soccer - Jupyter Notebook

Created by Gael AHOUANVOEDO

🚀 Soccer Database 📊 Udacicty Data Analyst NanoDegree 📈

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🚀 SOCCER DATABASE 🚀

For more information you can contact me at +221781203911👍

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Introduction

In this project I will have to exploit a database on football and get information out of it using pandas and numpy

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Imports

Entrée [1]:

```
import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

import sqlite3

import warnings

warnings.filterwarnings('ignore')
```

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Data Wrangling

Data wrangling approach

I opted to process each of the database tables one after the other. For tables having common variables, I used pandas merge function to link them together. For long tables like the matches table, I reduced the number of columns as much as possible to have an easily observable and exploitable data set.

The process steps are:

- import the table from the database
- define its size and the number of missing values
- merge common variables with other tables
- remove useless or redundant variables
- rearrange the columns for better reading

We will create a connection to be able to connect to our SQL database. At the end of the project We should remember to OFF the connection. For import the datas we will use SELECT * FROM

Entrée [2]:

```
con = sqlite3.connect("database.sqlite")

country = pd.read_sql_query("SELECT * from Country", con)
```

```
league = pd.read_sql_query("SELECT * from League", con)

match = pd.read_sql_query("SELECT * from Match", con)

player = pd.read_sql_query("SELECT * from Player", con)

player_attributes = pd.read_sql_query("SELECT * from Player_Attributes", con)

team = pd.read_sql_query("SELECT * from Team", con)

team_attributes = pd.read_sql_query("SELECT * from Team_Attributes", con)

con.close()
```

In the following we will study the dataset one by one to check if they are well imported so as not to get tangled up in the consistency of the work

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EDA Country Dataset

📌 **Observations in Dataset:**

- *There are total of **2 columns** and **11 rows** in the dataset.*
- *Dataset contains **22 observation** with **0 missing values**.*

We will define a function that will allow us to have the information about the shape of our dataest to avoid repetitive code

Entrée [3]:

```
def dataset_info(df):

    print(f'\033[94mNumber of rows in the dataset: {df.shape[0]}')

    print(f'\033[94mNumber of columns in the dataseta: {df.shape[1]}')

    print(f'\033[94mNumber of values in the dataset: {df.count().sum()}')

    print(f'\033[94mNumber missing values in the dataset: {sum(df.isna().sum())}')
```

Entrée [4]:

```
country.head(3)
```

Out[4]:

	id	name
0	1	Belgium
1	1729	England
2	4769	France

Entrée [5]:

```
dataset_info(country)
```

```
Number of rows in the dataset: 11
Number of columns in the dataseta: 2
Number of values in the dataset: 22
Number missing values in the dataset: 0
```

We cannot currently do any study on this dataset

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EDA League Dataset

📌 **Observations in Dataset:**

- *There are total of **3 columns** and **11 rows** in the dataset.*
- *Dataset contains **33 observations** with **0 missing values**.*

Entrée [6]:

```
league.head(3)
```

Out[6]:

	id	country_id	name
0	1	1	Belgium Jupiler League
1	1729	1729	England Premier League
2	4769	4769	France Ligue 1

Entrée [7]:

```
dataset_info(league)
```

```
Number of rows in the dataset: 11
Number of columns in the dataseta: 3
Number of values in the dataset: 33
Number missing values in the dataset: 0
```

We have the ID of the countries in the league dataset, it would then be necessary to merge the countries corresponding to the IDs to our datatset with Country Dataset

Entrée [8]:

```
country.rename(columns={'name':'country'}, inplace=True)

league = league.merge(country, how='inner', on= 'id' )

league.drop('country_id', axis=1,inplace=True)

league.head(3)
```

Out[8]:

	id	name	country
0	1	Belgium Jupiler League	Belgium
1	1729	England Premier League	England
2	4769	France Ligue 1	France

It would be useful to know now how many leagues our dataset offers us

Entrée [9]:

```
league.nunique()
```

Out[9]:

```
id         11
name       11
country    11
dtype: int64
```

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EDA Team Dataset

📌 **Observations in Dataset:**

- *There are total of **5 columns** and **299 rows** in the dataset.*
- *Dataset contains **1484 observations** with **11 missing values**.*

Entrée [10]:

```
team.head(3)
```

Out[10]:

	id	team_api_id	team_fifa_api_id	team_long_name	team_short_name
0	1	9987	673.0	KRC Genk	GEN
1	2	9993	675.0	Beerschot AC	BAC
2	3	10000	15005.0	SV Zulte-Waregem	ZUL

Entrée [11]:

```
dataset_info(team)
```

```
Number of rows in the dataset: 299
Number of columns in the dataseta: 5
Number of values in the dataset: 1484
Number missing values in the dataset: 11
```

Entrée [12]:

```
team.isnull().sum()
```

Out[12]:

```
id                  0
team_api_id         0
team_fifa_api_id    11
team_long_name      0
team_short_name     0
dtype: int64
```

We can't make any study with this dataset now. Just remember that for future merging, team_api_id is more complete than team_fifa_api_id

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EDA Match Dataset

📌 **Observations in Dataset:**

- *There are total of **115 columns** and **25979 rows** in the dataset.*
- *Dataset contains **2580190 observations** with **407395 missing values**.*

Entrée [13]:

```
match.head(3)
```

Out[13]:

	id	country_id	league_id	season	stage	date	match_api_id	home_team_api_id	away_team_api_id	home_tea
0	1	1	1	2008/2009	1	2008-08-17 00:00:00	492473	9987	9993	1
1	2	1	1	2008/2009	1	2008-08-16 00:00:00	492474	10000	9994	0
2	3	1	1	2008/2009	1	2008-08-16 00:00:00	492475	9984	8635	0

3 rows × 115 columns

Entrée [14]:

```
dataset_info(match)
```

```
Number of rows in the dataset: 25979
Number of columns in the dataseta: 115
Number of values in the dataset: 2580190
Number missing values in the dataset: 407395
```

Our dataset is too big, it will be better to risize it by remove all unnecessary columns : redundant information, missing values, feature that give unimportant data...

Drop ID columns and Date. They will not be usefull for our study

Entrée [15]:

```
match.drop(['id','country_id','match_api_id','date'],axis=1,inplace=True)
```

Entrée [16]:

```
match.head(1)
```

Out[16]:

	league_id	season	stage	home_team_api_id	away_team_api_id	home_team_goal	away_team_goal	home_player_
0	1	2008/2009	1	9987	9993	1	1	NaN

1 rows × 111 columns

They are successuffly remove. Now we will find all features that have more than 0.34 (1/3) missing values and remove them also. The ratio of missing data is to important to make our study

Entrée [17]:

```
null = pd.DataFrame(match.isnull().sum()/len(match),columns=['count'])
```

Entrée [18]:

```
null_drop = null.query('count > 0.34')
```

Entrée [19]:

```
null_drop.index
```

Out[19]:

```
Index(['goal', 'shoton', 'shotoff', 'foulcommit', 'card', 'cross', 'corner',
       'possession', 'PSH', 'PSD', 'PSA', 'SJH', 'SJD', 'SJA', 'GBH', 'GBD',
       'GBA', 'BSH', 'BSD', 'BSA'],
      dtype='object')
```

Entrée [20]:

```
match.drop(['goal', 'shoton', 'shotoff', 'foulcommit', 'card', 'cross', 'corner','possession', 'PSH', 'PSD', 'PSA', 'SJH',
'SJD', 'SJA', 'GBH', 'GBD','GBA', 'BSH', 'BSD', 'BSA'],axis=1,inplace=True)
```

Entrée [21]:

```
match.head(1)
```

Out[21]:

	league_id	season	stage	home_team_api_id	away_team_api_id	home_team_goal	away_team_goal	home_player_
0	1	2008/2009	1	9987	9993	1	1	NaN

1 rows × 91 columns

We go from 115 to 91 columns.Observe the remaining columns, and identify which are not usefull to answer questions.

Entrée [22]:

```
match.columns
```

Out[22]:

```
Index(['league_id', 'season', 'stage', 'home_team_api_id', 'away_team_api_id',
       'home_team_goal', 'away_team_goal', 'home_player_X1', 'home_player_X2',
       'home_player_X3', 'home_player_X4', 'home_player_X5', 'home_player_X6',
       'home_player_X7', 'home_player_X8', 'home_player_X9', 'home_player_X10',
       'home_player_X11', 'away_player_X1', 'away_player_X2', 'away_player_X3',
       'away_player_X4', 'away_player_X5', 'away_player_X6', 'away_player_X7',
       'away_player_X8', 'away_player_X9', 'away_player_X10',
       'away_player_X11', 'home_player_Y1', 'home_player_Y2', 'home_player_Y3',
       'home_player_Y4', 'home_player_Y5', 'home_player_Y6', 'home_player_Y7',
       'home_player_Y8', 'home_player_Y9', 'home_player_Y10',
       'home_player_Y11', 'away_player_Y1', 'away_player_Y2', 'away_player_Y3',
       'away_player_Y4', 'away_player_Y5', 'away_player_Y6', 'away_player_Y7',
       'away_player_Y8', 'away_player_Y9', 'away_player_Y10',
       'away_player_Y11', 'home_player_1', 'home_player_2', 'home_player_3',
       'home_player_4', 'home_player_5', 'home_player_6', 'home_player_7',
       'home_player_8', 'home_player_9', 'home_player_10', 'home_player_11',
       'away_player_1', 'away_player_2', 'away_player_3', 'away_player_4',
       'away_player_5', 'away_player_6', 'away_player_7', 'away_player_8',
       'away_player_9', 'away_player_10', 'away_player_11', 'B365H', 'B365D',
       'B365A', 'BWH', 'BWD', 'BWA', 'IWH', 'IWD', 'IWA', 'LBH', 'LBD', 'LBA',
       'WHH', 'WHD', 'WHA', 'VCH', 'VCD', 'VCA'],
      dtype='object')
```

We can delete all player features because we don't want to use them to make our analysis

Entrée [23]:

```
match.drop(['home_player_X1', 'home_player_X2', 'home_player_X3','home_player_X4', 'home_player_X5', 'home_player_X6',
'home_player_X7','home_player_X8', 'home_player_X9', 'home_player_X10','home_player_X11'],axis=1,inplace=True)

match.drop(['away_player_X1', 'away_player_X2', 'away_player_X3','away_player_X4', 'away_player_X5', 'away_player_X6',
'away_player_X7','away_player_X8', 'away_player_X9', 'away_player_X10','away_player_X11'],axis=1,inplace=True)
```

Entrée [24]:

```
match.drop(['home_player_Y1', 'home_player_Y2', 'home_player_Y3','home_player_Y4', 'home_player_Y5', 'home_player_Y6',
'home_player_Y7','home_player_Y8', 'home_player_Y9', 'home_player_Y10','home_player_Y11'],axis=1,inplace=True)

match.drop(['away_player_Y1', 'away_player_Y2', 'away_player_Y3','away_player_Y4', 'away_player_Y5', 'away_player_Y6',
'away_player_Y7','away_player_Y8', 'away_player_Y9', 'away_player_Y10','away_player_Y11'],axis=1,inplace=True)
```

Entrée [25]:

```
match.drop(['home_player_1', 'home_player_2', 'home_player_3','home_player_4', 'home_player_5', 'home_player_6',
'home_player_7','home_player_8', 'home_player_9', 'home_player_10','home_player_11'],axis=1,inplace=True)

match.drop(['away_player_1', 'away_player_2', 'away_player_3','away_player_4', 'away_player_5', 'away_player_6',
'away_player_7','away_player_8', 'away_player_9', 'away_player_10','away_player_11'],axis=1,inplace=True)
```

Entrée [26]:

```
match.columns
```

Out[26]:

```
Index(['league_id', 'season', 'stage', 'home_team_api_id', 'away_team_api_id',
       'home_team_goal', 'away_team_goal', 'B365H', 'B365D', 'B365A', 'BWH',
       'BWD', 'BWA', 'IWH', 'IWD', 'IWA', 'LBH', 'LBD', 'LBA', 'WHH', 'WHD',
       'WHA', 'VCH', 'VCD', 'VCA'],
      dtype='object')
```

We still have many columns. Most of them is about betting. We will fix it after

Entrée [27]:

```
match.head(3)
```

Out[27]:

	league_id	season	stage	home_team_api_id	away_team_api_id	home_team_goal	away_team_goal	B365H	B365I
0	1	2008/2009	1	9987	9993	1	1	1.73	3.4
1	1	2008/2009	1	10000	9994	0	0	1.95	3.2
2	1	2008/2009	1	9984	8635	0	3	2.38	3.3

3 rows × 25 columns

To better understand our dataset we will merge informations taken from the other dataset that would be useful

Entrée [28]:

```
league.rename(columns={'id':'league_id'}, inplace=True)

match = match.merge(league, how='inner', on= 'league_id' )

match.drop(['league_id','country'], axis=1,inplace=True)

match.head(1)
```

Out[28]:

	season	stage	home_team_api_id	away_team_api_id	home_team_goal	away_team_goal	B365H	B365D	B365A
0	2008/2009	1	9987	9993	1	1	1.73	3.4	5.0

1 rows × 25 columns

Entrée [29]:

```
match.columns
```

Out[29]:

```
Index(['season', 'stage', 'home_team_api_id', 'away_team_api_id',
       'home_team_goal', 'away_team_goal', 'B365H', 'B365D', 'B365A', 'BWH',
       'BWD', 'BWA', 'IWH', 'IWD', 'IWA', 'LBH', 'LBD', 'LBA', 'WHH', 'WHD',
       'WHA', 'VCH', 'VCD', 'VCA', 'name'],
      dtype='object')
```

Entrée [30]:

```
team.head(3)
```

Out[30]:

	id	team_api_id	team_fifa_api_id	team_long_name	team_short_name
0	1	9987	673.0	KRC Genk	GEN
1	2	9993	675.0	Beerschot AC	BAC
2	3	10000	15005.0	SV Zulte-Waregem	ZUL

Entrée [31]:

```
team.rename(columns={'team_api_id':'home_team_api_id'}, inplace=True)

match = match.merge(team, how='inner', on= 'home_team_api_id' )

match.drop(['id', 'team_fifa_api_id', 'team_fifa_api_id', 'team_short_name'], axis=1,inplace=True)

match.head(1)
```

Out[31]:

	season	stage	home_team_api_id	away_team_api_id	home_team_goal	away_team_goal	B365H	B365D	B365A
0	2008/2009	1	9987	9993	1	1	1.73	3.4	5.0

1 rows × 26 columns

Entrée [32]:

```
team.rename(columns={'home_team_api_id':'away_team_api_id'}, inplace=True)

match = match.merge(team, how='inner', on= 'away_team_api_id' )

match.drop(['id', 'team_fifa_api_id', 'team_fifa_api_id', 'team_short_name'], axis=1,inplace=True)

match.head(1)
```

Out[32]:

	season	stage	home_team_api_id	away_team_api_id	home_team_goal	away_team_goal	B365H	B365D	B365A
0	2008/2009	1	9987	9993	1	1	1.73	3.4	5.0

1 rows × 27 columns

Entrée [33]:

```
match.drop([ 'home_team_api_id', 'away_team_api_id'], axis=1,inplace=True)
```

It's done! Now we will just keeep one bet predict and remove all others

Entrée [34]:

```
match.columns
```

Out[34]:

```
Index(['season', 'stage', 'home_team_goal', 'away_team_goal', 'B365H', 'B365D',
       'B365A', 'BWH', 'BWD', 'BWA', 'IWH', 'IWD', 'IWA', 'LBH', 'LBD', 'LBA',
       'WHH', 'WHD', 'WHA', 'VCH', 'VCD', 'VCA', 'name', 'team_long_name_x',
       'team_long_name_y'],
      dtype='object')
```

Entrée [35]:

```
match.drop([ 'B365H', 'B365D','B365A','IWH', 'IWD', 'IWA', 'LBH','LBD', 'LBA', 'WHH', 'WHD', 'WHA', 'VCH', 'VCD', 'VCA'],
axis=1,inplace=True)
```

Entrée [36]:

```
match.head(1)
```

Out[36]:

	season	stage	home_team_goal	away_team_goal	BWH	BWD	BWA	name	team_long_name_x	team_long_nar
0	2008/2009	1	1	1	1.75	3.35	4.2	Belgium Jupiler League	KRC Genk	Beerschot AC

Going from 115 to 10 columns

Entrée [37]:

```
match.columns
```

Out[37]:

```
Index(['season', 'stage', 'home_team_goal', 'away_team_goal', 'BWH', 'BWD',
       'BWA', 'name', 'team_long_name_x', 'team_long_name_y'],
      dtype='object')
```

Entrée [38]:

```
match.rename(columns = {'stage':'journey', 'home_team_goal':'HTG', 'away_team_goal':'ATG','name':'league',
'team_long_name_x':'home_team', 'team_long_name_y':'away_team'},inplace=True)
```

Entrée [39]:

```
match.head(1)
```

Out[39]:

	season	journey	HTG	ATG	BWH	BWD	BWA	league	home_team	away_team
0	2008/2009	1	1	1	1.75	3.35	4.2	Belgium Jupiler League	KRC Genk	Beerschot AC

Entrée [40]:

```
match = match.reindex(columns=['season','journey','league','home_team','away_team','HTG','ATG', 'BWH', 'BWD', 'BWA'])
```

Entrée [41]:

```
match.head(5)
```

Out[41]:

	season	journey	league	home_team	away_team	HTG	ATG	BWH	BWD	BWA
0	2008/2009	1	Belgium Jupiler League	KRC Genk	Beerschot AC	1	1	1.75	3.35	4.20
1	2009/2010	5	Belgium Jupiler League	KRC Genk	Beerschot AC	1	1	1.80	3.40	3.95
2	2010/2011	1	Belgium Jupiler League	KRC Genk	Beerschot AC	2	1	1.91	3.30	3.70
3	2011/2012	1	Belgium Jupiler League	KRC Genk	Beerschot AC	3	1	1.45	3.95	6.25
4	2012/2013	11	Belgium Jupiler League	KRC Genk	Beerschot AC	3	0	1.50	4.00	5.50

Now that our dataset is ready. We can answer to questions

`How many games do you play in a season?`

Entrée [42]:

```
match.season.unique()
```

Out[42]:

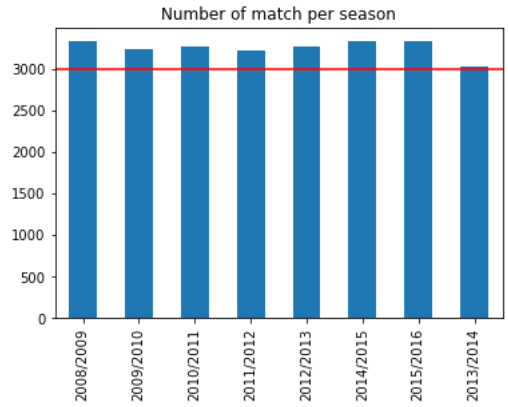
```
array(['2008/2009', '2009/2010', '2010/2011', '2011/2012', '2012/2013',
       '2014/2015', '2015/2016', '2013/2014'], dtype=object)
```

Entrée [43]:

```
plt.figure()

match.season.value_counts(sort=False).plot(kind='bar')

plt.title('Number of match per season')

plt.axhline(y=3000, color='r', linestyle='-')
```

Out[43]:

```
<matplotlib.lines.Line2D at 0x2426359b8e0>
```



It is noted that each season, at least 3000 matches have been played since 2008. Our red line on 3000 is touch by each bar

---

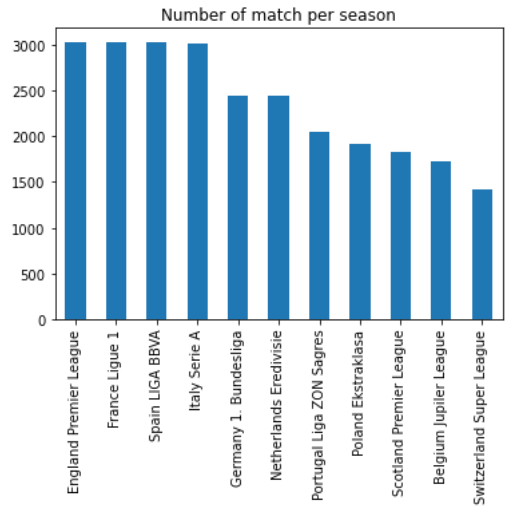
Which league plays the most matches and which plays the least?

Entrée [44]:

```
plt.figure()

match.league.value_counts(sort=True).plot(kind='bar')

plt.title('Number of match per season')
```

Out[44]:

```
Text(0.5, 1.0, 'Number of match per season')
```



The championship where we play the most is the English championship and the one where we play the least is the Swiss championship

---

Of the home and away teams, who scores the most on average?

Entrée [45]:

```
match.HTG.describe()
```

Out[45]:

```
count    25979.000000
mean         1.544594
std          1.297158
min          0.000000
25%          1.000000
50%          1.000000
75%          2.000000
max         10.000000
Name: HTG, dtype: float64
```

Entrée [46]:

```
match.ATG.describe()
```

Out[46]:

```
count    25979.000000
mean         1.160938
std          1.142110
min          0.000000
25%          0.000000
50%          1.000000
75%          2.000000
max          9.000000
Name: ATG, dtype: float64
```

Home teams tend to score more goals than away teams. They mean is 1.54 and for away team 1.16

In what direction do the predictions of bookmakers in general go?

Entrée [47]:

```
BET = pd.DataFrame([match.BWH.mean(),match.BWA.mean(),match.BWD.mean()], columns=['value'], index= ['Home Team Win','Away Team Win','Draw'])

BET.head()
```

Out[47]:

	value
Home Team Win	2.559245
Away Team Win	4.396949
Draw	3.747597

Among bookmakers the tendency is much more to designate the winning home team or to predict a draw. The mean of value of winning team win bet is the smaller in our tab. In betting, smaller value have de best probability to outcome.

Which teams have played every game since recording started in england?

Entrée [48]:

```
england_league = match.query('league=="England Premier League"')

england_league.head(3)
```

Out[48]:

	season	journey	league	home_team	away_team	HTG	ATG	BWH	BWD	BWA
1728	2008/2009	1	England Premier League	Manchester United	Newcastle United	1	1	1.30	4.75	8.25
1729	2010/2011	1	England Premier League	Manchester United	Newcastle United	3	0	1.22	5.50	12.50
1730	2011/2012	13	England Premier League	Manchester United	Newcastle United	1	1	1.37	4.60	8.25

Entrée [49]:

```
england_league_team = england_league.home_team.append(england_league.away_team)
```

Entrée [50]:

```
max = len(england_league.season.unique())*38

print(max)
```

```
304
```

Entrée [51]:

```
england_league_team.value_counts().head(11)
```

Out[51]:

```
Manchester United       304
Liverpool               304
Sunderland              304
Arsenal                 304
Aston Villa             304
Everton                 304
Manchester City         304
Tottenham Hotspur       304
Chelsea                 304
Stoke City              304
West Bromwich Albion    266
dtype: int64
```

The teams having played all the matches since the beginning of the recording are : Manchester United, Liverpool, Sunderland, Arsenal, Aston Villa, Everton, Manchester City, Tottenham Hotspur, Chelsea, Stoke City. For 304 possible matches.

`Which team has scored the most goals?`

Entrée [52]:

```
match.query('home_team== "Manchester United"').HTG.sum()+match.query('away_team== "Manchester United"').ATG.sum()
```

Out[52]:

```
582
```

Entrée [53]:

```
match.query('home_team== "Liverpool"').HTG.sum()+match.query('away_team== "Liverpool"').ATG.sum()
```

Out[53]:

```
531
```

Entrée [54]:

```
match.query('home_team== "Arsenal"').HTG.sum()+match.query('away_team== "Arsenal"').ATG.sum()
```

Out[54]:

```
573
```

Entrée [55]:

```
match.query('home_team== "Manchester City"').HTG.sum()+match.query('away_team== "Manchester City"').ATG.sum()
```

Out[55]:

```
606
```

Entrée [56]:

```
match.query('home_team== "Chelsea"').HTG.sum()+match.query('away_team== "Chelsea"').ATG.sum()
```

Out[56]:

```
583
```

Manchester City is the team that has scored the most goals over the period. The sum off they home and away goals is more than the oders

---

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EDA Player Dataset

📌 **Observations in Dataset:**

- *There are total of **7 columns** and **11060 rows** in the dataset.*
- *Dataset contains **77420 observations** with **0 missing values**.*

Entrée [57]:

```
player.head()
```

Out[57]:

	id	player_api_id	player_name	player_fifa_api_id	birthday	height	weight
0	1	505942	Aaron Appindangoye	218353	1992-02-29 00:00:00	182.88	187
1	2	155782	Aaron Cresswell	189615	1989-12-15 00:00:00	170.18	146

	id	player_api_id	player_name	player_fifa_api_id	birthday	height	weight
2	3	162549	Aaron Doran	186170	1991-05-13 00:00:00	170.18	163
3	4	30572	Aaron Galindo	140161	1982-05-08 00:00:00	182.88	198
4	5	23780	Aaron Hughes	17725	1979-11-08 00:00:00	182.88	154

Entrée [58]:

```
dataset_info(player)
```

```
Number of rows in the dataset: 11060
Number of columns in the dataseta: 7
Number of values in the dataset: 77420
Number missing values in the dataset: 0
```

What are the physical characteristics recommended to be a footballer?

Here, we will observe the distribution of physical caracteristics of the player and determine the best range that specify the common characteristics

Entrée [59]:

```
player.height.describe()
```

Out[59]:

```
count    11060.000000
mean       181.867445
std          6.369201
min        157.480000
25%        177.800000
50%        182.880000
75%        185.420000
max        208.280000
Name: height, dtype: float64
```

Entrée [60]:

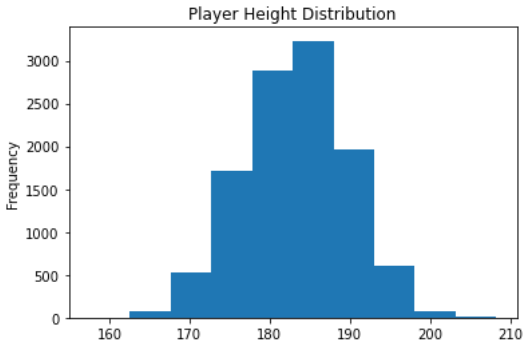
```
plt.figure()

player.height.plot(kind='hist')

plt.title('Player Height Distribution')
```

Out[60]:

```
Text(0.5, 1.0, 'Player Height Distribution')
```



The distribution is skewed to the left with most values falling between 177 and 185. It is recommended that a player have a height located within this set.

Entrée [61]:

```
player.weight.describe()
```

Out[61]:

```
count    11060.000000
mean       168.380289
std         14.990217
min        117.000000
25%        159.000000
50%        168.000000
75%        179.000000
max        243.000000
Name: weight, dtype: float64
```

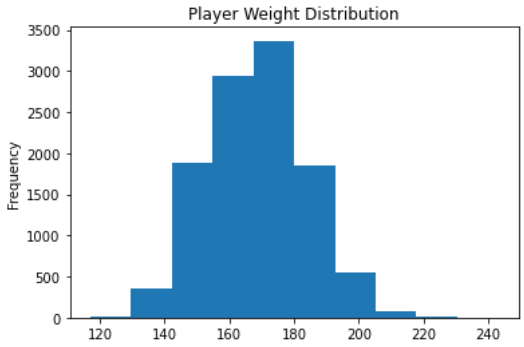
Entrée [62]:

```
player.weight.plot(kind='hist')

plt.title('Player Weight Distribution')
```

Out[62]:

```
Text(0.5, 1.0, 'Player Weight Distribution')
```



The distribution is skewed to the right with most values falling between 159 and 179. It is recommended that a player have a weight located within this set.

So,The physical characteristics recommended to be a footballer are :

Height : [177 - 185] and Weight : [159 - 179]

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EDA Player Attributes Dataset

📌 **Observations in Dataset:**

- *There are total of **42 columns** and **183978 rows** in the dataset.*
- *Dataset contains **7679775 observations** with **47301 missing values**.*

Entrée [63]:

```
player_attributes.head(3)
```

Out[63]:

	id	player_fifa_api_id	player_api_id	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive
0	1	218353	505942	2016-02-18 00:00:00	67.0	71.0	right	medium	medium
1	2	218353	505942	2015-11-19 00:00:00	67.0	71.0	right	medium	medium
2	3	218353	505942	2015-09-21 00:00:00	62.0	66.0	right	medium	medium

3 rows × 42 columns

Entrée [64]:

```
dataset_info(player_attributes)

Number of rows in the dataset: 183978
Number of columns in the dataseta: 42
Number of values in the dataset: 7679775
Number missing values in the dataset: 47301
```

To have players name we have to merge Player Dataset with Player Attributes

Entrée [65]:

```
player.head(3)
```

Out[65]:

	id	player_api_id	player_name	player_fifa_api_id	birthday	height	weight
0	1	505942	Aaron Appindangoye	218353	1992-02-29 00:00:00	182.88	187
1	2	155782	Aaron Cresswell	189615	1989-12-15 00:00:00	170.18	146
2	3	162549	Aaron Doran	186170	1991-05-13 00:00:00	170.18	163

Entrée [66]:

```
player.columns
```

Out[66]:

```
Index(['id', 'player_api_id', 'player_name', 'player_fifa_api_id', 'birthday',
       'height', 'weight'],
      dtype='object')
```

Entrée [67]:

```
player_attributes = player_attributes.merge(player,how='inner', on='player_api_id')

player_attributes.drop(['player_api_id', 'birthday','height', 'weight','id_y','player_fifa_api_id_y'],axis=1,inplace=True)

player_attributes.head(3)
```

Out[67]:

	id_x	player_fifa_api_id_x	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_rate
0	1	218353	2016-02-18 00:00:00	67.0	71.0	right	medium	medium
1	2	218353	2015-11-19 00:00:00	67.0	71.0	right	medium	medium
2	3	218353	2015-09-21 00:00:00	62.0	66.0	right	medium	medium

3 rows × 42 columns

Entrée [68]:

```
player_attributes.columns
```

Out[68]:

```
Index(['id_x', 'player_fifa_api_id_x', 'date', 'overall_rating', 'potential',
       'preferred_foot', 'attacking_work_rate', 'defensive_work_rate',
       'crossing', 'finishing', 'heading_accuracy', 'short_passing', 'volleys',
       'dribbling', 'curve', 'free_kick_accuracy', 'long_passing',
       'ball_control', 'acceleration', 'sprint_speed', 'agility', 'reactions',
       'balance', 'shot_power', 'jumping', 'stamina', 'strength', 'long_shots',
       'aggression', 'interceptions', 'positioning', 'vision', 'penalties',
       'marking', 'standing_tackle', 'sliding_tackle', 'gk_diving',
       'gk_handling', 'gk_kicking', 'gk_positioning', 'gk_reflexes',
       'player_name'],
      dtype='object')
```

Entrée [69]:

```
player_attributes = player_attributes[['id_x', 'player_fifa_api_id_x', 'player_name','date', 'overall_rating',
'potential','preferred_foot', 'attacking_work_rate', 'defensive_work_rate','crossing', 'finishing', 'heading_accuracy',
'short_passing', 'volleys','dribbling', 'curve', 'free_kick_accuracy', 'long_passing','ball_control', 'acceleration',
'sprint_speed', 'agility', 'reactions','balance', 'shot_power', 'jumping', 'stamina', 'strength', 'long_shots','aggression',
'interceptions', 'positioning', 'vision', 'penalties','marking', 'standing_tackle', 'sliding_tackle',
'gk_diving','gk_handling', 'gk_kicking', 'gk_positioning', 'gk_reflexes']]

player_attributes.head(2)
```

Out[69]:

	id_x	player_fifa_api_id_x	player_name	date	overall_rating	potential	preferred_foot	attacking_work_rate	defer
0	1	218353	Aaron Appindangoye	2016-02-18 00:00:00	67.0	71.0	right	medium	mediu
1	2	218353	Aaron Appindangoye	2015-11-19 00:00:00	67.0	71.0	right	medium	mediu

2 rows × 42 columns

Entrée [70]:

```
player_attributes.columns
```

Out[70]:

```
Index(['id_x', 'player_fifa_api_id_x', 'player_name', 'date', 'overall_rating',
       'potential', 'preferred_foot', 'attacking_work_rate',
       'defensive_work_rate', 'crossing', 'finishing', 'heading_accuracy',
       'short_passing', 'volleys', 'dribbling', 'curve', 'free_kick_accuracy',
       'long_passing', 'ball_control', 'acceleration', 'sprint_speed',
       'agility', 'reactions', 'balance', 'shot_power', 'jumping', 'stamina',
       'strength', 'long_shots', 'aggression', 'interceptions', 'positioning',
       'vision', 'penalties', 'marking', 'standing_tackle', 'sliding_tackle',
       'gk_diving', 'gk_handling', 'gk_kicking', 'gk_positioning',
       'gk_reflexes'],
      dtype='object')
```

Entrée [71]:

```
player_attributes.drop(['id_x','player_fifa_api_id_x'],axis=1, inplace=True)
```

For have the last player attributes we have to retrieve the years from the date. And create a database that only have the last year attributes

Entrée [72]:

```
player_attributes.date = player_attributes.date.str[:4]
```

Entrée [73]:

```
player_attributes.head(2)
```

Out[73]:

	player_name	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_rate	crossing	finis
0	Aaron Appindangoye	2016	67.0	71.0	right	medium	medium	49.0	44.(
1	Aaron Appindangoye	2015	67.0	71.0	right	medium	medium	49.0	44.(

2 rows × 40 columns

Entrée [74]:

```
player_attributes_2016 = player_attributes.query('date=="2016"')

player_attributes_2016.head()
```

Out[74]:

	player_name	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_rate	crossing	fin
0	Aaron Appindangoye	2016	67.0	71.0	right	medium	medium	49.0	44
5	Aaron Cresswell	2016	74.0	76.0	left	high	medium	80.0	53
6	Aaron Cresswell	2016	74.0	76.0	left	high	medium	80.0	53
7	Aaron Cresswell	2016	73.0	75.0	left	high	medium	79.0	52
38	Aaron Doran	2016	65.0	67.0	right	medium	medium	64.0	58

5 rows × 40 columns

Who is the best player right now in the database?

Entrée [75]:

```
player_attributes_2016.query('overall_rating==overall_rating.max()')
```

Out[75]:

	player_name	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_rate	crossing
109033	Manuel Neuer	2016	90.0	90.0	right	medium	medium	15.0
109034	Manuel Neuer	2016	90.0	90.0	right	medium	medium	15.0
109035	Manuel Neuer	2016	90.0	90.0	right	medium	medium	15.0
131464	Neymar	2016	90.0	94.0	right	high	medium	72.0
131465	Neymar	2016	90.0	94.0	right	high	medium	72.0

5 rows × 40 columns

In our dataset, the best players are Neuer and Neymar

Who is the best potential right now in the database?

Entrée [76]:

```
player_attributes_2016.query('potential==potential.max()')
```

Out[76]:

	player_name	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_rate	crossing
131464	Neymar	2016	90.0	94.0	right	high	medium	72.0
131465	Neymar	2016	90.0	94.0	right	high	medium	72.0

2 rows × 40 columns

In our dataset, the best potential is Neymar

A club wants to recruit an attacking player who is also involved in defensive play and who has a very good level. who would you advise?

Entrée [77]:

```
player_attributes_2016.query('attacking_work_rate=="high" &defensive_work_rate=="high" & overall_rating >85 ')
```

Out[77]:

	player_name	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_rate	crossin
8485	Alexis Sanchez	2016	86.0	87.0	right	high	high	77.0
8486	Alexis Sanchez	2016	86.0	87.0	right	high	high	77.0
8487	Alexis Sanchez	2016	86.0	87.0	right	high	high	77.0
8488	Alexis Sanchez	2016	86.0	87.0	right	high	high	77.0
19614	Bastian Schweinsteiger	2016	86.0	86.0	right	high	high	79.0
26301	Carlos Tevez	2016	86.0	86.0	right	high	high	73.0
170797	Thomas Mueller	2016	86.0	88.0	right	high	high	79.0

	player_name	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_rate	crossin
170798	Thomas Mueller	2016	86.0	88.0	right	high	high	79.0
170799	Thomas Mueller	2016	86.0	88.0	right	high	high	79.0

9 rows × 40 columns

The players who best match the request are : Alexis Sanchez, Bastian Schweinsteiger, Calos Tevez, Thomas Mueller. They have high attacking and defending work and they overall rating is more than 85

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EDA Team attributes Dataset

📌 **Observations in Dataset:**

- *There are total of **40 columns** and **183978 rows** in the dataset.*
- *Dataset contains **7311819 observations** with **47301 missing values**.*

Entrée [78]:

```
team_attributes.head(3)
```

Out[78]:

	id	team_fifa_api_id	team_api_id	date	buildUpPlaySpeed	buildUpPlaySpeedClass	buildUpPlayDribbling	buildUp
0	1	434	9930	2010-02-22 00:00:00	60	Balanced	NaN	Little
1	2	434	9930	2014-09-19 00:00:00	52	Balanced	48.0	Normal
2	3	434	9930	2015-09-10 00:00:00	47	Balanced	41.0	Normal

3 rows × 25 columns

Entrée [79]:

```
dataset_info(team_attributes)
```

```
Number of rows in the dataset: 1458
Number of columns in the dataseta: 25
Number of values in the dataset: 35481
Number missing values in the dataset: 969
```

We have to merge Team dataset with Team Attributes dataset for have the team name next to they attibutes

Entrée [80]:

```
team_attributes.columns
```

Out[80]:

```
Index(['id', 'team_fifa_api_id', 'team_api_id', 'date', 'buildUpPlaySpeed',
       'buildUpPlaySpeedClass', 'buildUpPlayDribbling',
       'buildUpPlayDribblingClass', 'buildUpPlayPassing',
       'buildUpPlayPassingClass', 'buildUpPlayPositioningClass',
       'chanceCreationPassing', 'chanceCreationPassingClass',
       'chanceCreationCrossing', 'chanceCreationCrossingClass',
       'chanceCreationShooting', 'chanceCreationShootingClass',
       'chanceCreationPositioningClass', 'defencePressure',
       'defencePressureClass', 'defenceAggression', 'defenceAggressionClass',
       'defenceTeamWidth', 'defenceTeamWidthClass',
       'defenceDefenderLineClass'],
      dtype='object')
```

Entrée [81]:

```
team.columns
```

Out[81]:

```
Index(['id', 'away_team_api_id', 'team_fifa_api_id', 'team_long_name',
       'team_short_name'],
      dtype='object')
```

Entrée [82]:

```
team_attributes = team_attributes.merge(team,how='inner', on='team_fifa_api_id')

team_attributes.drop(['id_y', 'away_team_api_id',
'team_short_name','id_x','team_fifa_api_id','team_api_id'],axis=1,inplace=True)

team_attributes.head(5)
```

Out[82]:

	date	buildUpPlaySpeed	buildUpPlaySpeedClass	buildUpPlayDribbling	buildUpPlayDribblingClass	buildUpPlayPas
0	2010-02-22 00:00:00	60	Balanced	NaN	Little	50
1	2014-09-19 00:00:00	52	Balanced	48.0	Normal	56
2	2015-09-10 00:00:00	47	Balanced	41.0	Normal	54
3	2010-02-22 00:00:00	70	Fast	NaN	Little	70
4	2011-02-22 00:00:00	47	Balanced	NaN	Little	52

5 rows × 23 columns

Entrée [83]:

```
team_attributes.columns
```

Out[83]:

```
Index(['date', 'buildUpPlaySpeed', 'buildUpPlaySpeedClass',
       'buildUpPlayDribbling', 'buildUpPlayDribblingClass',
       'buildUpPlayPassing', 'buildUpPlayPassingClass',
       'buildUpPlayPositioningClass', 'chanceCreationPassing',
       'chanceCreationPassingClass', 'chanceCreationCrossing',
       'chanceCreationCrossingClass', 'chanceCreationShooting',
       'chanceCreationShootingClass', 'chanceCreationPositioningClass',
       'defencePressure', 'defencePressureClass', 'defenceAggression',
       'defenceAggressionClass', 'defenceTeamWidth', 'defenceTeamWidthClass',
       'defenceDefenderLineClass', 'team_long_name'],
      dtype='object')
```

Entrée [84]:

```
team_attributes = team_attributes[['team_long_name','date', 'buildUpPlaySpeed', 'buildUpPlaySpeedClass','buildUpPlayDribbling',
'buildUpPlayDribblingClass','buildUpPlayPassing', 'buildUpPlayPassingClass','buildUpPlayPositioningClass',
'chanceCreationPassing','chanceCreationPassingClass', 'chanceCreationCrossing','chanceCreationCrossingClass',
'chanceCreationShooting','chanceCreationShootingClass', 'chanceCreationPositioningClass','defencePressure',
'defencePressureClass', 'defenceAggression','defenceAggressionClass', 'defenceTeamWidth',
'defenceTeamWidthClass','defenceDefenderLineClass', ]]
```

Entrée [85]:

```
team_attributes.date = team_attributes.date.str[:4]
```

Entrée [86]:

```
team_attributes.date.unique()
```

Out[86]:

```
array(['2010', '2014', '2015', '2011', '2012', '2013'], dtype=object)
```

Entrée [87]:

```
team_attributes_2015 = team_attributes.query('date=="2015"')

team_attributes_2015.head()
```

Out[87]:

	team_long_name	date	buildUpPlaySpeed	buildUpPlaySpeedClass	buildUpPlayDribbling	buildUpPlayDribblingClass
2	FC Aarau	2015	47	Balanced	41.0	Normal
8	Aberdeen	2015	59	Balanced	64.0	Normal
14	AC Ajaccio	2015	59	Balanced	57.0	Normal
20	Milan	2015	48	Balanced	70.0	Lots
26	Académica de Coimbra	2015	53	Balanced	53.0	Normal

5 rows × 23 columns

Entrée [88]:

```
team_attributes_2015.drop(['buildUpPlaySpeedClass','buildUpPlayDribblingClass',
'buildUpPlayPassingClass','buildUpPlayPositioningClass','chanceCreationPassingClass', 'chanceCreationCrossingClass',
'chanceCreationShootingClass', 'chanceCreationPositioningClass','defencePressureClass', 'defenceAggressionClass',
'defenceTeamWidthClass','defenceDefenderLineClass', ],axis=1,inplace=True)
```

Entrée [89]:

```
team_attributes_2015.head(5)
```

Out[89]:

	team_long_name	date	buildUpPlaySpeed	buildUpPlayDribbling	buildUpPlayPassing	chanceCreationPassing	chanc
2	FC Aarau	2015	47	41.0	54	54	63
8	Aberdeen	2015	59	64.0	53	51	72
14	AC Ajaccio	2015	59	57.0	52	48	38
20	Milan	2015	48	70.0	52	66	36
26	Académica de Coimbra	2015	53	53.0	44	55	51

Entrée [90]:

```
team_attributes_2015.buildUpPlayPassing.isnull().sum()
```

Out[90]:

```
0
```

Entrée [91]:

```
team_attributes_2015.chanceCreationPassing.isnull().sum()
```

Out[91]:

```
0
```

Entrée [92]:

```
team_attributes_2015['generalPassing'] =
team_attributes_2015['chanceCreationPassing']+team_attributes_2015['chanceCreationPassing']

team_attributes_2015['generalPassing'] = team_attributes_2015['generalPassing']/2
```

Entrée [93]:

```
team_attributes_2015.head(5)
```

Out[93]:

	team_long_name	date	buildUpPlaySpeed	buildUpPlayDribbling	buildUpPlayPassing	chanceCreationPassing	chanc
2	FC Aarau	2015	47	41.0	54	54	63
8	Aberdeen	2015	59	64.0	53	51	72
14	AC Ajaccio	2015	59	57.0	52	48	38
20	Milan	2015	48	70.0	52	66	36
26	Académica de Coimbra	2015	53	53.0	44	55	51

`A player wants to play in the club that has the best passing game, which club would you recommend?`

Entrée [94]:

```
team_attributes_2015.query('generalPassing==generalPassing.max()')
```

Out[94]:

	team_long_name	date	buildUpPlaySpeed	buildUpPlayDribbling	buildUpPlayPassing	chanceCreationPassing	chan
141	Bayer 04 Leverkusen	2015	73	29.0	55	77	54
171	Birmingham City	2015	56	32.0	75	77	62

I would advise him to sign for Bayer Leverkusen or Birmigham

Entrée [95]:

```
con.close()
```

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Conclusion

`How many games do you play in a season?`

It is noted that each season, at least 3000 matches have been played since 2008.

`Which league plays the most matches and which plays the least?`

The championship where we play the most is the English championship and the one where we play the least is the Swiss championship

`Of the home and away teams, who scores the most on average?`

Home teams tend to score more goals than away teams

`In what direction do the predictions of bookmakers in general go?`

Among bookmakers the tendency is much more to designate the winning home team or to predict a draw

`Which teams have played every game since recording started in england?`

The teams having played all the matches since the beginning of the recording are : Manchester United, Liverpool, Sunderland, Arsenal, Aston Villa, Everton, Manchester City, Tottenham Hotspur, Chelsea, Stoke City

`Which team has scored the most goals?`

Manchester City is the team that has scored the most goals over the period

`What are the physical characteristics recommended to be a footballer?`

The physical characteristics recommended to be a footballer are ---->

Height : [177 - 185], Weight : [159 - 179]

`Who is the best player right now in the database?`

In our dataset, the best players are Neuer and Neymar

`Who is the best potential right now in the database?`

In our dataset, the best potential is Neymar

`A club wants to recruit an attacking player who is also involved in defensive play and who has a very good level. who would you advise?`

The players who best match the request are : Alexis Sanchez, Bastian Schweinsteiger, Calos Tevez, Thomas Mueller

---

```
A player wants to play in the club that has the best passing game, which club would you recommend?
```

I would advise him to sign for Bayer Leverkusen or Birmigham

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Limitation

The limits encountered during operation are:

There are a lot of columns in tables, for example Match table has 115 columns most of which don't have a proper explanation of what it is.

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Entrée [ ]: