**Analytics Systems Technology**

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**ALY6140, WINTER 2022**

**Capstone Project Draft**

**Capstone Group**: 09

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**Football Match Probability Prediction**

**Introduction:**

Predicting match outcomes is the most difficult undertaking, and it always delights football fans to try to anticipate the conclusion of each match. In the discipline of data science, football takes center stage. We will create models to forecast match results using event recognition and team analysis in this paper. The outcome of a match between two teams is mostly determined by their current form, but the teams' current form may be determined by looking at their recent sequence results against other teams. As a result, the match's probability might differ between two teams.

William McGregor, a Perthshire lord, and Aston Villa F.C. director was the driving force behind meetings in London and Manchester in 1888 with 12 football teams in the hopes of organizing a league. These 12 clubs would eventually become the Football League's 12 founding members.

To forecast the outcome of a football game, the project dataset was acquired from Kaggle.com's "Football Match Probability Prediction." The information was gathered from 150000 past international football matches between 2019 and 2021 by the community prediction competition team. The information was gathered from over 9500 teams and 860 leagues. We'll choose 10-15 variables from this dataset, which comprises 189 variables and 72711 observations, depending on the project's needs, in order to forecast and show the results using multiple regression models.

Football is constantly in high demand since there are sports fanatics all around the world. Fans of football are nervous and interested in the game's uncertain outcomes, which adds to the thrills and tension. Football is the most fun activity for fans to divert their attention away from their daily concerns. Leagues will allow us to deduce patterns from the previous success and failure of matches, as well as another variable in this project team's data, to predict the outcome. It's based on a number of factors, including target, home\_team\_name, away\_team\_name, player id, coach id, league id, match date, ratings and other various factors.

**Goals:**

To assess the chance of a future event, data analytics, statistical algorithms, and machine learning approaches are used to compare data to previous events. Instead of only knowing what has happened, the goal is to make better predictions of what will happen in the future.

Predictive techniques are used to analyze the team's performance during the match. In this study, different models will be employed to estimate the results of a football match, including Random Forest Classifier, K Nearest Neighbor, and Logistics Regression.

The purpose of a data scientist is to collect data, do analysis, interpret the data in a meaningful way, and apply prediction models to the data.

**Methods:**

I: Predict the matches by getting historical data of the team with the home team coach and opponent team coach.

II. Predict the accuracy by knowing the history match dates of the home and opponent team

III. Predict the motivation of the team by evaluating the team history rating.

**Questions to Investigate** :

1. What was the team performance history at home play?
2. What was the rating of the opponent team?
3. In the past, when did a match help you?
4. Which coach had a better track record in previous leagues?
5. What were the results of a team's prior leagues?

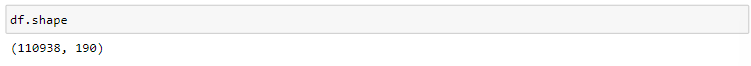
**Exploratory Data Analysis**

The process of exploratory data analysis helps in analyzing the insights from the dataset which provide the statistical analysis and graphical representation of the data. In this dataset for the prediction of a football match from the huge dataset, a selected few variables were to apply the predictive models. Initially, after importing the dataset in a jupyter notebook, installing various modules which will require analyzing the dataset helped in the visualization of the statistics.

**Description analysis:**

In this task, the shape of the dataset consists of 110938 rows and 190 columns, whereas id is an integer, target, home team name, away team name, match date, away team history are float datatype. Selection of the variable is the most difficult task to undertake with the predictive models in mind.

* + Shape of the dataset:



* + Datatypes of each variable

Graphical user interface

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Some common features used from the dataset:

1. Id: Match identity of the data available for the team
2. Target: this feature of the dataset will compare the home team and the away team
3. Home\_team\_name: team name which is called Home
4. Away\_team\_name: team name which defines away
5. Match\_date: define the time zone of the match
6. League\_name: it explains the name of the league
7. League\_id: for two team league names can be found identical
8. Is\_cup : the match played for the cup
9. Home\_team\_coach\_id: it defines the id of the coach in Hometeam
10. Away\_team\_coach\_id: it defines the id of the coach in the away team

There are more features that we have to use for the comparison to implement the predictive model in the dataset. The historical data are taken from the more than 150000 historical world football matches from 2019-2021 which define our goal in forecasting the outcome of the match by implementing the various models.

**Data Extraction**

After importing the data from the dataset. These features include historical data of the home team and the away team

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**Data Cleanup:**  In this task after analyzing the dataset, we drop many variables from the dataset and took variables as per our requirements which will help in predicting the accuracy of the model are given below:

* 'home\_team\_history\_is\_play\_home\_1'
* 'home\_team\_history\_opponent\_goal\_1'
* 'home\_team\_history\_rating\_1'
* 'home\_team\_history\_coach\_1'
* 'home\_team\_history\_league\_id\_1'
* 'away\_team\_history\_is\_play\_home\_1'
* 'away\_team\_history\_goal\_1'
* 'away\_team\_history\_opponent\_goal\_1'
* 'away\_team\_history\_rating\_1'
* 'away\_team\_history\_opponent\_rating\_1'
* 'away\_team\_history\_coach\_1'

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**Data Analysis and Interpretation:**

1. In this task analyses the comparison of the home team with the name and target of the team. The below bar graph is shown to describe the home team name with counts with comparison away, home, draw as we are targeting for the prediction of the match.

**Chart, bar chart

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1. In this task analyses the comparison of the away team with name and target of the team The below bar graph is shown to describe the away team name with counts with comparison away, home, draw as we are targeting for the prediction of the match.

**Chart, bar chart

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1. In this task collect the data of the team history at home team and away team

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1. In this task analyze the track record of the coach in the previous matches with the comparison between away, home teams, and draw.

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1. In this task analyze the track record of the history cup of the away team

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**Predictive Models:** In the present job market, the future of predictive modeling in statistics is the key emphasis. We may forecast the answer via predictive modeling by adopting modeling solutions based on historical and recent data. Data is obtained and created using predictions, and then confirmed using the most up-to-date information available once the dataset has been trained.

1. **Logistic Regression Model** When the variable is categorical, what type of regression analysis should be used? (binary). The logistic regression, like other regression studies, is a predictive analysis. To describe data and explain the connection between one dependent binary variable and one or more nominal, ordinal, interval, or ratio-level independent variables, logistic regression is utilized.

• Easier to Implement

• Efficient to train

• Fast while classifying unknown records

• Interpret the Model coefficient as indicators

Logistics Regression helps in predictive analysis to evaluate the relationship between the nominal ordinal of the interval, by checking the ratio-level independent variables, or one dependent binary variable. The regression studies suggest that the cross-validation is 1.0462 with 46% of accuracy.

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1. **Random Forest Classifier**: is a classifier that combines a number of decision trees on different subsets of a dataset and averages the results to increase the dataset's predicted accuracy." Rather than depending on a single decision tree, the random forest collects predictions from each tree and makes decisions based on them.

• Works well with large dimensional data

• Working with a subset

• Fast to train than the decision tree

• Easily work with hundreds of features

• Low correlation is the key

Random Forest classifier is based on supervised learning and provides the solution for regression and creating multiple decision trees by evaluating the average prediction of that tree Here, the cross-validation is 1.0462 with 46% of accuracy.

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**Chart, treemap chart

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1. **KNN-neighbors:** The supervised learning technique K-nearest neighbors (KNN) is used for both regression and classification. By computing the distance between the test data and all of the training points, KNN tries to predict the proper class for the test data. Then choose the K number of points that are the most similar to the test data.

• Highly accurate Predictions

• Solves both classification and regression problem statement

• KNN algorithm for multiclass classification

• Recommendation Systems

KNN regression model is defined by the analyst by measuring the size of the neighborhood to check the validation of the model. Here, the cross-validation is 9.79.17 with 39% of accuracy

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**Interpretive and Conclusions**

**Logistic Regression** confusion matrix provides the data predictive label which includes home team, away that is opponent team, and draw team which has matched with home and away has 1807 matches, 9 of home and draw, home and home has 7807, draw and away has 1550, draw and draw 14 matches, draw at home has 3966, away and away 3071 matches, away and draw has 10 matches, away and home has 3954 matches which leas to the 49% of accuracy. However, the cross-validation log loss is 1.0208.

**Random classifier** confusion matrix provides the data predictive label which includes home team, away that is opponent team, and draw team which has matched with home and away has 435 matches, 0 of home and draw, home and home has 9188, draw and away has 437, draw and draw 0 matches, draw at home has 5093, away and away 1175 matches, away and draw has 0 matches, away and home has 5860 matches which least to the 46% of accuracy. In this case, cross-validation log loss is 0.0462

**KNN** confusion matrix provides the data predictive label which includes home team, away that is opponent team, and draw team which has matched with home and away has 3660 matches, 1507 of home and draw, home and home has 4456, draw and away has 2407, draw and draw 933 matches, draw at home has 2190, away and away 3469 matches, away and draw has 1172 matches, away and home has 2394 matches which lead to the 39% of accuracy. In this model, we can see the cross-validation is 9.7917.

**In conclusion**, we experimented with a variety of Machine Learning models and features to improve our prediction error as much as possible. The predicting outcome will help determine the instance outcome of the psychology towards the match and create the opportunity. Many organizations are using these forecasting methods to build for the outperformance of the results in the field of data science.

We removed numerous factors from the dataset after evaluating it and replaced them with variables that will help us anticipate the model's accuracy. After that compares the home team's name and target to the team's name and target. The bar graph below depicts the home team name with counts in relation to away, home, and draw since we are aiming for a match prediction. Compares the away side's name and goal to that of the home team The bar graph below depicts the away team’s name with counts and a comparison of away, home, and draw, as we are aiming for a match prediction.

**Logistics Regression** helps in the evaluation of the link between the nominal ordinal of the interval and the ratio-level independent variables, or one dependent binary variable, in predictive analysis. According to regression research, the cross-validation is 1.0462 with a 46 percent accuracy.

**The Random Forest classifier** is based on supervised learning and provides a solution for regression and multiple decision tree creation by evaluating the tree's average prediction. The cross-validation, in this case, is 1.0462 with a 46 percent accuracy.

**K-Nearest Neighbor** The analyst defines the KNN regression model by measuring the size of the neighborhood to ensure the model's validity. The cross-validation score is 9.79.17, with a precision of 39%.

We built a model training and testing pipeline using our various model components to quickly and easily change and test new assumptions. We compared our forecasts to benchmark methodologies to better understand the predictive performance of our models. We discovered that this model may be improved to obtain data on the matches and the coach id, which appears to be an outlier. We may have predicted the models with less accuracy due to a lack of data. We need to anticipate the train and test the model in such a way that we can reach that accuracy to develop the model to the level of 90-95 percent accuracy, and we need to provide a better outcome after running the model numerous times.

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**References:**

**[1]Football Match Probability Prediction**

[**https://www.kaggle.com/c/football-match-probability-prediction/data?select=test.csv**](https://www.kaggle.com/c/football-match-probability-prediction/data?select=test.csv)

**[2]learn**

[**https://scikit-learn.org/stable/**](https://scikit-learn.org/stable/)

**[3]pandas**

[**https://pandas.pydata.org/**](https://pandas.pydata.org/)

**[4]seaborn: statistical data visualization — seaborn 0.11.2 ...**

seaborn: statistical data visualization. ¶. Seaborn is a Python data visualization library based on matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics. For a brief introduction to the ideas behind the library, you can read the introductory notes or the paper.

[**https://seaborn.pydata.org**](https://seaborn.pydata.org/)

**[5]sklearn.ensemble.RandomForestClassifier**

[**https://scikit-learn.org/stable/modules/generated/sklearn.ensemble.RandomForestClassifier.html**](https://scikit-learn.org/stable/modules/generated/sklearn.ensemble.RandomForestClassifier.html)

**[6]sklearn.neighbors.KNeighborsClassifier**

[**https://scikit-learn.org/stable/modules/generated/sklearn.neighbors.KNeighborsClassifier.html**](https://scikit-learn.org/stable/modules/generated/sklearn.neighbors.KNeighborsClassifier.html)

**[7]sklearn.model\_selection.train\_test\_split**

[**https://scikit-learn.org/stable/modules/generated/sklearn.model\_selection.train\_test\_split.html**](https://scikit-learn.org/stable/modules/generated/sklearn.model_selection.train_test_split.html)

**[8]sklearn.metrics.accuracy\_score**

[**https://scikit-learn.org/stable/modules/generated/sklearn.metrics.accuracy\_score.html**](https://scikit-learn.org/stable/modules/generated/sklearn.metrics.accuracy_score.html)

**[9]sklearn.metrics.confusion\_matrix**

[**https://scikit-learn.org/stable/modules/generated/sklearn.metrics.confusion\_matrix.html**](https://scikit-learn.org/stable/modules/generated/sklearn.metrics.confusion_matrix.html)

**[10]sklearn.metrics.classification\_report**

[**https://scikit-learn.org/stable/modules/generated/sklearn.metrics.classification\_report.html**](https://scikit-learn.org/stable/modules/generated/sklearn.metrics.classification_report.html)

**[11]warnings - Warning control¶**

[**https://docs.python.org/3/library/warnings.html**](https://docs.python.org/3/library/warnings.html)

**[12]sklearn.linear\_model.LogisticRegression**

[**https://scikit-learn.org/stable/modules/generated/sklearn.linear\_model.LogisticRegression.html**](https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.LogisticRegression.html)

**Appendix:**

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