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ARTIFICIAL INTELLIGENCE AS A TOOL SUPPORTING THE PROCESS OF MANAGING A FOOTBALL TEAM AT THE TRAINING LEVEL

Przemysław DEMBOWSKI

University of Lodz Faculty of Management; Przemyslaw.dembowski@wz.uni.lodz.pl,
ORCID: 0000-0002-5006-2512

Purpose: The reason for writing this article is to explore various areas where artificial intelligence can be applied and see what the results are.
Design/methodology/approach: In his work, the author focused primarily on examining the literature on AI technology and the topic of creating models for soccer training. Additionally, the author reviewed the use of technology in soccer training journals to understand the opinions of the soccer community on the subject.
Findings: The author noted that ready-made models are already being developed to meet the needs of top football teams regarding data analysis, which can help optimize the training and team management process. At the same time, the use of this simple technology can be observed in academies specializing in training youth teams.
Research limitations/implications: While you can find articles on the creation of AI models, you need to remember that these are largely solutions for specific clubs, and therefore knowledge about them is, for obvious reasons, limited only to a narrow group of interested people.
Practical implications: The increased use of artificial intelligence could have a significant impact on the future of not only football (which is the subject of this article) but also sport in general.
Originality/value: This article is an overview and analysis of the issue of AI in football, which, despite its popularity in many leagues, is still something new and worth considering.
Keywords: Football Club Management, AI in Sport, AI in Football, Data analyse in sport.
Category of the paper: Management, Management in sport.

1. Introdution

These days, professional football teams face a number of challenges. The biggest of these, to paraphrase the words of a Polish footballer "There are no weak teams left in Europe" is, of course, intense competition. The stronger the team, the more matches there are to be played, as league competitions must also include matches in various national and international cups,

individual players' performances in national team matches, and so on. High performance requirements, coupled with the simultaneous growth of already vast data streams (from player tracking, training analysis, match analysis), require a comprehensive approach to team management. This is essential to selecting the optimal lineup for each match, with players in peak form in a given microcycle, along with the appropriate formation.

Technologies such as artificial intelligence offer significant opportunities for clubs, providing them with advantages, streamlining decision-making, player selection, and improving squad training. This article provides an overview of AI's use and potential applications in football team management (including selection and formation), match and training management (tactics, performance, collective behavior), and training organization (individual training, workload management, injury prevention). The current state of research/literature is reviewed. Practical applications and organizational implications for clubs are also presented, and the author explores the potential for implementing developments in this field.

Football is arguably one of the most complex team sports in the world, operating on multiple levels:

- Sporting (tactics, player performance, fitness/injuries) – It combines individual physical and technical behavior, collective tactical coordination, opponent adaptation, and a high level of uncertainty (related to random factors such as a player's reaction to pressure, acclimatization to a new environment, etc.).
- Administrative (transfers, contracts, scouting) – Selection and observation of players, not only in terms of how a given player behaves on the pitch, their results, etc., but also whether their game fits the current club concept/philosophy and their adaptability to the current player combination. As coach Eelco Schattorie said in an interview, "You should never choose the best player for every position, but the best combination of players who fit together" (Schattorie, 2023).
- Commercial (sponsorship, fan engagement, media).
- Operational (logistics, planning, data management).

In this article, the author focuses on aspects of coaching thus touching on the sporting and, to some extent, administrative aspects of transfers and the elements surrounding this topic. While the author's approach might seem simplistic, upon closer inspection, statistical football analysis itself attempts to provide quantitative answers to questions about various aspects of the game. In particular, these include characterizing the playing styles of players and teams, assessing the impact these teams have on the pitch, and making temporal and counterfactual predictions about player actions (Tuyls, Omidshafiei, Muller, Zhe Wang, Connor, Hennes, 2020).

Traditional coaches and management have long relied on video recordings, statistical summaries, and coach experience to make decisions about lineup selection, tactics, training load, and recovery.

However, in the last decade, the combination of large-scale tracking data, wearable sensors, computer vision, cloud computing, and advanced machine learning has created new opportunities.

Artificial intelligence broadly encompassing machine learning, deep learning, computer vision, and optimization algorithms-offers the potential to improve decision-making, support real-time analytics, personalize training, optimize team formations, and even automatically generate new tactical suggestions. The purpose of this article is to synthesize the scientific evidence and practical implementations of AI in football, with a focus on three broad areas:

- team management and player selection,
- match/training analysis and tactical decision-making,
- training organization, including physical load, regeneration and injury prevention.

In the past, the coaching staff consisted primarily of a coach, an assistant coach, and a person responsible for physical preparation and wellness. If we were to look at the coaching staffs of professional football teams today, the number of players could be considered a new team, including a bench. Analyst, Sporting Director, assistant analysts, assistant coaches, second and third coaches, etc. The multiplication of positions is dictated by the demands of modern football, where the sheer volume of issues and data requires greater specialization than ever before.

2. Team management – selecting players and formations

Tactical preparation is crucial in football. Decisions regarding formation, opponent analysis, set-piece patterns, substitutions, pressing, and player roles are increasingly data-driven. Creating the right AI model can help identify the most appropriate players and combinations for a given team context.

For example, in the article *Intelligent team formation and player selection: a data-driven approach for football coaches* the authors have developed a machine learning framework that supports coaches by optimally matching players to positions and selecting team formations based on historical match performance indicators (Nouraie, Eslahchi, Baca, 2023). As a starting point (i.e. the data on which the model was based) in this study, the SOFIFA dataset was used, which is available and published annually (SOFIFA Players FIFA 23).

This dataset includes most of the world's adult football players, along with their performance in various football-related skills (such as shooting, passing, ball control, etc.), contract information, and more. FIFA experts (scouts) have compiled these attributes into a single dataset, with each parameter assigned a specific numerical value. They closely monitor player performance throughout the season and assign a score from 1 to 100 to each player's individual attribute.

The model adopted depends on the coaching staff. For example, the authors (Uzochukwu, Enyindah, 2015) to develop a player selection model, they used neural network techniques, where the attributes needed for player selection are analysed in four main categories, encompassing four aspects: technique, speed, physical condition, and endurance. Of course, the word "speed" can be misleading here, so it's important to note that this isn't about the classic definition of speed, i.e., how fast a player can run on a straight line. Speed was assessed based on reaction time, how quickly a player moves with the ball while dribbling, and take-off/acceleration. The remaining three parameters were calculated similarly, and this comprehensive data was used to select the lineup for the match.

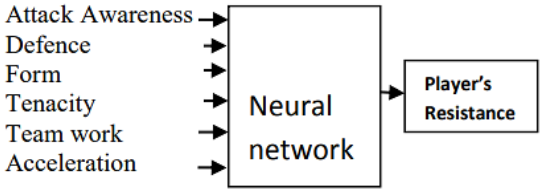

Figure 1. Architecture of a neural network model for testing soccer player endurance.

Source: (Uzochukwu, Enyindah, 2015).

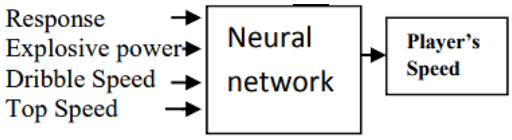

Figure 2. Neural network model architecture for player velocity status.

Source: (Uzochukwu, Enyindah, 2015).

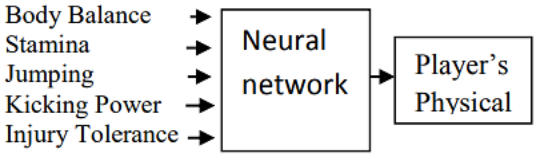

Figure 3. Neural network model architecture for the player's physical state.

Source: (Uzochukwu, Enyindah, 2015).

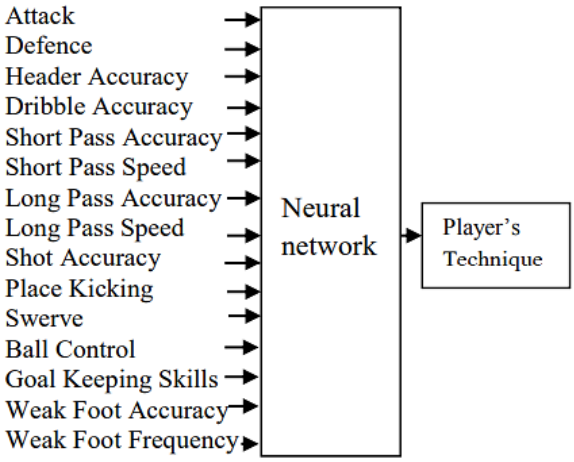

Figure 4. Neural network model architecture for player technique.

Source: (Uzochukwu, Enyindah, 2015).

The architecture/model outline presented above is, of course, just one of many, as it all depends on how the coach (training staff) approaches the issue, meaning what they pay attention to. This influences the specific data collected and the data mining method, as described by the authors (Evwiekpaefe, Bitrus, Ajakaiye, 2020).

For one coach, short passing skills will be more important than long crosses, so a "weighting" system can be adopted, with more important parameters having higher values than others. At the same time, this also depends on whether the coach selects players for a given formation (e.g., 4-5-1, 3-5-2) or adapts the formation based on specific players.

For example, if you have a strong wing-back formation with at least three solid centre-backs, it's worth considering a 3-5-2 with wing-backs who are strong enough to support both defensive and offensive efforts throughout the entire match (or for a significant portion of the match). By analysing historical match data (opponent behaviour, spatial patterns, passing networks) and adapting it to the team's strengths and weaknesses, you can optimize your formation and tactics.

In the article *Predicting Football Team Performance with Explainable AI: Leveraging SHAP to Identify Key Team Level Performance Metrics* (Moustakidis, Plakias, Kokkotis, Tsatalas, Tsaopoulos, 2023; Moustakidisetal, 2023) explainable AI (XAI) techniques were used to identify which team-level performance indicators predict success. In the article [https://arxiv.org/pdf/2310.10553], the authors focused on corner kicks themselves when developing their model, arguing that they offer coaches the most direct opportunities for interventions and improvements. As you can see, in addition to the fact that there can be several models developed, they can also cover comprehensive tactical analysis, including formation and tactic selection, as well as a subset of them (corners, free kicks, etc.).

3. Tactics

One of the largest areas of application of artificial intelligence is the analysis of so-called tactical behavior using spatial-temporal tracking data (e.g., position of players and the ball, movement of a player with the ball, movement of a player without the ball).

In the article *Mapping football tactical behavior and collective dynamics with artificial intelligence: a systematic review* (Teixeira, Maio, Pedro Afonso, Encarnação, Machado, Morgans, Barbosa, Monteiro, Fort, Ferraz, Branquinho, 2025) the author summarized 32 studies and highlighted how artificial intelligence techniques (neural networks, neural networks, variational autoencoders, graph-based metrics) are used to obtain information on formation, team coordination, passing networks, space control and player interactions.

For example, one study used graph metrics (betweenness centrality, clustering coefficient) for passing networks to infer which players are central during possession phases, allowing coaches to emphasize or restructure player roles accordingly. This allows, for example, to determine whether, after winning the ball back, it is passed into the opponent's half or slowly played. If it is passed, which player does it? If it is passed, which side of the pitch is played more often, and so on.

Based on such analysis, decisions can also be made about whether to play against an opponent who presses high. Whether to open up play from the goalkeeper to the defenders or whether to utilize long passes is preferable. Whether to trade shots against a given opponent with a high defensive line, or whether it is better to position your defense lower and wait for opportunities to counterattack.

More advanced models can help coaches predict which tactical styles are most likely to succeed and which require modification. Furthermore, generative models are now able to simulate and propose alternative formations or player patterns (Wang, Tuyls, 2025).

4. Training

Training, a key aspect of squad management, encompasses both physical and tactical preparation (learning how to react to specific situations on the pitch, positioning, etc.). Artificial intelligence can bridge the gap between match analysis and training session design.

Even in lower leagues and youth teams, smart sports camera systems are already very popular. These systems, used to record matches, track ball movement, eliminating the need to manually control the camera to follow the action. Furthermore, built-in logic "pulls out" key moments from the recording, such as shots on goal or a goal, providing the analyst with a pre-prepared video that allows them to analyse matches more effectively without having to rewind the entire video. This shortens the time spent watching the match, allowing them to focus more on the important elements and prepare a more thorough analysis.

Furthermore, such recordings can be used to analyse both their own team and the opponents' performance. By transmitting data from match/tracking systems to training planning software, clubs can identify training tasks that reflect the tactical, physical, and team demands of real-world matches. For example, by recognizing opponents' play patterns (e.g., when opponents press high or defend deep), it is possible to design training units specifically for a given opponent.

Additionally, computer vision processing and data from wearable sensors or AI tracking of each player individually enable the creation of positional heat maps (i.e., analysis of the area a given player has travelled through) and deviations from optimal movement corridors (unusual plays and positional drifts). This allows, for example, analysis of whether a winger's drop into

midfield has been effective or whether it has created a threat to his own team by creating a gap in the formation.

In addition to analysing match behaviour, artificial intelligence can optimize training sessions, monitor player load and fatigue, and propose personalized training units (Bucea-Manea-Țoniş, Vasile, Truşcă, Stănescu, 2025).

Going further, one could attempt to analyse a player's weak points and select appropriate individual training. At one time, Hertha Berlin employed three goalkeeping coaches to improve their goalkeepers' play, each with a different role. One was responsible for analysing and improving the player's grip, another solely for positioning, and the third for fall technique (on the one hand, to prevent injuries and at the same time develop positions that would allow the goalkeeper to get back up as quickly as possible after a fall). Analysis of the goalkeeper's shots and conceded goals in a specific area of the goal could be implemented immediately, to analyse, for example, which side of the goalkeeper (left/right) is the weaker side, as shown in the Piotr Kruszewski' article (Kruszewski, 2025).

5. Injuries

The increasing number of matches players must play (especially those in the highest domestic leagues) has put them at greater risk of injury than ever before. This translates to high match demands and sometimes short recovery periods. The use of artificial intelligence (AI) opens up interesting prospects for predicting injury risk and performance in team sports. A better understanding of AI techniques and the sports in which AI is used is undoubtedly warranted (Claudino, Capanema, Vieira de Souza, Serrão, Pereira, Nassis, 2019).

Here, too, injury prevention methods can vary. Medical knowledge is fundamental, of course, but knowledge from other sources is equally important: The athlete's injury history how often they were injured, at what times of the season, and what type of injury it was.

Additionally, you can approach the topic from a different perspective: Which periods of the season caused the most injuries? Which training sessions were more taxing, allowing you to reduce the number of injuries through appropriate micro- and macro-cycle design.

6. Future Direction

Of course, speculation remains as to how AI will develop in this field. One development direction is enabling AI systems to operate in real time during matches (or at halftime) to support tactical changes. This requires ultra-low latency tracking, fast models, and integration with coaches' decision-making processes.

The growth in data sources and computing power may also allow for simulations of our team's match against its nearest opponent, helping us choose the best gameplay scenario (Scott, Fujii, Masaki Onishi, 2021).

The question now arises: has high-quality training so far involved, among other things, hiring the right staff (as it was often said that a coach would take "his" people with him after moving to another club), or will the opposite trend occur now? The growing role of artificial intelligence will mean there will be no need to hire as many people (e.g., analysts), which will significantly change the structure of clubs, and this refers only to the coaching staff itself.

Of course, there are certain risks to implementing such solutions, including ethical ones. All data maintained by each team must be stored somewhere. If the data is to be accessible to staff anywhere in the world, a cloud-based solution seems logical. But what if such data leaks? What impact will it have on players and their careers if, for example, information about a player's weaknesses becomes public? This raises numerous legal and ethical questions that will ultimately need to be answered.

7. Summary

Integrating AI into football team management, tactical and training analysis, and training organization is no longer theoretical—it's already happening. AI enables clubs to optimize player selection, formations, tactics, training load, and recovery in ways previously impossible.

The scientific literature, including systematic reviews and applied research, indicates clear potential and early successes. However, practical implementation requires a robust data infrastructure, organizational change, trust in algorithmic results, interpretability, and strong governance. The future holds opportunities for real-time decision support, multi-agent simulations, personalized training, and broader club-level implementation. For football clubs willing to invest, AI can become a strategic asset—changing how teams prepare, play, and recover.

If we were to summarize this article and the conclusions it draws, the only common element between each model is, of course, data. Everything else—the method of acquisition, the type of data, and the scope of its use—depends primarily on the strategy adopted by the team.

Table 1.
Possible methods for conducting analyses and collecting data

Data source	Detail	Areas of use
Sports portals, portals like SOFIFA etc.	1	Player selection during purchase based on parameters such as: • Review of overall on-field experience. • Insight into playing experience in a given position. • Injury history.
Video recordings – this assumes the use of intelligent forms of match recording. Therefore, the level of detail will depend on the specific information collected.	1-2	Tactics selection, development of training units, and individual training sessions based on the following information: • Comprehensive analysis of team play, including: – Key situations, – Heat map of player movement, – Team statistics (passes, shots, fouls, etc.). • Individual player performance assessment: – Area of movement on the pitch, – Behavior in key situations, – Preliminary analysis of player fatigue based on monitoring game intensity over time.
Body sensors, advanced databases.	3	Transfers, tactics, and training methods are selected based on: • Player physical parameters, • Player health parameters, • Injury history and potential injury risk.

In his analysis, the author adopted a three-point scale for detail column. The higher the rating, the greater the detail and the potential for creating more complex models. Of course, these elements can be combined in various ways, yielding more complex datasets. However, it's important to remember that the more complex the model, the greater the knowledge required to analyse it. This question remains open for now: Will the amount of data eventually become so large that Big Data in sports is only a matter of time?

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