athlete or team and identify their strengths and weaknesses in the game. The second one is team performance analytics, which is also an important topic. AI can analyze the way teams work together and their game strategies, and evaluate team performance. The third one is injury prevention and recovery, which are topics where AI analytics has great importance. AI can be used to predict and prevent injury risks in athletes. By analyzing the training data and physiological parameters of athletes, it is possible to identify potential injury risks (Beal, Nor- man, & Ramchurn, 2019; Chmait & Westerbeek, 2021; Claudino et al., 2019). This information helps coaches and health staff

take appropriate measures for athletes and minimize injury risk. In addition, the use of AI in the recovery process after injury is also important. The data obtained during the rehabilitation processes of athletes are analyzed by AI algorithms and customized recovery plans are offered to athletes. These plans ensure that athletes recover quickly and effectively and shorten their return to the field times (Rutgers University, 2022).

BENEFITS OF ARTIFICIAL INTELLIGENCE IN SPORTS TRANNING

AI can be used in sports training to improve athletes' training and performance. Some of the benefits and welfare use of using AI in sports training are:

1. Artificial Intelligence-Enhanced Coaching: AI can have a major impact on the strategic decisions that coaches make before, during, and after the game. With the help of sensors and speed cameras, AI programs can calculate advanced passes, penalty shots, LBW in cricket and other relevant activities in different sports. This information will enable coaches to coach players for each game and create stronger training programs for their teams (The New Playing Field of Artificial Intelligence, 2023).

Machine learning coaches are as effective as human coaches, but artificial intelligence cannot replace human coaches due to its lack of awareness and emotional intelligence (Terblanche, et al., 2022). In a study, the impact of artificial intelligence-enhanced video feedback on reflective coaching development was examined, and it was found that this method helped coaches gain awareness, skills, and confidence, but also had some disadvantages such as technological difficulties and neglecting the coaching context (Bridgeman & Giraldez-Hayes 2023).

2. Improving Player Performance: AI can be used to improve players' performance by analyzing data and providing insights. AI technology can be used to enhance athletes' physical function status, evaluate and analyze sports posture, analyze winning rules, regulate mental state before competition and prevent sports injuries (Li, 2023). In many cases, the pertinent of traditional statistical techniques has been overused and artificial learning methods have been applied, adapted and developed to inspect sports data. Elite coaches and athletes often use their experience, knowledge, intuition and framework to make successful decisions. However, some serious decisions are very difficult because the number and interactions of factors to consider are very complex. If the right type of data is available, artificial intelligence methods can be used to create models that can support complex decision-making processes (Dwyer, Kempe, & Knobbe, 2022).

3.Improved decision making and prediction: AI's role in decision making and prediction in sports is tremendously expanding and attracting more attention in both the scholastic sector and the industry (Chmait & Westerbeek, 2021). One of the first studies to discuss the probable applications of AI in sports performance and its positive impact on improving decision-making was done by Lapham and Bartlett (1995). Machine learning can be used to automate or semi-automate data collection, process data into meaningful information (previously) and mechanize to understand which information is important in terms of health and performance, and finally help coaches and athletes make complex decisions (Lapham & Bartlett, 1995). AI can also be used to analyze large data sets in sports medicine (Rigamonti et al., 2021).

4.Data analysis: AI can be used to analyze data obtained from matches and training sessions to help coaches make better decisions (Sudeep, 2023). AI can be used to analyze athletes' strengths and weaknesses, areas of improvement, advantages and disadvantages compared to their opponents. For example, a basket- ball player can see their own shot maps and statistics with AI and machine learning (Chmait & Westerbeek, 2021).

However, when some scientific research examples are examined, it is clear that there are some difficulties in this regard. In a recent study (Hammes, et al., 2022), the authors address the role of AI in elite sports from two perspectives: showing AI success stories in various sports fields with a literature-based overview and evaluating the current situation with interviews with leading sports scientists. According to the authors, there are six main challenges encountered in sports analytics. These are; data quality and accessibility, ethical use of AI and machine learning, sports analytics education and competence, dissemination and acceptance of sports analytics applications, quality and impact of sports analytics research, collaboration and communication of sports analytics community.

3. Simulation of training scenarios: AI can provide specific support to athletes' physical education training in various ways, such as data analysis and simulation of training scenarios (Wei, et al., 2021). When some scientific research on the simulation of sports training scenarios and the use of AI are examined, Wei et al., (2021) present three specific case studies of AI application in sports training. For example, using computer vision to analyze athletes' movements, using natural language processing to understand athletes' speeches, and using data mining to evaluate athletes' performance. The article also discusses the benefits of AI applications in sports training, such as use, convenience and innovation. Chmait and Westerbeek (2021), presenting some hypothetical scenarios on how AI and machine learning can shape the future of sports, state that AI and machine learning can be used to improve athletes'

performance, prevent injuries, regulate their nutrition and improve their psychological state, for example, a tennis player can train with AI that mimics the playing styles of their opponents.

Artificial intelligence improves the fairness and appreciation of competitive sports.

In sports events, the Hawkeye system is an immediate replay system of motion trajectories used in tennis and cricket competitions. The Hawkeye system divides the three-dimensional space of the competition field into milli meter level measurement units, comprising of eight to ten high-speed cameras Capture the flight trajectory of the ball from different angles, use the artificial intelligence method to find out the data to generate a three-dimensional image, and then use even imaging technology to produce and broadcast the generated motion trajectory in real time to the screen for broadcast. The whole process does not exceed ten seconds, and the accuracy rate is as high as 99%. The eagle eye that is the sharp eye technology improves various objective factors and disadvantages of naked eye observation, and it also avoids visual blind spots, helping referees to make fair, just and open judgments.

Artificial intelligence Assists Athlete Training

The American Professional Basketball League Golden State Warriors are a typical representative of relying on machine learning technology to gain competitive advantage. In training, they keep a close eye on heart rate and other data through wearable Catapult Sports monitors, use Edgeware equipment to monitor nervousness, body levels and continuously use machine learning methods. Improve the training parameters and upgrade the training model. There are reasons to believe that artificial intelligence technology has directly helped the training guidance.

Artificial intelligence assists in the development of tactics in competitive sports

For coaches, AI technology can also help them plan tactics in all kinds of rigorous competitive sports. During the game interval, the machine learning program will continue to provide various outlook and profoundly influence the specific tactics calculated by the coach. Through the combination of wearable sensors and high-speed cameras, the machine learning platform can now accurately measure the speed, rotation and position information of various objects in tennis, hockey, cricket and other sports, and of course, it can accurately bring the players on the court. The action and the impact on the progress of the game. After mastering these data, coaches can better prepare for the next game and this proves to be a support system. More importantly machine learning technology can also predict the success opportunities of various confrontation strategies. For example, some rugby coaches are using AI to quickly figure out the correct and accurate technical and tactical ideas. Artificial intelligence can help athletes train more efficiently and more accurately but Artificial intelligence may gradually lose the fun of chess and other intellectual sports.

Although machine learning can assist athletes in more accurate training, for some specific projects, the huge impact of artificial intelligence has also caused some negative effects, such as AlphaGo, which shines in the field of Go. Ke Jie, who has played against AlphaGo many times, also expressed such concerns. He thinks that Alpha Go has made the game of Go rigid and formulaic. "For me, I don't want AI to appear. Because AI can close the gap between chess players to a large extent. For the higher-level chess players, the first 50 moves may be able to open the gap through the layout. There are now all with AI, there are tools to assist players, and chess players will play in full accordance with AI.

Artificial intelligence has brought a positive impact in the field of competitive sports.

By referring to news and literature, survey statistics, and interviews with professionals, we can know that machine learning has indeed brought many positive effects to the field of competitive sports and helped to accurately reach results. For example, the use of VR technology and other lens tracking precise technologies in competitive games not only ensures the fairness of the game, but also increases the viewing of the game and more people support it. Outside the arena, artificial intelligence can also keep athletes from improvising better training programs and keep athletes in a better competitive state. Athletes can also wear some artificial intelligence devices and take help to understand their physical state and protect themselves. At the same time, machine learning can also assist industry players in completing their tasks more accurately, such as conducting statistics and interpretation of competition and athlete data, and calculating strategies on the field. What is more, in different types of competitive sports machine learning has more special applications. In some sports like F1, the application of machine learning greatly protects the safety of racing athletes, ensure that athletes can devote themselves to the game. In chess sports and e-sports, players can quickly improvise their own level by playing against artificial intelligence, or conduct targeted training. All in all, there is no doubt that the application of machine learning in competitive sports has brought evolving change and innovation to competitive sports, and has brought many positive influences on it. With the tremendous development of Internet technology, this trend will also reach various arenas and more artificial intelligence applications appear in the competitive sports arena. Machine learning has indeed brought many possibilities and problems to the field of competitive sports, and it has also had many effects on athletes and industry players, but these can be solved and prevented.

During competitive sports competitions, the use of VR video technology improves the fairness of the game and results in a constant result, but frequent use of VR video technology for playback will affect the accuracy of the game. In this case,

you can limit the use of VR technology to solve this problem. In this way, the fairness of the game can be ensured, the fluency and accuracy of others game is also ensured, and a certain extent of drama in the game is retained. On the other hand, in chess games and e-sports, the introduction of machine learning is indeed a challenge for players. They need to face the fact that artificial intelligence continues to energize or even exceed human players, but this does not mean that machine learning will destroy Intellectual competitive sports. On the contrary, I think it will tremendously improvise the level of human players, and at the same time help these sports add more vitality and allow more people to participate in these sports. Regarding the issue of machine learning obtaining athletes' private information, I think this is one of the main issues that need to be paid attention to and brought forward, because it involves privacy and legal issues. So, I think athletes and industry players need to raise their legal awareness to solve and avoid these problems.

All in all, the impact and ideology of the application of artificial intelligence on the competitive sports industry is objective, and it does bring about various problems and agendas, but I think that the application of artificial intelligence in competitive sports has more pros than cons, and these drawbacks can also be solved and avoided. As the application of machine learning continues to deepen, more and more problems will continue to appear and it needs more strength, which also requires people to continue to solve, but I believe that the benefits of machine learning to competitive sports will exceed the problems it brings.

Conclusion

AI is a technology that is used by computer systems to imitate human intelligence. Machine learning is increasingly used in sports, as in many other fields. There are many evocative benefits of using AI in sports. For example, AI can create personalized improvised plans to improve athletes' performance, health and training, process data for game analysis and strategy development and for further results, use image processing techniques for refereeing, produce automatic reports for sports journalism and clarification and offer chatbots or virtual reality to enhance fan experience. Machine learning can also be used to predict sports betting. There are also some grave and extreme challenges or problems encountered in the use of AI in sports. For example, AI systems can make erroneous decisions based on wrong or incomplete data, endanger the privacy or security of athletes or teams, reduce the competitive or fun aspect of sports or cause ethical issues. Therefore, the use of AI in sports should be done carefully and responsibly. In the future, more research and innovation are needed to further develop the use of AI in sports. The use of AI in sports is an important trend that changes and improves the sports industry and sports culture.

Machine learning has brought creation and impact to the competitive sports industry. It not only brings many positive effects, but also brings many grave challenges and problems, but these can be solved by people. With the continuous development of the Internet, the application of machine learning will continue to expand and deepen, which means that the competitive sports industry will also face more situations and problems. Therefore, athletes and industry players need to continuously improve their professional level and IT.

REFERENCES

1. Beal, R., Norman, T. J., & Ramchurn, S. D. (2019). Artificial intelligence for team sports: a survey. The Knowledge Engineering Review, 34, e28.
2. Bridgeman, J., & Giraldez-Hayes, A. (2023): Using artificial intelligence-enhanced vid- eo feedback for reflective practice in coach development: benefits and potential draw- backs, Coaching: An International Journal of Theory, Research and Practice, DOI: 10.1080/17521882.2023.2228416).
3. Boesch G., Computer Vision in Sports – Use Cases in 2023, Retrieved 01.07.2023 from https://viso.ai/applications/visual-ai-in-sports/.
4. Boucher, P. (2020). Artificial intelligence: How does it work, why does it matter, and what can we do about it?, EPRS: European Parliamentary Research Service. Belgium. Retrieved 25.08.2023 from https://policycommons.net/artifacts/1336906/artificial-intelli- gence/1944453/. CID: 20.500.12592/00dvnz.
5. Burrows L., (2021, October 19). The present and future of AI. Retrieved 18.07.2023 from https://seas.harvard.edu/news/2021/10/present-and-future-ai.
6. Chan KS, Chan YM, Tan AHM, et al. (2022). Clinical validation of an artificial intelligence- enabled wound imaging mobile application in diabetic foot ulcers. Int Wound J. 19:114–124. 10.1111/iwj.13603.
7. Chmait N and Westerbeek H (2021) Artificial Intelligence and Machine Learning in Sport Research: An Introduction for Non-data Scientists. Front. Sports Act. Living 3:682287. doi: 10.3389/fspor.2021.682287.
8. Claudino, J. G., Capanema, D. D. O., de Souza, T. V., Serrão, J. C., Machado Pereira, A. C., & Nassis, G. P. (2019). Current approaches to the use of artificial intelligence for injury risk assessment and performance prediction in team sports: a systematic review. Sports medicine-open, 5, 28. https://doi.org/10.1186/s40798-019-0202-3.
9. Copeland B.J. (2023, Aug. 23). Artificial intelligence. Retrieved 15.07.2023 from https:// www.britannica.com/technology/artificial-intelligence).
10. Coşkun, F., & Gülleroğlu, H. D. (2021). Yapay zekânın tarih içindeki gelişimi ve eğitimde kullanılması. Ankara University Journal of Faculty of Educational Sciences (JFES), 54(3), 947-966.
11. Dwyer, D. B., Kempe, M., & Knobbe, A. (2022). Using artificial intelligence to enhance sport performance. Frontiers in Sports and Active Living, 4, 886730.

12. Gautam R. (2023, Mar 30). Artificial Intelligence in Sports Training, Geek Culture, Retrieved 28.07.2023 from https://medium.com/geekculture/artificial-intelligence-in-sports-train- ing-2d7736734819.
13. Godfrey, A., Hetherington, V., Shum, H., Bonato, P., Lovell, N. H., & Stuart, S. (2018). From A to Z: Wearable technology explained. Maturitas, 113, 40-47.
14. Hammes F, Hagg A, Asteroth A. and Link D. (2022). Artificial Intelligence in Elite Sports—A Narrative Review of Success Stories and Challenges. Front. Sports Act. Living 4:861466. doi: 10.3389/fspor.2022.861466.
15. Krotkov, E. (1988). Focusing. Int J Comput Vision. 1, 223–237. https://doi.org/10.1007/ BF00127822 .
16. Kumba S. (2019, November 28). Artificial Intelligence in Sports – Current and Future Ap- plications. Retrieved 21.08.2023 from https://emerj.com/ai-sector-overviews/artificial-intel- ligence-in-sports/ .
17. Laranjo, L., Ding, D., Heleno, B., Kocaballi, B., Quiroz, J. C., Tong, H. L., ... & Bates, D.
18. W. (2021). Do smartphone applications and activity trackers increase physical activity in adults? Systematic review, meta-analysis and metaregression. British journal of sports med- icine, 55(8), 422-432.
19. Lapham, A. C., and Bartlett, R. M. (1995). The use of artificial intelligence in the analysis of sports performance: a review of applications in human gait analysis and future directions for sports biomechanics. J. Sports Sci. 13, 229–237. doi: 10.1080/02640419508732232 .
20. Leeming J. (2021). How AI is helping the natural sciences. Nature 598(7880):S5-S7, doi: 10.1038/d41586-021-02762-6.
21. Li, L. (2023). Summary of the Research Status of Artificial Intelligence in Sports Performance Analysis of Athletes. Open Access Library Journal, 10: e10539. https://doi.org/10.4236/oal- ib.1110539 .
22. Linden, T. C. G. (2017). Algorithms for journalism: The future of news work. The journal of media innovations. 4.1 (2017), 60-76. doi: https://doi.org/10.5617/jmi.v4i1.2420 .
23. McDonough, D. J., Su, X., & Gao, Z. (2021). Health wearable devices for weight and BMI reduction in individuals with overweight/obesity and chronic comorbidities: systematic re- view and network meta-analysis. British journal of sports medicine, 55(16), 917-925.
24. Naik, B. T., Hashmi, M. F., & Bokde, N. D. (2022). A comprehensive review of computer vision in sports: Open issues, future trends and research directions. Applied Sciences, 12(9), 4429.
25. Rigamonti, L., Estel, K., Gehlen, T., Wolfarth, B., Lawrence, J. B., & Back, D. A. (2021). Use of artificial intelligence in sports medicine: a report of 5 fictional cases. BMC Sports Science, Medicine and Rehabilitation, 13, 1-7.