

Construction of a New Basketball Game Data Analysis Platform Based on Data Analysis

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Abstract

With basketball as an iconic sport, better data processing models will drive sports games to be played more efficiently. As an important sport in China, basketball has a history of more than 100 years. With the leap development of basketball, data analysis technology has also been widely used. The data seen in basketball games is a set of systematic data formed by professional workers through division of labor and close cooperation, classification and aggregation and statistical analysis. In addition, based on the information on the court, spectators get a general idea of how the players are performing in the game and predict where the data will go. This article explores the significance and application of basketball game data analysis methods. Combining the outstanding advantages of block chain, edge computing and machine learning in today's data analysis, this paper proposes a new basketball game data analysis platform based on the above three technologies shows that the analysis of basketball game data can effectively promote the development of basketball.

Keywords: Block Chain, Edge Computing, Machine Learning, Basketball, Data Analysis, Platform Construction.

Introduction

With the integration of various scientific and technological means, the advancement of basketball game data analysis has been greatly improved. Firstly, the level of intelligence of sports-related equipment has increased, providing more solid hardware support for data collection and data analysis. Secondly, the development of various advanced technologies and algorithms has provided theoretical support for solving basketball-related technical problems. For example, the application of database technology provides the basis for the preservation and application of basketball-related data (Chen et al., 2021), and the application of advanced data analysis algorithms provides a faster and more efficient means of finding the internal patterns reflected in basketball data (Wu et al., 2022). In addition, the rise of various basketball-related new media and data analysis teams has injected an accelerant into the basketball data analysis industry. The involvement of relevant media has led to more entities participating in the technical statistics of the game, and the addition of data analytics teams has provided specialized references for the progress and development of teams. However, there are still many deficiencies and gaps in current basketball data analysis. First, basketball games and basketball-related new media are complex, diverse and relatively independent, and existing basketball databases are centralized, such as Sina Sports, Tencent Sports, etc. Centralized databases will cause data monopoly, resulting in data cannot be shared and circulated, and the phenomenon of "information silo"

is very obvious, resulting in large, medium and small basketball. The phenomenon of "information silo" is obvious, which leads to the lack of data access for large, medium and small basketball-related organizations, and a large amount of data demand can only resort to data blackmail, data oligarchs and data alliances, without forming a perfect data circulation mechanism (Feroli, Rampinini, et al., 2020). Second, basketball data analysis is poor in real time and subjective error (Horvat, Havaš, & Srpak, 2020), and coaches and their teams need to analyze opponents' as well as their own technical and tactical levels based on relevant theories and experiences, combined with basketball players' skill level data. This model is highly subjective, and coaches need to spend a lot of time to analyze technical and tactical skills and athletes' technical movements, which generates a lot of wasted time and subjective judgment errors.

In the context of the information age, the development of all fields is basically based on data, and, of course, the sports industry is no exception, through the study of game information, so as to understand the true level of the athletes. Regarding the data in basketball games, whether it is the number of shots made by a certain athlete or the object supported by a certain spectator, this information can be done with the help of statistical systems. In other words (Cai et al., 2019), the information that people understand is a relatively complete set of data, which is obtained by the relevant staff through effective cooperation, statistics and analysis of the data of the whole game process. Basketball game data analysis refers to the

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analysis of various information shown by the athletes, such as their skill play, based on their behavioral performance on the court. In addition to analyzing the data of two teams and each athlete, the comparison between the athlete and the team is also analyzed (Marszałek et al., 2019). In the preparation phase of a basketball game, before it even starts, a large amount of information can be obtained, where one can learn about the previous results of the competing teams, the dominant characteristics and proficiency of each player in basketball, etc., and predict what will happen in the game, especially the outcome (Chandra et al., 2018). Therefore, the goal of our study is to strengthen the data analysis of basketball games and provide better visual information.

The development of science and technology to promote social progress, the development of national undertakings cannot be separated from science and technology. Similarly, sports science and technology is an important part of the development of sports in China, and is the precursor and support for the realization of the Olympic Games and the national fitness program, and the level of development of sports science and technology affects the level of sports development of a country and a region to a certain extent, especially in today's increasingly competitive sports field, sports technology has become the general consensus of developed countries and regions of competitive sports (García et al., 2020). On July 12, 2017, the central group of the State General Administration of Sports invited eleven high-tech enterprises from Zhongguancun, which hold the world's top professional R&D technologies and independent intellectual property rights, to conduct a special presentation on "Science and Technology for Sports" (Saghezchi et al., 2013), in which experts and R&D personnel from the enterprises made a practical match with the needs of sports on the comprehensive practical application of big data, which benefited the participants greatly. The advent of the data and information era has provided a convenient way to store and apply massive amounts of information, which can even be fully synchronized with human behavior in real time, and scientific and technological researchers can also obtain commercial information of high value by analyzing and filtering these massive amounts of data (Pino-Ortega et al., 2021). Basketball as a competitive sport is loved worldwide, and professional basketball leagues have their fanatic fans, so the social value of this sport has increased dramatically, and with it the commercial value of professional basketball leagues, such as the NBA, which represents the highest level of competition and professionalism in the world, and the league has continuously promoted the commercialization of the game, which has also expanded its global reach (Palanisamy et al.,

2021). It is undeniable that basketball statistics are an important part of the development of the game, and we can get an overview of the game from the information reflected in traditional statistics, as well as some advanced indicators to get a more in-depth understanding of the game and the players, which are not difficult to obtain on some foreign data sites (Alsubari et al., 2022; Vázquez-Guerrero & Garcia, 2021; Zuccolotto, Manisera, & Sandri, 2018).

Related Work

The technical statistics of a player is the aggregation and classification of the players' performance by the statistician with relevant indicators according to their level of competition on the court (Qingfeng, Chenxuan, & Yanan, 2019). Technical statistics are not only the data of individual players or teams, but also the data of individual players and the team as a whole, so that we can make a simple evaluation of the game through the technical statistics of both sides of the game. Basketball traditional data include dozens of indicators such as points, rebounds, assists, steals and caps, the role of these data is also reflected in many aspects, first of all, traditional basketball data can make a most basic evaluation of a player, in 2017, the Basketball Association issued a document that the Chinese men's basketball team will be divided into red and blue teams, in the selection of players, the two training team coaching team can select players based on their understanding of the league and players Besides, they can also select players based on some data of the league, for example, if they need some stable three-point shooters from the outside, they can select indicators such as three-point shooting number and hitting percentage as a reference for selecting a player (Al-Mekhlafi et al., 2020; Bansode et al., 2016; Tian et al., 2019; Yu, Jamali, & Husain, 2023). Yao Ming's regular technical indicators in the 2004-2005 and 2005-2006 NBA regular seasons were analyzed and compared by using literature research method, watching game video method and mathematical and statistical analysis method. The results showed that Ming's Yao post-season strength was higher than that of the pre-All-Star Game in scoring, rebounding and other key indicators for evaluating a player's athletic ability. In addition to comparing the indicators of the two adjacent seasons, we also compare Ming's Yao average data in the 2005-2006 season with that of O'Neal, the most dominant center in the league, whose technical indicators are similar, but O'Neal is at the end of his career, so the authors believe that Ming Yao has gradually shown the dominance of the league's No. 1 center (Schenk & Reed, 2020). The author believes that Yao has gradually shown the dominant power

of the league's first center. The correlation between Yao's personal data and the Rockets' game wins and losses was also analyzed. When Yao scored more than 20 points, the Rockets won 20 games with a 58.9% win rate, and when Yao scored 5, 6, 8, 13, 14, 15, the Rockets lost all 9 games, so it was concluded that Yao's personal technical indicators had a correlation with the team's game wins and losses (Abd Algalil & Zambare, 2016; Al-Azab et al., 2022; Ma, Huang, & Hu, 2023). The disadvantages of this system are the short time to accumulate data, the lack of a large database, the high operating costs, and the difficulty in promoting the technology and equipment, making the system successful only in the four major sports leagues and the NCAA tournament in the United States. In the introduction of the fine-grained higher-order data metrics analysis system, 16 higher-order data metrics, including turnovers, tempo, assist rate, defensive rebound rate, offensive rebound rate, offensive efficiency, defensive efficiency, efficiency differential, effective shooting percentage, true shooting percentage, transition defense, transition offense, scoring contribution value, possession use value, points per possession conversion, and possession use rate, as well as the calculation formula and function, are introduced. Through these data indicators, fans can have a deeper understanding of the players and evaluate them (Ali, Siddiqi, & Lee, 2015; Alqahtani et al., 2022; Andrianova et al., 2021; Estok, 2022; Ferioli, Rucco, et al., 2020). In a word, we can obtain useful data indicators by literature research, watching game videos and mathematical statistics analysis, which can make a more in-depth evaluation of basketball players.

Platform Design

Combining the outstanding advantages of block chain, edge computing and machine learning in today's data analysis, this paper proposes a new basketball game data analysis platform based on the above three technologies (see Figure 1). The main ideas are as follows: firstly, a distributed database is formed based on advanced block chain technology to store basketball game related data for data sharing; secondly, high-performance edge computing servers are deployed nearby (around the basketball game venue) and advanced machine learning algorithms are loaded on the edge computing platform; finally, the edge computing platform uses advanced machine algorithms to analyze database data and then feeds the results to the demander of data analysis services. The following paper will describe the operation mechanism and significance of the three major components.

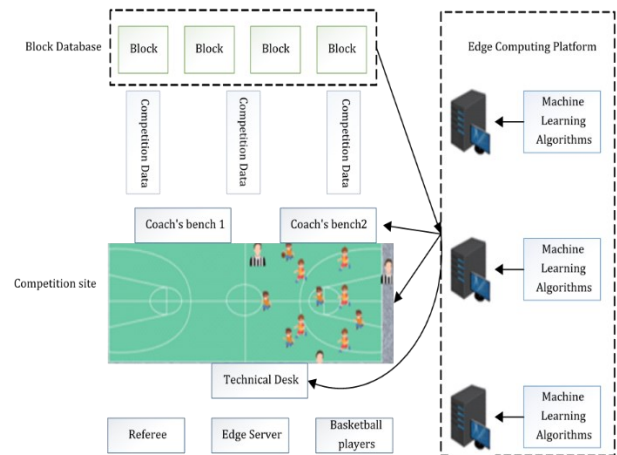


Figure 1: Schematic Diagram of the New Basketball Game Data Analysis Platform.

Design a real-time data analysis system for basketball indoor training and game based on data analysis to solve the current situation that it is impossible to obtain real-time shooting position and running path of each player, team's offensive and defensive tactics, as well as players' shooting hot zone, running distance, overall team tactics and tactical change analysis in existing basketball training and game, to achieve dynamic positioning of detection targets and provide required data and information. The system composition includes the following modules: ultra-wideband wireless communication data analysis sensor, data analysis positioning tag, wireless receiver, host computer and data processing and analysis software. In the implementation of the training process, the installation is shown in Figure 2.

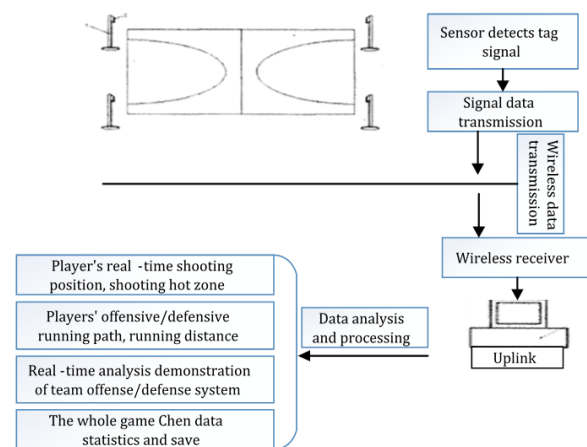


Figure 2: System Installation Method.

Flowchart as described in Figure 3, the data analysis sensor base station is arranged in the basketball court detection area; each player carries a data analysis positioning tag; the data analysis sensor base station receives the data analysis tag signal and sends the signal data by wireless communication, which is received by the wireless receiver, and the positioning information is sent to the upper

computer; the upper computer obtains each player's The upper computer obtains the shooting position and running path of each player, the team's offensive and defensive tactics in real time through the data processing analysis software, and gives the players shooting hot zone, running distance, overall team tactics and tactical change analysis after the training or game. The specific process is as follows.

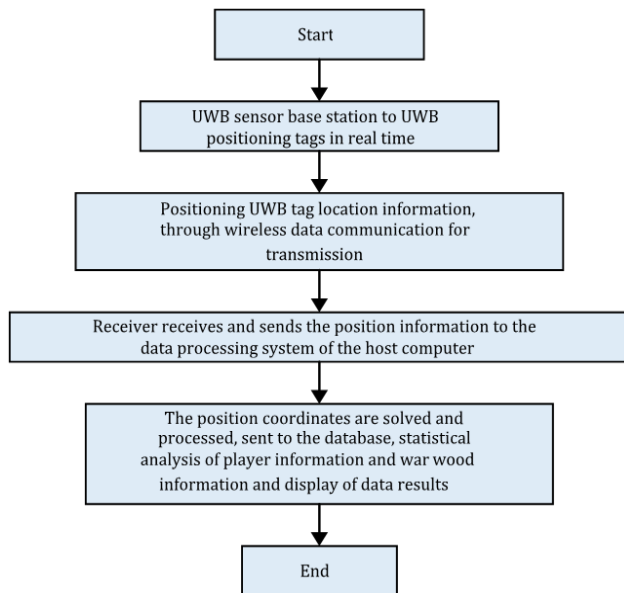


Figure 3: System Flow Chart.

The data analysis sensor base station uses TOA to locate the data analysis positioning tag. Since only the player's position on the basketball court needs to be obtained, only the coordinates in X and Y directions need to be determined, i.e., only two-dimensional plane positioning is required. The data analysis location tag signals are received by the data analysis sensor base stations at $t_1, t_2, t_3, t_4, \dots$, respectively, assuming that the coordinates of the data analysis location tag are (X, Y) and the two-dimensional plane coordinates of the four data analysis sensor base stations are $(x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4)$, respectively, according to the equation

$$(x_1 - X)^2 + (y_1 - Y)^2 = (c \times t_1)^2 \quad (1)$$

$$(x_2 - X)^2 + (y_2 - Y)^2 = (c \times t_2)^2 \quad (2)$$

$$(x_3 - X)^2 + (y_3 - Y)^2 = (c \times t_3)^2 \quad (3)$$

$$(x_4 - X)^2 + (y_4 - Y)^2 = (c \times t_4)^2 \quad (4)$$

Theoretically, the coordinates of the data analysis positioning tag can be found as (X, Y) according to two equations. The location information data received from the data analysis sensor base station is analyzed in the upper computer, and the four equations are optimized to obtain the optimal coordinate position solution. Pre-competition preparation is divided into five secondary elements: information collection, pre-competition status diagnosis, pre-competition training organization, competition plan development, and preparation of

competition items. In-competition performance is divided into four stages: player's competitive performance, coach's command, judge's judgment, and objective factors. The post-competition participation organization is divided into three secondary elements: post-competition recovery training, evaluation of participation results, and summary of participation work. In summary, the participation can be summarized into three stages, i.e. pre-competition preparation stage, in-competition participation and regulation stage, and post-competition summary and evaluation stage (as shown in Figure 4).

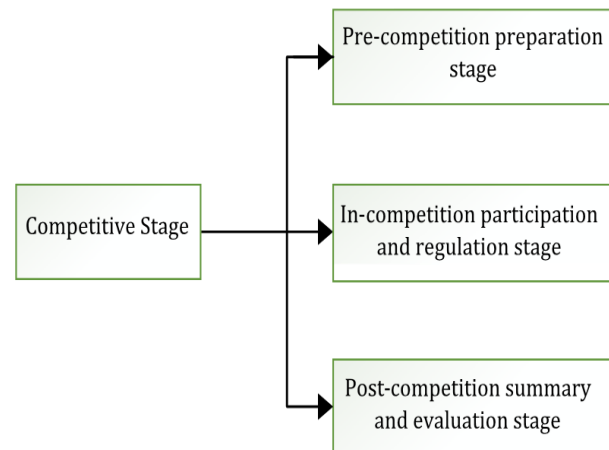


Figure 4: Diagram of the Stages of Competitive Participation.

The work of the coaching team after the start of the CBA league can be divided into three stages: pre-game, in-game and post-game from the dimension of time, when preparing for a multi-game league system, the training and participation cycle has a more fixed operation process. Figure 5 shows the operation flow of training and participation during the league competition. The diagram divides the competition process into 7 stages, the work in part 1 and part 2 belongs to the post-competition summary and evaluation stage, which is the last stage of a competition cycle and is an essential and important stage. The work of using the software basketball game to collect the game data to derive the higher-order data indicators and various visual charts is done in the first part of the flowchart, and from the perspective of using higher-order data, this collection work is divided into the collection and processing of higher-order data. The work of summarizing and evaluating the overall and individual performance of the team in the game using the resulting high-level data is done in the second part of the flowchart, which is also classified as the analysis and evaluation stage from the perspective of high-level data application. Both of these stages in the use of higher-order data are part of the post-match summary and evaluation stage of competitive participation theory.

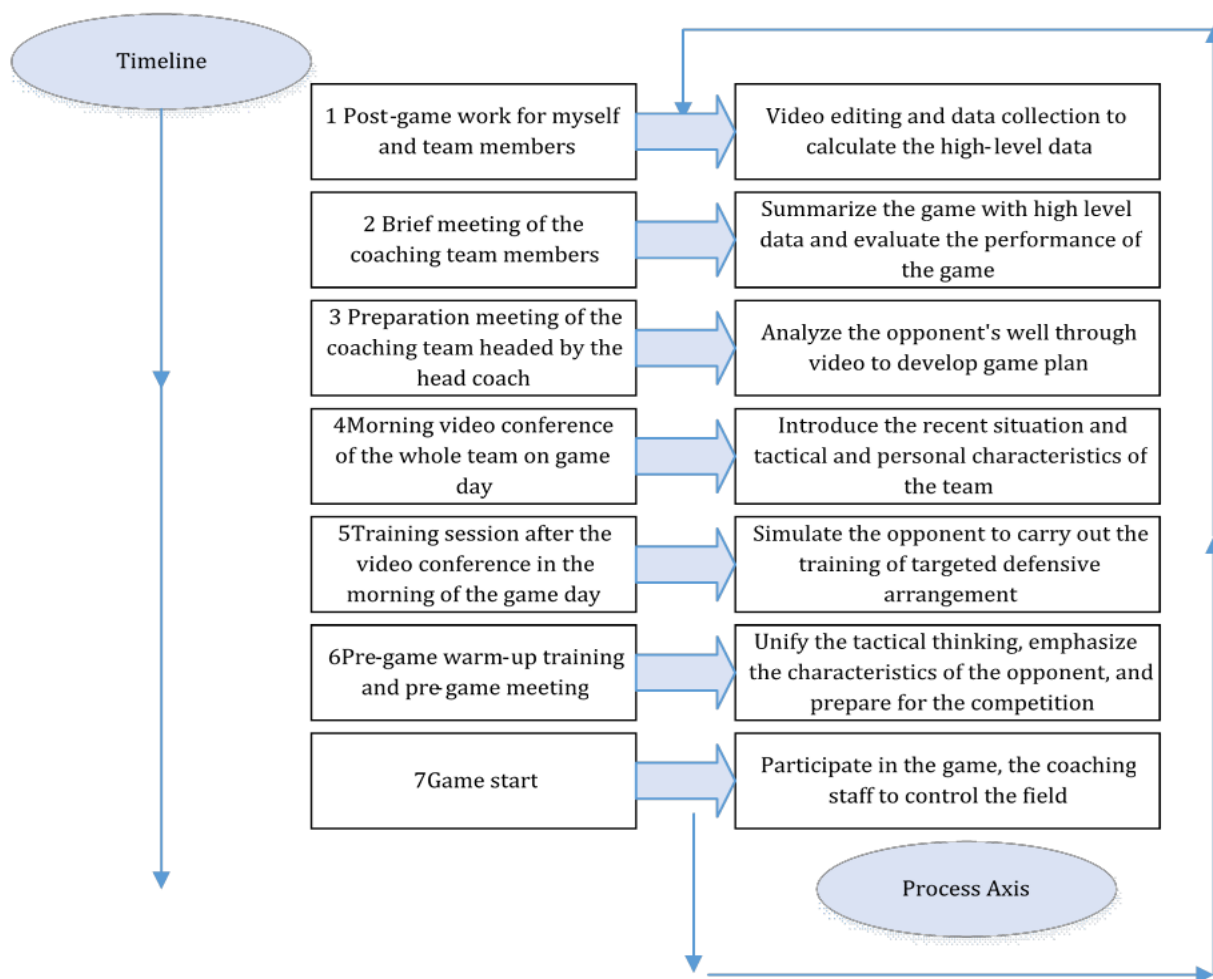


Figure 5: Flow Chart of Guangzhou Team's Participation.

Phases 3 through 6 are part of the pre-competition preparation phase, which is the first phase in a cycle of competitive participation and is naturally important. "Everything is done in advance, but not in advance." This is a famous line from "The Book of Rites - The Mean", which means that a thing cannot be completed without sufficient preparation, and without detailed preparation and careful arrangement, the effect will only be half the effort or even an empty bamboo basket. In "Competitive Competition", this phase is divided into six main parts: information preparation, mental preparation, physical preparation, technical preparation, tactical preparation and material preparation.

The evaluation of high level data from the completed matches provides competitive information about both teams, which is processed and used before the next match as part of the information preparation phase, as mentioned in the previous article, the data is full of redundant information, which needs to be selectively utilized by coaches after screening, and the valuable information will help in the formulation of game plans, mainly in the deployment of lineups. From the perspective of higher-

level data use, we designate this part as use and fine-tuning. The 7th stage is the in-competition participation and control stage, in which the use of higher-order data is very little, because the real-time collection of it cannot be completed in the in-competition stage, and the only part of the use is the use of the information of the higher-order data of the finished competition in the competition plan made by the coaches before the competition, so the use of higher-order data is mainly concentrated in the pre-competition preparation stage and the post-competition summary and evaluation stage, and is less used in the in-competition participation and control stage. The use of higher-order data is mainly concentrated in the pre-competition preparation stage and post-competition summary and evaluation stage. According to the above analysis, the use process of higher-order data corresponds to the operation process of the competition, and its use stages are mainly divided into three parts, as shown in Figure 6, which are the three stages of collection and processing, analysis and evaluation, and use and fine-tuning of higher-order data.

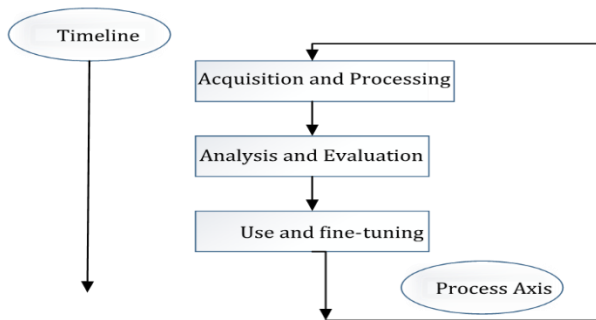


Figure 6: Flowchart of Using High Level Data.

The coaching staff's approach to reviewing and analyzing previous games seems thorough and effective. By combining video footage and high-level data, they can gain comprehensive insights into the team's performance. This allows them to address any weaknesses or problems that were exposed during the games, both on a team-wide level and for individual players. By using this feedback to inform their preparations for the regular season games, the coaching staff can tailor their strategies and training to maximize the team's performance and chances of success.

Table 2

Table of Scoring Events in the Scoring Climax Period

	Remaining Time	Guangzhou Team Event List	Score	Shanxi Team Event List
Section 1	5:08	Ziming Fan hit both free throws	18:24	Scola defensive foul
	4:38	Yuezhuo Gu hit a three-point shot	21:24	
	3:58		21:25	Lingxu Zeng three-point shot
	2:58	Yuezhuo Gu hit a three-point shot	24:25	
	9:59	Sonny hit a layup, assisted by Yuezhuo Gu	63:64	
	9:51	Sonny hit a layup, assisted by Yuezhuo Gu	65:64	
Section 3	9:35		65:66	Pengfei Yan shot under the basket
	9:16	Hansbrough made two free throws	67:66	Pengfei Yan defensive foul
	8:44:	Foul by Junwei Ren, two free throws by Xudong Luo	69:66	Defensive foul by Junwei Ren
	7:57	Yuezhuo Gu hit a fast break layup	71:66	
	7:35	Yuezhuo Gu hit a three-point shot	74:66	Head coach requested timeout

Through Table 2, we can find that in the 8:3 scoring climax in the first quarter, Yuezhuo Gu used two consecutive three-pointers to bring the difference to two points and avoid further expansion of the difference; in the 16:3 scoring climax in the third quarter, Yuezhuo Gu first assisted Sunny to tie the score, and finally scored five points through a fast break counterattack and a three-pointer to open up the difference to nine points to stop Shanxi team. Guangzhou team opened up the difference to nearly double digits, which became the watershed for Guangzhou to win.

Table 1

Yuezhao's Gu 3-Point Shooting and Scoring after the Window Period

	Qingdao	Tianjin	Shanxi	Average
Number of Three-Point Shots	2	3	4	3
Number of Three-Point Attempts	4	3	5	4
Points Scored	6	9	10	10.332

As shown in Table 1, in the first three games after the window (the fourth game was injured), Yuezhao Gu scored 10.332 points and hit three three-pointers per game, which compensated to some extent for the team's lack of offense from the outside due to the injury of Fogg and Yingjun Chen. As a second-year college player in the CBA, she did not lose her confidence in the face of the huge gap in her position in the team, but seized the odd playing time to prove her ability and show her good athletic condition. The following is a statistical analysis of the scoring events in the two time periods using the play by play method, see (Table 2).

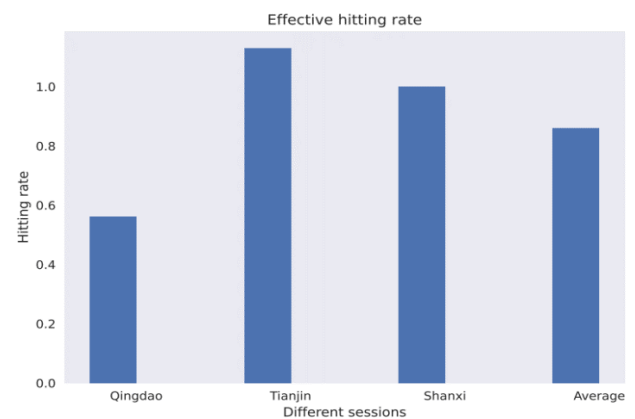


Figure 7: Yuezhao's Gu Effective Hitting Rate Statistics.

In these three games, Yuezhuo Gu also maintained a high effective hitting rate, as shown in Figure 7, with an effective hitting rate of 0.5, 1.125, and 1.015 in these three games, averaging an effective hitting rate of 0.88, which also verifies that his high ranking statistic in the games before the window was not a coincidence. As mentioned in the previous article, each team will play twice in the CBA league. When meeting the same opponent again in the second round, two questions need to be considered: what were the keys to victory or what were the reasons for defeat

in the last meeting? Since this is a single game, we need to exclude the phenomenon that the number of shots is small but the hitting rate is high, so we choose the players of Guangzhou team who have higher score than Zhun Zheng and also have three points hitting for comparison, as shown in Table 3, we can find that Zhun Zheng has the highest effective hitting rate among them, which also reflects the effectiveness of the coaching staff in the game plan.

Table 3

Comparison of Guangzhou's Main Scoring Points

	Two-Point Shot Hit	Two-Point Shots	Three-Point Hit	Three Point Shot	Effective Shooting Percentage
Sonny	8	10	4	5	0.718
Kristen	10	22	2	3	0.478
Zhun Zheng	0	1	5	8	0.76

In the post-game summary, the Guangzhou coaching staff thought that the game was correct in terms of game strategy, because it was difficult for Dejun Han to pounce on the three-point line to interfere with Zhun's Zheng shooting, and once he sealed out, it opened up space for Asian foreign aid Sonny, who is good at inside offense, and Kristen, who is good at outside breakthrough, making the Liaoning team lose focus on the defensive end, and at the same time, based on the information reflected in these high-level data, it was thought that Zhun Zheng, who is the key to win, showed his athletic ability well and accomplished his task on the court, playing a key role in achieving the tactical purpose for the whole team. In the 37th round of the regular season, Guangzhou met Liaoning again at home. The coaching team summarized and extracted the feedback from the last match as reference and formulated the game plan. In the game, Zhun Zheng, whose self-confidence was boosted by his excellent play in the last meeting, was more determined and confident in the offense, efficiently scoring 17 points to become the top scorer among domestic players, and the only

one in the team who scored higher than him and had three point hits was Fogg. In the end, Guangzhou defeated Liaoning again 120:112, becoming the only team in the 2017-2018 season to defeat both home and away in the regular season. Figure 8 shows the shot chart of Fogg and Zhun Zheng in that game.

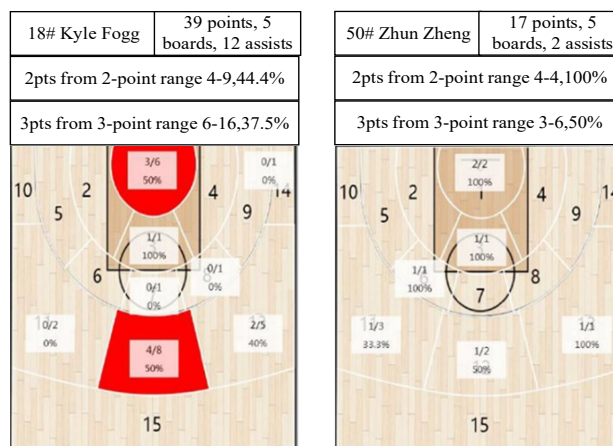


Figure 8: Heat Map of Fogg and Zheng Jun's Shooting.

Table 4

Comparison of Guangzhou's Main Scoring Points Shooting

	Two-Point Shot Hit	Two-Point Shots	Three-Point Hit	Three Point Shot	Effective Shooting Percentage
Fogg	4	9	7	15	0.51
Zhun Zheng	4	4	4	7	0.86

As shown in Table 4, a comparison of the effective hitting rate shows that Zheng's efficiency was higher than the last time against Liaoning. This performance reflects the player's individual technical style on the one

hand, and the coaching team's game plan formulation on the other hand, the game plan cannot be formulated without the collection and screening of various information, so this also reflects the contribution of the

high-level data report is used in the pre-game information preparation stage to the team.

Case Study

Guangzhou's home win against Beikong in the 32nd round of the regular season was one of the most crucial victories of the season. Beikong, Guangzhou's strongest contender for the playoffs, had beaten Guangzhou in the 13th round, so the importance of this win in the 32nd round was equivalent to two games. At the same time, other potential rivals Tongxi, Zhejiang, Shanghai and Fujian, who were competing with Guangzhou for playoff spots in this round, lost, and Guangzhou climbed directly from 11th to 9th in the rankings, taking the initiative to squeeze into the

playoffs. After winning this crucial game, Guangzhou has strengthened its competitive state, team morale and players' confidence, and is actively preparing for its 33rd round opponent, Beijing, to further consolidate its playoff spot. In the last game against Beijing, Guangzhou lost on the road, when the team's Fogg, Yingjun Chen and Yuezhao Gu were all on injured reserve, and the whole team scored 5 three-pointers, while Beijing scored 16 three-pointers in the whole game, facing such a big gap in outside scoring, but Beijing only won by 6 points. Especially in the third quarter of the game, he scored 18 points and 7 rebounds in a single quarter, including 5 offensive rebounds, while he caused four fouls for Beijing, leading Guangzhou to cling to the score, which is also a microcosm of his performance in the whole game.

Table 5(a)

Beijing Vs Guangzhou in the 14th Round of the Regular Season

Score	Fast Break	Invaded	Dunk	Block A Shot	Error	Snatch	Foul	Assists	Defensive Rebound	Offensive Rebound	Free Throw-Shot	3-Points Medium Shot	2 Points Medium Shot
12	0/0	4	1	1	0	0	1	0	4	1	4-5 (80%)	0-1 (0%)	4-8 (50%)
11	0/0	3	0	0	3	0	2	2	1	0	3-4 (75%)	2-6 (33%)	1-3 (33%)
9	0/0	1	0	0	1	0	3	0	2	0	0-0 (0%)	1-4 (25%)	3-5 (60%)
8	0/0	4	0	0	2	2	2	5	3	1	0-0 (0%)	0-3 (0%)	4-10 (40%)
2	0/0	2	0	0	0	0	1	3	2	0	0-2 (0%)	0-0 (0%)	1-2 (50%)
7	0/0	2	0	0	1	0	2	4	3	0	1-2 (50%)	0-2 (0%)	3-5 (60%)
6	0/0	1	0	0	1	0	1	0	2	0	1-2 (50%)	1-1 (100%)	1-4 (25%)

Table 5(b)

Beijing Vs Guangzhou in the 14th Round of the Regular Season

Score	Fast Break	Invaded	Dunk	Block A Shot	Error	Snatch	Foul	Assists	Defensive Rebound	Offensive Rebound	Free Throw-Shot	3-Points Medium Shot	2 Points Medium Shot
5	0/0	2	0	0	2	3	0	1	2	1	1-1 (100%)	0-1 (0%)	2-3 (67%)
2	0/0	1	0	0	1	1	4	0	5	0	0-0 (0%)	0-0 (0%)	1-4 (25%)
2	0/0	2	0	1	0	0	0	0	0	1	2-2 (100%)	0-0 (0%)	0-1 (0%)
24	0/0	1	0	0	0	1	0	0	1	1	3-3 (100%)	5-15 (33%)	3-6 (50%)
22	0/0	1	0	0	1	1	4	3	3	2	0-1 (0%)	6-12 (50%)	2-4 (50%)
13	0/0	2	0	1	6	7	3	3	5	2	1-2 (50%)	2-7 (29%)	3-7 (43%)
11	0/0	6	1	0	1	3	2	2	1	3	5-5 (100%)	0-2 (0%)	3-8 (38%)
2	0/0	1	0	3	1	1	4	1	2	0	0-0 (0%)	0-2 (0%)	1-3 (33%)
15	0/0	4	1	3	0	0	3	2	3	1	2-2 (100%)	3-7 (43%)	2-5 (40%)
5	0/0	3	0	0	1	2	2	5	1	1	1-1 (100%)	0-0 (0%)	2-5 (40%)
4	0/0	2	1	1	1	0	5	0	2	1	2-4 (50%)	0-0 (0%)	1-2 (50%)
2	0/0	3	0	0	0	5	0	11	0	2	0-0 (0%)	0-4 (0%)	1-3 (33%)
0	0/0	0	0	0	0	0	0	0	0	0	0-0 (0%)	0-0 (0%)	0-0 (0%)

As shown in Table 5, according to the game's point spread flow chart, it can be found that Guangzhou played a total of four scoring climaxes in this game, namely 3:9, 3:10, 1:11 and 1:9, in which Hansbrough was involved in three of these four periods. When evaluating Hansbrough using higher-order stats, Hansbrough barely made any three-point shots in the game, Hansbrough also has a higher probability of being infringed upon by opponents and getting free throws because he is constantly playing in the box as an inside player. For example, in the game against Beijing, Hansbrough was violated 10 times and got 17 free throws, taking into account this, it is possible to use true shooting percentage instead of regular shooting percentage to better evaluate his scoring efficiency, the most crucial regular technical statistics as an inside player are scoring and rebounding, the case of rebounding rate has been introduced in the previous article, so I won't repeat it here.

True shooting percentage, or TS% for short, is defined as the adjusted shooting percentage after taking into account

the contribution of free throws. The formula is: True shooting percentage = total number of points scored / [2 × (number of shots made + 0.44 × number of free throws made)]. According to this formula we can find that the indicator of true shooting percentage takes the number of free throws into account and is used to evaluate the shooting percentage of players with better foul making ability to highlight the player's athletic ability better than the traditional shooting percentage indicator. As shown in Table 6, in the 14th round road loss to Beijing, Beijing's inside Hamilton was traditionally a much better hitter than Hansbrough. However, Hansbrough outperformed Hamilton in free throw percentage, which takes free throws into account, and scored twice as many points as Hamilton, and an exaggerated 35.724 to 0 in offensive rebounding rate. Hansbrough also outrebounded Hamilton in both total rebounds and total rebounding percentage, and by combining the game live and high-level data we can assume that Hansbrough completely overpowered Hamilton in this matchup.

Table 6

Comparison of Beijing Vs Guangzhou Inside and Outside Players in the 14th Round

	Two Points Hit	Two-Point Shot	Hitting Percentage	Free Throw Shooting	Free Throw Attempts	Points Scored	True Shooting Percentage	Offensive Rebounding Rate	Total Rebounds	Total Rebounding Rate
Hansbrough	11	18	0.539	16	18	39	0.929	35.723	11	26.247
Hamilton	6	7	0.776	5	3	18	0.884	0	7	9.856

In the 33rd round, Guangzhou's coaching staff made sufficient pre-game preparations, re-watched the game video of the last meeting, and summarized the main reasons for the loss as the lack of three-point points from the outside of the team and the lack of pressure on the opponent's outside defense. At the same time, according to the high level data, the coaching team thought that they were also responsible for the last loss, because they saw that the high level technical indicators reflecting Hansbrough's competitive status were so excellent, but he only played 2 minutes and 16 seconds in the fourth quarter with only one outside player. Hansbrough also revealed a message to the coaching staff: Hamilton and I met in the United States, he plays a very soft style, like to choose the outside shot opportunities rather than kill the inside, in both offense and defense are afraid of the opponent to give him physical confrontation, which is exactly my advantage, so every time I play against him I am confident, the last time we met the data achieved is not an outbreak, I think that is when I play against him I think that was my normal play against

him. Based on the information obtained from the evaluation of high-level data and the recent technical and tactical status of Beijing team shown in the video analysis meeting, the Guangzhou coaching staff formulated a game plan for the game against Beijing team in the pre-game preparation stage, believing that offensively they must let Beijing team know that the three-point shooting ability of Guangzhou team has come back now, mobilize their defensive players, open up the space for attack inside, create opportunities for Hansbrough to The team must let Beijing know that the team's three-point shooting ability has returned, open up their defenders, create opportunities for Hansbrough to play alone, combine strong inside attack with long-range outside shooting, and pay attention to their outside defense. In the pre-game locker room meeting, head coach Wanjun Cui again emphasized the tactical layout of the game. The last time we met we limited their outside very poorly and let them shoot a lot of threes, this time we learned a lesson and grew wise, everyone in the defensive station must master the right distance, this

morning's pre-game training session I have told you, do not over-assist defense. On offense we are not the same as last time, Yingjun Chen and Fogg are back, increasing the team's threat from the outside, they will not all be inside to let you throw three points, I ask you whether it is three points or breakthrough must be resolute, at the same time

Hansbrough you have a lot of experience against Hamilton, their other inside is not as tough as you, so you receive the ball in the low position when the opportunity arises, you must also be resolute to attack the basket. Play to your strengths, play aggressively and show your dominance. Remember, don't over-assist on defense, everyone!

Table 7

Flow Chart of Lineup Spread of Guangzhou Vs Beijing Game in the 33rd Round of Regular Season

2 Points Shot	3-Point Shot	Free Throw - Shot	Offensive Rebound	Defensive Rebound	Assists	Foul	Snatch	Error	Block A Shot	Dunk	Invaded	Fast Break	Score
3-4 (75%)	3-3 (100%)	1-2 (50%)	0	2	0	2	0	0	0	0	1	0/0	16
5-10 (50%)	1-4 (25%)	2-2 (100%)	2	4	9	3	1	4	0	0	2	0/0	15
3-7 (43%)	0-1 (0%)	2-2 (100%)	1	2	4	3	2	3	0	0	4	0/0	8
2-4 (50%)	1-8 (13%)	0-0 (0%)	0	4	1	1	1	4	1	0	4	0/0	7
2-6 (33%)	0-1 (0%)	0-0 (0%)	1	2	7	0	0	0	1	0	0	0/0	4
4-5 (80%)	2-4 (50%)	4-4 (100%)	0	3	6	3	1	1	1	0	3	0/0	18
5-8 (63%)	0-0 (0%)	1-4 (25%)	7	3	1	2	0	1	1	0	4	0/0	11
2-3 (67%)	2-3 (67%)	0-0 (0%)	1	1	2	2	2	0	0	0	0	0/0	10
1-3 (33%)	2-4 (50%)	1-1 (100%)	0	4	0	2	0	1	0	0	2	0/0	9
2-7 (29%)	0-0 (0%)	1-2 (50%)	2	2	1	3	1	0	0	0	1	0/0	5
0-0 (0%)	7-9 (78%)	0-0 (0%)	0	1	1	0	0	0	0	0	0	0/0	21
8-15 (53%)	0-0 (0%)	2-4 (50%)	4	8	2	4	4	1	1	1	3	0/0	18
3-3 (100%)	3-7 (43%)	1-1 (100%)	1	8	13	1	3	3	1	0	7	0/0	16
6-9 (67%)	0-3 (0%)	2-3 (67%)	2	5	1	3	2	0	2	0	2	0/0	14
3-9 (33%)	0-3 (0%)	1-2 (50%)	0	2	4	1	4	3	1	0	1	0/0	7
4-5 (80%)	0-2 (0%)	4-5 (80%)	0	2	2	1	0	2	0	0	5	0/0	12
2-3 (67%)	1-3 (33%)	2-2 (100%)	2	1	0	3	0	2	0	0	1	0/0	9
2-2 (100%)	1-2 (50%)	0-0 (0%)	0	1	6	2	1	0	0	0	1	0/0	7
3-5 (60%)	0-0 (0%)	0-0 (0%)	1	5	0	5	1	2	0	1	0	0/0	6
1-4 (25%)	1-3 (33%)	1-1 (100%)	1	1	3	2	0	1	0	0	3	0/0	6

As shown in the lineup spread flow chart in [Table 7](#), unlike the last meeting where they were outscored in the opening minutes, Guangzhou established a lead right

out of the gate and scored 6 offensive touchdowns in the game. Hansbrough once again had a great game, scoring 34 points and grabbing 10 rebounds in the game, as

Guangzhou trailed 55-62 at halftime. In the first half of the third quarter, Hansbrough led Guangzhou to an 11-3 run to overtake Beijing, scoring 20 points in one

quarter and causing seven fouls and nine free throws. **Figure 9** is a screenshot of Hansbrough's 1-for-4 fouls on the fast break.



Figure 9: Fast Break 1 Hit 4 Kills.

Table 8 shows the list of Guangzhou's scoring events from trailing to overtaking after the start of the third quarter. Hansbrough's performance in this 11:3 scoring mini-boom was outstanding, except for Fogg's two free throws in the end to overtake the game. In addition to

Fogg's two free throws at the end of the game, the rest of the points were scored by Hansbrough, and two of the nine consecutive points were fast break counters, which shows his aggressiveness and determination in attack.

Table 8

List of Scoring Events in the First Half of the Third Quarter of the 33rd Round of Guangzhou Vs Beijing

Game Time	Guangzhou Team Event List	Score	Beijing Event List
11:38	Hansbrough hits a basket	57:63	
11:14:		57:65	Jackson hit a layup
11:11	Hansbrough makes one of two free throws for a foul	58:65	
10:29	Hansbrough hits a fast break under the basket	60:65	
10:13		60:64	Xiaochuan Zhai makes two free throws for foul
9:22	Hansbrough hits a basket	62:64	
8:22	Hansbrough dunks and hits a fast break	64:64	
7:33	Fogg makes two foul shots	66:64	

Table 9 shows the comparison of Hansbrough's and Hamilton's stats, according to this table we can find that Hansbrough has 17 more free throws than Hamilton in the second matchup. In the second matchup with Hamilton, Hansbrough made 17 more free throws than Hamilton, and although the traditional hitting rate is Although the traditional shooting percentage was lower than Hamilton's, he surpassed him in the real shooting percentage, which is enough to show his offensive aggressiveness inside, and he also did better than his opponent in terms of rebound protection, so it can be said that he once again suppressed

Hamilton comprehensively, and finally helped his team win the game. It is worth mentioning that the coaching staff gave Hansbrough 8 minutes of playing time in the fourth quarter of the game based on the feedback from the first game against Beijing, and although his scoring was not as explosive as in the third quarter, he contributed 2 steals, and the second key steal directly helped his teammates to extend the lead to 8 points at 1:56 before the end. Although his scoring was not as explosive as the third quarter, he contributed 2 steals, and the second key steal directly helped his teammates to extend the lead to 8 points

at 1:56 before the end of the game, which can be said to be the most important credit for the victory, but of course, it is also inseparable from the scientific preparation mode of the coaching staff, not only pay attention to the opponent's recent competitive status, but also review and analyze the last meeting with high-level data and video to obtain

feedback information to assist the coaching staff in making decisions. The coaching team not only paid attention to the opponent's recent performance, but also reviewed and analyzed the last match with high level data and video to get feedback information, which assisted the coaching team to make decision and led Guangzhou to win the crucial match.

Table 9

Comparison of Beijing Vs Guangzhou Inside and Outside Players in the 33rd Round

	Two Points Hit	Two-Point Shot	Hitting Percentage	Free Throw Shooting	Free Throw Attempts	Points Scored	True Shooting Percentage	Total Rebounds	Total Rebounding Rate
Hansbrough	10	17	0.537	15	17	25	0.829	11	15.468
Hamilton	9	15	0.779	2	1	23	0.797	6	8.656

Conclusion

In this paper, various potential technologies related to data processing are considered, and a "new basketball game data analysis platform" is proposed to provide theoretical reference for the further development of more advanced technologies in the field of sports data analysis.

The new data analysis platform will overcome several problems of the existing basketball data analysis platform;

Using block chain to establish basketball database can better realize the sharing of basketball data and facilitate the realization of basketball data analysis of each unit.

Using edge computing technology to solve the problem of basketball data analysis, improve the real-time of data analysis, easy to respond quickly; The use of advanced machine learning algorithms for data analysis will improve the accuracy of data analysis and improve the game's win rate.

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