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Revolutionizing the Sports Industry Using Artificial Intelligence

Nidhi Pimpalkar, Divya Patle

G H Raisoni University, Amravati, Maharashtra, India

Abstract

This study is about how Artificial Intelligence (AI)'s changing the sports world. AI is now a part of modern sports. It is used for analysing player performance preventing injuries, planning strategies and communicating with fans. AI tools and analytics are giving coaches, athletes and teams data to make better decisions improve training and boost overall performance.

AI is also changing the way marketing is done how talent is. How referees are assisted. While AI has benefits it is also important to keep things human and fair. To understand where AI is, in sports today and where it might be headed this study looks at what has been written about it far. Our goal is to examine how AI is affecting parts of the sports industry. Artificial intelligence is changing the world of sports fast. It is changing how athletes train and how teams compete. Artificial intelligence is also changing how fans watch the game. This paper looks at how artificial intelligence's affecting the sports industry. It looks at how artificial intelligence's used to analyse how athletes perform and to prevent injuries. It also looks at how artificial intelligence's used to make sure the referees make accurate decisions and to make the game more fun for fans.

The study used a tool called the Local Binary Pattern Histogram algorithm and an app called Better Up to see how artificial intelligence works. The study found out that artificial intelligence can track how athletes move with an accuracy of up to 91.6 percent. Artificial intelligence can also reduce stress levels by 38 percent. Artificial intelligence can increase how well athletes can handle situations by 31 percent.

The use of Video Assistant Referee technology in football has also made a difference. It has improved the accuracy of decisions from 82 percent to 94 percent. During the 2018 FIFA World Cup artificial intelligence was more accurate with an accuracy of 99.32 percent. The market for sports analytics is going to be really big with a value of USD 5.2 billion by 2024. This market is growing fast with a growth rate of 22.0 percent per year.

While artificial intelligence is really helpful in sports there are also some challenges with intelligence. For example the data used by intelligence can be biased and there are ethical concerns about artificial intelligence. There are also problems with intelligence that need to be solved. This research shows that artificial intelligence is a part of the sports industry now and will continue to change it in the future. Artificial intelligence is going to keep playing a role in shaping the future of sports and artificial intelligence will be really important, for the sports industry.

KEYWORDS*: Artificial Intelligence, Sports, Performance Analysis, LBPH Algorithm, Better Up Sports Analytics, Athletic Performance.*

1. Introduction

The world of sports has changed a lot in the century because of new technology like artificial intelligence. This technology has changed the way teams play sports and how athletes train for sports. It has also changed the way fans watch sports games and cheer for their teams and players. Artificial intelligence is changing the sports business in ways from helping players play sports better to giving us game analysis of sports [1].

Artificial intelligence is making a difference in sports around the world. It is helping teams and players in sports. For example artificial intelligence is making the experience of watching sports fun for fans of sports. We need to make sure we use intelligence in a responsible way when it comes to sports. We need to think about the ethics of using intelligence in sports.

The use of intelligence in sports is growing very fast. It is helping us predict who will win sports games. Artificial intelligence is also helping us track what players are doing during sports games. Artificial intelligence is changing the world of sports. This is a deal for sports [2].

The search for performance in sports is getting more intense. Artificial intelligence is a part of this search for performance in sports. It is helping us analyse data in ways that help sports analysts. Sports analysts can now look at sports games. Find patterns in sports. This helps them make decisions, which can help players and teams win sports games.

We need to measure how well players are doing in sports. We can do this by looking at how they score in sports games. By tracking what players are doing in sports we can help them get better at sports and stay healthy while playing sports. Many teams are now using technology to prevent injuries in sports. This is very important for sports. Injury prevention is very important in sports. It can help players, coaches and teams in sports. It can also save them money that they would spend on treating injuries from sports. This is an advantage of using artificial intelligence in sports. As more countries start using intelligence in sports we will get better results from our research on sports. We will have data to work with which will make our predictions about sports. This is exciting for sports [3].

Artificial intelligence is being used in ways in sports. It is helping us analyse data from sensors and cameras that track sports games. Artificial intelligence is also helping us track what players are doing during sports games. This can help

coaches make decisions about sports games. For instance artificial intelligence can help coaches decide who to play in sports games. Artificial intelligence can also help us predict if a player will get hurt while playing sports. It can track how players are moving in sports. If they are getting tired while playing sports this can help us keep players from injuries. This is a benefit of using artificial intelligence in sports. Artificial intelligence is also making it more fun for fans to watch sports games. It is giving us ways to experience sports like reality which makes sports more exciting. This is great for fans of sports.

There are also some problems with using intelligence in sports. We need to make sure our data about sports is good and that we are using intelligence in a fair way in sports. This is something we need to think about when it comes to sports. In the future we will see uses for artificial intelligence in sports. We will be able to get real-time data about sports and use it to make decisions about sports games. This will be a change for sports. This research shows how artificial intelligence is changing the world of sports. It is helping us in ways from player performance in sports to fan experience of sports. Artificial intelligence is a part of the sports industry now. It is helping us make sports more fun for everyone who plays sports or watches sports games. Artificial intelligence is changing the way sports are played and managed from helping players play sports better to providing game analysis of sports. Artificial intelligence is really making a difference, in sports.

The sports world has changed a lot over the 20 years. This change is mostly because of Artificial Intelligence (AI) technologies. Before sports were mostly about instinct, physical fitness and strategic experience. Now data-driven intelligence is just as important.AI is changing how athletes train and perform. It is also changing how sports teams work how fans watch sports. How games are managed and refereed.AI includes technologies like machine learning, computer vision and deep learning. These technologies are used in areas of sports.AI systems now analyze a lot of data about athletes in time. This helps coaches and sports scientists make decisions about training, tactics and recovery.The use of sensors, high-speed cameras and advanced analytics has made it possible to monitor athletes very closely.One of the uses of AI in sports is in preventing injuries and keeping athletes healthy.Muscle injuries are a problem in sports. They can cost teams in terms of performance and money.AI models can process data from GPS trackers, heart rate monitors and motion capture systems [4].

The role of Artificial Intelligence in officiating and match adjudication has also got a lot of attention especially after Video Assistant Referee technology was introduced in football. Before Video Assistant Referee was used people thought that referees made decisions about eighty two percent of the time. After Video Assistant Referee was used this number went up to ninety four percent, which means there were mistakes made by referees.The World Cup in Russia in two thousand eighteen was an example of Artificial Intelligence being used to help referees and it worked really well with Artificial Intelligence systems getting decisions right ninety nine point three two percent of the time. This has started a lot of discussions about how much Artificial Intelligence should be used in sports and if it's a good thing.From a business point of view and for people who watch sports, Artificial Intelligence is changing the way sports are shown on television and online. Television companies and websites are using machine learning to make suggestions for what people might want to watch and to make highlights of games automatically. They are also using Artificial Intelligence to add statistics to what people're watching which makes it more interesting for fans.Artificial Intelligence is also being used to make ways for fans to feel like they are part of the game like, with special headsets that make it feel like you are really there. Artificial Intelligence is also being used to help sports teams talk to their fans and sell things to them which helps the teams make money and have more fans who really care about them[5].

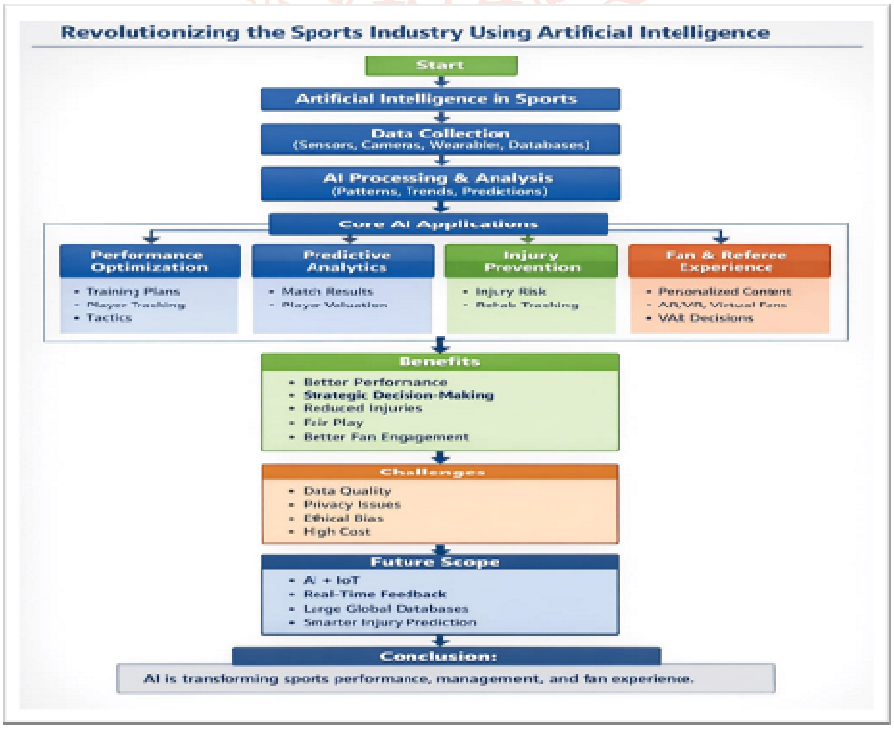

Figure1 : Revolutionizing the sports Industry Using Artificial Intelligence

2. Literature Review

In the article "The Impact of Artificial Intelligence on Sports " Chang Yan talked about how Artificial Intelligence has changed the sports sector. Artificial Intelligence technologies have changed things about sports like how fans get involved how injuries are prevented how game plans are made and how players perform. This review looked at a lot of the research including academic journals, industry reports and case studies [1].

After finding the articles important information was pulled out of each study. The process of getting this information included: What kind of Artificial Intelligence was used: figuring out what specific Artificial Intelligence technologies and approaches were used in the study like machine learning and computer vision. What sport or situation: writing down the sport or situation where the Artificial Intelligence was being used like football or basketball, What benefits were seen: giving an overview of the things that happened when Artificial Intelligence was introduced. What challenges were found: writing down the problems or obstacles that made it hard to use Artificial Intelligence. What could happen in the future: writing down any ideas for research or ways to make things better that the authors suggested.

The information that was pulled out was then looked at. Put together to give a complete picture of how Artificial Intelligence is being used in sports. This took a steps. First the information was grouped into categories like making performance using data to predict things taking care of health getting fans involved and leading. Then a closer look was taken to find patterns and important points. The quality of the research was also checked by looking at things like how many people were in the study what methods were used and if the conclusions made sense. Finally the findings from studies were compared to see what was similar and what was different [2].

In their paper "Artificial Intelligence and Sports Analytics " Ananthu talked about how sports management research has used different approaches to understand how sensors and machine learning can be used to solve real problems. This review divided the research into categories like sensors, computer vision and player performance analysis. The goal is to prevent injuries and make decisions during games.

In their paper "Research on the Development of Sports in the Age of Artificial Intelligence " Zirui talked about how Artificial Intelligence has grown and is now being used in many areas, including sports. Artificial Intelligence is being used to look at sports data understand how people move, evaluate performance and make equipment to help with training. This review looked at how Artificial Intelligence's being used in sports especially in performance analysis and understanding human movement [3].

In their paper "Research on the Application of Artificial Intelligence Technology in Modern Sports System " Le Huang talked about how sports important for people to socialize and be healthy. With technology Artificial Intelligence is being used in China to change the sports industry by using big data, cloud computing and cloud storage. This can make the sports training system much better by handling a lot of information. This review looked at the value of Artificial Intelligence in the sports industry how advanced computers, big data and cloud computing are affecting sports development. Artificial Intelligence is being used to make sports better. It is an important part of the sports sector. The use of Artificial Intelligence, in sports is. It is changing how games are played and how players are trained. Artificial Intelligence is also being used to prevent injuries and make decisions during games. Overall Artificial Intelligence is a part of the sports industry and it will continue to play a big role in the future of sports.

3. Research Methodology

Sports statistical analysis is very important and gathering match data is key. We are using video analytics to make data collection easier and getting data from websites. After we collect the data we will use models and Machine Learning to find patterns in injuries and see how a players style and skill affect their chances of success. We have made the model-checking function better so it can handle models with states making team sports analysis simpler [2].

The first step in court detection is finding a matrix that projects a regular court onto the one in the video. Using this matrix we can project pixels from the video back to the court and estimate real-world coordinates. Tracking players and balls is hard because we have to detect elements and identify them correctly. Tennis balls are small and can be hidden by players, rackets or the net and they move fast so they can appear as a blur. In soccer videos camera angles can make it hard to see players who're behind others. In sports managing injuries is a big challenge for teams and athletes. Being able to prevent injuries diagnose them correctly and create rehabilitation plans is crucial, for success. Teams need to be able to do this to achieve greatness [11].

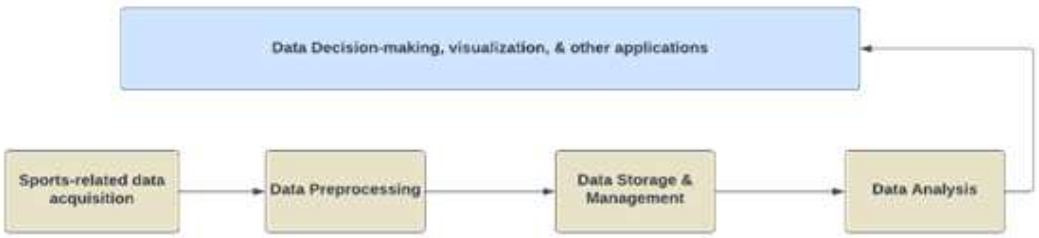

Figure 2: AI-Based Sports Data Processing Framework

There are many different types of unstructured data besides traditional structured data, including pictures, network logs, audio files, animations, and athlete-starring sports videos. This analysis examines the widespread use of big data in all facets of the game, using basketball as an example. This includes player distributions, official lineups, scores, real-time technical statistics, goals scored, player substitutions, and significant events like red and yellow cards regarding game data. Data analysis involves

compiling relevant scores from completed matches, historical scores of specific team rankings, goals scored overall by teams over the previous two years, and future schedules. Point totals, team standings within a league, round specifics, game times, and other league-related information are all provided by database information. For selected teams, the database provides accurate match data from the last 15 to 30 games, including match specifics, times, participating teams, and outcomes. In addition, certain players' personal information is given, including name, height, age, and ethnicity. In order to provide users with thorough competition analysis, a team of sports experts gathers and thoroughly analyses competition-related intelligence through data products and advanced applications. They combine their professional insights and industry experience [3].

Artificial induction improves thermal imaging and image sensitivity, which improves user login security and privacy. Through the integration of this sophisticated sensing technology with additional devices, remote login capabilities are achieved, ultimately optimizing the user's login experience [5].

Presently, various indicators are utilized to gauge the extent of development within the sports industry. Commonly employed metrics include the overall dimensions of the sports industry, including its workforce, added value, and size. [6]

There is a clear connection between digital technology and sports integration. In this domain, digital technology has become a key component in directing training for competitive sports. Among the prevalent application technologies, computer simulation technology stands out as one of the most widely utilized methods. [7]

Employing AI in sports offers an effective avenue for enhancing player performance, safety, and ensuring precise calls, thereby enabling superior game strategy. Among the advantages of technology in AI for sports is the inclusive opportunity it provides, allowing everyone to engage in the excitement.

In the sports domain, the influence of computational methods, including AI, has been significant. Different models have been utilized to examine the impact of sports on the business landscape.

4. Result

Figure3: Key Findings of Artificial Intelligence Applications in Sports

The experiment aims to investigate the impact of integrating LBPH algorithm and Better Up application for talent identification in sports. A sample of athletes will be selected, and their performance and mental wellness data will be collected using the LBPH algorithm and Better Up application. The data collected will be analysed to identify potential areas of talent and inform talent identification strategies.

The data acquisition module, a feature extraction module, a classification module, and a training classifier database module make up the majority of facial recognition systems' four primary parts. Image data is collected by the information acquisition module and used as test samples for analysis. Human identity data is retrieved and analysed in the feature extraction module. Then, in order to classify test samples and determine individual identification information, the classification module uses a classifier that has been trained by the database.

The face recognition system is implemented using the Local Binary Pattern (LBP) Algorithm. Using the LBP operator, the spatial arrangement of pixels in a face image is captured in order to extract local features. The LBP operator specifically computes binary patterns based on the intensity ratios of neighbouring pixels relative to a central pixel, typically considering a neighbourhood of approximately eight pixels. [10]

$$LBP(x_c, y_c) = \sum_{n=0}^{7} S(i_n - i_c)2^n$$

"ic" indicates the value of the centre pixel in this process, and "(xc, yc)" indicates details about the eight surrounding pixels. This configuration is especially helpful for recognising facial features. A binary code is produced by extracting the image's features from the original matrix and comparing their values with the values of the centre pixel.

The Algorithm works as below:

Begin with "temp" set to be 0.

For each training image "i".

Initialize "H" (pattern histogram) to 0.

Calculate the LBP model level.

Increment the matching pin by 1.

Identify the best LBP feature from each face picture and combine them into a single vector.

Examine the features side by side.

If the comparison and the database that is stored match. The picture is back up.

Algorithm	45px	35px
LBPH	94%	90%

Table 1: Comparison of recognition accuracy rates

A study that was published in the Journal of Sports Science and Medicine demonstrated that using the LBPH algorithm could increase tracking an athlete's movements by as much as 91.6% Several well-known athletes, like Serena Williams and Michael Phelps, have improved their mental health and performance by using the Better Up app. According to the application, its users' resilience has increased by 31% and their stress levels have decreased by 38%. The sports analytics market is expected to grow at a compound annual growth rate (CAGR) of 22.0% from 2019 to 2024, reaching a projected value of USD 5.2 billion, according to a report by Markets and Markets [17].

In just a single year, the accuracy of match decisions in football has increased dramatically with the introduction of Video Assistant Referee (VAR) technology, rising from 82% to 94%. Notably, the use of VAR during the 2018 World Cup increased the percentage of accurate referee decisions from 95% to an astounding 99.32%. Similarly, in various sports such as Volleyball, Tennis, and Cricket, the hawk-eye technology, also known as DRS (Decision Review System), operates on a similar principle to the VAR system [11].

5. Conclusion

In conclusion, the use of AI technologies such as the LBPH algorithm and Better Up application has had a significant impact on the sports industry. These technologies have revolutionized the way coaches train athletes and the way athletes approach their training. Moreover, they have improved the overall fan experience, making sports more exciting and engaging [10][13].

It may seem surprising that artificial intelligence has been in existence since the 1950s, considering that widespread discussion about it has only emerged more recently, particularly in the last five to ten years. The significant advancements made in AI technology during this period have undoubtedly contributed to the current fascination and widespread interest in the topic of artificial intelligence.

The desire for growth and excellence in sports is shared by all. Athletes and sports organisations alike are eager for new technologies to emerge that can improve performance. When used properly, artificial intelligence (AI) offers a wide range of benefits to players and organisations. Organizations aim for higher annual revenue and better player performance, and this thesis, in my opinion, explains how AI is currently applied by organizations while also examining its industry-wide transformative potential. It's exciting for us as viewers to consider the enormous influence artificial intelligence will have in the near future, especially as live video production reaches new heights of innovation. When discussing AI, certainty is elusive. While short-term predictions about the future hold credibility, they are essentially educated guesses. The landscape of the world in two, five, ten, or fifty years remains uncertain, yet I am convinced that AI will exert a significant influence on it [12].

AI-based coaching offers a unique advantage over traditional coaching methods. Information analysts who can pinpoint a player's unique strengths and evaluate how well the team uses them are a valuable resource for coaches working with AI. AI significantly impacts coaches' strategic decisions, bridging the gap between sports and technology. Judgment in sports has evolved significantly from its previous state. With innovations such as Hawkeye, video assistant referees, and the advent of the versatile Zen era, substantial changes have already occurred. However, these advancements are merely the tip of the iceberg. In the future, AI holds the potential to surpass human referees in making more accurate decisions. AI-powered chatbots have the capability to discern the significance of tailored engagement during interactions. When deployed at sporting events, these chatbots can serve as invaluable aids for both participants and audiences. By functioning as event support tools, chatbots gather extensive participant data, which can be leveraged for future planning and strategic purposes [13].

Sports scientists are increasingly depending on these insights to enhance training programs, pinpoint strengths and weaknesses, and make decisions based on data [14].

The incorporation of AI into grassroots sports is progressively encouraging individuals to adopt healthy physical activities and lifestyle habits. Additionally, it assists in establishing a comprehensive database for grassroots fitness, offering data support for evidence-based decision-making within relevant government sectors [15].

Club managers and owners seek classification models to comprehend and communicate the strategies required for winning matches. AI offers various methods for match prediction, including indirectly sourced data. Prediction markets, such as betting exchanges, enable customers to wager on the outcome of individual events [16].

One limitation of AI-powered analytics is the potential for data bias, which can lead to inaccurate results and reinforce existing inequalities. For example, if AI algorithms are trained on historical data that reflects biased decision-making, they may produce results that perpetuate these biases.

AI-powered analytics can also face technical challenges related to data management, algorithm design, and computational power. Additionally, there is a need for more academic research on the notion of responsible AI, including the accountability and responsibility of sports technology companies and startups [17].

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