NBA Win Prediction

With Machine Learning Models

7 May 2021

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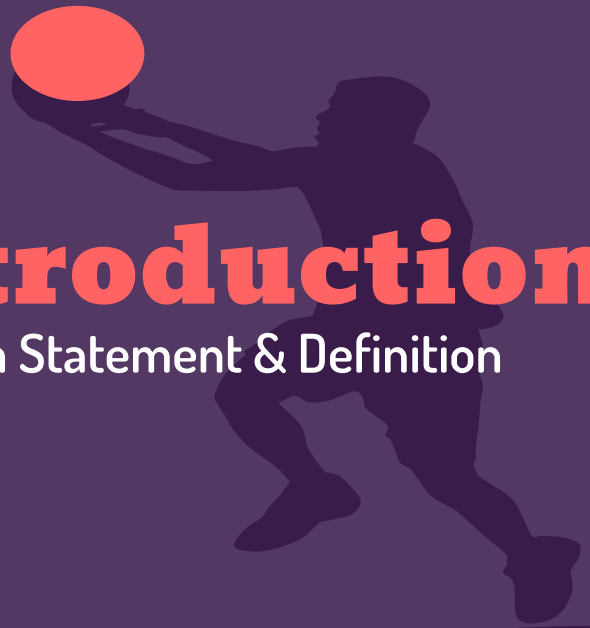
Problem Statement & Definition



Problem Statement

As the manager of the basketball team in NBA, I want to understand and know how my team players are performing and predict if the team have the chance of winning the next game at our familiar home grounds.

Problem Definition

Goal

Ability to predict if the team win or lose a game.

Classification Problem

Predict if the team falls in the winning or losing category.

Target Audience

Anyone who manage the basketball team

Outcome

To see whether to adjust training routines of players to better perform in the games.

"Talent win games, but teamwork and intelligence wins championships."

–Michael Jordan

02 Methodology

Datasets, Models, Metrics, Tools

Datasets

EDA done for all csv, but will focus on players.csv and games_details.csv
Machine Learning will be using data from games.csv to predict win/lose.

24,146
Games

7,228
Players

30
Teams

602,767
Games Details

191,112
Ranking Records

Source: (KAGGLE) https://www.kaggle.com/nathanlauga/nba-games

Machine Learning For NBA Games

ML Models

K-Nearest Neighbor (KNN)
Naïve Bayes
Logistic Regression

Metrics

Precision
Recall
F1 Score

Tools

Google Colab
Numpy
Pandas
Matplotlib
Seaborn
Sklearn

03

Process Workflow

EDA, Data preparation, Data analysis,
ML model training/evaluation

Data Preparation & Transformation

Data Cleaning

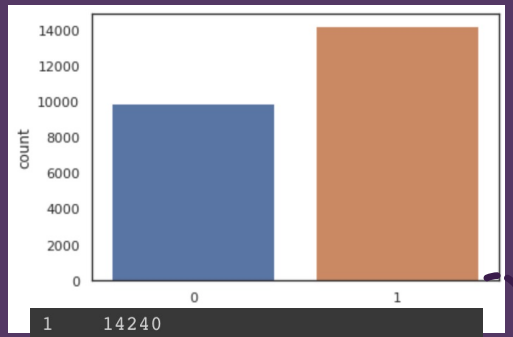
- Checking for NULL values and dropping rows
- Dropping of unused columns

```
GAME_ID                0
HOME_TEAM_ID           0
VISITOR_TEAM_ID        0
SEASON                 0
HOME_TEAM_WINS         0
TEAM_ID_homeTeam       0
SEASON_ID              0
TEAM_homeTeam          0
G_homeTeam           600
W_homeTeam           600
L_homeTeam           600
W_PCT_homeTeam       600
TEAM_ID_awayTeam       0
SEASON_ID_awayTeam     0
TEAM_awayTeam          0
G_awayTeam           564
W_awayTeam           564
L_awayTeam           564
W_PCT_awayTeam       564
dtype: int64
df without nans size: 23479
```

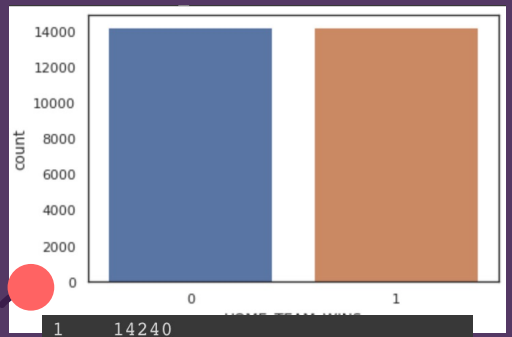
```
GAME_ID                0
HOME_TEAM_ID           0
VISITOR_TEAM_ID        0
SEASON                 0
HOME_TEAM_WINS         0
dtype: int64
```

Balancing Target Variable

- Balancing the records ensure more accurate prediction.




```
1    14240
0     9906
Name: HOME_TEAM_WINS, dtype: int64
```




```
1    14240
0    14240
Name: HOME_TEAM_WINS, dtype: int64
```

Exploratory Data Analysis

Performed initial investigations on data so as to discover patterns, to spot anomalies, to test hypothesis and to check assumptions with the help of summary statistics and graphical representations.

Did You Know This?

```
GAME_ID              24146
HOME_TEAM_ID            30
VISITOR_TEAM_ID         30
SEASON                  18
HOME_TEAM_WINS           2
dtype: int64
```

18 seasons of NBA Games.

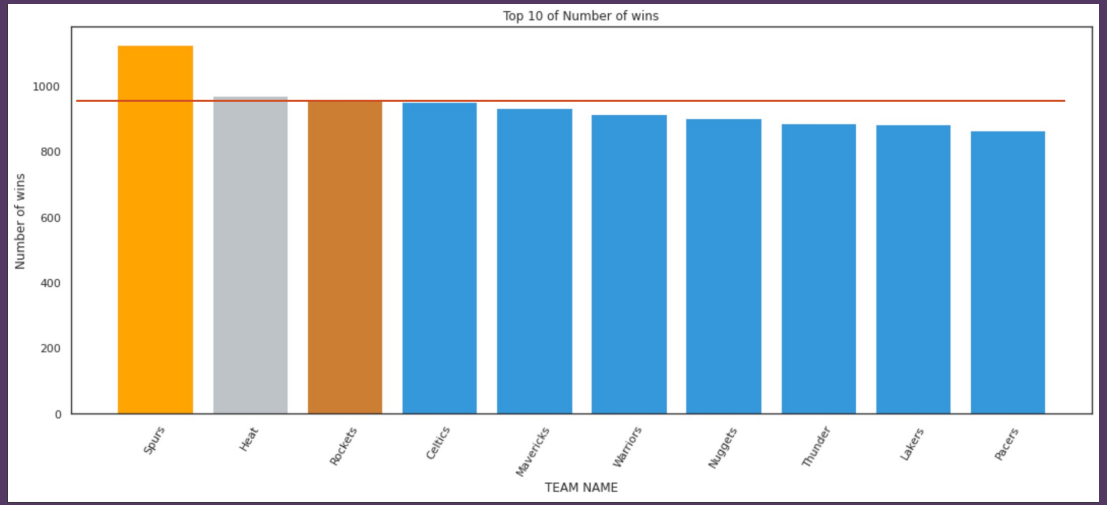
Total of 24146 Games completed so far.

LeBron James played in 1689 games, most in history!

Team That Won The Most Games Since 2004.

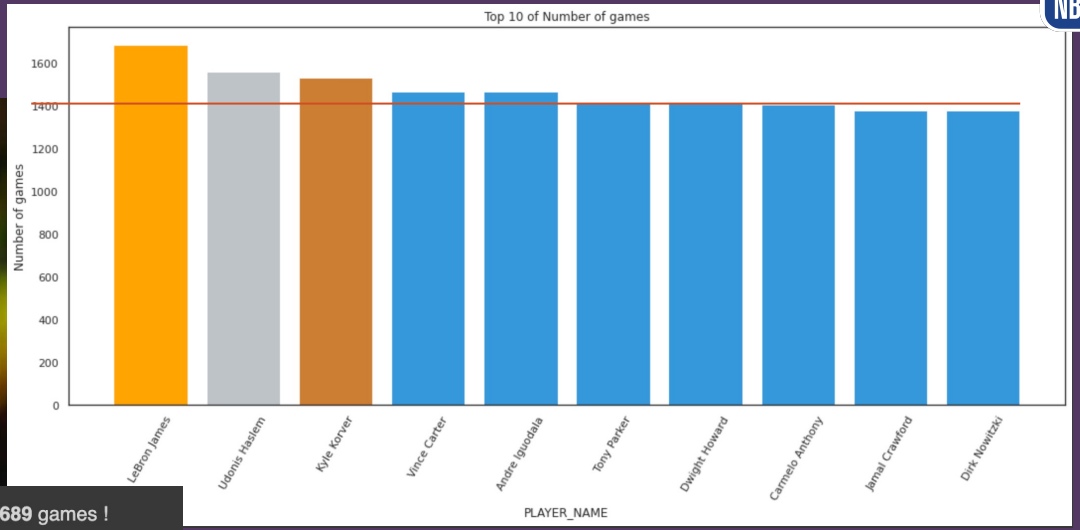
1126 Games WON!

Spurs won the most games in history!



Warriors in the 6th, Lakers in the 9th.

Most Games Played By Who?



LeBron James played **1689** games !

	PLAYER_NAME	Number of games
0	LeBron James	1689
1	Udonis Haslem	1561
2	Kyle Korver	1534
3	Vince Carter	1470
4	Andre Iguodala	1468

LeBron James played 1689 games!

Stats Of Stephen Curry

Curry is quite strong in most areas compared to the average stats of all others players

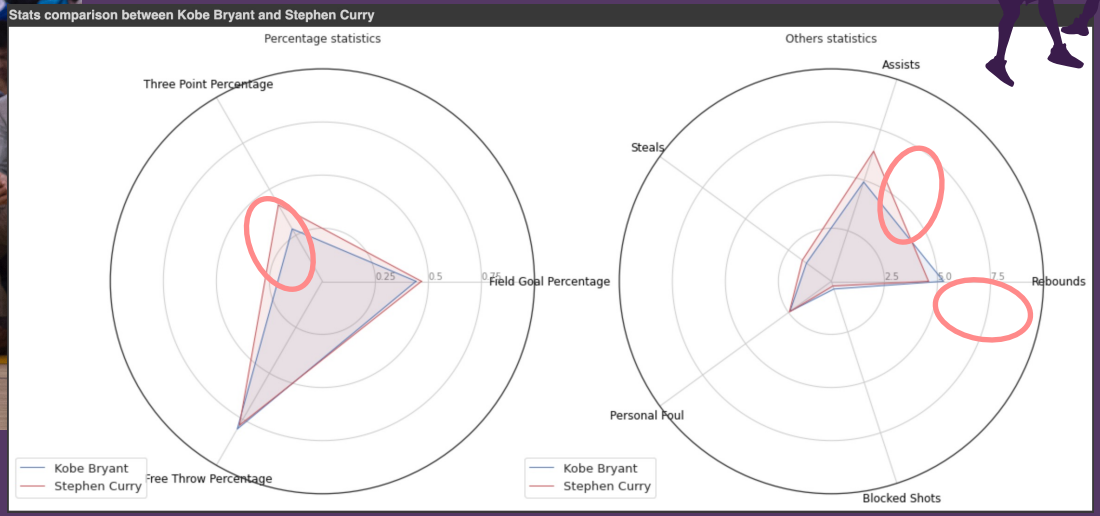
Curry played **947** games for **Warriors** which won **914** games to date.

Legend Kobe Bryant Vs Stephen Curry

Curry is a better 3-pointer!

Curry is better at assisting fellow team-mates

Kobe is better at rebounds



Kobe played **1102** games for **Lakers** which won **883** games to date.

Correlation Of Player Stats

The highest correlation for player to score points(PTS) with Field Goal Made (FGM: 0.96) and Field Goal Attempted(FGA: 0.88) . This means that for the team with total points scoring of FGA and FGM per player will influence the win prediction.

ML Model Training/Evaluation

K-Nearest Neighbor

Using sklearn, KNeighborsClassifier

Naïve Bayes

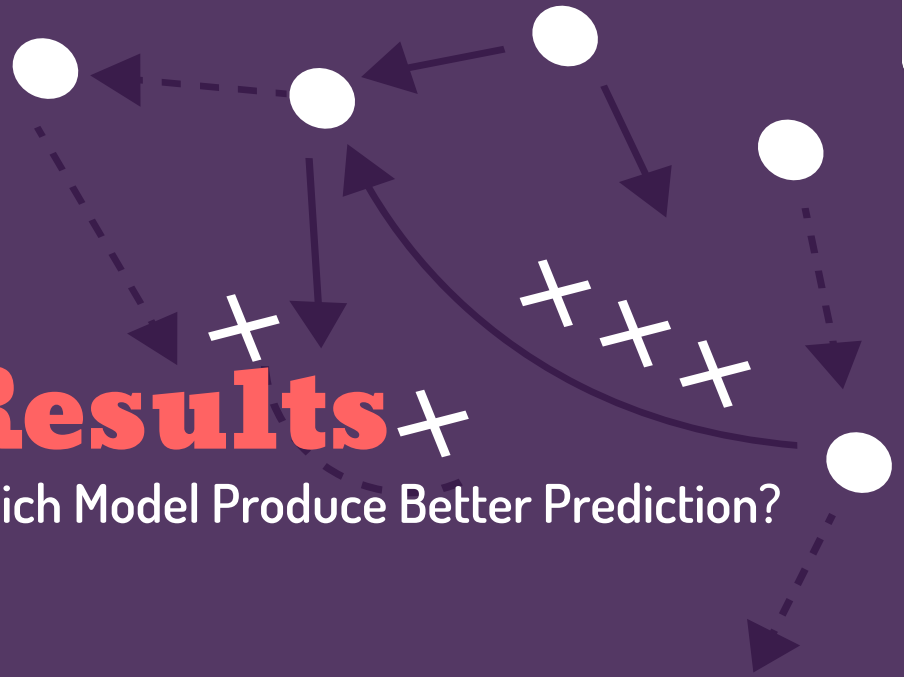
Using sklearn, MultinomiaNB

Logistic Regression

Using sklearn, LogisticRegression

Hyperparameter Optimization

Model	Validation Method	Scores
K-Nearest Neighbor(KNN)	Best/Optimal K = 1	Accuracy = 62.43%' with 'K = 1' F1-score = 62.31%' with 'K = 1'
Naïve Bayes	K-fold cross validation CV = 5	F1-score = 47.45% Alpha = 1
Naïve Bayes	K-fold cross validation CV = 10	F1-score = 47.45% Alpha = 1
Naïve Bayes	Randomized K-fold cross validation.	F1-score at: 47.45% Alpha = 0.1837
Logistic Regression	K-fold cross validation	Mean F1-score= 47.0% Standard deviation = 0.01



04 Results

Which Model Produce Better Prediction?

ML Using K-Nearest Neighbor (KNN)

Best Estimated Accuracy and F1 Score

Results for accuracy in F1 score is about 55%

Classification report:

	precision	recall	f1-score	support
0	0.54	0.70	0.61	2848
1	0.57	0.40	0.47	2848
accuracy			0.55	5696
macro avg	0.56	0.55	0.54	5696
weighted avg	0.56	0.55	0.54	5696

ML Using Naïve Bayes

Best Estimated Accuracy and F1 Score

Results for accuracy in F1 score is less than 50%

Classification report:

	precision	recall	f1-score	support
0	0.50	0.71	0.59	2848
1	0.49	0.28	0.35	2848
accuracy			0.49	5696
macro avg	0.49	0.49	0.47	5696
weighted avg	0.49	0.49	0.47	5696

ML Using Logistic Regression

Best Estimated Accuracy and F1 Score

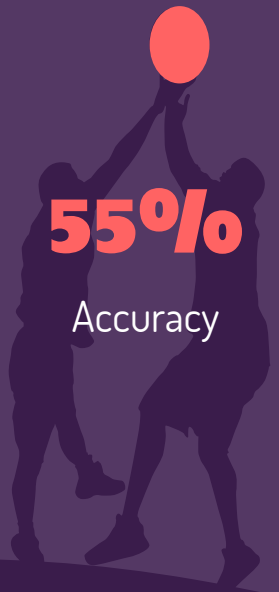
Results for accuracy in F1 score is less than 50%

Somehow the classification report for Logistic Regression is similar to that for Naïve Bayes.

Classification report:

	precision	recall	f1-score	support
0	0.50	0.71	0.59	2848
1	0.49	0.28	0.35	2848
accuracy			0.49	5696
macro avg	0.49	0.49	0.47	5696
weighted avg	0.49	0.49	0.47	5696

Which ML Model Better?



55%

Accuracy

K-Nearest Neighbor(KNN)

Is a better model to use for training and prediction as it has a higher accuracy compare to the other model.

	Desired Output (Actuals)	Predicted Output
3939	1	1
1212	1	1
9611	1	0
21570	1	0
3964	1	1
25897	0	0
24554	0	1
28080	0	0
15661	1	1
5980	1	1

54%

Macro Average F1-Score

55%

Macro Average Precision

56%

Micro Average Recall

05 Conclusion

Conclusion

Yes, although the KNN training model do help to predict if the game is a win or lose, however, we cannot really depend on the predicted results to help with the team performance as the accuracy is actually quite low, at 55%.

	Desired Output (Actuals)	Predicted Output
9611	1	0
21570	1	0
24554	0	1
20461	1	0
20115	1	0
16842	0	1
28458	0	1
1353	0	1
9405	1	0
11368	1	0

There is a 45% chance that the prediction is wrong!

```
Prediction: 0
My prediction is a LOSE.

This was the input data:
GAME_ID                20400657
HOME_TEAM_ID         1610612760
VISITOR_TEAM_ID      1610612759
HOME_TEAM_WINS                0
Name: 2085, dtype: int64
```

```
Prediction: 1
My prediction is a WIN.

This was the input data:
GAME_ID                21700386
HOME_TEAM_ID         1610612765
VISITOR_TEAM_ID      1610612738
HOME_TEAM_WINS                0
Name: 19928, dtype: int64
```

Error Prediction???

Future Opportunities

- Machine learning training with other models, etc. Random Forest or Decision Tree
- Fine tune feature selection: Predict potential attribute of players that helps with the classification performance for win/lose.
- Improve fine tuning and optimization with hyperparameter may improve the accuracy and F1-score.

Questions?