**TOPIC: PREDICTING LEAGUE WIN BASED ON COACHES ' TEA MODEL**

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**CHAPTER ONE**

**INTRODUCTION**

* 1. **BACKGROUND OF STUDY**

Soccer is one of the most popular sports around the world with a significant number of fans (Razali, Mustapha, Yatim & Ab Aziz, 2017), therefore, predicting the result of each match is an attractive and exciting thing for audiences to speculate the competitions and bet respective team. On the other hand, predicting the actual outcomes of soccer games can also give a series of practical suggestions for the football club to improve their matches strategies, and has insight into their rivals. The earliest human team activity with the ball occurred in ancient Mesoamerican cultures over 3000 years, and the original precursors of soccer game took place in ancient China between the 3rd and 2nd century BC. However, the beginning of the modern soccer was in England in 1863. Nowadays, the English Premier League is the top level of English soccer organization and one of the most powerful leagues in the international soccer field. Each team in this league has the same chance to win the final championship. Regardless of wins a match or leagues, all concentartion focuses on the players. In this work, we would consider the coach.

According to North (2018), a coach is a person involved in the direction, instruction and training of the operations of a sports team or of individual sportspeople. Coaching is a process used by a coach to an individual or group in a sporting activity. Since sport is defined as an individual or group competitive activity involving physical exertion or skill, governed by rules, and sometimes engaged in professionally. It is necessary for any sport person or team in any kind of sport to have a coach. Most people consider a coach’s primary job is to be encouraging individual in a team, as well as the team. Top-notch coaches help produce winning players and teams. How coaches create an environment of encouragement is the key to successful coaching and player performance. Yet coaching is known as the activity or profession of training of sports players or athletes. Eastley (2008) proposes that there are certain traits about the successful coach which are personal qualities some are regarded as desirable, less of the style employed, such as understanding of the players, enthusiasm, self-discipline, determination, ability to motivate, tolerance and a sense of humor. The success of a team lies more on the coach. (Cassidy, 2011).

Effective coaching is about changing the mindset of the team. Every coach is a coach because at some point in time he determined that he could make a difference for the destiny of a team and in the lives of individuals. He has decided that through his influence, mentoring, love and leadership, he can help people and groups of people be what they never thought they could become. Coaches believe that people and the future will be better because of them. Every effective coach assumes at least two major responsibilities. First a coach must develop the individual talents and potential of each player on the team. Secondly the coach must mold the individuals into a team so they can maximize their chances of winning. Everything that a coach does revolves around these two responsibilities. Coaching revolves around developing others to be something and do something. You also must help them work together to maximize their effectiveness. (Swanson, 2019)

According to Jones (2008) , the duties of a coach can vary depending on the level they are coaching at and the country they are coaching in, amongst others. In football, the primary objective of a coach is to aid players in the development of their technical skills, with emphasis on the enjoyment and fair play of the game rather than physical or tactical development. In recent decades, efforts have been made by governing bodies in various countries to overhaul their coaching structures at youth level with the aim of encouraging coaches to put player development and enjoyment ahead of winning matches. Several researchers has considered different approaches in predicting the outcome of any soccer matches.

Hijmans & Bhulai (2017) worked on predicting Dutch football by using Machine Learning classifiers along with random forest, Naïve Bayes and the k-nearest neighbour models. Their work had an interesting result, finding that the tactics of the team coach do not have much effect on the final result of a match. The dataset is composed of three types of matches which are friendly, qualification and tournament, with the details of individual players adopted in it as well. In the random forest models, the authors applied the generalized boost method, which can synthetically use weak predictors and generate a series of constraints for each node of decision trees to control the random outputs or overfitting issues, testing different nodes to find out the best fit tree.

Pariath, Shah, Surve & Mittal (2018) considered their system from the perspective of coaches and team management, estimated and generated a performance value for one soccer player from his value budget, competitiveness, position and skills in his individual career. As a result of that, they scrapped data which included 21280 players with 36 attributes from the grassroots level of players in India from the 2017 version of EA sports. The overall performance accuracy can reach 84.34%, and market value prediction accuracy is around 91% under the linear regression model. During the modelling step, Pariath, Shah, Surve & Mittal tried to separate players in a different position (Forward, Midfielder, Defender and Goalkeeper) which provided a balanced exploration for players in their proper and individual standard.

In this paper, we would consider using TEA Model (Tactics Experience Achievement) based on coach. Coach tactics range from the way the coach want the player to stands or moves, to the pace, style, positioning and movement of the entire team. Tactics are important, but they cannot be executed without a mastery of technique. The tactics been laid down by a coach to the team plays a vital role in the success of the team. Experience of a coach also take part in the success of a coach toward a team. Experiences of a coach is the number of years the coach had been coaching and the number of teams the coach had coached. It is also the number of countries the coach had travelled down to and the number of matches the coach had witnessed. The experience of a coach also takes part in the success of a team because the coach with much experience would have different concept and ideas on how to manage a team. An experience coach who had coached many team has the tendency to have achieve a lot, but in come situation, reverse is the case. The achievement of a coach is the number of trophies the coach had witness, won and the number of award the coach had won for himself and the record the coach had set for the team.

In pursuit of a better approach for predicting league wins, Artificial Neural Network (ANN) is proposed as the algorithm to develop a model with high predictive accuracy. ANN is a computational model that is based on the structure and functions of biological neural networks which takes all nodes in the network as artificial neurons. The origins of artificial neural networks (ANN) are in the field of the biology. The biological brain consists of billions of highly interconnected neurons forming a neural network. Human information processing depends on this connectionist system of nervous cells. Based on this advantage of information processing, neural networks can easily exploit the massively parallel local processing and distributed storage properties in the brain. A classical comparison of information processing by a human and a computer is focused on the ability of pattern recognition and learning.

**1.2 PROBLEM STATEMENT**

Thou, several papers has talked about making prediction on football matches using different criterial, some makes their prediction based on the current match lines-up while focuses on the tactic used. Little or no paper has focus on the coach. The coach plays a vital role in the success of the team as well. Some of the duties of a coach in a team are listed below.

1. Selecting the team of players for matches, and their formation.
2. Planning the strategy tactics, and instructing the players on the pitch.
3. Motivating players before and during a match.
4. Facing the media in pre-match and post-match interviews.
5. Delegating duties to other coaching and medical staff.

Having considered that a coach is also an important factor to a team in winning a league. We have concluded in applying machine learning neural network algorithm on the tactics, experience and achievement of a coach to predict league wins.

**1.3 MOTIVATION OF STUDY**

Several predictive models such as machine learning, quantitative or qualitative analysis has been applied to different aspect related to football to predict league wins or match wins. But few or no paper has talk about using TEA model to make prediction.

**1.4 AIM AND OBJECTIVES**

**1.4.1 Aim**

The aim of this research work is to predict leagues win based on coaches tactics, experiences and achievement toward the teams.

**1.4.2 Objectives**

The objective that this research work aims to achieve is to use tactic, experience and achievement of a coach to predict league win.

To achieve the set aim, the research work will cater for these objectives:

1. To collect data associated to a coach base on TEA.
2. To prepared the data collected and make it ready for prediction.
3. To apply Neural network algorithm on the data so as to develop a model.
4. To train the model.
5. To evaluate the performance of the model.
6. To test the model

**1.5 RESEARCH METHODOLOGY**

In other to achieve the aim of this work, several steps would be considered.

DATA PREPARATION

MODEL DEVELOPMENT

Data Collection

Data Preparation

Build Model

(ANN)

Train Model

Prediction

Test Model

1. **Data Collection:** This stage involve the process where the data for the prediction would be collected. The quantity & quality of your data dictate how accurate our model is. In this stage, data to be used for the prediction really matters. The outcome of this step is generally a representation of data (Guo simplifies to specifying a table) which we will use for training. The data to be used would be the tactic, experiences and achievement of coaches
2. **Data Preparation:** The data collected would be preprocessed to ensure all data are in the right format. Wrangle data and prepare it for training. Clean that which may require it (remove duplicates, correct errors, deal with missing values, normalization, data-type conversions, etc. Randomize data, which erases the effects of the particular order in which we collected and/or otherwise prepared our data. Visualize data to help detect relevant relationships between variables or class imbalances (bias alert!), or perform other exploratory analysis. Split into training and evaluation sets
3. **Model Building:** Machine learning is a techniques that comprises of numerous algorithms. The kind of algorithm used decide on how accurate the algorithm is. Different algorithms are for different tasks; choose the right one. In this work, the researcher would use Artificial Neural Network.
4. **Train Model**

After the model has been selected, we have to train the model. Training of a model involves applying the algorithm selected of the prepared datasets. Sample of how training dataset looks like.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | Class |
| 1 | 0 | 0 | 1 | Good |
| 1 | 0 | 0 | 0 | Bad |

1. **Test Model**

Testing of a model invloves applying an empty value class and the model built makes the prediction itself. Sample of a test data.

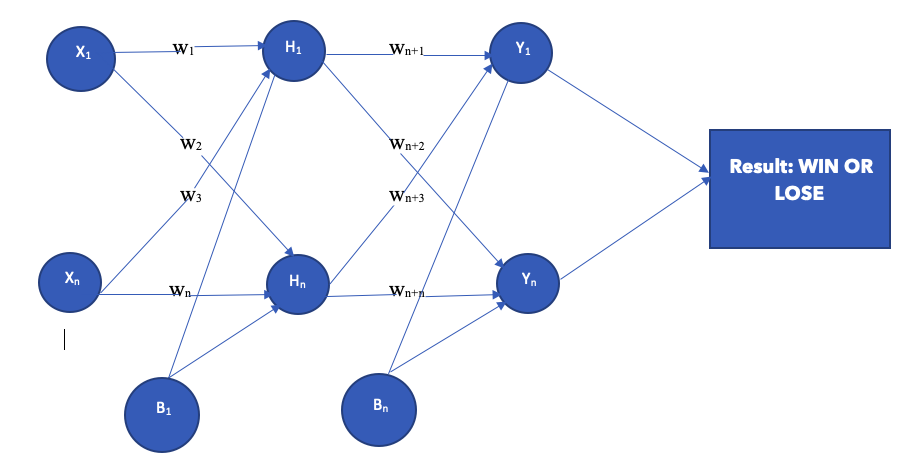
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | class |
| 1 | 0 | 0 | 1 | ? |
| 1 | 0 | 0 | 0 | ? |

1. **Prediction**

The prediction is the final predicted value.

**1.6 Proposed Model**

**1.6.1 Conceptual Model**

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**1.6.2 Proposed Mathematical Model**

The mathematical model of the proposed system is presented as follows:

**The Forward Propagation (forward pass):**

The activation function of the artificial neurons in ANNs implementing the forward propagation and of the sum of the inputs (xi)multiplied by their respective weights (wji). where (xi) are attributes and (wji) are the weight of attributes in each case.

Aj(x,w) = ∑n**i** = 0xiwji (1)

The activation function depends only on the inputs and the weights. The most common output function is the sigmoidal function:

Oj(x,w) = 1 / (1+eAi(x,w)) (2)

The goal of the training process is to obtain a desired output when certain inputs are given. Since the error is the difference between the actual and the desired output, the error depends on the weights, hence the weights of each attributes are adjusted in order to have a minimal error. The square of the difference between the output and the desired target is taken because it will always be positive, so it is greater if the difference is big and lesser if the difference is small. The total error of the model will simply be the sum of all errors of each neuron. We can define the error function for the network (model) output:

Ej(x,w,d) =∑ (Oj(xi,wji) – dj)2 (3)

**The Backward Propagation (backward pass):**

The backpropagation algorithm now calculates how the error depends on the output, inputs, and weights. After this is found, the weights can be adjusted using the method of gradient descent:

**∆**wji = E **/** wji (4)

This formula can be interpreted as: the adjustment of each weight (**∆**wji) will be the negative of a number multiplied by the dependence of the previous weight on the error of the network, which is the derivative of E in respect to (wji). The size of the adjustment will depend on the number and the contribution of the weight to the error of the function. If the weight contributes a lot to the error, the adjustment will be greater than when it contributes in a smaller amount. The goal of the backward pass algorithm is to find the derivative of E in respect to wji. So first, we calculate how much the error depends on the output, which is the derivative of E in respect to Oj (from (3)).

E **/** wji = 2(Oj **-** dj)(5)

And then how much the output depends on the activation, which also depends on the weights (from (1) and (2)):

Oj **/** w= Oj **/** ajaj **/** wji) = Oj(1 - Oj)xi (6)

Then (from (5) and (6))

E **/** wj = Ej **/** OjOj **/** wj)= 2(Oj- dj) \* Oj (1 – Oj)xi (7)

Therefore, the adjustment to each weight will be (from (4) and (7)):

**∆**wji = 2(Oj- dj) \* Oj(1 – Oj)xi (8)

Finally, the goal of the backward propagation (pass) is achieved by adjusting the weights of each attributes, thereby minimizing the error of the network (model).

**1.6 SIGNIFICANCE OF RESEARCH**

The research work will be of immense benefit in that:

1. To researcher, it would be helpful as a related work to study in the areas of machine learning and soccer prediction.
2. To readers, it would help in the understanding that a coach plays a vital role in the success of a team and how prediction can be done using a coach

**1.7 DEFINITION OF TERMS**

**Coach:** In sports, a coach is a person involved in the direction, instruction and training of the operations of a sports team or of individual sportspeople.

**Football:** Football is a family of team sports that involve, to varying degrees, kicking a ball to score a goal between two teams

**T.E.A:** Tactics Experience and Achievement

**Prediction**: A prediction, or forecast, is a statement about a future event. A prediction is often, but not always, based upon experience or knowledge.