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A system for the control of the performance of high level soccer players applying fuzzy logic

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Abstract*—Data analytics systems are increasingly popular as an effective framework for comprehending and enhancing sports performance. Consequently, they are commonly utilized by technical staff in several sports organizations, including national teams and clubs, with positive outcomes reflected in their victories. Nevertheless, accurately measuring the positioning of players remains a challenge. For instance, some technical staff of soccer institutions rely on their empirical knowledge to determine player positions, which can be time-consuming and imprecise. This research introduces FuzzyFootball, a web application intended primarily for soccer technical staff and, to a lesser extent, soccer fans. The purpose of the application is to determine the positions of soccer players on the field using logic that considers each player's most critical attributes, rather than relying on empirical decision-making. The application's solution is based on fuzzy logic, wherein quantitative values are assigned to player attributes, providing a performance score for each player in each position. As part of the validation process, indicators were established, interviews and surveys were conducted with defined users. The results indicate that the average time required to conduct a player analysis was reduced by more than 87%. Moreover, since the application's results are generated using logic rather than empiricism, they are more precise and accurate, which is supported by the satisfaction level of respondents.

***Keywords*— Fuzzy Logic, Soccer, Sports Analytics, Matlab**

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I. INTRODUCTION

Today, Sports are widely practiced globally, either as a recreational activity or professionally, in which case discipline is crucial for individuals and teams to achieve their goals. Coaches require knowledge of players' attributes to position and classify them appropriately. Consequently, sports organizations invest in tools to help achieve this objective. One such tool is "Wyscout", which records matches of national teams and potential new talents in their respective clubs within 36 hours after their last competition. Ricardo Gareca, the technical director of the Peruvian soccer team, began using Wyscout in 2015 to improve the team's performance, resulting in their qualification for the World Cup after 36 years [16].

Data analytics systems are gaining popularity as an effective framework for understanding and improving sports performance [5]. As such, it is commonly used by technical staff in various sports organizations, such as national teams and clubs, with positive outcomes reflected in their victories. Additionally, these systems can analyze the performance of younger players in minor divisions to identify the best young talent.

Despite the existence of data analysis systems, there are still problems in being able to correctly measure the positioning of the players. For example, some technical staff of soccer institutions usually apply their empirical knowledge when choosing the positions of their players [11]. As a consequence, the use of data analysis systems has become vital for obtaining more precise results.

Many solutions have emerged that propose different methods to be able to analyze athlete attribute data, such as the artificial neural network [8], fuzzy logic [20] or the genetic algorithm [17]. While certain data analysis methods may prove successful in various scenarios, their efficacy may be limited in specific cases. As such, the method employed in this particular instance was Fuzzy Logic, which is a superior tool to use when faced with uncertain or imprecise data. Fuzzy Logic is also particularly advantageous in situations where expert knowledge is available since it can encode this knowledge and facilitate a more straightforward understanding of the results compared to neural networks and genetic algorithms. These latter methods are often regarded as black box models that render it challenging to comprehend how the system arrived at a particular decision.

Fuzzy logic was used to create a model that could represent the value of attributes qualitatively and quantitatively. To make this model, it was necessary to use software that could create fuzzy logic models. To do this, various software that fulfilled this purpose were studied, such as Matlab [12], Alteryx designer [6] and Wolfram Mathematica [1]. Among all of them, Matlab was chosen, mainly because it has a very friendly interactive environment. Also, a web system was programmed in Visual Studio, where the said model would be introduced. For system programming, the C# language was used.

Our main contributions are the following:

- A fuzzy logic-based data analysis model was constructed using Matlab software to perform a qualitative and quantitative analysis of players' attributes.
- A web-based environment has been developed, which effectively utilizes the constructed model and enables the input of players' attribute values for comprehensive analysis.
- An analysis of the developed system, showcasing its outcomes and findings.

Then, Section II will explain the definitions of the technologies related to Fuzzy Logic and the process of developing the system. Similar solutions currently implemented in the literature will be explained in section III. In section IV, the contribution of the project will be presented. Section V will detail the experiments and their results. Section VI will describe the main conclusions reached.

II. Background

The utilization of data analysis in sports has become increasingly popular in recent years due to its advantageous impact on decision making. Nonetheless, the process of identifying suitable methodologies and technologies to effectively execute such analyses continues to pose a significant challenge. This article elucidates the various approaches and techniques employed to address this persistent challenge, thereby offering valuable insights and solutions.

A. Fuzzy Logic

- Truth value: Fuzzy logic is a form of many-valued logic in which the truth value of the variables can be any real number between 0 and 1. It is used to handle the concept of partial truth, where the truth value can range from completely true to completely false [10]. Fuzzy logic is based on the observation of decisions made by people based on imprecise and non-numerical information. Fuzzy logic models have the ability to recognize, represent, manipulate, interpret and use data and information that are vague and lack certainty [2].

- Fuzzy logic tools: There are a variety of tools to carry out fuzzy logic, but the Matlab tool is the one that presents the best and easiest handling, in addition to allowing technological and scientific calculations to be carried out from a representation of values that it's based on Arrays. Also, it offers a very simple interactive environment that allows both the programming of algorithms, the input and output of data in a functional and versatile way, as well as the visualization of these in a simple and comfortable way [13]. An example of this can be observed in Figure 1.

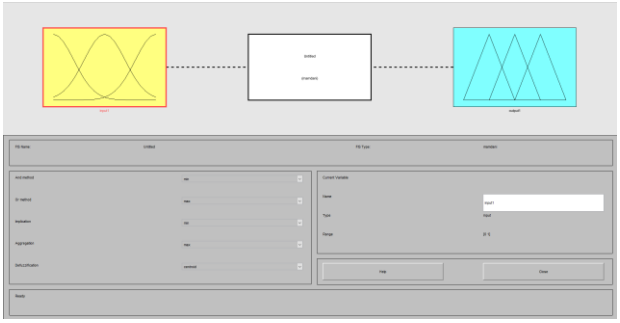

Fig. 1: Fuzzy logic in Matlab.

B. Attributes in relation to football positions

There are specific places where the players will position themselves, having the obligation to carry out specific activities. Four basic positions can be considered for the sport of soccer, which are: Goalkeeper, defense, midfield and forwards. Within the field there are more specific positions, with even more specific responsibilities. For this reason, this issue is of vital importance to determine optimal player performance on the field of play. To evaluate the optimal position of a player, various methods have been used, but in all of them the main factors that determine it are the characteristics and physical attributes of the player [3]. Figure 2 demonstrates the quantitative assessment of a player's attributes, as exemplified by the given image.

Fig. 2: Example of a player's attribute relationship (FIFA).

C. Analytics in sports

- Definition: Sports analytics is the research and modeling of sports performance, implementing scientific techniques. More specifically, sports analytics refers to the management of structured historical data, the application of predictive analytical models that use this data, and the

use of information systems in order to inform decision makers and enable them to help their organizations to gain a competitive advantage [7].

- Data mining in sports: Sports teams make use of data mining methodologies in order to interpret or segment them, which will ultimately help the organizations make an appropriate decision. Bringing together data mining techniques and important information can empower a team and provide a competitive advantage. This advantage may be greater depending on the precision of the analysis carried out, either through the technique or the systems used for it. Currently, the effectiveness of many technologies that perform data analysis in the sports area has been demonstrated, which motivates organizations to want to implement it in their strategies to achieve better competitive performance [7].

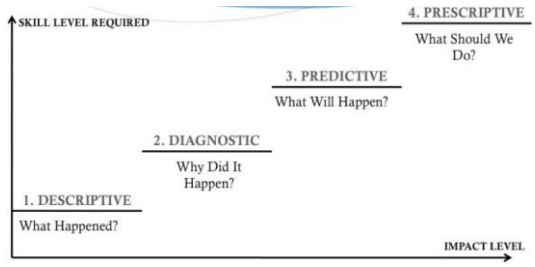

Fig. 3: Sports Analytics Skills vs. impact correlation [7].

Figure 3 illustrates the correlation between sports analytics and the requisite skills. Sports analytics has begun to have a tendency to perform prescriptive analysis in order to better understand soccer matches in greater depth.

III. Related Works

Subsequently, the distinct extant solutions grounded in fuzzy logic will be succinctly elaborated upon. These solutions encompass the creation of a data analysis model for soccer or sports in general, and are therefore being duly considered.

[15] contend that to effectually analyze and exploit data, biometric and location devices are indispensable. These devices permit the ascertainment of the comprehensive physical activity of players during games and training sessions. This in turn facilitates the assessment of their performance in specific attributes, including speed, endurance, distance covered, and movement patterns, as well as their playing style and performance at distinct periods, be it during an official or practice match. By utilizing these tools, methods to enhance players' performance can be identified, such as through positional rotation or tailored training focused on improving specific attributes.

[14] presented a project which employed an objective fuzzy inference program based on fuzzy logic to evaluate players from various sports, in this particular case they used soccer as an example. The system aimed to evaluate data related to the performance of strikers during official matches. The authors utilized the Method of Characteristic Objects (COMET), which consists of five phases. In the first phase, an expert selects a number of criteria to determine the dimensionality of the problem and fuzzy numbers are assigned to each criterion. The second phase involves generating characteristic objects, which can be either real or idealized objects that do not exist. The third phase involves classifying the characteristic objects by means of a matrix based on the expert's opinion. In the fourth phase, each characteristic object is transformed into a fuzzy rule. Finally, in the fifth phase, the final inference and classification is made for each of the alternatives.

[18] conducted a study in which they collected performance metrics related to physical and technical skills in the game for all participants in the U-18 national championship of the 2014 Australian Football League (AFL). The sample consisted of 65 players selected from a larger population of 244, who were equipped with GPS devices to collect metrics while playing on the field. The data was downloaded after each game by the support staff of the Academy State using proprietary analysis software, and only active game data was used for analysis. Data such as counts, quarter breaks, and trading periods for each player were excluded from the analysis. The study aimed to model the relationship between position within a draft round and physical and technical abilities. To this end, a set of 16 single-term models was developed for each draft round using the same response and predictor variables as described above.

[19] employed three analytical approaches to determine the ability of twelve skill performance indicators in classifying the position of a player in Australian rules soccer. The study involved pooling data from 244 18-year-old players through repeated observations and quantitative data provided by Champion Data to evaluate the technical abilities of players in various positions such as Defender, Offender, Midfielder, and Ruckman. The technical skills considered in the evaluation included Kick, Handball, disposals, Effective Disposals, contested possessions, uncontested possessions, Mark, Contested mark, Uncontested mark, Inside 50, Tackle, and Clearance. Three analyses were performed to classify players based on these skill indicators. In the first analysis, Linear Discriminant Analysis (LDA), the technical ability indicators were used as explanatory variables while the playing position was considered as the categorical response variable. The "Random Forests" algorithm was used in the second analysis to classify players in the dataset using a machine learning technique that grows a collection of decision trees. Finally, the PART decision list consisting of six rules was used in the third analysis to generate a set of rules that best ranked the positions of the four players. The model was

pruned to ensure that there were at least ten instances for each rule, and a five-time cross-validation was performed to avoid overfitting.

[4] provides a valuable contribution by identifying the determinants of psychological performance and the differences between age groups in young soccer players. This research aims to enhance the accuracy of selecting youth players by conducting a cross-sectional study with a sample of 118 male soccer players. The training frequency for the U14 and U16 categories was four sessions per week, while for the U19 and semiprofessional categories, it was five sessions per week, in addition to the competition match in both cases. Prior to data collection, the Educational Psychology Area of Córdoba CF, SAD obtained consent and permission from parents, coaches, and managers to administer the required questionnaires during the season. Mental strength was assessed using each of the mental ability areas defined in the Loeh model. The study employed a statistical analysis, which included calculating Cronbach's alpha value to determine the internal consistency of the questionnaire and checking for normality using the Kruskal-Wallis test. The descriptive statistics of the variables by age group were calculated and expressed as the mean ± standard deviation (SD).

IV. Main Contribution

To develop a data analysis-based system for monitoring high-level soccer player's performance, it was proposed to use fuzzy logic and tools that have the ease of being able to implement said methodology, for this case Matlab. Additionally, a web application in C# was created to implement the proposed model and perform the desired analysis.

A. Fuzzy Logic

In this section, we first explain how the Matlab tool was used to configure the fuzzy logic model, followed by a description of how the model was linked to the management of soccer players' data.

- Matlab tool: The Matlab tool enables the development of fuzzy logic models where values (inputs) can be configured, in this case qualitative, and then converted or assigned a quantitative value. A quantitative value (range) will be configured within the inputs. For the project, the inputs were set as attributes of a player in the required position for the analysis, you can also see their ranges as well as the output, which in this case would be the resulting position. Figure 4 shows the Matlab configuration for the forward position (FW), where the inputs and their output can be observed.

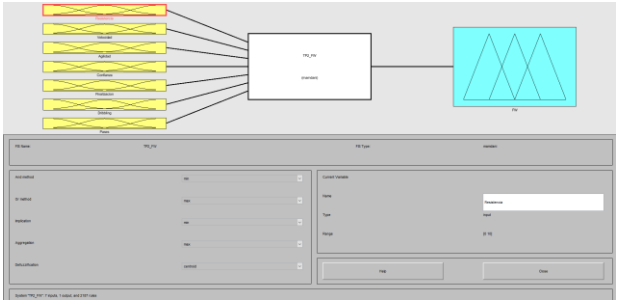

Fig. 4: Fuzzy logic design in Matlab of the position and attributes of a forward.

- Analysis of positions in Matlab: To analyze the positions of soccer players in Matlab (as illustrated in Figure 1), it is imperative to initiate a configuration process that involves specifying the positions that need to be examined. Accordingly, this study has selected five fundamental positions in soccer, namely Forward (FW), Central Defender (DC), Midfielder (MC), Goalkeeper (PT), and Side Defender (DL), which have been denoted with these abbreviations in Matlab. The system aims to evaluate the characteristics of each position to identify the most appropriate position for a player. In the subsequent sections, we elaborate on the attributes that will be examined for each position.

  - Forward (FW): Stamina, Speed, Agility, Confidence, Finishing, Dribbling, and Passing.
  - Central Defense (DC): Height, weight, musculature, resistance, concentration and speed in decision making.
  - Midfielder (MC): Endurance, agility, confidence, quick decision making, creativity and passing.
  - Goalkeeper (PT): Height, weight, musculature, agility, confidence and speed in decision making.
  - Lateral defense (DL): Speed, resistance, agility and passes.

  The Attributes that will be used in Matlab are defined as follows:

  - Height: Height of the soccer player.
  - Weight: Weight of the soccer player.
  - Musculature: Build of the player, that is, body shape (thin, normal, stocky, etc.) has to be balanced with the weight of the player to obtain a better performance.
  - Speed: Maximum speed without the ball of the player.
  - Resistance (Stamina/Endurance): Level of physical condition of the player (stamina)
  - Agility: Ability to change direction efficiently, making quick turns and evading tackles from opposing

players.

- Confidence: Mental ability that will help the player to carry out risky actions without hesitation.
- Concentration: Mental ability that will help the player to be more mentally stable during the game, avoiding mistakes.
- Speed in decision making: Ability to make the best decisions as quickly as possible in any situation.
- Creativity: Ability to plan strategies and creative plays in any game situation.
- Dribbling: Player's ability to maintain control of the ball while driving the ball at speed.
- Passing: Ability to pass the ball quickly and accurately.
- Completion: Accuracy of the player when finishing off the goal.

The following figures show the parameters and ranges of an attribute (resistance) and the output for the forward position.

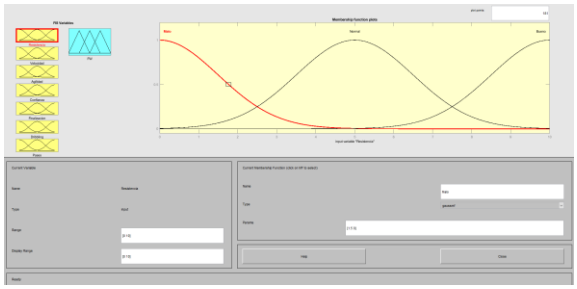

Fig. 5: Parameters, range and graphic description of the resistance attribute.

Figure 5 shows the configuration of an attribute (resistance) in Matlab where the configuration of the range of the attribute can be seen. It should be noted that this configuration is universally applied to all attributes.

Figure 6 shows the configuration of an output (Result of analysis of a position) in Matlab where the configuration of the output range can be seen. This configuration is also applied to all outputs.

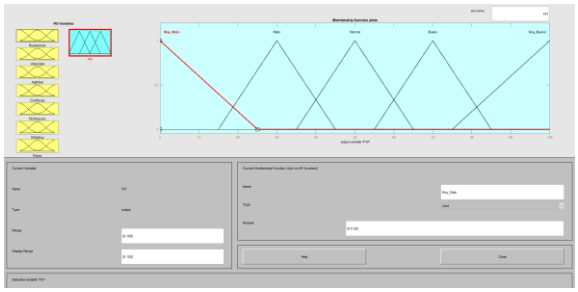

Fig. 6: Parameters, range and graphic description of the output corresponding to Forward

Our proposed approach involves the application of the fuzzification process to convert quantitative input values into qualitative values. Specifically, input values closer to 1 will be categorized as "Bad", while those closer to 5 will be labeled as "Normal", and values closer to 10 will be classified as "Good".

These qualitative values will be processed by a set of rules that vary depending on the position. This process will generate a corresponding qualitative value output for each rule, which can be "Very Bad", "Bad", "Average", "Good", or "Very Good".

Subsequently, the fuzzy qualitative output values undergo aggregation, a process whereby they are combined into a single fuzzy value that represents the output for each position.

Lastly, the defuzzification process will be applied to convert the output qualitative values back into quantitative values. The output values corresponding to "Very Bad" will have a value closer to 1, while those corresponding to "Very Good" will have a value closer to 100.

Overall, this approach will enable us to determine the performance score of players for each position.

In the subsequent section, a more detailed discussion on the aforementioned rules will be presented.

- Rules for performing position analysis: To adequately determine the positions of soccer players, The rules will be the combinations of the qualitative input values of the attributes, resulting in a qualitative output value. These rules must be grounded in prior research and scientific literature on soccer and fuzzy logic.

The following text represents the configuration of a single rule in Matlab corresponding to the forward position (FW):

If (Resistance is Bad) and (Speed is Bad) and (Confidence is Bad) and (Completion is Good) and (Dribbling is Good) and (Passing is Bad) then (FW is Bad)

Figure 7 displays a set of rules, consisting of precisely 2187 rules for the forward position (FW). Subsequently, we will elaborate on the quantity of attributes linked to each position, along with the corresponding number of rules.

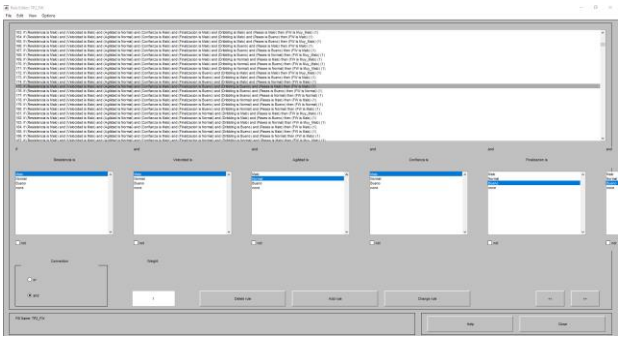

Fig. 7: Rule's configuration.

Table 1 demonstrates that a specific number of rules were formulated for each position, and the quantity of such rules was contingent upon the number of attributes that were established for the position.

TABLE I: Number of rules per each position (The positions and variables are described in the IV-A section)

Positions	Variables	N° Rules
Central Defense **(DC)**	Height, Weight, Musculature, Resistance, Concentration, Speed in decision making.	729
Lateral Defense **(DL)**	Speed, Resistance, Agility, Passing	81
Midfielder **(MC)**	Resistance, Agility, Confidence, Speed in decision making, Creativity, Passing.	729
Forward **(FW)**	Speed, Resistance, Agility, Confidence, Dribbling, Passing, Completion.	2187
Goalkeeper **(PT)**	Height, Weight, Musculature, Agility, Confidence, Speed in decision making.	729
Total		4455

- Web Interface:

  – Soccer player interface: As observed in Figure 8, the user is required to assess the soccer player attribute using numerical values based on their own criteria, where a rating closer to 1 corresponds to "Bad" and closer 10 corresponds to "Good".

  – Results Interface: The present study utilizes a fuzzy logic model to conduct an analysis based on the attributes previously introduced. The obtained results are presented in Figure 9. The output displays a score assigned to each of the designated positions, namely FW, DL, DC, PT, and MC. The degree of excellence of a player in a particular position increases as the score approaches 100.

Fig. 8: Soccer player interface (The text is in Spanish because the system was developed in Perú).

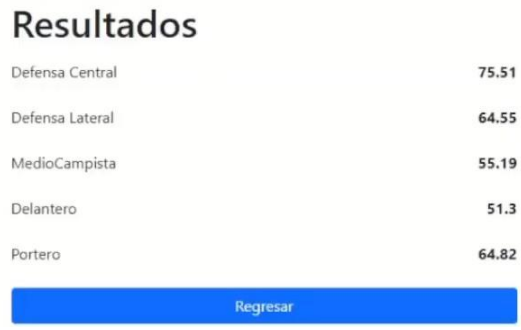

Fig. 9: The performance ratings of soccer players in relation to their respective positions on the field (The text is in Spanish because the system was developed in Perú).

  – User history interface: The previous analyses are presented, providing the opportunity to download the results in Excel format and filter the players based on their highest scoring position. Furthermore, it is possible to review each analysis in detail and delete them individually. This can be observed in Figure 10.

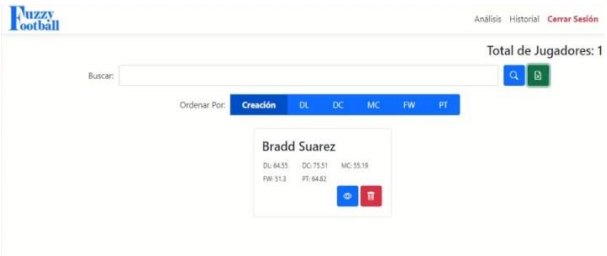

Fig. 10: Analysis history (The text is in Spanish because the system was developed in Perú).

V. Experiments

This section will address the experimental procedures utilized in our project, along with the necessary information to reproduce these experiments. Additionally, a detailed examination of the results obtained from these experiments will be presented.

A. Experimental Protocol

In order to reproduce the methodology employed for the development, training, and evaluation of the model utilized in our project, we commence the discourse by elaborating on the fundamental prerequisites necessary to execute these procedures.

- Development Environment: The proposed system was developed using Microsoft Visual Studio 2022 and C# was chosen as the primary programming language for the web application. The decision to employ this particular environment and language was based on our expertise as developers in utilizing these technologies.

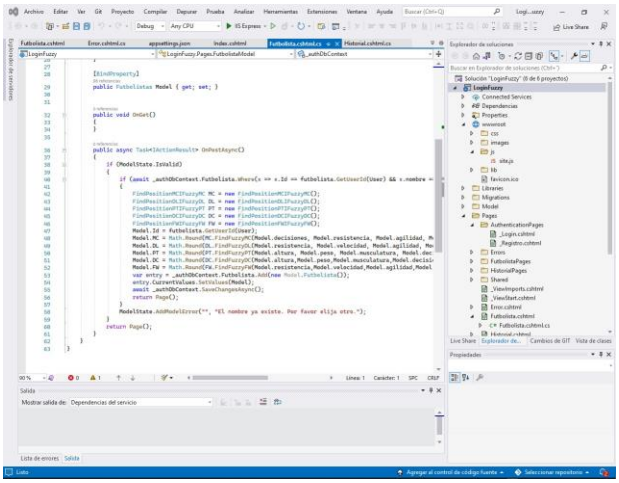

Fig. 11: Code used for the development of the web application (C#).

- Deployment: To facilitate the deployment of the project on the Internet, it was necessary to leverage the services provided by Microsoft Azure. This involved configuring the database, as well as creating a virtual machine instance within the Azure environment. This instance provides scalable computing resources on a usage-based pricing model. Subsequently, Matlab Runtime was utilized, which is a self-contained set of shared libraries, Matlab code, and additional files that enable the execution of Matlab files on computers that do not have a locally installed version of Matlab. This was essential to ensure accurate execution of the proposed data analysis, which was reliant entirely on Matlab to yield the expected outcomes.

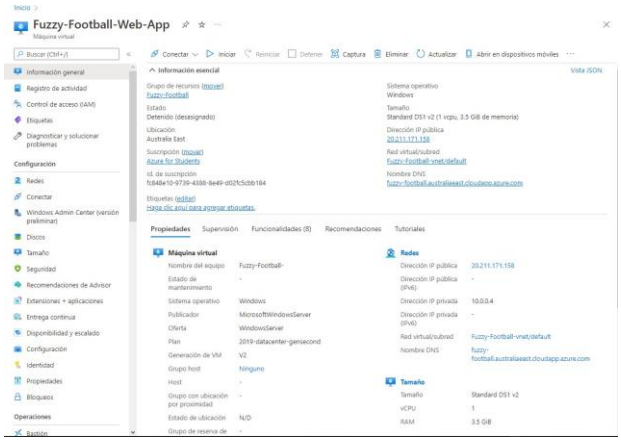

Fig. 12: Configuration of the Azure Virtual Machine where the web application is hosted (The text is in Spanish because the system was developed in Perú)

- Source code: The codebase and data set utilized in this research are openly accessible and can be found at https://github.com/Cricked/FuzzyFootball, featuring the developed code and associated libraries. Moreover, comprehensive installation and deployment instructions have been included, outlining all the necessary steps and directives to effectively utilize the proposed system.

B. Definition of indicators

In order to facilitate analysis of project outcomes, success indicators were established. These metrics will prove valuable in informing future project enhancements.

TABLE II: Success Indicators

Positions	Variables
Indicator 1	Percentage reduction of analysis of soccer players in strategic positions
Indicator 2	User's satisfaction percentage

C. Test Scenario

In order to validate the project, a test scenario was implemented at the Universidad Peruana de Ciencias Aplicadas located in Lima. The test group consisted of 32 individuals, comprising both university soccer coaches and student soccer

enthusiasts. The acquired data is tabulated in Table 3, which includes the time taken to conduct a comprehensive player analysis, taking into account the player's attributes, with and without the use of the web application. Additionally, the table presents the percentage of performance enhancement achieved through the utilization of the application.

D. Indicator evaluation

- Indicator 1 - Percentage reduction of analysis of soccer players in strategic positions: Based on the quantitative data derived from a comprehensive analysis of soccer players in strategic positions, as presented in Table 3, two variables were introduced for both conventional analysis time and web application-based analysis time. These variables, in conjunction with a particular equation, enable the determination of the optimization percentage in analysis time. The equation is depicted below:

$$\left(\frac{x-y}{x}\right) * 100 = Z$$

x = Traditional Analysis time of soccer players in strategic positions (minutes).
y = Analysis time of soccer players in strategic positionsusing the web application (minutes).
Z = Percentage of optimization of the analysis time of soccer players in strategic positions.

- Indicator 2 - User's satisfaction percentage: The validation process for usability, efficiency, and user interface of the web application will be primarily reliant on the user's perception of the interface and the accuracy of the functionalities specified. The UX design process was adopted to achieve a satisfactory relationship between the web application and the user.

E. Analysis and discussion of results

This section will outline the findings generated from the proposed indicators according to the validation process employed for the project's solution.

- Average time in minutes of analysis of soccer players in strategic positions: To validate the average time, a survey was conducted among 32 participants to determine the duration required for analyzing soccer players in strategic positions through traditional means (refer to Figure 13). The same respondents then used the proposed web application, which employs fuzzy logic, to determine the time required for the same task (refer to Figure 14).

Fig. 13: Average time in minutes of traditional analysis of soccer players in strategic positions.

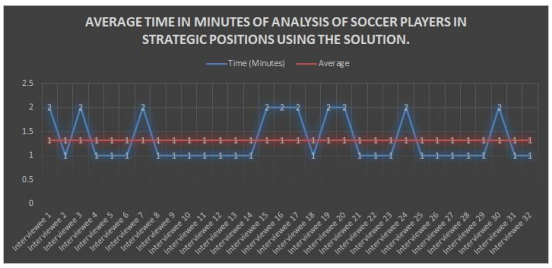

Fig. 14: Average time in minutes of analysis of soccer players in strategic positions using the solutions.

The findings indicate that the use of the web application results in an 87.57% optimization. This value was determined by computing the average of the times displayed in Figures 13 and 14, and applying the previously presented formula. The values in Figures 13 and 14 were taken into account with precision to two decimal places for the computation.

- User satisfaction percentage: The level of user satisfaction was determined by calculating an approval percentage, which was based on the parameters of usability, efficiency, and user interface. To accomplish this, a survey was conducted in which the users were asked to choose their degree of satisfaction from the options of Very dissatisfied, dissatisfied, satisfied, and very satisfied. The degree of satisfaction is reflected in Figure 15, which indicates that the overall satisfaction level is high, as only satisfied and very satisfied responses were recorded. For instance, regarding usability, 17% of the participants reported being satisfied, and 83% very satisfied. For efficiency, 33% of the users expressed satisfaction, and 67% were very satisfied. Finally, concerning the user interface, 17% of the respondents were satisfied, and 83% were very satisfied.

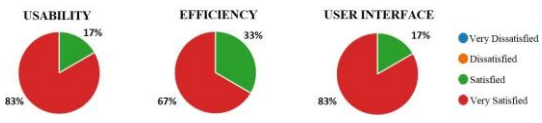

Fig. 15: User's satisfaction percentage.

TABLE III: Data obtained via inquiries and questionnaires.

Interviewees	Analysis time of soccer players in traditional strategic positions. (minutes)	Analysis time of soccer players in strategic positions with a web application. (minutes)	Percentage of optimization of the analysis time of soccer players in strategic positions.
1	7	2	71.43%
2	9	1	88.89%
3	8	2	75.00%
4	8	1	87.50%
5	10	1	90.00%
6	8	1	87.50%
7	13	2	84.62%
8	10	1	90.00%
9	11	1	90.91%
10	10	1	90.91%
11	12	1	91.67%
12	9	1	88.89%
13	13	1	92.31%
14	12	1	91.67%
15	10	2	80.00%
16	14	2	85.71%
17	9	2	77.78%
18	13	1	92.31%
19	8	2	75.00%
20	9	2	77.78%
21	15	1	93.33%
22	10	1	90.00%
23	13	1	92.31%
24	12	2	83.33%
25	9	1	88.89%
26	12	1	91.67%
27	11	1	90.91%
28	14	1	92.86%
29	10	1	90.00%
30	9	2	77.78%
31	9	1	88.89%
32	11	1	90.91%

It is noteworthy that the usability and efficiency results presented in Figure 15 pertain to the viewpoint of the users regarding the outcomes depicted in the analysis, as exemplified in Figure 9. The feedback received from the users indicates that they largely concurred with the solution's obtained results, which reveal that the actual performance of the analyzed players in the selected positions (FW, DL, DC, PT, and MC) is akin to, or consistent with, the results presented by the solution.

In comparison to previous solutions, such as those outlined in point 3, the effectiveness of this proposed approach lies in its exclusive focus on soccer and its provision of a user-friendly web interface. The accessibility of this interface facilitates extensive user feedback that can help identify areas for improvement and correction, thereby facilitating continual enhancements to the solution. This approach is possible due to one of the key advantages of fuzzy logic, which allows for ease of editing and adjustment compared to similar techniques. For instance, in this particular instance, further refinement of the results can be achieved by incorporating more specialized positions or augmentation of rule sets for existing positions, thereby further enhancing the precision of the results.

VI. Conclusion

Based on the data collected during the validation process, it has been observed that using fuzzy logic to assess player performance according to their position on the field is not only feasible but also useful for soccer coaches and their associations. The developed solution, FuzzyFootball, which has been designed to enhance the accuracy and efficiency of player analysis. The findings reveal that the traditional analysis of player performance according to their position on the field took an average of 11 minutes, whereas analysis through the FuzzyFootball web application led to a reduction of this average time to only 1 minute, resulting in a significant optimization of 87.57%. Furthermore, the interviewees reported that the application's outcomes were congruent with, or closely resembled, those observed in real-life scenarios. These findings serve to attest to the solution's high degree of accuracy, given that the data inputted is as close to reality as possible. Such optimization and accuracy will aid coaches in streamlining team formation, as they will have a clearer understanding of which positions their players are most effective in. Additionally, a significant majority of the survey respondents, approximately 67%, expressed being "Very Satisfied" with the usability and efficacy of the web application, while 33% reported being "Satisfied". The

respondents characterized the application as a highly accurate and advantageous tool for evaluating a player's performance in specific positions, indicating its potential value in both individual and team training. Notably, approximately 83% of the respondents expressed being "Very Satisfied" with the application interface, commending its intuitive design and minimalist appearance.

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