Application of Artificial Intelligence and Big Data in Sports Event Service——Take Guilin as an Example

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Abstract. In recent years, many cities improve their brand awareness by holding sports events, but the traditional service mode of sports events cannot meet the needs of people at present. Through artificial intelligence and big data technology to improve and strengthen the service ability of event organizers is one of the current mainstream trends. However, there are not many practical application cases at present, so this paper puts forward the application research based on artificial intelligence and big data in sports event service, Taking Guilin as an example. This paper makes an in-depth investigation and Research on the demand of different ticket holders for the event service in Guilin. Through the analysis of the survey results, it can be seen that different ticket holders have different demand points for the event service. However, in the traditional service mode of sports events, it is difficult to meet the needs of users due to the lack of data support. In view of this, according to the characteristics of sports event service, combined with artificial intelligence and big data technology, this paper puts forward optimization and improvement measures. By improving the information gain in big data mining, this measure simplifies the algorithm and makes the calculation results more in line with the actual needs of sports event services. Analysis shows that under the background of information age, artificial intelligence and big data technology can further improve the comprehensive ability of China's sports event service, meet the needs of users, and promote the development of sports.

Keywords: Artificial Intelligence, Big Data Technology, Sports Events, Event Services

1. Introduction
With the rapid development of science and technology, mobile Internet, Internet of things, cloud computing and various sensors have been widely used in production and life. With the rapid growth of the scale and type of data, the era of big data has come. In competitive sports, big data has become an important way for professional sports teams to manage information and guide training practice [1-3]. The detailed, comprehensive and professional data system can provide objective and accurate reference for the decision-making of athletes and coaches, and promote the continuous innovation and reform of competitive sports. Data is the carrier of information and the source of knowledge. It can be
predicted that in the near future, competitive sports teams that are good at using and mining the value of big data will become the leaders of the industry, while teams that ignore or slow to respond will be in a passive and unfavorable state [4-6].

In recent years, with the sustained, rapid and healthy development of China's economy, sports industry has become a sunrise industry in China. Especially with the 2008 Beijing Olympic Games, as well as the Tennis Masters Cup and other events in China, the development of competitive performance market is particularly rapid [7-8]. In terms of the operation of the event itself, the normal operation of the sports event service guarantee system is an important part of the success of the event. Therefore, under the premise of service consciousness, how to allocate, coordinate and utilize various resources in a unified way, and establish a sports event service guarantee mode will play an important role in the development of China's sports industry [9-10].

In this paper, Guilin events as a case study, in-depth study of the actual needs of spectators for sports events services, understand that the service needs of different ticket holders are different, and there are great differences. As a national sport, sports events cannot meet the actual needs of various users in the event service, which will seriously affect the hosting effect of the event. In view of this situation, this paper puts forward the application research based on artificial intelligence and big data in sports event service. The research of this paper still takes Guilin games as the research object. On the basis of the traditional service mode of events, it adds artificial intelligence and big data technology, and uses data mining and other methods to deeply analyze the needs of users and formulate improvement measures. Combined with the characteristics of sports events, this paper further optimizes the information gain steps of data mining technology, so that it can better adapt to the service of sports events. Through further comparative study, it can be seen that after the adoption of artificial intelligence and big data scheme, Guilin's event comprehensive service ability has been further improved, which has significant advantages over the traditional service mode, and has been widely praised.

2. Big Data and Artificial Intelligence

2.1. Characteristics of Big Data

Massive: the total amount of data is large, and all aspects of life will produce new data. In one area, datasets range in size from a few terabytes to dozens of petabytes.

Diversification: with the development of science and technology and the change of people's living habits, there are many new multi structure data. For example, the development and popularization of networks and intelligent terminals have changed the way people work, play and travel, and unintentionally increase the diversity of data.

Speed: data generation and transmission speed are faster and faster.

Value: through processing a large number of seemingly unrelated data, discovering internal relations and rules, finding problems, summarizing experience and solving problems are the value embodiment of big data.

2.2. Artificial Intelligence and Sports Events

Artificial intelligence is a frontier subject based on computer science, information theory and philosophy. Its research has expanded the function of human brain and made the development speed of science and technology revolution unprecedented. With the rapid development of computer technology, artificial intelligence technology has been greatly improved, and has been more and more widely used in sports competitions. It can not only satisfy the audience to enjoy the wonderful moment of sports events, but also objectively and fairly evaluate the sports competition, and reduce the referee disputes between referees and athletes. This is also the coaches, athletes and referees' ardent expectation for artificial intelligence technology, and also points out the direction for sports researchers.
3. Investigation on the Demand of Different Ticket Holders in Guilin Event for the Service of the Event

In recent years, major sports events include the interests of participants in various sports events. Due to the different needs of different consumer groups for venues and facilities, people should pay attention to meet the needs of audience differentiation in the operation of sports events. However, at present, the operation organization and service ability of large-scale sports events in China cannot meet the needs of consumers. This conclusion can be seen from the survey results of Guilin sports event audience demand, as shown in Table 1.

From the statistics in Table 1, it can be seen that the audience with medium and high-ticket prices have the highest demand for catering services, followed by on-site transportation and leisure activities, reaching 42.3%, 26% and 28% respectively. However, under the same circumstances, the spectators with low price tickets are more concerned about the conditions, display effect and on-site traffic. The demand is 31%, 29% and 26% respectively. The analysis shows that the different demand of different ticket price audience reflects the consumption demand of different consumer groups. However, if you want to do a good job in sports event service, we should make effective and timely adjustment to the data information mined by big data and artificial intelligence. It can be said that only by attaching importance to the application of artificial intelligence and big data technology in the service of sports events can we better serve the audience and run the events well.

Table 1. Statistics on the demand of different ticket holders for the event service in Guilin

| Facility requirements       | Middle and high ticket audience (%) | Low fare audience (%) | Facility requirements       | Middle and high ticket audience (%) | Low fare audience (%) |
|----------------------------|------------------------------------|-----------------------|----------------------------|------------------------------------|-----------------------|
| Catering service (A)       | 42.3                               | 14.5                  | Display effect (E)         | 1.9                                | 29                    |
| On site traffic (B)         | 26                                 | 26                    | Information transfer (F)   | 7.3                                | 6.8                   |
| Leisure activities (C)      | 28                                 | 8.6                   | Souvenirs (G)              | 7.5                                | 12.7                  |
| Viewing conditions (D)      | 8.6                                | 31                    | Other (H)                  | 6.2                                | 16.9                  |

4. Discussion

4.1 Analysis on the Application Effect of Artificial Intelligence and Big Data Technology in Guilin Event Service

In order to verify the actual effect of artificial intelligence and big data technology on sports event service, this paper takes Guilin events in 2018 and Guilin events in 2017 as experimental samples, respectively analyzes the service level of events from different service indicators after the application of artificial intelligence and big data technology.

According to the survey results in Figure 1, after the application of artificial intelligence and big data technology in Guilin in 2018, all indicators including catering service level, on-site traffic level and leisure service level have been significantly improved. Compared with the event service water in 2017, it can be concluded that the comprehensive service level of Guilin events has been improved qualitatively. According to the analysis, it is precisely because of the use of artificial intelligence and big data technology that the event operators can more accurately grasp the service needs of spectators, and guarantee high-level service quality while achieving humanization.

In addition, according to the survey results in Figure 2, after Guilin sports events optimized the event service through artificial intelligence and big data technology, in the survey of service satisfaction of the whole sports event scene, ticket purchasing channels, catering, safety, staff, and the degree of excellence were all highly satisfied. It is worth affirming that in the statistics of the above
items, there are few negative comments that are not very good, which further shows that under the influence of artificial intelligence and big data technology, Guilin sports events have achieved accurate grasp of audience demand and better meet the audience's demand for service.

**Fig 1.** Comparative analysis on service level of Guilin events in 2018 and 2017
4.2 Information Gain

Entropy is one of the parameters that represent the state of matter in thermodynamics. Its physical meaning is the measure of the chaotic degree of the system, and then it is used to measure the amount of information. In 1948, in order to solve the problem of information quantification, people put forward the concept of information entropy. The amount of information in information is directly related to its uncertainty. The greater the uncertainty of a problem is, the more information we need to know and the greater the information entropy. The calculation formula of information entropy is as follows:

\[ H(X) = -\sum_{i=1}^{n} p_i \log p_i \]  

In feature selection, if the feature is \( A \) and the corresponding training data set is \( T \), then the information gain degree is the difference of information entropy between the two data, that is, the difference between the information entropy \( H(T) \) of training data set \( T \) and the conditional information entropy \( H(T|A) \) of \( T \) under the condition of feature \( A \). The formula is as follows:

\[ G(T, A) = H(T) - H(T|A) \]
The change of information gain is closely related to characteristic attributes. The larger the information gains changes, the more orderly the information changes, and the stronger the classification ability of features.

4.3 Essence of Service Process of Sports Events
The service products of professional sports events have five obvious characteristics: intangibility, heterogeneity, synchronization of production and consumption, no storage and no ownership transfer. Of all the properties, invisibility is the foundation. Due to the intangible nature of service products, production and consumption can be carried out at the same time. They interact and influence each other, forming the particularity of service products. The service of sports events is mainly divided into two aspects: one is service production, aiming at the event itself, improving the quality of products, reasonably optimizing the events of personnel, materials, information and other elements, providing high-quality, efficient and differentiated services to improve competitiveness and competitive advantage. The second is to provide services. The purpose of service manufacturing is to provide services, which mainly include intermediate customers and final customers. Through the provision of pre-sale, in-sales and after-sales services, marketing as a channel to obtain more revenue.

4.4 Application of Big Data in New Media Communication of Large-Scale Sports Events
The use of big data has changed the concept of traditional media, taking content as a product and understanding the information needs of users. According to users' preferences, satisfying users' needs forces media to change its past pursuit of content readability. How to make the content clearer and easier to read, the editor can judge the information needs of users according to their experience and subjective feelings, and then judge the information needs of users on the basis of real-time big data and create users. It makes the demand preference of news information, thus greatly improving the production efficiency and readability of content.

4.5 Application Prospect Analysis of Artificial Intelligence in Sports Event Communication
(1) From the perspective of sports communicators, this paper analyzes the significance of intelligent auxiliary interpretation in sports communication.

(2) From the perspective of sports communication content production, realize the personalized distribution of information and content to groups and individuals. Information products break the original concept and realize the focus of event content production. Through the gradual optimization algorithm of big data, we can obtain the relevant data of social relationship attributes between users, and classify them in the way of human-computer dialogue, so as to realize the real personalized needs.

(3) From the perspective of sports media, the trend of media convergence is irresistible. On the basis of the integration of the original media, in the era of artificial intelligence, the media has realized the characteristics of immersion, holographic and intelligent.

(4) From the perspective of sports spectators, it is concluded that in the era of artificial intelligence, the audience's subjective consciousness is constantly enhanced, and the demand for participating in sports event information dissemination is increasingly strong. The change of audience's role makes the media's thinking change from advanced disseminator to information service provider.

5. Conclusions
In the case of Guilin events based on artificial intelligence and big data in the application of sports event service research, this paper makes an in-depth investigation and Research on the main needs of spectators for sports event services. The analysis shows that in the traditional service mode of sports events, less attention is paid to the needs of individual users, especially in the aspects of different groups, and no differentiated services are made. In view of this deficiency, this paper puts forward the optimization and improvement strategy based on artificial intelligence and big data technology, which makes up for the shortcomings of traditional sports event service. In the relevant investigation and research, it shows that the service ability of the event using artificial intelligence and big data
technology is obviously better than that of the traditional service mode. The analysis shows that this is mainly through deep mining and analysis of user needs through big data technology, and strengthening the service experience through intelligent means. Artificial intelligence and big data technology are industries in the information age. The application of information technology in sports event service has put forward new requirements for event service under the development of the times. Many cases also further verify that information technology can not only improve the quality of the event, but also make great achievements in the event service. The research in this paper has achieved ideal results and made contributions to the research of artificial intelligence and big data technology in the field of sports event service.

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