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# Review on Data Mining Technology Application in Sport Techniques and Tactics Analysis

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**Abstract:** There are many sports very intense, complex, highly technical, highly confrontational, and very popular in people. In order to better understand the techniques and tactics of various sports, many scholars at home and abroad start from methods and disciplines, implement multi-level, multi-angle discussions. The author tries to summarize and discuss, with a view to provide scientific basis for sports techniques and tactics analysis. By collecting the papers and books about data mining technology application in sports techniques and tactics analysis, on the basis of literature and data compilation, analysis, points out that the application of multi-disciplinary development in techniques and tactics analysis is a trend in sports techniques and tactics analysis.

**Keywords:** Sports; Data Mining; Techniques and Tactics Analysis

## 1. Introduction

Data mining (data mining) is the process to extract implicit, people do not know in advance, but potentially useful information and knowledge from large, incomplete, noisy, fuzzy, random data. The main tasks of data mining are association analysis, cluster analysis, classification, prediction, timing patterns and deviation analysis.

## 2. Data Mining Research and Application Status

After years of development, research and application of data mining technology have achieved fruitful results. Currently, data mining is used in many fields, especially in the banking, telecommunications, insurance, retail and other basic areas of large volumes of data. Typical problems data mining can solve include: market analysis such as database marketing, customer groups division, background analysis, cross-selling acts etc., and customer lost analysis, customer credit scoring, fraud detection, etc. Currently, there are many domestic and foreign research institutions, companies and academic organizations engaged in research and development on data mining tools, there have been some areas of data mining tools and systems, and has been put into commercial applications. More influential data mining companies in international systems such as: SAS's EnterpriseMiner; Canada Simon-Fraser university "intellectual decision tree technology in the analysis of student achievement", database system research laboratory created DBMiner database mining system; IBM developed the QUEST and IntelligentM mainner, and so on. It can be seen, data mining research and applications get more and more attention by academia, business and government departments, but basically on academic research, practical application is still in its infancy.

In sports events, a large number of data mining technologies have been used in many sport techniques and tactics analysis, and the use of the tool is also becoming more and more mature. A large number of data mining used in techniques and tactics analysis, also provides a new approach and idea for provides a new approach and idea in sports events.

In short, after more than ten years of development, the study of data mining changed from the initial surface, and isolated problem to the systematic, comprehensive direction. Broadly speaking, the data mining research is currently focused on three areas of data mining techniques and algorithms, data mining theory research and data mining application, this paper focuses on the study of data mining technology applications.

## 3. Clustering Research Status in Sport Techniques and Tactics Analysis

lustering is the process to divide physical or abstract objects collection into classes consisted of similar objects, which is called clustering. Clusters generated by the clustering is a set of data objects, these objects with the same

object are similar to each other in a cluster, are different from objects in other clusters.

Through access to relevant literature, which are more representative of the following: Gong MingBo, Zhong Ping in "Capability Classification Application Study of Scale-space Hierarchical Clustering in Football Team Techniques and Tactics" [1] introduced scale space theory to simulate the human visual system, proposed classification based on the scale-space hierarchical clustering of the football team techniques and tactics, and the 2004 European Cup, 16 teams for the application. Classification results objectively reflect the 2004 European Cup, teams comprehensive strength of techniques and tactics, revealing trends in world football, and explore a classification approach of team techniques and tactics level. Hou Weidong in the "A Comprehensive Evaluation of Technical and Tactical abilities of the Football Teams Participating in the 4th Women's Soccer World Cup" [2] for the16 participating teams in 4th World Cup, Q-type clustering statistics of 10 key indicators of offensive and defensive, variance analysis and the differences comparisons for the multiple clustering index, the use of rank correlation method to test for clustering results, the results objectively reflect the overall strength of the team techniques and tactics, revealing trends in world football, and explored a more reasonable and effective quantitative evaluation of the team technical and tactical capabilities. Zeng Jiajun in "Implementation and Application of Improved AGNES Algorithm on Technical-tactics Analysis of Badminton Match" [3] badminton techniques and tactics based on the acquisition of technology acquisition system, the dynamic generation technology roadmap, and then use improved AGNES algorithm of data mining, data mining hierarchical clustering of dynamically generated roadmap. In this paper, sort of the data preprocessing technology line, and data merging were studied and discussed. Chen Youzhong, Zhang Yonglong in "Using Q-type analysis to the 15th World Men's Basketball Championship Ability Generalized Analysis" [4] for the 15th World Basketball Championships, 24 teams in 80 games with 10 indicators of cluster statistics of shooting attacks, two point shooting, point shooting, offensive rebounds, defensive rebounds, blocked shots, assists, steals, turnovers, success and failure rate, indicators for the clustering analysis, variance and multiple comparisons for differences, the use of rank correlation method to test for clustering results, achieve quantitative evaluation of techniques and tactics ability of the teams around the world, help Chinese basketball team re-set strategic objectives in line with their own development based on the current development situation in the world.

To sum up, we can see that clustering analysis is an exploratory analysis, analyze the inherent characteristics and laws of things, and classify things in accordance with the principle of similarity, is a commonly used data mining techniques, especially in the collective ball games, application of techniques and tactics analysis has been more extensive.

## 4. Research Status Quo of Artificial Neural Network in Sports Techniques and Tactics Analysis

Artificial neural network (Artificial Neural Networks, abbreviated as ANNs), also referred to as neural networks (NNs) or known as connectionist model (Connectionist Model), which is a algorithms mathematical model to model animal neural network behavior, for distributed and parallel information processing. Such networks rely on the complexity of the system, by adjusting the internal connection relationship between a large number of nodes, so as to achieve the purpose of information processing. Artificial neural network has self-learning and adaptive capabilities, can according to a number of pre-reciprocal input-output data, analyze the potential laws between the two, the ultimately based on these laws, with new input data to calculate the output the results.

Through access to relevant literature, which are more representative of the following: Wang Tiesheng, Zhong Ping, "Self-organizing Feature Map Neural Network Based Model for Evaluating Technical and Tactical Abilities of Football Teams in UEFA EURO2004", [4] in 2004 the European Cup, 16 teams scoring, shooting, shooting core, shooting rate, corner, the ball successfully passes, steals, stolen, fouls, offside and conceded, principal component analysis of 11 offensive and defensive techniques indicators, on this basis, determine the composite index on the evaluation of techniques and tactics ability of teams. The introduced self-organizing feature map neural network model, proposed classification method based on self-organizing feature map network team in the unsupervised case, through the study of self-organization, achieved a rational, scientific team classification. Classification reflected the objective overall strength of the 2004 European Cup team tactics, revealed trends in world football, and explored a reasonable evaluation of the team techniques and tactics approach. Yu Lijuan, Zhang Hui, etc. in the "Theory and Methods of Analyzing Techniques & Tactics of Net Antagonistic Event Competitions" [6] analyzed table tennis, badminton, tennis, volleyball and other games across the net, the project indicators, and techniques and tactics observation data processing methods, namely the traditional game statistical analysis, computer-aided analysis of race unity, diagnostic mathematical modeling sports against across the net, artificial neural network technology applications in the race analysis, data mining technology in the application of techniques and tactics analysis, multi-media applications in techniques and tactics analysis. They proposed problems and development of techniques and tactics analysis of sports against across net. Yu Lijuan, Zhang Hui, etc. in the "Systematic Study and Application of Analysis of Technique and Tactics in Table Tennis

Matches" [7] in combination with techniques and tactics analysis of the game instance, the system described table tennis techniques and tactics analysis with the new theories, new methods, such as application of data mining and artificial neural networks technology in the table tennis techniques and tactics analysis, based on system dynamics theory of causal analysis of table tennis game. The research results through multimedia technology, applied in the Chinese table tennis team preparing for the 49th World Championships and 2008 Beijing Olympic Games.

To sum up, artificial neural networks are parallel distributed systems, are completely different mechanism from using traditional artificial intelligence and information processing technology, overcome deficiencies of the traditional symbolic logic-based artificial intelligence in dealing with intuition, unstructured information, have adaptive, self-organization and real-time learning features. At this stage, artificial neural network is used in sports against across net.

## 5. Research Status Quo of Association Rule Mining in Sports Techniques and Tactics Analysis

Association rule mining is early and still active research method in data mining research.Through access to relevant literature, which are more representative of the following: Gao Hongge and Zhao Heiqun in "Application of Association Rule Mining in Analyzing Techniques and Tactics of Table Tennis Match" [8], we introduce the applications of association rule mining techniques in tactics analysis of table tennis, in the world's top six, Wang Hao and Ryu Seung Min techniques and tactics game as data mining objects, using the data collection of tactics use the method described in the script, use association rules mining Apriori algorithm to find the game technology association between tactics, so as to provide a scientific basis for coaches and decision-making. Jian Rong, Huang Ben in the "Association Rules in Volleyball Techniques and Tactics Analysis" [9] mining objects are in the 2004 Olympic women's volleyball semi-final, the techniques and tactics data between China and Cuba, using the method described script preprocess on race tactics data, use the apriori algorithm in association rules data mining, find meaningful association rules in the game, provide a scientific basis for the coaches to spot strategy formulation and decision-making. And use data mining software for empirical analysis. Zhao Yangqing, Yu Lijuan and Zhang Hui in "Application of Sequential Model Digging-Out to Analysis of Table Tennis Matches' Techniques and Tactics" [10] take the techniques and tactics statistics of the world's best women's table tennis players as the data mining objects, use methods of techniques and tactics description, and use intelligent data acquisition software for data acquisition tactics collection, actual data collected early needs for secondary treatment, make the techniques and tactics indicators after secondary treatment fully reflect the status of athletes as far as possible. The results showed: improved AprioriAll using association rules algorithm, mining user-specified threshold above the maximum sequence of winning tactics, can clearly reflect the success and failure of the continuous state hitting tactics of athletes.

To sum up, association rule mining successful realizes the relationship between the variables. At this stage, the main application of Chinese association rule mining is sports against across the net, which provides new ideas of techniques and tactics analysis.

## 6. Conclusion

By retrieving access to domestic and international techniques and tactics aspects of the sport's study found that, some experts and scholars based on a lot of sports competition data, through data mining clustering, artificial neural networks, association rule mining methods, made techniques and tactics analysis, obtained laws between the various data, which provides new methods of techniques and tactics analysis.

Modern mathematics, statistics, data mining and other disciplines of knowledge closely combined with sporting theory, and penetrate into the techniques and tactics analysis of sports events, which form a set of theoretical system with their respective disciplines as the main, provide a scientific basis for identification and selection of the sport's techniques and tactics analysis. But only techniques and tactics analysis from a single dimension of academic is not enough. Future studies will focus more on the subject together to analyze sports techniques and tactics, which need more scholars and experts for further study.

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