School of Professional Studies   Master's Papers

6-2021

The Effects of Artificial Intelligence on Competitive Sports

Qiyu Pu

School of Professional Studies

Research Thesis

The Effects of Artificial Intelligence on Competitive Sports

Author: Qiyu Pu

Advisor: Richard Aroian

The Effects of Artificial Intelligence on Competitive Sports

Qiyu Pu

Clark University

Abstract

This Research thesis is to explore the application and impact of artificial intelligence in the field of competitive sports, discover the risks and problems in it, and discuss solutions. Nowadays, artificial intelligence has been applied to all walks of life, and the field of competitive sports is no exception, such as VR video technology, artificial intelligence for competition and player data analysis, artificial intelligence equipment to help players train, artificial intelligence to develop tactics, etc. But artificial intelligence has also brought about problems such as disrupting game viewing, making intellectual competitive sports meaningless, and threatening the status of industry practitioners. Many people worry that artificial intelligence will bring many uneliminated negative effects to competitive sports, but this is not the case. By referring to news and literature, conducting online questionnaires and interviews with industry practitioners, after discussion and analysis, conclusions were reached. Artificial intelligence has brought innovation and influence on the competitive sports industry. The positive impact it brings far exceeds the risks and problems. At the same time, these negative problems can be solved by artificial control. The application of artificial intelligence will continue to deepen in the competitive sports industry and promote the better development of competitive sports.

Keywords: Artificial Intelligence, Competitive Sports, VR, AlphaGo, Go, F1, Coach

1. Introduction

Artificial intelligence is a frontier subject, developed based on multiple subjects such as computer science, cybernetics, information theory, systems science, philosophy, etc. It can simulate, extend, and expand human intelligence. Its research has extended the functions of the human brain, deepened and expanded human intelligent labor, and made the development of the scientific and technological revolution unprecedented.

With the development of artificial intelligence technology, it has emerged in many fields, such as driverless cars, big data analysis, etc. At the same time, artificial intelligence and data science have played an increasingly important role in the field of sports. There are few things in the world that cannot be quantified, and everything that can be quantified can be accurately predicted using a combination of data analysis and artificial intelligence. In the field of sports, the quantifiable elements are very rich, which is suitable for artificial intelligence to show its talents. Another point that needs to be clarified is that the application of artificial intelligence in the field of sports is by no means limited to improving athletes' performance on the field. At the same time, it is also used to improve the viewing of the game, ensure the fairness of the game, and protect athletes.

The research thesis project's goals are through investigation, analysis and discussion, exploring the current application, impact of artificial intelligence on competitive sports and its future development prospects, this is the first project goal. At the same time, we must pay more attention to the potential risks and problems brought by artificial intelligence in the field of competitive sports. For example, artificial intelligence may threaten the status and interests of

sports-related players. Finding ways to avoid risks and solve problems through this research is also one of the project goals.

1.1 Artificial intelligence improves the fairness and appreciation of competitive sports

In sports events, the Hawkeye system is an instant replay system of motion trajectories used in tennis and cricket competitions. The Hawkeye system divides the three-dimensional space of the competition field into millimeter-level measurement units, consisting of eight to ten high-speed cameras Capture the flight trajectory of the ball from different angles, use the machine learning method to calculate the data to generate a three-dimensional image, and then use even imaging technology to generate 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 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. In the future, it will inevitably be used by more and more competitions. Introduce.

In football, volleyball, badminton and other ball games, there are often out-of-bounds violations. Too fast the ball makes it difficult to visually determine whether the pressure point of the ball is in contact with the sideline, which is controversial for better judgment. For the out-of-bounds ball, the digital detection system played a huge role. The optical three-dimensional motion real-time capture device continuously captures the digital position information of the sphere in real time when the sphere is moving, and the machine calculates the three-dimensional coordinates (X, Y, Z) of the center of the sphere. When the ball is about to land (Z is the minimum value), after calculation and graphics processing, (X, Y) is compared with the standard value of the out-of-bounds range to determine whether it is out of bounds, which greatly improves the accuracy and scientific of the penalty for out-of-bounds ball. . However, this method also has certain

drawbacks. Some balls (such as badminton) models are not standard circles, and there is a relatively large error in using the coordinates of the center of the sphere. Secondly, in order to accurately capture the position information of the center of the sphere, the sphere needs to pass through Infrared spraying or other processing methods may have a certain impact on the performance of the players.

1.2 Artificial intelligence assists athlete training

With the help of artificial intelligence, athletes will accurately understand cadence, heart rate, speed and other data by wearing smart wearable devices, intelligently analyze the data obtained from device monitoring during exercise to understand their personal physique, and use professional and scientific methods to rationally formulate exercise Plan to improve physical fitness. Intelligence is more widely used in professional athletes' sports training. It relies on computer technology to analyze the characteristics of athletes' physique and muscle training from the perspective of genes and energy metabolism, obtains athletes body data through genetic testing, and collects daily training athletes' heart rate and acceleration through scientific and technological means. Analyze the relationship between athletes' aerobic training, sports performance and sports technology, generate athlete's physical fitness data, fully understand the athlete's physical health and relative training intensity, establish athletes' physical fitness files, customize reasonable sports training plans for athletes, and standardize training movements , Prevent physical injury caused by improper training, and analyze whether the athlete has the conditions to play on the court through various data indicators. The American Professional Basketball League Golden State Warriors are a typical representative of relying on artificial intelligence technology to gain competitive advantage. In training, they monitor heart rate and other data through wearable Catapult Sports monitors, use Omegeware equipment to monitor

nervousness, and continuously use machine learning methods. Improve the training parameters and optimize the training model. There are reasons to believe that artificial intelligence technology has directly helped the training guidance.

1.3 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 fierce competitive sports. During the game interval, the AI program will continue to provide various insights and profoundly influence the specific tactics formulated by the coach.

Through the combination of wearable sensors and high-speed cameras, the AI 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 grasp 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. More importantly, AI 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 technical and tactical ideas.

Take Formula One (F1) racing as an example. This is one of the most watched sports in the world today, and it is also the most popular event driven by data. At present, most F1 cars are equipped with 200 to 400 sensors. The development of data science has greatly simplified the data collection process, and AI technology is responsible for interpreting these data. With the help of AI, the fleet can visually organize data and calculate pit stops. At present, Amazon Web Services (AWS) has provided a cloud computing platform for multiple F1 teams, which saves race data over the past sixty years, which can be analyzed by each team to find the best tactics for the current race.

2. Hypothesis (Theory)

In this research paper, mainly put forward 3 kinds of hypotheses and theories, and use cases and data (from online data and my online survey) for analysis and discussion.

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

2.2 At the same time, artificial intelligence has brought negative effects and troubles to athletes and those practitioners engaged in competitive sports.

2.3 The future development direction of artificial intelligence can be expected and controlled.

3. Methodology

3.1 Online Survey

Because of the coronavirus, I did not do interviews on campus, I conducted a survey and data collection on WeChat online. There are 40 people participating in the survey, after one week of investigation and data collection, I have completed the Online Survey Section of my research paper. I will represent these data in the form of histograms and pie charts to facilitate more intuitive observation of the data and draw conclusions for discussion.

3.1.1 Questionnaire question design

A. Do you understand artificial intelligence? What are the applications of artificial intelligence in competitive sports?

B. What advantages do you think artificial intelligence brings to competitive sports?

1. Improve viewing.

2. Improve fairness.

3. Protect athletes.

4. Assist athletes in training.

5. Develop tactics

6. Tap talent

7. Others

C. What are your concerns about the impact of artificial intelligence in competitive sports?

1. Replace athletes.

2. Affect employment like coach in related industries.

3. Reduce the drama in the game.

4. Affect the fluency of the game.

5. Others

D. Do you think the risks which artificial intelligence brings to competitive sports can be controlled or eliminated?

3.2 Study cases of artificial intelligence in competitive sports

This research thesis takes AlphaGo's victory over the Go champion, artificial intelligence to help the Golden State Warriors win the NBA championship, and Google's artificial intelligence performance in the e-sports StarCraft 2 as examples for the main analysis and discussion. At the same time, online surveys and online interviews are also used to obtain the views and opinions of the audience and personnel in related industries and conduct auxiliary demonstrations.

3.2.1 AlphaGo in Go

AlphaGo is the first artificial intelligence robot to defeat a human professional Go player and the first world champion of Go. It was developed by a team led by Google's DeepMind company Damis Hassabis. Its main working principle is "deep learning".

In March 2016, AlphaGo and Li Shishi, the world champion of Go and a professional nine-dan player, won the game with a total score of 4-1. At the end of 2016 and early 2017, the program was named "Master" on the Chinese chess website (Master) for a registered account to compete with dozens of Go players from China, Japan and South Korea, with no defeat in 60 consecutive rounds; in May 2017, at the Wuzhen Go Summit in China, it played against Ke Jie, the world's No. 1 Go champion. The battle was won by a total score of 3 to 0. It is recognized by the Go world that the chess power of Alpha Go has surpassed the top level of human professional Go. In the world professional Go rankings published on the GoRatings website, its level has surpassed the number one player Ke Jie.

On May 27, 2017, after the human-machine battle between Ke Jie and Alpha Go, the Alpha Go team announced that Alpha Go will no longer participate in the Go competition. On October 18, 2017, the DeepMind team announced the strongest version of Alpha Go, code-named AlphaGo Zero.

After just 3 days of self-training, AlphaGo Zero defeated the old version of AlphaGo that had previously defeated Li Shishi, with a record of 100:0. After 40 days of self-training, AlphaGo Zero defeated the AlphaGo Master version. "Master" has defeated the world's top Go players, even the world's number one Ke Jie.

3.2.2 Artificial intelligence helps Golden State Warriors win NBA championship

The famous NBA team, the Warriors, has won 4 NBA championships in 5 years. Behind their strong personal skills and teamwork, a lot of high-tech equipment is inseparable. For example, the Warriors will allow players to use sleeping bags that can effectively reduce jet lag. They have been wearing high-tech devices that can help the team determine the fatigue of players, including data such as heart rate and leg strength. After being tested by the NBA Development League for one year, the Warriors also began to use the pressure suit Athos with built-in sensors during training. This sensor embedded in the jersey will track the player's muscles, heart rate, nerves and other physical functions . At the end of 2016, the Warriors also installed the PlaySight SmartCourt system in the California training hall to track and transmit player training through video in real time through nine high-definition cameras.

According to the "New Yorker" report, the Warriors also recently launched a new headset device that can transmit pulse signals to the brain to improve muscle memory. It is reported that this device called "Halo Sport" was created by Halo Neuroscience and uses transcranial direct current

stimulation (tDCS) technology to help athletes improve muscle memory. At present, Warriors players will be required to wear this equipment before each training. Halo Neuroscience stated that this equipment has greatly improved the training efficiency of Warriors players.

3.2.3 AlphaStar and Real-Time Strategy Game StarCraft II

Games have been used for decades as an important way to test and evaluate the performance of artificial intelligence systems. As capabilities have increased, the research community has sought games with increasing complexity that capture different elements of intelligence required to solve scientific and real-world problems. In recent years, StarCraft, considered to be one of the most challenging Real-Time Strategy (RTS) games and one of the longest played esports of all time, has emerged by consensus as a "grand challenge" for AI research.

Now, we introduce our StarCraft II program AlphaStar, the first Artificial Intelligence to defeat a top professional player. In a series of test matches held on 19 December, AlphaStar decisively beat Team Liquid's Grzegorz "MaNa" Komincz, one of the world's strongest professional StarCraft players, 5-0, following a successful benchmark match against his team-mate Dario "TLO" Wünsch. The matches took place under professional match conditions on a competitive ladder map and without any game restrictions.

Although there have been significant successes in video games such as Atari, Mario, Quake III Arena Capture the Flag, and Dota 2, until now, AI techniques have struggled to cope with the complexity of StarCraft. The best results were made possible by hand-crafting major elements of the system, imposing significant restrictions on the game rules, giving systems superhuman capabilities, or by playing on simplified maps. Even with these modifications, no system has come anywhere close to rivalling the skill of professional players. In contrast, AlphaStar plays

the full game of StarCraft II, using a deep neural network that is trained directly from raw game data by supervised learning and reinforcement learning.

3.2.4 Artificial intelligence and F1

Behind the sleek appearance of today's McLaren F1 cars is a complex engineering technique that greatly improves their speed, flexibility and precision. However, the excellent technology that powers supercars has also expanded the threat sphere of hackers.

At a glance, the modern F1 car under the hood reveals a series of instruments, all of which must be working in harmony. This car has more than 25,000 individual components, of which the chassis alone has 11,000 components, the engine has 6,000 components, and 8,500 electronic components.

These components are coordinated with advanced data analysis. During the two-hour race, McLaren's F1 electronic control unit (ECU) transmitted more than 750 million data points, allowing the car's performance to be continuously monitored. ECU has more than 300 sensors. In grand prix with an average of 300 kilometers, ECU processes more than 1,000 input parameters and transmits more than 300GB of real-time data back to the garage.

This system is called F1 telemetry, which analyzes engine performance, suspension status, gearbox data, fuel status, temperature readings, gravity measurement, and drive control. Engineers from the F1 headquarters team analyze these data in real time to investigate the performance and performance of the drivers and cars in the race, including engine conditions, tire degradation and fuel consumption.

This continuous analysis of the data allows the team to optimize performance at a granular level during the race and accurately determine the best moment to get the car off the track. The

telemetry data also helped the team decide how to adjust the differential, a mechanism that allows the two rear wheels to rotate at different speeds, thus greatly reducing time.

Having such a close connection with the schedule has resulted in a lot of data that needs to be protected, and many of these components are networked, making them vulnerable to attacks by external hackers. Traditional security tools have tried to prevent attackers from entering computer networks and use rule-based systems to identify known malicious behaviors.

Protecting McLaren's network and equipment from fast and complex malware and other forms of attacks requires more advanced technology applications. Today, tireless artificial intelligence is used to continuously monitor the entire environment and determine whether digital activity is as expected, or whether any elements are suspicious and potentially malicious.

3.3 Online interviews with practitioners in the competitive sports

In addition to the online survey, I will also interview an online player in the competitive sports-related industry. His name is Chen Kailiang and he is the coach of the Xi'an Badminton Team in Shaanxi Province, China. Through interviews with him, I want to have a deeper understanding of the views of people in the competitive sports industry on artificial intelligence, to obtain more professional and objective views. To this end, I have prepared the following questions:

    a. What do you think artificial intelligence brings to competitive sports?

    b. What impact do you think artificial intelligence has brought to those of you in the competitive sports industry?

c. Do you think artificial intelligence will replace some competitive sports

practitioners in the future?
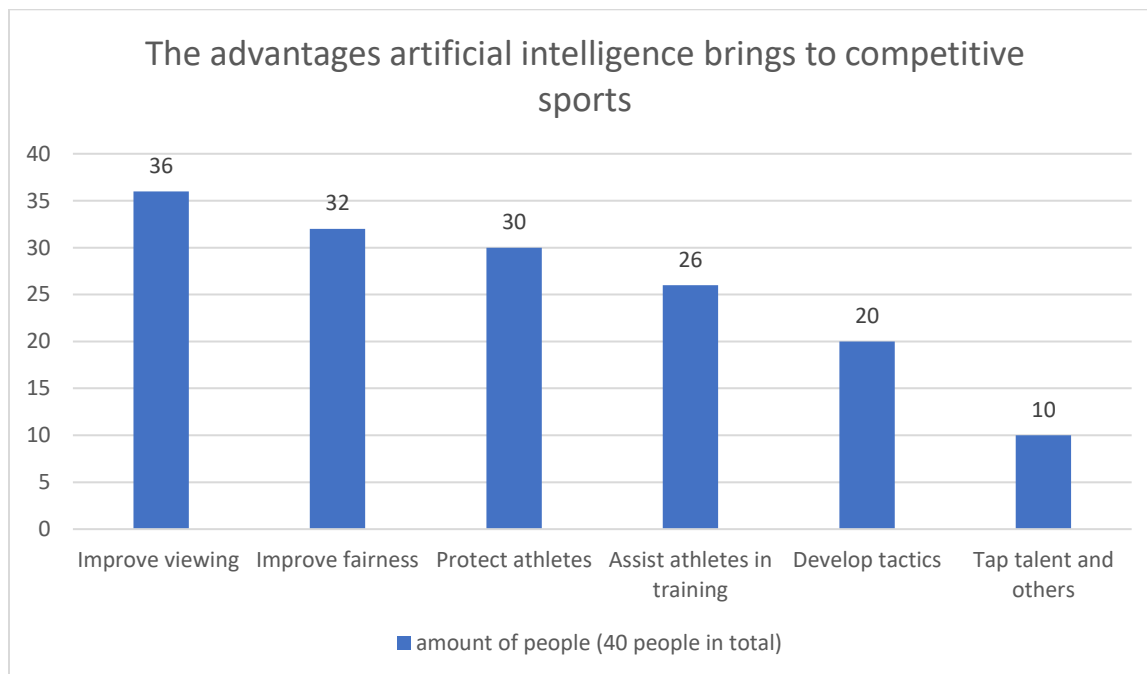
4. Findings

4.1 Findings from Online survey result

I organized and summarized the 40 questionnaires, and displayed them in the form of tree diagrams and icons, and analyzed and elaborated opinions.

Question 1. Application of artificial intelligence in competitive sports.

Most people know that artificial sports have been popularized in various competitive sports. At the same time, what most people understand is how to help referees decide matches.

Figure 2. The advantages artificial intelligence brings to competitive sports.

The advantages artificial intelligence brings to competitive sports

- Improve viewing: 36
- Improve fairness: 32
- Protect athletes: 30
- Assist athletes in training: 26
- Develop tactics: 20
- Tap talent and others: 10

amount of people (40 people in total)

There are 36 and 32 respectively believe that artificial intelligence has improved the appreciation and fairness of competitive sports. In addition, 30 and 26 believe that artificial intelligence can protect athletes from injury and assist athletes in training. In the end, 20 people felt that artificial intelligence could help formulate strategies in competitive sports. Only 10 people think that artificial intelligence can assist in talent discovery and other help.

Figure 3. Some worries and risks arising from artificial intelligence in competitive sports.
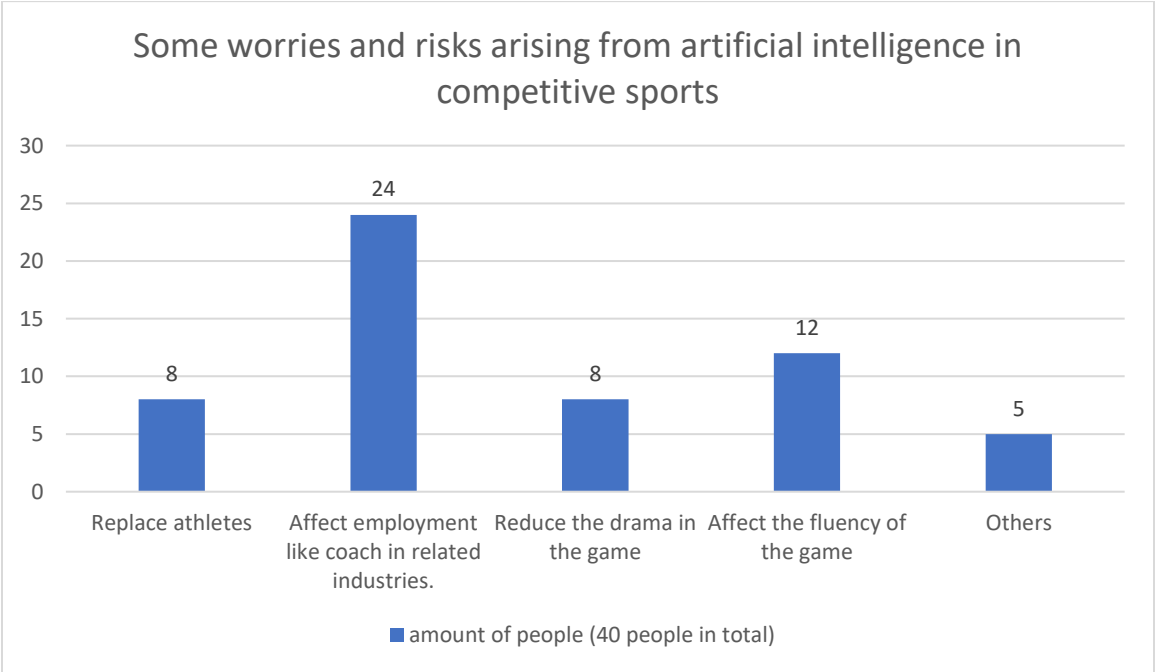
Only 8 people think that artificial intelligence may threaten the status of athletes to replace athletes, but 24 people think that artificial intelligence is likely to threaten other practitioners, such as stadium coaches. In addition, 8 people believe that artificial intelligence will reduce the dramatic phenomenon in competitive sports. What is more, 12 people believe that the

participation of artificial intelligence in competitive sports will affect the smoothness of the game. 5 people think there are other risks.

Figure 4. Whether artificial intelligence can be controlled and avoid risks in competitive sports.
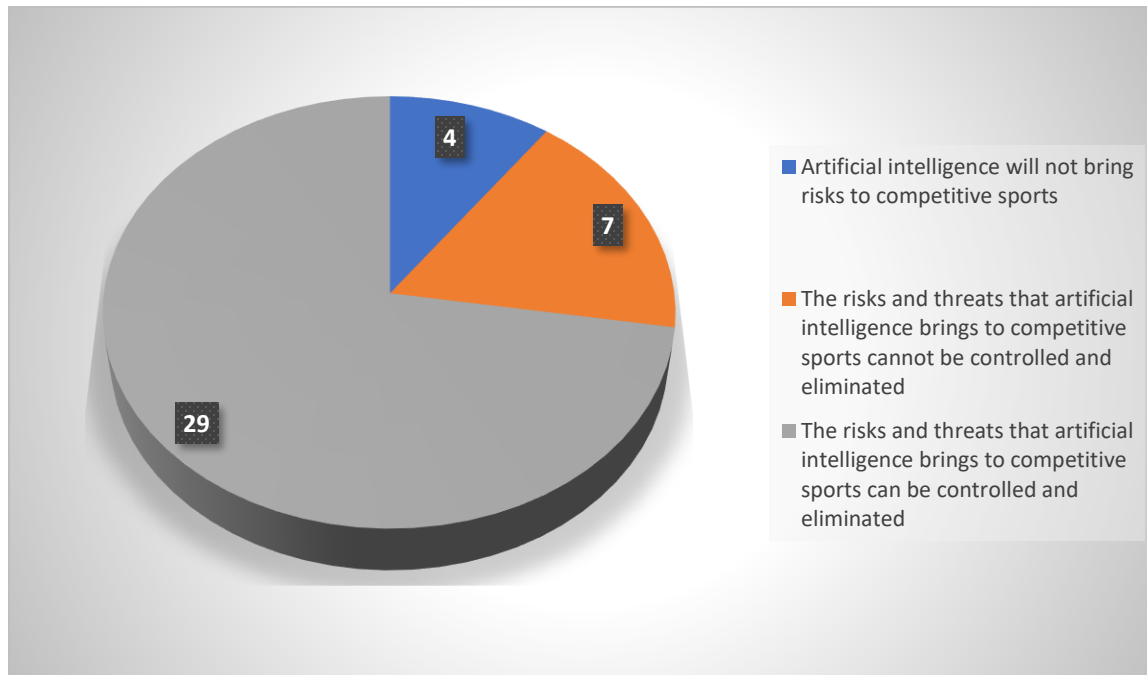
4 people think that artificial intelligence will not bring risks to competitive sports. On the contrary, 7 people think that the risks and threats that artificial intelligence brings to competitive sports cannot be controlled and eliminated. The remaining 29 people believe that although artificial intelligence will bring some risks and challenges to competitive sports, it can control and eliminate these risks and problems.

4.2 Findings from Materials Analysis

4.2.1 The trade-offs of artificial intelligence on the various impacts of competitive sports

As shown in the materials and surveys, artificial intelligence is currently widely used in competitive sports arenas. Through the introduction of artificial intelligence, it can satisfy the audience to appreciate sports events, but also evaluate sports games objectively and impartially, reducing the number of referees on the competition field. dispute. For example, the current Eagle Eye system uses high-speed cameras at different angles to capture the flight trajectory of tennis or volleyball in high-speed sports, determine its precise landing point, and assist in the competition. The electronic real-time judgment system in football can accurately judge the occurrence of offside or suspected goals during the game. Through the introduction of smart technology, in such competitions, the judging will become more active and exciting, and also fairer and fairer, which will greatly weaken the subjectivity of people and reflect the objectivity of the game more vividly. Especially in martial arts, synchronized dance, diving, gymnastics and other competitions, it will have a revolutionary impact on competitive sports, and it will greatly reflect the fairness and justice of the competition.

However, The VR replay is used to determine various situations that occur on the field, which will also reduce the fluency of competitive sports games. In today's competitive competitions, it often happens that VR replays make judgments, sometimes even in a game many times, which greatly reduces the smoothness of the game and affects the audience's viewing experience. Nevertheless, the game will be fairer. In addition, there have been classic and dramatic phenomena in some games, such as "The hand of God"("The hand of God" was a phrase used by Argentine footballer Diego Maradona to describe a goal that he scored during the Argentina v England quarter finals match of the 1986 FIFA World Cup. The goal took place on 22 June 1986, at the Estadio Azteca (Aztec Stadium) in Mexico City. Under association football rules, Maradona should have received a yellow card for using his hand[1] and the goal disallowed.

However, as the referees did not have a clear view of the play and video assistant referee technology did not yet exist, the goal stood and Argentina led 1–0. The game ended with a 2–1 win for the Argentines, thanks to a second goal scored by Maradona, known as the "Goal of the Century". After the match, Diego Maradona stated that the goal was scored "a little with his head, and a little with the hand of God".) Many viewers think this is also a kind of charm in competitive sports.

4.2.2 Artificial intelligence can help athletes train more efficiently，but Artificial intelligence may gradually lose the fun of chess and other intellectual sports.

Although artificial intelligence can assist athletes in more efficient 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. The older generation of chess players may feel that the current chess has lost the beauty of the past, because they are played in the same way as AI. "Ke Jie said.

At the same time, Ke Jie also believes that AI has made the Go industry more and more competitive: "In the past, I thought it was easier to win a game of chess. Now it is getting more and more difficult. Human players are all learning from artificial intelligence. Everyone knows how to make the layout."

In 2017, Ke Jie and the artificial intelligence "AlphaGo" had three duels, and Ke Jie finally lost 0:3. Nowadays, Ke Jie's free time is almost all spent on researching AI. He said: "It is more painful for me to see AI now, because I know I can't make a good chess that is better than AI."

As Ke Jie said, with the addition of artificial intelligence, intellectual competitive sports may no longer be a contest of intelligence between people, but a confrontation between artificial intelligence.

4.2.3 Artificial intelligence can help formulate strategies on the race schedule, but it may replace coaches and other workers on the competitive arena in the future.

Artificial intelligence has learned how to formulate tactics that originally required years of practical experience to make judgments as the main responsibility of the coach. Compared with the "experience" of senior coaches, AI's conclusions based on large amounts of statistics and probabilities may be more objective and well-founded.

Although it is technically a reality for artificial intelligence to formulate tactics, the results of calculations based on data are fixed, which means that all teams that purchase this system or use similar algorithms can reach similar conclusions. The value of tactical formulation lies in surprises and unpreparedness. How to use the advice and intelligence given by AI to design clever tactics that the enemy can unexpectedly win. This is a task that only human coaches can complete. Moreover, the current artificial intelligence is not yet capable of the task of on-the-spot

command. The situation of the game is ever-changing, and unexpected emergencies may occur at any time. It is difficult for humans to teach AI when to call a timeout and arrange players on the field. After all, this is not as fixed as tactics. rule.

In addition, in competitive sports, the player's personality and psychological quality are also one of the important factors that affect their performance and future development. For example, during the draft, artificial intelligence can only judge the physical fitness and skill level of the players through video analysis, and know nothing about their mental state. In the highly competitive NBA arena, a strong psychological endurance is a necessary condition for becoming an excellent player.

However, this also brings some problems and concerns. Since artificial intelligence can replace coaches in formulating strategies on the competitive arena, is there no longer a need for coaches in competitive sports in the future?

4.2.4 Artificial intelligence can protect athletes from more aspects, but there are also certain risks.

Taking F1 racing cars as an example, various types of sensors are currently installed on F1 racing cars to collect more than 270 types of data including temperature, wind speed, piston speed, and pressure. After each race, the team will use the results of data analysis to improve the performance of the car. In the course of fierce competition, the state of the car will generate a large amount of data of various types. Once you start to analyze these data, you will need more data to assist, except for the data of the car itself, such as the wind speed of the race and the race. Various environmental index data such as road humidity should also be collected. Human

resources alone cannot quickly process such a large amount of data. At this time, various artificial intelligence, cognition, and analysis technologies are available.

What is more, having such a close connection with the schedule has resulted in a lot of data that needs to be protected, and many of these components are networked, making them vulnerable to attacks by external hackers. Traditional security tools have tried to prevent attackers from entering computer networks and use rule-based systems to identify known malicious behaviors.

Protecting F1 team's network and equipment from fast and complex malware and other forms of attacks requires more advanced technology applications. Today, tireless artificial intelligence is used to continuously monitor the entire environment and determine whether digital activity is as expected, or whether any elements are suspicious and potentially malicious.

4.2.4 Artificial intelligence may become the ultimate opponent of some competitive sports, rather than humans themselves, such as in e-sports.

E-sports is a recently emerging competitive sports project. Today, with the rapid development of the Internet, more and more people understand and accept e-sports. Until today, the attention of e-sports has caught up with traditional sports. According to statistics, there are currently 400 million e-sports spectators in the world.

Today, artificial intelligence is also impacting the field of e-sports. Alpha Star's performance in Real-Time Strategy Game StarCraft II cannot be ignored. More and more viewers are focusing on the confrontation between competitive players and artificial intelligence. This makes people worry about whether e-sports will simply become a confrontation between e-sports players and computers in the future, which will let e-sports lost the meaning of itself.

4.3 Findings from online interviews with practitioners in the competitive sports.

In the interview with Chen Kailiang, coach of the Xi'an Badminton Team in Shaanxi Province, China, I briefly recorded his views on artificial intelligence in the field of competitive sports.

He thinks artificial intelligence has brought reform and innovation to competitive sports. Firstly, there is no doubt that artificial intelligence will make badminton games fairer. Secondly, the introduction of artificial intelligence helps their badminton players to better develop training plans. Thirdly, he believes that there are many potential applications of artificial intelligence, which can help the better development of competitive sports.

At the same time, Chen Kailiang also thinks that artificial intelligence has brought challenges and impacts to the competitive sports industry. According to his description, many industry players have begun to learn the relevant knowledge of artificial intelligence applications to improve their competitiveness in the industry. At the same time, artificial intelligence It can efficiently complete some complex tasks, such as statistical analysis of game data, and mining of hot spots for players. To a certain extent, artificial intelligence can replace some industry players to complete their tasks.

However, Chen Kailiang was not worried that artificial intelligence will replace coaches and related practitioners in the field of competitive sports in the future. He said although artificial intelligence can complete some tasks in competitive sports like humans, and can do better, it can't replace industry players at all. He uses his coaching capacity as an example. Artificial intelligence can indeed help coaches formulate strategies on the field. However, there are many other factors on the field that affect the performance of players, such as mentality, encouragement, comfort, etc., these things only the coach can communicate with players as a people to help players.

5. Discussion

5.1 How to trade-offs of artificial intelligence on the various impacts of competitive sports race?

There is no doubt that artificial intelligence improves the fairness of competitive sports games, and one of the cores of competitive sports is fairness, so it is unreasonable to abandon the application of artificial intelligence for the smoothness and drama of the game. Moreover, artificial intelligence not only improves fairness in competitive sports competitions, but also makes some events more enjoyable, such as fencing, fighting, and some events, by capturing and replaying wonderful shots. Increase the viewing of the game.

Of course, if the use of artificial intelligence is not restricted, the smoothness of the game will also be reduced. Many viewers believe that there will be frequent pauses during the current competitive sports game, and the referee will then use VR playback to determine what happened on the scene, although This ensures the fairness of the game, but for the audience, it also prevents them from enjoying the game smoothly.

So, I think there are some restrictions on the use of artificial intelligence, such as limiting the number of times participating teams or players can use VR playback. For example, in the NBA, the restrictions on VR playback are very reasonable. In an NBA game, both teams have one initiative to appeal to the referee and apply for the video assistant referee to watch the VR playback ruling. After the game, artificial intelligence will make it. A referee report is issued to make rulings and penalties for some omissions.

In this way, it ensures that the use of artificial intelligence improves the fairness and viewing of the game, while also minimizing the viewing of the game, allowing the audience to better enjoy the game.

What's more, this also guarantees a certain degree of drama, this also retains some drama in competitive sports competitions. For example, in the 2018 Russia World Cup finals, artificial intelligence VR playback also added a certain drama to the game. In the 18 minutes of the game, Griezmann of the French team was brought down with the ball in the front court, and the referee decisively awarded a free kick. But from the slow-motion playback, Griezmann has obvious traces of flopping, but the penalty for fouling is unchangeable. The French team also used this free kick to turn the score on the court into 1:0. In the 39th minute of the game, the biggest controversy of the game appeared. The French team took a corner kick from the right. The Croatian player Perisic, who was defending in the penalty area, accidentally handball a foul. The referee used video playback technology to award a penalty kick. The French team led the field score to 2:1 again, but such a penalty is also very controversial. . But it was the referee who used video playback technology to award the ball to France, and the French team won the championship in the end. This also shows that the emergence of artificial intelligence on the field may not only reduce the degree of drama in the game, but may even increase the degree of drama.

5.2 Whether artificial intelligence will destroy intellectual competitive sports?

Ke Jie's point of view is correct from a certain point of view. AlphaGo has calculated the best move method in various situations through deep learning of many Go games, and some players have imitated and memorized AlphaGo's moves. In the Go game, the first 50 or even 100 moves

are rigidly imitated to gain the advantage of the game, so Ke Jie said that artificial intelligence has largely narrowed the gap between the players and made Go lose the fun.

However, I do not think artificial intelligence will not destroy mental sports and make mental sports uninteresting although it was indeed greatly impacted. We need to look at the impact of artificial intelligence on intellectual competitive sports from many aspects.

Firstly, Artificial intelligence itself has given human chess players a lot of different insights, which has greatly enriched the development of the Go field. Although there are a lot of very prescriptive forms of artificial intelligence cognition, many Go players are now using it, but it has also opened a lot of new ideas. The understanding of the game will also enable human players to make continuous progress.

Secondly, the emergence of artificial intelligence can provide the convenience of ordinary amateur chess players, and lowers the barrier to learning Ordinary Go enthusiasts do not need to find real people to play chess. Artificial intelligence can also adjust the difficulty at will by changing its own settings, and even make a match. People make progress together, and do not even worry about opponents being too strong or weak, this will also attract more newcomers to participate in the sport.

5.3 Whether artificial intelligence will replace coaches and another practitioner in the future competitive arena?

Through the example of artificial intelligence helping the Golden State Warriors win the NBA championship, we can know that artificial intelligence can indeed assist in the development of

tactics on the court to help the team gain an advantage. However, I don't think artificial intelligence can completely replace the coach on the court in the future.

Although it is technically a reality for artificial intelligence to formulate tactics, the results of calculations based on data are fixed, which means that all teams that purchase this system or use similar algorithms can reach similar conclusions. The value of tactical formulation lies in surprises and unpreparedness. How to use the advice and intelligence given by AI to design clever tactics that the enemy can unexpectedly win. This is a task that only human coaches can complete. Moreover, the current artificial intelligence is not yet capable of the task of on-the-spot command. The situation of the game is ever-changing, and unexpected emergencies may occur at any time. It is difficult for humans to teach AI when to call a timeout and arrange players on the field. After all, this is not as fixed as tactics. rule.

In addition, in competitive sports, the player's personality and psychological quality are also one of the important factors that affect their performance and future development. For example, during the draft, artificial intelligence can only judge the physical fitness and skill level of the players through video analysis, and know nothing about their mental state. In the highly competitive NBA arena, a strong psychological endurance is a necessary condition for becoming an excellent player. Regarding this point, it can only be judged by the direct contact between the human coach and the player, and AI cannot help. And as basketball is a team sport, the interpersonal relationship between players sometimes needs to be reconciled by the coaching team. The head coach also bears the responsibility of encouraging players and improving team morale during the game.

5.4 Whether artificial intelligence can completely protect the safety of athletes? Will it cause other risks? Can it be avoided?

Nowadays, a lot of artificial intelligence are used in the training and competition of athletes to protect the safety of athletes. Athletes can wear various devices to track exercise, sleep, recovery and so on. Based on following his personal data in every practice and every game, artificial intelligence can detect changes, and artificial intelligence may warn performance personnel that he is facing a high risk of injury. Then, the sports trainer can adjust the training for the player, reduce the time of the next game, or let him withdraw from the game altogether.

However, when some artificial intelligence obtains and analyzes various data of athletes, it will involve various personal information and privacy of athletes. It is illegal to obtain these data without the permission of athletes. In addition, if these personal data are not strictly encrypted and protected and leaked, it will also pose a huge risk.

To avoid the risk, personal data must be processed in a transparent manner. The disclosure of the decision-making process of AI systems to the athlete is a much-debated issue.

The data used by the artificial intelligence system must be of sufficient quality to prevent any deviation. Certain players may perform poorly under the guidance of specific coaches or in specific work environments/activities (e.g., loss of family members). Therefore, AI systems that use such historical data may take it into account to prevent incorrect decisions about player performance and abilities.

Training, developing, and using artificial intelligence systems in sports requires a lot of personal data. At the same time, compliance with the principle of data minimization is essential. It must

be ensured that any personal data is appropriate, relevant, and limited to what is "necessary" for processing purposes. In this regard, organizations can rely on artificial intelligence systems in the technological development movement to process as little personal data as possible while still maintaining normal functions.

6. Conclusion

After discussing the reference news and literature, statistical data, and interviews with practitioners in related industries, some conclusions can be drawn about the assumptions made before the research thesis.

6.1 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 artificial intelligence has indeed brought many positive effects to the field of competitive sports. For example, the use of VR technology and other lens tracking technologies in competitive games not only ensures the fairness of the game, but also increases the viewing of the game. Outside the arena, artificial intelligence can also keep athletes from formulating better training programs and keep athletes in a better competitive state. Athletes can also wear some artificial intelligence devices to understand their physical state and protect themselves. At the same time, artificial intelligence can also assist industry players in completing their tasks more efficiently, such as conducting statistics and analysis of competition and athlete data, and formulating strategies on the field.

What is more, in different types of competitive sports, artificial intelligence has more special applications. In some sports like F1 , the application of artificial intelligence 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 improve their own level by playing against artificial intelligence, or conduct targeted training.

All in all, there is no doubt that the application of artificial intelligence in competitive sports has brought revolution and innovation to competitive sports, and has brought many positive influences on it. With the continuous development of Internet technology, this trend will also expand, and more artificial intelligence applications appear in the competitive sports arena.

6.2 Artificial intelligence has indeed brought many challenges and problems to the field of competitive sports, and it has also had many impacts on athletes and industry players, but these can be solved and prevented.

Just like the hypothesis proposed before, although the application of artificial intelligence in competitive sports has brought many positive effects to competitive sports, there are also some drawbacks. It also has a huge impact on the field of competitive sports. Competitive sports competitions, Athletes and industry players have been affected, and there are also risks and hidden dangers. However, after discussion, I think these risks and problems can be prevented and eliminated.

During competitive sports competitions, the use of VR video technology improves the fairness of the game, but frequent use of VR video technology for playback will affect the smoothness 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 of the game is also ensured, and a certain degree of drama in the game is retained.

On the other hand, in chess games and e-sports, the introduction of artificial intelligence is indeed a challenge for players. They need to face the fact that artificial intelligence continues to strengthen or even exceed human players, but this does not mean that artificial intelligence will destroy Intellectual competitive sports. On the contrary, I think it will continuously improve 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 artificial intelligence obtaining athletes' private information, I think this is one of the focus issues that need to be paid attention to, 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 of the application of artificial intelligence on the competitive sports industry is objective, and it does bring about various problems, 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 artificial intelligence continues to deepen, more and more problems will continue to appear, which also requires people to continue to solve, but I believe that the benefits of artificial intelligence to competitive sports will exceed the problems it brings.

6.3 Artificial intelligence will promote the development of competitive sports related industries, and will not replace the status of industry players.

With the rapid development of artificial intelligence, more and more people worry that artificial intelligence will replace human beings. This is also true in the competitive sports industry. Artificial intelligence can perform accurate data acquisition, data analysis and strategy formulation, and it can replace humans efficiently complete some tasks, but can it really replace the practitioners in the arena? After discussion, the conclusion is artificial intelligence cannot replace the practitioners.

Although artificial intelligence can replace practitioners to better complete some tasks on the field, artificial intelligence also has things it cannot do.

For example, the coach needs to pay attention to the emotional state of the athletes at all times on the field, communicate with the athletes at the right time, adjust the athletes' emotions, or give encouragement and comfort to the athletes, to improve the competitive state of the athletes. This is something that machines cannot do.

However, artificial intelligence does bring many challenges for industry players, they need to understand artificial intelligence and apply it better to ensure their competitiveness in the industry. This is one of the reasons why the competitive sports industry now needs many IT talents. Therefore, Artificial intelligence has brought new development momentum and technological innovation to the players in the competitive sports industry.

6.4 Summary

After the above discussion, analysis, and conclusions are drawn, a summary can be made. Artificial intelligence has brought innovation and impact to the competitive sports industry. It not only brings many positive effects, but also brings many challenges and problems, but these can be solved by people. With the continuous development of the Internet, the application of artificial intelligence will continue to 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. Relevant knowledge to better deal with the challenges brought by artificial intelligence.

7. Bibliography

References:

1. James Vincent. (2019) Former Go champion beaten by DeepMind retires after declaring AI invincible from: https://www.theverge.com/2019/11/27/20985260/ai-go-alphago-lee-se-dol-retired-deepmind-defeat

2. Bove Beardsley. (2019) WINNING WITH DATA SCIENCE, GOLDEN STATE WARRIORS STYLE from: https://dataconomy.com/2017/07/golden-state-warriors-data-science/

3. The AlphaStar team. (2019) AlphaStar: Mastering the Real-Time Strategy Game StarCraft II from: https://deepmind.com/blog/article/alphastar-mastering-real-time-strategy-game-starcraft-ii

4. Conor McKeon. (2018) How AI Could Impact F1 from: https://blog.v-hr.com/blog/how-ai-could-impact-f1

5. Roundhill Team. (2020) ESPORTS VIEWERSHIP VS. SPORTS IN 2020 from: https://www.roundhillinvestments.com/research/esports/esports-viewership-vs-sports

6. Wikipedia. (2021) The hand of God from: https://en.wikipedia.org/wiki/The_hand_of_God

7. David Geier (2021)Predicting and preventing sports injuries using artificial intelligence from: https://www.postandcourier.com/sports/predicting-and-preventing-sports-injuries-using-artificial-intelligence/article_7aeade1c-80eb-11eb-9492-4bcbb05bb448.html