

**Team ranking prediction
using partial order relation of rough sets
and cluster analysis of multivariate statistics**

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Abstract

Fuzzy mathematics rough set dominance analysis and cluster analysis can objectively reflect the comprehensive strength of the team. In this paper, the teams participating in the Euro 2024 competition are taken as the object set, and the football technical ability index is taken as the attribute set. The competition data are statistically analyzed through the data records on the official website, and the ability index of each team is analyzed. Using fuzzy mathematics to reduce the set of attributes, combined with MATLAB assisted calculation, the teams are sorted and classified, and the ranking of the participating teams is predicted. According to the method provided in this paper, the prediction of the champions of the 2024 European Cup and the adjustment of the tactics of the Chinese men's football team in the 2026 US–Canada–Mexico World Cup in Asia will be given a strong basis.

Key words: European Cup, World preliminaries, Dominance degree analysis, Cluster analysis, Ranking prediction, Tactical adjustment

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1 Introduction

Rough set theory of paste mathematics is an important tool to deal with uncertain and incomplete factors. Fuzzy dominance analysis is an analytical method to evaluate fuzzy objects by scientific statistics of some precise data. Fuzzy cluster analysis is an analysis method to determine the degree of affinity of research objects by digitizing some features between research objects and establishing fuzzy similarity relationship.

With the advent of the era of big data and artificial intelligence, data processing ideas have been applied in all walks of life. The management of each competition is actively seeking scientific evaluation methods to cooperate with the coach to formulate the best tactics for each team's players and provide better decisions for their long-term development. At present, FIFA generally evaluates teams through the technical data statistics of a complete season, or adopts Elo rating, and adopts mathematical statistics, weighting and correlation coefficient testing methods to analyze team rankings, which is insufficient in timeliness. The fuzzy mathematics method is fuzzy, dynamic and scientific. Based on the fuzzy mathematical rough set theory, this paper carries out attribute reduction on the technical indicators of football matches, and establishes a relatively scientific evaluation system to evaluate the comprehensive ability of football teams in stages through dominance analysis and cluster analysis,

which provides a strong scientific basis for the timely adjustment and development of football teams.

2 Application of fuzzy dominance analysis in the ranking prediction of Euro 2024

2.1 Background

The European Football Championship, also known as the European Championship, is the main football tournament organized by the Union of European Football Associations (UEFA). The tournament is played by the men's national teams of UEFA member countries to determine the European Cup champion. It is the second most watched football tournament in the world after the FIFA World Cup (UEFA European Championship, 2024). Until 2 July 2024, the 24 participating teams were divided into six groups for the group stage, through 36 group games and eight eighth finals have been determined. In this paper, the average game data of the eight teams participating in the quarterfinals in the group stage is processed and analyzed by using rough set knowledge and matlab cluster analysis to predict the championship favorites of this European Cup.

2.2 Statistical calculation of average game data

According to the statistics on the official website of the European Championship (as of July 2, 2024), the statistical indicators for this analysis

were determined, and the following average match data table was obtained (UEFA, 2024) :

National team	Number of goals	Ball controlling percentage	Shoot (at goal)	Pass count	Placement	Number of tackles taken	Foul count	Red and yellow card	Number of saves made by the goalkeeper	Clearance times
Switzerland	1.75	46.25%	11.5	429	5	13.25	11.75	1.75	1.5	20.75
Germany	2.5	66%	18	643.25	7.75	15.5	11.5	1.25	1.75	17
England	1	59.5%	11.25	667.5	4.5	16.75	9	1.75	2.5	13
Spain	2.25	59.5%	20.5	604	7.25	20.75	14.25	1.5	2.5	12.25
France	0.75	56%	16.75	567.5	6	17.75	9.25	1.5	3	17.5
Portugal	1.25	68.25%	18.25	682.5	9	20.25	8.25	2	1.5	15
Holland	1.75	55%	15.75	476.25	6.75	15	10	1	3.25	18
T ü rkiye	1.75	52%	14.25	474.25	6.25	13.25	10	4.5	3.25	26.25

Table 1 Average game data of the top 8 teams in Euro 2024

2.3 Dominance analysis method of rough sets with full ordering of partial order relation

2.3.1 Theory and formula

Rough set method is to establish the dominance relationship on the partial order relationship, transform the information system into the dominance relationship model, and get the order of objects through the relationship model. By calculating the dominance degree of each object and the overall dominance degree, the ranking can be given more accurately.

$$(1) [x_i]_B^{\leq} = \{x_j | (x_i, x_j) \in R_B^{\leq}\}$$

Among them, $[x_i]_B^{\leq}$ Indicates that under the condition of attribute set B, The set of all objects superior to object x_i is called the dominant class of x_i .

$$(2) R_B(x_i, x_j) = \frac{|\overline{[x_i]_B^{\leq}} \cup [x_j]_B^{\leq}|}{|n|}$$

Among them, $|a|$ represents the number of set elements and n represents the number of objects. Formula (2) indicates the degree to which object x_i is superior to x_j .

$$(3) R_B(x_i) = \frac{1}{n-1} \sum_{j \neq i} R_B(x_i, x_j)$$

Formula (3) represents the comprehensive dominance degree of object x_i under attribute set B.

2.3.2 National team data advantage ranking steps and results

Set $U = \{x_1, x_2, \dots, x_8\}$ to represent the object set of 8 teams of the European Cup, and $A = \{a_1, a_2, \dots, a_{10}\}$ to be the attribute set.

Step 1: Establish the following classification indicators of the information system, among which the index level relationship: $A > B > C > D$

Class	Number of goals(a_1)	Ball controlling percentage(a_2)	Shoot (a_3)	Pass count(a_4)	Placement(a_5)
A	>2	>60%	>20	>650	>8
B	$1.5 < a_1 \leq 2$	$55\% < a_2 \leq 60\%$	$16 < a_3 \leq 20$	$550 < a_4 \leq 650$	$6.5 < a_5 \leq 8$
C	$1 < a_1 \leq 1.5$	$50\% < a_2 \leq 55\%$	$12 < a_3 \leq 16$	$450 < a_4 \leq 550$	$5 < a_5 \leq 6.5$
D	≤ 1	$\leq 50\%$	≤ 12	≤ 450	≤ 5
	Number of tackles taken(a_6)	Foul count(a_7)	Red and yellow card(a_8)	Number of saves made by the goalkeeper(a_9)	Clearance times(a_{10})

<i>A</i>	≤ 15	≤ 9	≤ 1	> 3	> 25
<i>B</i>	$15 < a_6 \leq 17$	$9 < a_7 \leq 10.5$	$1 < a_8 \leq 1.5$	$2.5 < a_9 \leq 3$	$20 < a_{10} \leq 25$
<i>C</i>	$17 < a_6 \leq 19$	$10.5 < a_7 \leq 12$	$1.5 < a_8 \leq 2$	$2 < a_9 \leq 2.5$	$15 < a_{10} \leq 20$
<i>D</i>	> 19	> 12	> 2	≤ 2	≤ 15

Table 2 Indicators for the division of the Group 8 of Euro 2024

Step 2: According to the division indicators in Table 2, the original data in Table 1 is converted into the following table of average data information system. Among them a_1, a_2, a_3, a_4, a_5 is used as the offensive indicator of the team, $a_6, a_7, a_8, a_9, a_{10}$ is used as the defensive indicator of the team.

<i>U</i>	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	a_{10}
x_1	<i>B</i>	<i>D</i>	<i>D</i>	<i>D</i>	<i>D</i>	<i>A</i>	<i>C</i>	<i>C</i>	<i>D</i>	<i>B</i>
x_2	<i>A</i>	<i>A</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>C</i>	<i>B</i>	<i>D</i>	<i>C</i>
x_3	<i>D</i>	<i>B</i>	<i>D</i>	<i>A</i>	<i>D</i>	<i>B</i>	<i>A</i>	<i>C</i>	<i>C</i>	<i>D</i>
x_4	<i>A</i>	<i>B</i>	<i>A</i>	<i>B</i>	<i>B</i>	<i>D</i>	<i>D</i>	<i>B</i>	<i>C</i>	<i>D</i>
x_5	<i>D</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>C</i>	<i>C</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>C</i>
x_6	<i>C</i>	<i>A</i>	<i>B</i>	<i>A</i>	<i>A</i>	<i>D</i>	<i>A</i>	<i>C</i>	<i>D</i>	<i>D</i>
x_7	<i>B</i>	<i>C</i>	<i>C</i>	<i>C</i>	<i>B</i>	<i>A</i>	<i>B</i>	<i>A</i>	<i>A</i>	<i>C</i>
x_8	<i>B</i>	<i>C</i>	<i>C</i>	<i>C</i>	<i>C</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>A</i>	<i>A</i>

Table 3 Ranking table of average game data of the Top 8 groups of Euro 2024

Step 3: Analyze metrics. After analyzing the index of offensive capability, the rough set method of partial order relational information system can obtain the following identification matrix table of offensive capability:

U	x_1	x_2	x_3	x_4
x_1	\emptyset	\emptyset	$\{a_1\}$	\emptyset
x_2	$\{a_1, a_2, a_3, a_4, a_5\}$	\emptyset	$\{a_1, a_2, a_3, a_5\}$	$\{a_2\}$
x_3	$\{a_2, a_4\}$	$\{a_4\}$	\emptyset	$\{a_4\}$
x_4	$\{a_1, a_2, a_3, a_4, a_5\}$	$\{a_3\}$	$\{a_1, a_3, a_5\}$	\emptyset
x_5	$\{a_2, a_3, a_4, a_5\}$	\emptyset	$\{a_3, a_5\}$	\emptyset
x_6	$\{a_2, a_3, a_4, a_5\}$	$\{a_4, a_5\}$	$\{a_1, a_2, a_3, a_5\}$	$\{a_2, a_4, a_5\}$
x_7	$\{a_2, a_3, a_4, a_5\}$	\emptyset	$\{a_1, a_3, a_5\}$	\emptyset
x_8	$\{a_2, a_3, a_4, a_5\}$	\emptyset	$\{a_1, a_3, a_5\}$	\emptyset
	x_5	x_6	x_7	x_8
x_1	$\{a_1\}$	$\{a_1\}$	\emptyset	\emptyset
x_2	$\{a_1, a_2, a_5\}$	$\{a_1\}$	$\{a_1, a_2, a_3, a_4\}$	$\{a_1, a_2, a_3, a_4, a_5\}$
x_3	$\{a_4\}$	\emptyset	$\{a_2, a_4\}$	$\{a_2, a_4\}$
x_4	$\{a_1, a_3, a_5\}$	$\{a_1, a_3\}$	$\{a_1, a_2, a_3, a_4\}$	$\{a_1, a_2, a_3, a_4, a_5\}$
x_5	\emptyset	\emptyset	$\{a_2, a_3, a_4\}$	$\{a_2, a_3, a_4\}$
x_6	$\{a_1, a_2, a_4, a_5\}$	\emptyset	$\{a_2, a_3, a_4, a_5\}$	$\{a_2, a_3, a_4, a_5\}$
x_7	$\{a_1, a_5\}$	\emptyset	\emptyset	$\{a_5\}$
x_8	$\{a_1\}$	\emptyset	\emptyset	\emptyset

Table 4 Identification matrix of offensive ability

Step 4: Attribute reduction. According to the relationship between offensive ability identification matrix and rough set in Table 4, the superiority classes of reduced attribute set are obtained:

$$\begin{aligned}
 [x_1]_B^{\leq} &= \{x_1, x_2, x_4, x_7, x_8\} & [x_5]_B^{\leq} &= \{x_2, x_4, x_5, x_6\} \\
 [x_2]_B^{\leq} &= \{x_2\} & [x_6]_B^{\leq} &= \{x_6\} \\
 [x_3]_B^{\leq} &= \{x_3, x_6\} & [x_7]_B^{\leq} &= \{x_2, x_4, x_6, x_7\} \\
 [x_4]_B^{\leq} &= \{x_4\} & [x_8]_B^{\leq} &= \{x_2, x_4, x_6, x_7, x_8\}
 \end{aligned}$$

Step 5: Data processing

First, according to formula (2), the advantage matrix between objects is obtained by using MATLAB data processing:

$$R_B = \begin{bmatrix}
 1.0000 & 0.5000 & 0.3750 & 0.5000 & 0.6250 & 0.3750 & 0.7500 & 0.8750 \\
 1.0000 & 1.0000 & 0.8750 & 0.8750 & 1.0000 & 0.8750 & 1.0000 & 1.0000 \\
 0.7500 & 0.7500 & 1.0000 & 0.7500 & 0.8750 & 0.8750 & 0.8750 & 0.8750 \\
 1.0000 & 0.8750 & 0.8750 & 1.0000 & 1.0000 & 0.8750 & 1.0000 & 1.0000 \\
 0.7500 & 0.6250 & 0.6250 & 0.6250 & 1.0000 & 0.6250 & 0.8750 & 0.8750 \\
 0.8750 & 0.8750 & 0.8750 & 1.0000 & 0.8750 & 1.0000 & 1.0000 & 1.0000 \\
 0.8750 & 0.5000 & 0.5000 & 0.5000 & 0.8750 & 0.5000 & 1.0000 & 1.0000 \\
 0.8750 & 0.5000 & 0.5000 & 0.5000 & 0.7500 & 0.5000 & 0.8750 & 1.0000
 \end{bmatrix}$$

Then, according to formula (3), the comprehensive superiority degree

$R_B(x_i)$ of the team's offensive ability is calculated.

$$R_B(x_1) \approx 0.5714 \quad R_B(x_2) \approx 0.9464 \quad R_B(x_3) \approx 0.8214 \quad R_B(x_4) \approx 0.9464$$

$$R_B(x_5) \approx 0.7143 \quad R_B(x_6) \approx 0.9286 \quad R_B(x_7) \approx 0.7500 \quad R_B(x_8) \approx 0.6429$$

Sort objects from largest to smallest as $x_2 = x_4 > x_6 > x_3 > x_7 > x_5 > x_8 > x_1$.

In the same way, you can calculate the overall superiority of the team's defensive ability.

The following dominance ranking table is obtained:

National team	U	Offensive dominance Ranking	Defensive dominance Ranking	Superiority degree of comprehensive ability Ranking
Switzerland	x_1	0.5714 8	0.875 3	0.7232 8
Germany	x_2	0.9464 1	0.8036 6	0.875 1
England	x_3	0.8214 4	0.8929 2	0.8571 2
Spain	x_4	0.9464 6	0.6964 8	0.8214 5
France	x_5	0.7143 1	0.8214 5	0.7679 6
Portugal	x_6	0.9286 3	0.7879 7	0.8482 3
Holland	x_7	0.75 5	0.9286 1	0.8393 4
T ü rkiye	x_8	0.6429 7	0.875 3	0.7589 7

Table 5 Ranking table of dominance of the top 8 teams of Euro 2024

2.3.3 Analysis of offensive ability of the team

It can be seen directly from Table 5 that Germany (the national team) ranks first in the evaluation of offensive ability by absolute advantage. From Table 1, it can be seen that Germany has A great advantage in ball control and

passing, and its technical indicators of penalty shooting and shooting are classified as grade A, which shows that Germany has a strong offensive ability.

The German team has a number of players with outstanding attacking ability, such as Musiara, Haverz, Sane and so on. Musiara, with his excellent breaking ability and nose for a shot, has been a success for the team on several occasions during the game, while Haverts has been outstanding in the penalty area.

2.3.4 Analysis of the team's defensive ability

It can be seen from Table 5 that Germany ranks 6th in defensive superiority, which shows that the overall ability of center field and defender is insufficient. The Netherlands and the United Kingdom, ranked first and second respectively, are in tier A. With a backline made up of experienced veterans and dynamic new stars, England's overall defensive performance remained solid despite being held to a draw against Denmark in the group stage of Euro 2024. The team conceded only one goal in the group stage, showing strong defensive ability. In the knockout stages, England's defence continued to excel. In the match against Switzerland, the team defeated the opponent through overtime to advance to the last eight.

2.3.5 Comprehensive analysis of team ability

The predicted rankings can be clearly seen in Table 5. Germany, England, Portugal and the Netherlands are at the top of the overall rankings.

German football is known for its rigorous tactical system, excellent teamwork and strong overall strength. English football has a long history, with many world-class stars and rich experience in international competitions. Its defensive ability is particularly good, and the players in the back line are balanced and experienced. Portugal's performance in the European Championship has been closely watched, its flexible tactics and outstanding individual ability can often pose unexpected threats to opponents. Dutch football is known for its total tactical style and talented players. Although the Dutch team has narrowly missed the championship many times in its history, its unique style of football and powerful attack have always made fans crazy. The Dutch league often sends a large number of talents to the English Premier League, La Liga and Bundesliga, and the Netherlands is also known as the "uncrowned king".

3 Fuzzy ISODATA clustering algorithm (Cluster analysis method based on objective function)

3.1 Fuzzy cluster analysis theory

The theoretical basis of fuzzy cluster analysis is fuzzy equivalence relation.

When the domain U is a finite set, the ordinary equivalence relation is

represented by an equivalent Boolean matrix, and the fuzzy equivalence relation is represented by a fuzzy equivalent matrix, and the sufficient and necessary condition for R to be a fuzzy equivalent matrix is that any λ -cut matrix of R is an ordinary equivalent Boolean matrix. Therefore, for a finite domain of discourse, we can set up a fuzzy equivalent matrix on U , and choose the appropriate λ to classify it (obviously different values of λ , the classification results are different). Lambda change, constant change, this is dynamic clustering.

In addition, in the process of fuzzy cluster analysis, there are many methods for data standardization and fuzzy similarity matrix establishment. Data standardization usually has translation standard deviation change and shift range change. There are several methods to establish fuzzy similarity matrix, such as quantity product method, correlation coefficient method, maximum and minimum method, absolute value method and distance method. In this paper, translation standard deviation change method and Euclidean distance method are selected to process the data according to the actual situation.

3.2 National team data processing procedures

Let the field $U = \{x_1, x_2, \dots, x_8\}$ represent the sample of 8 teams of the European Cup, and each sample is represented by 8 idealized indicators, that is, $x_i = \{x_{i1}, x_{i2}, \dots, x_{i8}\}, (i = 1, 2, \dots, 8)$.

Step 1: Using the shift standard deviation change, the following data analysis table is obtained:

National team	Number of goals	Ball controlling percentage	Shoot (at goal)	Pass count	Placement	Number of tackles taken	Foul count	Red and yellow card	Number of saves made by the goalkeeper	Clearance times
Switzerland	1.75	46.25%	11.5	429	5	13.25	11.75	1.75	1.5	20.75
Germany	2.5	66%	18	643.25	7.75	15.5	11.5	1.25	1.75	17
England	1	59.5%	11.25	667.5	4.5	16.75	9	1.75	2.5	13
Spain	2.25	59.5%	20.5	604	7.25	20.75	14.25	1.5	2.5	12.25
France	0.75	56%	16.75	567.5	6	17.75	9.25	1.5	3	17.5
Portugal	1.25	68.25%	18.25	682.5	9	20.25	8.25	2	1.5	15
Holland	1.75	55%	15.75	476.25	6.75	15	10	1	3.25	18
T ü rkiye	1.75	52%	14.25	474.25	6.25	13.25	10	4.5	3.25	26.25
\bar{x}_k	1.625	57.81%	15.78	568.03	6.56	16.56	10.5	1.91	2.375	17.46
s_k	0.77	0.07809	3.07	91.17	1.37	2.69	1.82	1.023	0.73	4.21

Table 6 Analysis table of average game data of the top 8 groups of Euro 2024

Among them:

$$\bar{x}_k = \frac{1}{8} \sum_{i=1}^8 x_{ik} ; \quad s_k = \sqrt{\frac{1}{8} \sum_{i=1}^8 (x_{ik} - \bar{x}_k)^2} .$$

Step 2: Data standardization processing

Let $x'_{ik} = \frac{x_{ik} - \bar{x}_k}{s_k}$, $(i = 1, 2, \dots, 8; k = 1, 2, \dots, 8)$ to obtain the sample normalization

matrix R:

R

$$= \begin{bmatrix} 0.3080 & -0.1907 & -0.7591 & -1.1591 & -0.5014 & -0.6250 & 0.2207 & 0.3430 & -0.6638 & 0.5995 \\ 1.3310 & 1.7317 & 0.2514 & -0.0237 & 1.2548 & 0.2710 & 0.0764 & -0.3712 & -0.1722 & 0.2268 \\ -0.7156 & 0.9362 & -0.8540 & 0.1557 & -1.2644 & 0.6751 & -0.7982 & 0.3430 & 0.9532 & -0.3457 \\ 0.8083 & 0.9362 & 0.8340 & -0.1414 & 0.8827 & 1.4792 & 1.4883 & -0.0141 & 0.9532 & -0.5435 \\ -1.2383 & 0.0885 & 0.0148 & -0.3015 & -0.3171 & 0.9465 & -0.7328 & -0.0141 & 1.1509 & 0.1750 \\ -0.1937 & 2.2188 & 0.3451 & 0.4966 & 1.9636 & 1.2534 & -1.0590 & 0.7009 & -0.6638 & -0.0324 \\ 0.3080 & -0.0083 & -0.3971 & -0.9646 & 0.0608 & -0.4178 & -0.4329 & -0.6852 & 1.3486 & 0.2343 \\ 0.3080 & -0.1734 & -0.6231 & -0.9860 & -0.1690 & -1.4825 & -0.4329 & 1.1583 & 1.5538 & 1.8780 \end{bmatrix}$$

Step 3: Using Euclidean distance method to establish a similar matrix R, let

$$r_{ij} = 1 - C \cdot \sqrt{\sum_{k=1}^8 (x_{ik} - x_{jk})^2}, \text{ to obtain a fuzzy similar matrix R:}$$

$$R = \begin{bmatrix} 1.0000 & 0.5802 & 0.2983 & 0.5221 & 0.1616 & 0.2718 & 0.5106 & 0.4471 \\ 0.5802 & 1.0000 & 0.3170 & 0.3740 & 0.2898 & 0.3406 & 0.2860 & 0.2801 \\ 0.2983 & 0.3170 & 1.0000 & 0.3007 & 0.1125 & 0.1746 & 0.3777 & 0.2828 \\ 0.5221 & 0.3740 & 0.3007 & 1.0000 & 0.2144 & 0.1628 & 0.2487 & 0.1831 \\ 0.1616 & 0.2898 & 0.1125 & 0.2144 & 1.0000 & 0.1218 & 0.1413 & 0.3032 \\ 0.2718 & 0.3406 & 0.1746 & 0.1628 & 0.1218 & 1.0000 & 0.1047 & 0.2677 \\ 0.5106 & 0.2860 & 0.3777 & 0.2487 & 0.1413 & 0.1047 & 1.0000 & 0.2354 \\ 0.4471 & 0.2801 & 0.2828 & 0.1831 & 0.3032 & 0.2677 & 0.2354 & 1.0000 \end{bmatrix}$$

Step 4: Find its transitive closure matrix t(R) by MATLAB using the square

method:

$$t(R) = \begin{bmatrix} 1.0000 & 0.5802 & 0.2983 & 0.5221 & 0.3057 & 0.3406 & 0.5106 & 0.4471 \\ 0.5802 & 1.0000 & 0.3170 & 0.3740 & 0.2898 & 0.3406 & 0.3472 & 0.2801 \\ 0.2983 & 0.3170 & 1.0000 & 0.3007 & 0.2144 & 0.1746 & 0.3777 & 0.2828 \\ 0.5221 & 0.3740 & 0.3007 & 1.0000 & 0.2144 & 0.1628 & 0.2487 & 0.2828 \\ 0.3057 & 0.2898 & 0.2144 & 0.2144 & 1.0000 & 0.2144 & 0.1413 & 0.3032 \\ 0.3406 & 0.3406 & 0.1746 & 0.1628 & 0.2144 & 1.0000 & 0.1413 & 0.2677 \\ 0.5106 & 0.3472 & 0.3777 & 0.2487 & 0.1413 & 0.1413 & 1.0000 & 0.2354 \\ 0.4471 & 0.2801 & 0.2828 & 0.2828 & 0.3032 & 0.2677 & 0.2354 & 1.0000 \end{bmatrix}$$

3.3 Cluster analysis of national teams

According to the basic idea of fuzzy clustering, according to its transitive closure matrix, k-means algorithm can cluster 8 teams into three categories.

Category 1: England, France, Netherlands;

Category 2: Germany, Spain, Portugal;

Category 3: Turkey, Switzerland;

England, France and the Netherlands are the traditional powers of European football, all of which focus on the tactical concept of balanced attack and defence, and are good at using quick counter-attacks to create threats. However, this year, the Dutch midfielder has been injured, which has affected the play to a certain extent. Germany, Spain and Portugal all have a mix of young talent and veterans. Germany has young talents such as Musiala, Spain has a new generation of forces such as Yamal, and Portugal has experienced stars such as C Ronaldo and Pepe, showing a unique charm and competitiveness in the game. Both Turkey and Switzerland are regulars in the European Championship, and both teams have participated in the tournament on several occasions. Although the two teams have different best records in the European Championship (Turkey in the last four, Switzerland in the last eight), they have shown a relatively consistent level of competition, often qualifying from the group and reaching the knockout stage.

3.4 Forecast Results

Through the dominance analysis, the top four are Germany, England, Portugal and the Netherlands, and the cluster analysis first class teams are England, France and the Netherlands. England focus on the balance of attack and defence. The Dutch team is known for its total tactical style, which allows the team to quickly change the pace of attack and defense during the game.

Combining the two methods, the report predicts that England and the Netherlands are the top contenders.

4 Application of fuzzy dominance analysis in the technical adjustment of the 18 World Cup qualifiers of Chinese football in Asia

4.1 Background

China entered the Asian 18 round of the 2026 US–Canada–Mexico World Cup qualifying tournament, as of June 11, 2024, the record of China's five games is 2 draws, 2 losses and 2 wins, ranking last in the Group C table. This paper provides reference for the technical adjustment of national football team through the analysis of superiority degree.

4.2 Data Processing

According to the data of the official website of the World Preliminary Tournament (FIFA, 2024), the following statistics are made:

National team	Goals scored	Ball controlling percentage	Shoot (at goal)	Placement	Foul count	Red and yellow card
Japan	4	71.60%	20.8	7.6	10	0.6
Bahrain	1.83	57.17%	10.17	6.83	13.25	1.5
Australia	3.67	62.83%	14.67	6.17	12	1.5
Indonesia	1.33	51.20%	8.33	4.67	11	2.5
Saudi Arabia	2	63.33%	12.5	5.17	11.5	1.33
China	1.5	42.50%	9.33	4.17	14.67	2.83

Table 7: Average (partial) data of Group C of 18 Asian World Cup 2026

According to the fuzzy dominance analysis method in this paper, the 6 teams in Group C are sorted and the following table is obtained:

National team	U	Offensive dominance	Ranking	Defensive dominance	Ranking
Japan	x_1	0.9667	1	0.5563	6
Bahrain	x_2	0.9	2	0.8	2
Australia	x_3	0.8667	3	0.6633	4
Indonesia	x_4	0.6	6	0.7333	3
Saudi Arabia	x_5	0.7667	4	0.6633	4
China	x_6	0.68	5	0.9333	1

Table 8 Ranking table of the dominance of Group C teams in the Asian 18 Round of the
2026 USC–Mexico World Cup

4.3 Result analysis and technical adjustment

From Table 7 and Table 8, it can be seen that the Chinese team ranks first in the degree of defensive superiority, which shows that the national football team has relatively strong control in the middle and back field and mainly adopts defensive tactics. However, according to technical statistics, the Chinese team only has a shooting rate of 38.09%. In addition, there are obvious deficiencies in the possession rate of the Chinese team, in a single game, the number of shots of the Chinese team is only 2 times, and the possession rate is less than 30%, it is very difficult to break the goal.

Combining with fuzzy mathematics superiority degree analysis, Chinese football coaches can adjust training methods and tactics according to the current situation. First, we should not adopt conservative defensive tactics rigidly, but should learn to flexibly change the formation and carry out counterattacks on the basis of defense. Secondly, we should strengthen the training of players' physical quality and cooperation. In the process of scrambling, in addition to personal skills, physical quality is also the key to ensure the possession rate. The players on the side of the team should actively cooperate with the interests of the whole game. Third, we need to improve the mental quality of the players. Changing generals on the spot,

single missed, immature tactics and technology will suppress the pace of the Chinese team.

5 Summary

5.1 Limitations

The data in this article are still limited. The data analyzed in this paper are the data of the group stage of this competition, the European Cup group stage of three + a 1/8 final, the world Preliminary stage of the third group stage until the current 6 games, the data is not comprehensive enough to accurately locate a team;

In addition, the player's injury is an unmet factor, the same unforeseeable factors also include natural weather factors, historical clash factors (ditch capsized), unexpected factors, etc., which are difficult to statistics.

5.2 Certainty

England and Holland are predicted to be in the top four, using data from only four matches.

The index used in this paper will have dimensional influence, and the translation standard deviation change method is adopted in the analysis to eliminate certain influence and improve the accuracy of data analysis.

In addition, the finals of general football competitions use the knockout format. The analysis objects selected in this paper are all the teams after the group stage, and this prediction is more reasonable. The group stage is usually divided by drawing lots. When half or more of a group is strong, it is often called the "Group of Death." When the teams in the group are relatively even, it is also called the "group of death". If all teams are selected for analysis, unforeseen factors arising from the draw will cause the predicted results to differ greatly from the actual results.

Fuzzy mathematics rough set theory and cluster analysis play a practical role in team ranking, providing a real and effective basis for the formulation of team tactics and talent selection in the management, and can predict the development prospect of the team, which is difficult to achieve by other ordinary data analysis.

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